

Comments on the
U.S. Environmental Protection Agency's
Proposed

National Ambient Air Quality Standard for Ozone

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The Regulatory Analysis Program offers the following conclusions and recommendations regarding EPA's proposed revision to the ozone National Ambient Air Quality Standard (NAAQS) and the accompanying Regulatory Impact Analysis (RIA).

A. The proposal will not improve public health and welfare.

EPA interprets the Clean Air Act to prohibit the consideration of costs in setting NAAQS. Even if one were to accept EPA's interpretation of its statute, EPA appears to have ignored important public health and welfare considerations.

There is little scientific basis for the selection of the standard, and the health and welfare benefits attributed to the proposal are small and highly uncertain. Moreover, EPA has chosen not to consider important risk information relevant to public health and welfare, arguing that the statute only allows it to consider the *negative* impacts of chemicals, not their *positive* impacts.

As a result, EPA's proposal may *harm* public health and welfare, regardless of cost. For example, the potential for a change in the ozone standard to increase people's exposure to ultraviolet radiation raises serious questions about the net health and welfare effects of this proposal. Taking into consideration the beneficial screening effects of ozone on ultraviolet radiation, we estimate that the impact of attaining the proposed standard would be to *increase health risks by over \$280 million per year*. This is particularly disturbing in light of the enormous costs full attainment of this rule would impose on every aspect of our lives.

When the costs of the proposal are considered, the negative impact on public health is even more dramatic. If, as recent studies suggest, poverty is a more important risk factor for asthma than air quality, the rule may well increase the very disease it is purportedly targeted at improving. Moreover, studies linking income and mortality suggest that the cost of this proposal would, by lowering incomes alone, result in an increase in 4,250 to 5,667 deaths per year.

EPA has a responsibility for setting NAAQS that protect public health and welfare. To fulfill that responsibility it cannot ignore important health and welfare effects which can be readily, and reliably, quantified.

B. EPA's regulatory impact analysis does not provide an adequate basis for making a sound policy judgment.

According to EPA's own RIA, the costs of the proposal will exceed the benefits. Furthermore, questionable assumptions and serious omissions in the RIA lead to an understatement of costs. EPA admits that "aggregate total costs underestimate the true cost of each alternative to such an extent that the metric's reliability must be limited." EPA estimates the cost of only partially complying with the current and proposed standards. EPA does not include the costs of regional controls in its estimates of either the current or proposed ozone NAAQS. EPA also assumes that areas that can achieve ozone concentrations that are only 64 percent of the standard will incur no costs. As a result of these deficiencies, our analysis suggests that EPA's cost estimates reflect less than 5 percent of the true full costs of attainment.

Modeling, exposure, and valuation constraints make EPA's benefit estimates very uncertain. CASAC observed that due to the compounded uncertainties in the approach to estimating welfare effects, "small differences in benefits may have no significance..." EPA places its best (i.e., most likely) estimate of the incremental health benefits of the proposed standard is at the low end of its range, between \$11 million and \$108 million.

According to EPA, more than 98 percent of its total estimated health benefits come from reduced mortality, not the other health benefits EPA relies on to support its proposal. However, this estimate of reduced fatalities is based on a single study that was not discussed in the criteria document or staff paper, and thus not reviewed by EPA's science advisory committee (CASAC).

C. The costs of the proposed standard are strikingly high.

Even after imposition of all feasible control measures, EPA anticipates a large degree of nonattainment. Without any change in the current NAAQS, EPA estimates that between 39 million and 57 million people will live in non-attainment areas for the foreseeable future. EPA expects an additional 14 million to 32 million people would live in non-attainment areas under the proposed revised standard.

EPA estimates that partial attainment of the standard will cost billions of dollars each year and impose *costs in excess of benefits* on Americans of between \$1.1 billion and \$6.2 billion each year. These net costs are over and above EPA's estimates of the annual net costs of partially complying with the existing standard, which are also considerable—EPA estimates the costs of partially

meeting the current standard will exceed benefits by between \$400 million and \$2.2 billion per year.

The full costs of meeting this standard would be orders of magnitude higher than EPA's estimated costs of partial attainment. Our analysis suggests that the full cost of attaining the current standard will be between \$22 billion and \$53 billion per year. We estimate that the proposed standards will impose additional costs in the range of \$54 billion to \$328 billion per year (1990 dollars).

D. Recommendations

Based on our review and analysis of EPA's proposal, we offer the following recommendations.

- 1. EPA should not proceed with promulgation of the proposed standard.**

In light of EPA's science panel's conclusion that the proposed standard (level and number of exceedances) is not significantly more protective of public health than the alternatives examined, and the very real concern that implementation of this rule will actually harm public health and welfare, EPA should not proceed with its promulgation.

There may be adequate basis for changing the *averaging time* and *form* of the standard. However, as EPA's own analysis suggests that the current *level* of the standard already imposes social costs (both in terms of health and welfare) that exceed its benefits, EPA should not select a level and number of exceedances that is more stringent than the current standard.

- 2. More effective alternatives are available for addressing the potential ill effects of ozone.**

Non-regulatory approaches are available to achieve the public health benefits targeted by this rule. As CASAC recommended in its November 30, 1995 closure letter on the primary standard, public health advisories and other targeted approaches may be an effective alternative to standard setting.

Because there is no apparent threshold for responses and no "bright line" in the risk assessment, a number of panel members recommended that an expanded air pollution warning system be initiated so that sensitive individuals can take appropriate "exposure avoidance" behavior. Since many areas of the country already have an infrastructure in place to designate "ozone action

days" when voluntary emission reduction measures are put in place, this idea may be fairly easy to implement.

Furthermore, research and education are more likely to target what some public health experts regard as a more important factor behind the increasing incidence of asthma during a period in which ozone (and other pollutants) are declining—poverty and poor living conditions.

Ozone is a gas that occurs naturally in the earth's troposphere and stratosphere. It is also created when sunlight reacts with nitrogen oxides (NO_x), and volatile organic compounds (VOCs). Tropospheric (ground-level) ozone is the primary constituent of urban smog.

Ozone levels are heavily influenced from year to year by meteorological conditions. EPA observes that the lowest national mean level of ozone was recorded in 1992, and the highest in 1988. After adjusting for meteorological effects, however, the year to year trend shows a continued improvement in ozone concentrations of about one percent a year.¹

Ozone is associated with respiratory problems, particularly in sensitive individuals. It is also credited with reducing the harmful effects of ultraviolet rays. Because it "may reasonably be anticipated to endanger public health and welfare," ozone has been identified under the Clean Air Act as a "criteria pollutant." The U.S. Environmental Protection Agency (EPA) must periodically review and, as necessary, revise its National Ambient Air Quality Standards (NAAQS) for criteria pollutants.

The CAA charges EPA with setting NAAQS that protect public health and welfare. In these comments,² we examine whether EPA's December 1996 proposed revision to the ozone NAAQS meets this mandate.

The rest of our comments are organized as follows.

I. Section II

Review of EPA's Proposal

We review EPA's statutory obligations, its interpretation of those obligations, and the factors EPA relied on in making its policy judgment regarding the appropriate standard to protect public health and welfare. This review suggests that because EPA bases its policy judgment on a narrow set of criteria, the resulting rule is likely to result in public health and welfare outcomes contrary to EPA's expressed intent.

¹ U.S. EPA *National Air Quality and Emissions Trends Report, 1995*.

² These comments were prepared by Susan E. Dudley, Vice President and Director of Environmental Analysis at Economists Incorporated with support from the Regulatory Analysis Program at the Center for Study of Public Choice at George Mason University.

II. Section III Review of EPA's Regulatory Analysis

EPA's own regulatory analysis, summarized in the first part of this section, concludes that the costs of implementing the proposed standard will exceed the benefits. In the second part of this section, we identify major flaws in EPA's analysis and present revised estimates of the benefits and costs of the proposal based on our own analysis.

III. Appendix A Uncertainties in EPA's Analysis

Due to the considerable uncertainty in the science associated with both ozone modeling and the health and welfare effects of different ozone levels, EPA's analysis necessarily involves numerous assumptions. This appendix reviews key uncertainties and assumptions.

IV. Appendix B Ozone's Impact on Ultraviolet Radiation

Ozone in the troposphere, like ozone in the stratosphere, has the beneficial effect of screening ultraviolet radiation, which is known to have various health and welfare effects including melanoma and non-melanoma skin cancer, cataracts, and crop and fishery damage. This appendix presents our analysis of the harmful public health and welfare impact that would be caused by the reduction in tropospheric ozone if this rule is implemented.

V. Appendix C The Full Costs of Attainment

EPA's estimates reflect only the cost of partial attainment. In this appendix, we present our analysis of the full costs based (1) on assumptions EPA uses in its analysis, and (2) on our revisions to EPA's estimates.

VI. Appendix D Control Measures to Achieve Partial Attainment

This appendix reproduces EPA's Table C-1 from Appendix C of its Ozone NAAQS RIA. The table lists the control measures EPA expects to be used to achieve partial compliance with the current and proposed standards.

In this section we review the statutory basis for setting national ambient air quality standards (NAAQS), EPA's interpretation of its statutory obligations, and the criteria the agency considered in proposing to revise the ozone NAAQS. The following key conclusions emerge from this review.

Without scientific evidence that any of the analyzed alternatives is more protective of health and welfare than another, the selection of a standard reflects a policy judgment. EPA's Clean Air Scientific Advisory Committee (CASAC), a legislatively established body of independent experts that provides advice to EPA on scientific issues, agrees that the form and averaging period on which the current standard is based could be improved. However, CASAC concluded that "there is no 'bright line' which distinguishes any of the proposed standards (either the level or the number of allowable exceedances) as being significantly more protective of public health." Moreover, **the majority of members on the panel who expressed an opinion preferred a level of the standard that is less stringent than that proposed by EPA.** As ozone exhibits no threshold concentration level below which biological responses are not observed, EPA and its legal and scientific advisors agree that policy judgments must drive the selection of the standard. In other words, EPA must make a risk management decision.

By narrowly focusing its policy judgment, EPA's selection of the proposed level and form of the standard is likely to result in perverse and unintended public health and welfare outcomes. At best, EPA's own analysis suggests that the proposed standard will result in (1) very small changes in health status for a very small population of sensitive individuals, and (2) small reductions in crop damage. It is more likely that the proposal will actually harm public health and welfare. This is true even without considering the huge costs of the proposal, which clearly could be used in other ways to promote health and welfare more effectively.

The remainder of this section discusses these issues in greater depth. In section A we summarize the requirements of the Clean Air Act (CAA). In section B we summarize EPA's proposal. We examine and comment on EPA's decision regarding the primary standard in section C and the secondary standard in section D. We present our conclusions in section E.

A. Summary of Statutory Requirements

Sections 108 and 109 of the CAA require EPA to review periodically the air quality criteria and national ambient air quality standards (NAAQS) for criteria pollutants, including ozone (O₃). The CAA directs EPA to set both a primary standard (to protect the public health), and secondary standard (to protect public welfare).

The CAA defines a **primary standard** as one "the attainment and maintenance of which, in the judgment of the Administrator, based on such criteria and allowing an adequate margin of safety, are requisite to protect the public health."³

The Act states that a **secondary standard** must "specify a level of air quality the attainment and maintenance of which, in the judgment of the Administrator, based on [the] criteria, [are] requisite to protect the public welfare from any known or anticipated adverse effects associated with the presence of such air pollutant in the ambient air."⁴ Welfare effects include "effects on soils, water, crops, vegetation, manmade materials, animals, wildlife, weather, visibility and climate, damage to and deterioration of property, and hazards to transportation, as well as effects on economic values and on personal comfort and well-being."⁵

B. Summary of EPA's Proposal

EPA proposes changes in the primary and secondary NAAQS, as summarized below.

1. Primary Standard

EPA's November 1996 Federal Register notice (61 FR. 65716) proposes changes to the averaging period, level, and form of its primary (i.e., health based) ozone NAAQS that would:

- Base attainment of the standard on 8-hour, rather than 1-hour averages.
- Tighten the current "level" of the standard to 0.08 parts per million (ppm) averaged over eight hours from 0.12 ppm averaged over one hour.

³ CAA Section 109(b)(1) (42 U.S.C. 7409)

⁴ CAA Section 109(b)(2) (42 U.S.C. 7409)

⁵ CAA Section 302(h) (42 U.S.C. 7602(h))

- Change the test for attainment (which EPA refers to as the “form”) of the standard to a 3-year average of the third-highest ozone concentration (averaged over 8 hours). (The current test of attainment is whether a site exceeds the 1-hour standard on average no more than once per year, averaged over three years.)

Under the proposal, an area would be in attainment with the standard when the average of the third-highest daily ozone concentration⁶ over the last three years is less than or equal to 0.08 ppm. In addition to the proposed standard, EPA requests public comment on two alternative *levels* for the primary standard: a less stringent 0.09 ppm, and a more stringent 0.07 ppm.⁷ EPA also solicits comment on the appropriate concentration-based *form* (loosely referred to as the number of exceedances).

These comments focus primarily on EPA’s proposed change in the *level* of the standard. The rationale for the change in *averaging time* (that longer averages better reflect actual exposure to ozone) appears reasonable, and is supported by EPA’s science advisors. EPA’s rationale for changing the *form* of the standard (that the current form, which allows one exceedance per year, is unstable because areas flip-flop between attainment/nonattainment status) is also reasonable, though EPA’s choice of the third-highest maximum concentration is not supported by science.

2. Secondary Standard

EPA proposes to revise the secondary standard so that it will be identical to the proposed primary standard. (The current secondary standard is set identical to the existing 0.12 ppm 1-hour primary standard.) EPA requests comment on an alternative “seasonal standard expressed as a sum of hourly O₃ concentrations greater than or equal to 0.06 ppm, cumulated over 12 hours per day during the consecutive 3-month period of maximum concentrations during the O₃ monitoring season, set at a level of 25 ppm-hour.”⁸ This alternative form does not appear to be well-supported. Our comments on the secondary standard address both the *level* and the proposed alternative *form*.

The next two sections discuss the factors EPA’s considered in setting the primary and secondary standards, and the potential impact of these standards on public health and welfare.

⁶ These are daily maximum 8-hour average ozone concentrations.

⁷ EPA considers the current 0.12 ppm 1-hour standard equivalent to a 0.09 ppm 8-hour standard.

⁸ Preamble, I(A)

C. Evaluation of EPA's Decision Regarding the Primary Standard

In interpreting the statutory language regarding the primary or health-based standard, EPA recognizes:

The Act does not require the Administrator to establish a primary NAAQS at a zero-risk level but rather at a level that reduces risk sufficiently so as to protect public health with an adequate margin of safety.⁹

EPA's panel of science advisors, CASAC, emphasizes in its communications with EPA that no scientific basis exists for determining a threshold level that is protective of public health. Without a bright line, EPA admits that its selection of a level and number of allowed exceedances for the 8-hour standard is a **policy judgment**, as opposed to a purely scientific judgment, that must reflect an assessment of risk.

Yet, EPA constrains this policy judgment to a narrow range of considerations. "As interpreted by the Agency and the courts, this decision is a *health-based* decision that specifically is *not* to be based on cost or other economic considerations."¹⁰

This approach to interpreting EPA's responsibility for protecting public health prevents the agency from considering factors that would normally be considered important in any policy judgment. As discussed in Section III below, the estimated benefits and costs of this proposal raise serious questions about its effectiveness at protecting public health.

Even if one were to accept EPA's interpretation of what may be considered in setting the primary standard, EPA appears to have ignored important public health considerations. The scientific basis for the selection of the standard is far from definitive, and the health risk benefits attributed to the proposal are small and highly uncertain. Moreover, EPA has chosen not to consider important risk information relevant to public health. As a result, the proposed primary standard may well result in policy outcomes contrary to EPA's expressed intent.

⁹ Preamble, I(A)

¹⁰ RIA Executive Summary

1. The proposal lacks strong scientific support.

EPA bases the revised level of the standard on evidence that ozone-induced health effects may occur at levels lower than the current standard. Yet this evidence is weak, and the majority of EPA's science advisors preferred levels that are less stringent than that proposed by EPA.

a) Evidence of health effects is weak.

EPA bases its selection of the 0.08 standard on the following evidence of ozone-related effects:

- **Human clinical studies** show associations between exposure to ozone concentrations of 0.08 ppm over 6 to 8-hour periods and "lung function decrements, respiratory symptoms (e.g., cough, pain on deep inspiration), nonspecific bronchial responsiveness, and biochemical indicators of pulmonary inflammation."¹¹ EPA recognizes that the observed **clinical effects** are transient, reversible, and generally asymptomatic (i.e., do not present any symptoms of disease or discomfort). However, it concludes that "while group mean responses in clinical studies at the lowest exposure level tested of 0.08 ppm are typically small or mild in nature, responses of some extremely sensitive individuals are sufficiently severe and extended in duration to be considered adverse."
- **Epidemiological studies** suggest an association between high ozone concentrations and excess hospital admissions. EPA considers this epidemiological association to be a public health problem warranting a tighter standard, but it recognizes the effect of the proposal on respiratory hospital admissions will be very small (on the order two percent or less).¹²
- **Long-term laboratory animal studies** suggest changes in lung biochemistry and structure. However, these studies *do not show effects on lung function* as a result of those changes, even though the animals were exposed continuously over many months to much higher doses of ozone than would occur under

¹¹ Preamble, II(C)(2)

¹² EPA states "that the O₃-induced excess hospital admissions represent a relatively small fraction of the overall respiratory-related hospital admissions for asthmatics over the seven month O₃ season. Based on an estimated 15,000 admissions per year during the O₃ season, the reduction in hospital admissions for asthmatics for any respiratory-related reason in going from "as is" air quality to attaining a 0.08 ppm, 8-hour, 1-expected exceedance standard is about 2%. Similarly, the reduction from attaining the current 1-hour standard to attaining a 0.08 ppm, 8-hour, 1-expected exceedance standard represents about a 0.6% decrease in total respiratory admissions for asthmatics due to all causes." Preamble, II(B)(2)(b)

current standards. Moreover, EPA acknowledges that it is “unclear whether long-term exposures to ambient O₃ levels result in similar chronic health effects in humans.”¹³

b) The proposed level lacks support from scientific advisors.

To support its proposal, EPA focuses on the consensus reached by CASAC regarding the scientific basis for the proposed rule. The preamble to the proposal states:

“It was the consensus of the Panel that although our understanding of the health effects of ozone is far from complete, the document provides an adequate scientific basis for making regulatory decisions concerning a primary ozone standard.”

However, a review of CASAC closure documents reveals that the panel was more circumspect. **While the panel agreed that EPA had adequate bases for making a regulatory decision, it did not endorse the decision EPA made. In fact, most panel members who expressed an opinion on the level of the standard preferred one equivalent to the current standard.** CASAC also emphasized the uncertainties in the risk and exposure information on which the proposal is based, “because of the myriad of assumptions that are made to estimate population exposure and risk, large uncertainties exist in these estimates.”¹⁴

CASAC also highlighted the small differences in health protection between the current standard and the proposed alternatives. It concluded that

there is no ‘bright line’ which distinguishes any of the proposed standards (either the level or the number of allowable exceedances) as being significantly more protective of public health. For example, the differences in the percent of outdoor children ... responding between the present standard and the most stringent proposal (8H1EX at 0.07 ppm) are small and their ranges overlap for all health endpoints. ... [W]hen ozone-aggravated asthma admissions are compared to total asthma admissions, the differences between the various options are small.¹⁵

¹³ Preamble, II(C)(2)

¹⁴ CASAC letter to Carol Browner RE: Closure on the Primary Standard Portion of the Staff Paper for Ozone

¹⁵ Ibid.

Furthermore, the majority of CASAC preferred a less stringent standard than that proposed by EPA:

Of the ten panel members who expressed their opinions, all ten favored multiple allowable exceedances, three favored a level of 0.08 ppm, one favored the mid to upper range (0.08 - 0.09 ppm), three favored the upper range (0.09 ppm), one favored a 0.09 - 0.10 ppm range with health advisories issued when the 8-hour ozone concentration was forecasted to exceed 0.07 ppm, and two just endorsed the range presented by the Agency as appropriate and stated that the selection should be a policy decision.¹⁶

In summary, while EPA stresses that its decision is purely a public health decision, scientific experts stress that “there is no ‘bright line’ which distinguishes any of the proposed standards (either the level or the number of allowable exceedances) as being significantly more protective of public health.” In other words, the panel did not find the proposed standard to be significantly more protective of public health than the existing standard.

2. EPA’s selection criteria is flawed.

The preamble suggests that after examining the scientific evidence regarding the health effects of ozone, the Administrator put the public health effects associated with tropospheric ozone “into a broader public health perspective.”¹⁷

In deciding between the 0.08 ppm and 0.09 ppm alternatives, the Administrator took into account several factors including: 1) estimates of risk, in terms of the percentage of children likely to experience respiratory symptoms and decreases in lung function of concern; 2) estimates of exposures to the lowest concentration at which other, more uncertain effects have been observed; and 3) the body of health effects evidence as a whole.¹⁸

Yet, the factors actually considered by EPA in selecting the proposed 0.08 ppm level of the standard actually reflect a narrow set of public health considerations. **When considered in a broader context, it is not at all clear that overall public health would improve significantly as a result of implementing this rule. In fact, there is evidence that this proposal would actually have a detrimental effect on public health.**

¹⁶ Ibid.

¹⁷ Preamble, II(C)(2)

¹⁸ Preamble, II(C)(2)

The 1997 final report of the Presidential/Congressional Commission on Risk Assessment and Risk Management points out that “many risk management failures can be traced to ... not considering risks in their broader context” and that traditionally “most risk management has occurred in an artificially narrow context” without regard for other risks.¹⁹ The three factors identified in the preamble as the Administrator’s considerations in selecting the 0.08 ppm standard illustrate this problem.

For the first factor—estimates of risk to outdoor children—EPA observes a “continuum of risk reduction” in going from 0.09 ppm to 0.08 ppm. This observation is based on Table 1 of the preamble, which suggests that the percent of “outdoor children”²⁰ experiencing moderate or severe pain on deep inhalation would decline from 1.3 percent or 0.9 percent to 0.8 percent or 0.6 percent, depending on the form of the 0.08 ppm standard. As noted above, these clinically-observed effects are largely short-lived and reversible. Moreover, as CASAC pointed out, the ranges of effects overlap for all standards. For example, the percent of outdoor children expected to experience effects with a 0.09 ppm, 1 expected exceedance standard ranges from 0.1 percent to 3.5 percent, compared to a range of 0.1 percent to 3.2 percent for a 0.08 ppm, 5 expected exceedance standard. **Thus, while EPA’s table does suggest a continuum of risk reduction, the changes in risk are so small, uncertain, and overlapping that no level or number of allowable exceedances emerges as being more protective of public health.**²¹

The second factor considered by EPA are “estimates of exposures to the lowest concentration at which other more uncertain effects have been observed.” Here, EPA supports its decision with the observation that fewer outdoor children are likely to be exposed to concentrations of 0.08 ppm under a more stringent standard.²² This is not a surprising result. However, since there is no threshold of effects at concentrations of 0.08 ppm, it doesn’t provide much insight. Furthermore, if, as CASAC Chairman, Dr. Wolff noted in Senate hearings, the average person spends 90 percent of the day indoors, the change in exposure for the whole population as a result of this rule is likely to be very small indeed.

The third factor considered by EPA is the “body of health effects evidence as a whole.” Here, EPA observes that in clinical studies, researchers have chosen

¹⁹ The Presidential/Congressional Commission on Risk Assessment and Risk Management, *Framework for Environmental Health Risk Management, Final Report*, Volume 1, January 1997, pp. 5, 9.

²⁰ Though “outdoor children” is the at-risk population at which this rule is targeted, this term are not defined in the preamble.

²¹ The President’s Council of Economic Advisors (CEA) expresses this concern in its December 13, 1996 comments on EPA’s proposal.

²² Preamble, II(C)(2)

0.08 ppm as the lowest level on which to conduct studies, and that this level “does provide a strong point of consistency in the currently available scientific evidence.”²³ This “consistency,” however, reflects not scientific evidence of threshold effects at 0.08 ppm, but simply the lowest level researchers have chosen to study. Had researchers studied a level of 0.06 ppm, would EPA feel compelled to choose that as its standard? EPA appears to be seeking a threshold, even though it recognizes that ozone may elicit a continuum of biological response, and that no threshold exists.

None of these three factors considers the risk of exposures to ozone in a broader context. For example, these three factors do not reflect the acknowledged fact that the effects of concern are temporary and often asymptomatic. Nor do they reflect the fact that even in the more uncertain epidemiological studies, hospital admissions associated with ozone levels represent a very small fraction—0.6% percent—of all hospital admissions for asthmatics. The Presidential/Congressional Risk Commission states that a good policy decision “[c]an be shown to have a significant impact on the risks of concern,”²⁴ something that has not been attempted in setting this standard.

Perhaps most importantly, these factors do not consider any offsetting health effects associated with reductions in ozone. As discussed more fully below, because tropospheric ozone has the beneficial effect of reducing exposure to harmful ultraviolet rays, any reductions in ozone will have detrimental effects on public health.

3. EPA’s proposal may harm public health.

The narrow focus of this decision is unlikely to lead to effective public health outcomes. **Examined in the best light, the proposal may result in small changes in the health of a small number of sensitive individuals.**²⁵ As noted above, the uncertain scientific evidence suggests that EPA’s proposal will provide benefits in the form of transient, reversible, and largely asymptomatic respiratory effects. Hospital admissions from respiratory-related illness are optimistically estimated to decline by less than one percent. As scientists confirmed in Senate hearings on this rule, the vast majority of the population will observe no effect in their health or well-being as a result of this rule.²⁶ If funds for public health protection were unlimited, this might not be a concern. But this is not the case. As funding

²³ Preamble, II(C)(2)

²⁴ Risk Commission (*op cit*), p. 4.

²⁵ In its comments dated 12/13/96, the President’s Council of Economic Advisors concluded: “Reductions in adverse health effects, even for ‘sensitive’ populations, are small.”

²⁶ See Dr. Lippman’s response to questions by Senator Allard on February 5, 1997.

for public health programs becomes tighter, such programs need to be as cost-effective as possible, to provide the greatest value to the population.

Even if one focuses narrowly on children with asthma, as EPA does, the proposal is not an effective public health program. EPA defends its proposal in terms of benefits it will provide to children and sensitive individuals with asthma and other respiratory diseases.²⁷ Asthma is a disturbing health problem, particularly since (a) reported cases have been increasing in recent years (45 percent in the last decade), (b) one-third of its victims are children, and (c) it is most severe among the urban poor. Yet, air quality has been improving over the last decade; ozone levels in particular declined 6 percent between 1986 and 1995.²⁸ Recently, scientists at the National Institute of Allergy and Infectious Diseases funded a study to solve the paradox of why reported cases of asthma are growing when the factors believed to be causing it, such as air pollution, are declining. The study revealed that “the leading cause of asthma by far was ... proteins in the droppings and carcasses of the German cockroach.”²⁹ The American Thoracic Society concluded:

Poverty may be the number one risk factor for asthma. ... As with many of the health problems facing society today, education and prevention are the keys to controlling asthma in the inner city.³⁰

Thus, even if asthma were the only public health issue of concern, the proposal does not stand up to scrutiny. The potential impact on those afflicted with the disease is very small, and the costs of the rule will drain society’s resources from more effective remedies.

The ineffectiveness of the proposal as a public health program becomes even clearer when one considers public health issues more broadly. **The proposed change in the ozone standard will increase malignant and non-melanoma skin cancers and cataracts, as well as other health risk from ultraviolet radiation.** However, rather than presenting these important tradeoffs, EPA explicitly ignores information on the offsetting health effects caused by the effect of ozone on ultraviolet radiation. EPA’s own analysis indicates that these effects could dwarf the positive benefits EPA attributes to the proposed standard. As detailed in Appendix B to these comments, the proposed 10 ppb change in the ozone standard could result in 25 to 50 new melanoma-caused fatalities, 130 to 260

²⁷ See, for example, EPA’s “Fact Sheet” for this proposal.

²⁸ USEPA, *National Air Quality and Emissions Trends Report, 1995*.

²⁹ *Chemically Speaking*, July 1996.

³⁰ American Thoracic Society, 1996 Conference Articles.

incidents of cutaneous melanoma, 2,000 to 11,000 new cases of non-melanoma skin cancer, and 13,000 to 28,000 new incidents of cataracts *each year*.

When one considers the cost of the proposal, it becomes even more evident that it is not an effective way to protect public health. EPA argues that it may not consider implementation costs, only public health concerns, when setting NAAQS. Yet regulatory costs themselves affect public health. The Risk Commission recognizes the importance of such cost-health tradeoffs, noting that risk management decisions should consider “diversion of investments, or opportunity costs—such as having to spend money on environmental controls instead of using those resources to build a school or reduce taxes.”³¹

As the Risk Commission points out,

There may be even broader public health or ecological contexts that local governments and public health agencies have to confront and weigh against chemical exposures—for example, a high incidence of HIV or other infections, a low rate of childhood vaccination, a high drug use and crime rate, or a high rate of alcoholism and its contribution to liver disease, birth defects, and injuries from automobile accidents.³²

The annual budgets of the agencies charged with protecting the public health are small in comparison to the cost of this proposal. For instance, for carrying out its responsibilities with respect to cardiovascular, lung, and blood diseases, and blood and blood products, the National Heart, Lung and Blood Institute has been allocated less than \$1.5 billion in 1988. Similarly, the 1998 budget allocates the National Institute of Child Health and Human Development \$0.6 billion for research and programs related to child health and human development. The National Institute of Environmental Health Science has been allocated \$314 million. Thus, EPA’s estimates of the partial costs of attaining the proposed standard (\$0.6 billion to \$2.5 billion per year) exceed the amounts allocated for federal programs aimed directly at protecting children’s health and respiratory health.

The costs of this proposal will increase health risk. Implementation of this rule will impose costs on every aspect of our lives. Goods and services will be more expensive, causing disposable family income to decline. **If, as recent studies suggest, poverty is a more important risk factor for asthma than air quality,**³³

³¹ Risk Commission, p. 33

³² Risk Commission, p. 10

³³ American Thoracic Society, 1996 Conference Articles.

the rule may well increase the very disease it is purportedly targeted at improving. Even without this direct link between poor living conditions and asthma, it is widely recognized that, as family incomes rise, health improves. There is a growing body of empirical evidence regarding the negative public health impacts of regulatory programs that reduce incomes. As described in the Regulatory Program of the United States,

Health-health analysis computes the unintended risk increase attributable to the decline in spending on other risk reduction efforts that results when resources are shifted to comply with a regulation aimed at specific risks. Regulations have these unintended risk-increasing effects because families and other entities spend less on such items as health care, nutritious diets, and home and auto safety devices when their incomes decline.³⁴

The studies linking income and mortality find that every \$9 million to \$12 million decline in income induces one statistical death.³⁵ EPA estimates that the cost of achieving partial compliance with its proposal will involve annual costs of \$0.6 to \$2.5 billion. We estimate that the full costs are likely to exceed \$51 billion per year.³⁶ Using the \$9 million to \$12 million figure, **EPA's partial cost estimate would imply an increase in mortality in the range of 50 to 278 deaths each year. If our estimate of the full costs is accurate, the cost of this rule would result in an increase in 4,250 to 5,667 deaths per year.** (These estimates do not include the increase in melanoma deaths from UV-B exposure.)

D. Evaluation of EPA's Decision Regarding the Secondary Standard

As with the primary standard, there appears to be no threshold concentration below which ozone elicits no "welfare effects," such as effects on soils, water, crops, property, etc. This section examines the factors that went into EPA's policy judgment in selecting the secondary standard, and evaluates the proposal from a public welfare context.

1. EPA's expressed interpretation of the statute leads to outlandish outcomes.

In the preamble to the proposed standard, EPA observes:

³⁴ *Regulatory Program of the United States Government*, April 1, 1992 - March 31, 1993. p. 19.

³⁵ Lutter & Morrall. *Journal of Risk and Uncertainty*, 8:43-66 (1994)

³⁶ See Section IV and Appendix C.

The explicit inclusion of economic values in the list of potential public welfare effects of the presence of criteria pollutants in the ambient air has led to the suggestion by some that EPA may consider a broad array of economic values, including both the potential disbenefit as well as the benefits associated with reducing air pollution in making decisions with regard to secondary standards.³⁷

However, EPA rejects this notion, arguing that nothing in the statutory language “provides any indication that EPA may base its secondary standards on factors other than the effects of the pollutant at issue on welfare.”³⁸ EPA interprets this to exclude consideration not only of the costs of controls, but also “any alleged negative effect that reducing ambient concentrations of the relevant pollutant or its precursors may have on public welfare.”³⁹

In other words, EPA argues it cannot consider the wealth or inconvenience impacts of secondary standards, even though those impacts certainly influence personal comfort and well-being, which the act defines as welfare effects. **EPA further circumscribes its decision to include only the negative effects of the compound in question, while excluding its positive effects.**

While the preamble sets forth EPA's interpretation of the law, the agency solicits public comment on “the view that economic values be broadly construed to include the possible disbenefits and benefits resulting from implementation of standards for the purpose of establishing secondary standards.”

We believe that, if public welfare is truly to be protected, economic values must be construed broadly. Furthermore, we believe EPA's framework for setting secondary standard is seriously flawed. We find EPA's exclusive focus on the harmful effects of the pollutant itself artificially narrow, and unlikely to result in decisions that improve public welfare. EPA admits that the selection of the levels for the primary and secondary standard are public policy decisions, and that the statutory language does not call for a standard of zero.

Following EPA's expressed logic that only the negative effects of a compound can be considered can lead to outlandish results. As an example, oxygen is toxic in high doses, making it a public health concern. Moreover, it causes fires, and severe materials damage, which are public welfare concerns. If oxygen were classified as a criteria pollutant it certainly would have to be banned due to its

³⁷ Preamble, IV.

³⁸ Ibid.

³⁹ Ibid.

extremely adverse effects on health and welfare, without regard to its benefits in sustaining life (which, under EPA's interpretation, would be considered "disbenefits" of reducing oxygen levels).

This example highlights the flaws in the framework for standard setting that is expressed in the preamble to this rule. We present it to illustrate the problems generated by the constraints EPA claims the CAA imposes on its decision under the NAAQS.

2. The scientific evidence underlying EPA's secondary standard is weak.

EPA presents two policy choices for public comment: one is a standard identical to the primary standard, and the other, labeled the SUM06 exposure index, is based on the sum of hourly concentrations that exceed .06 ppm. The selected level of the standard suffers from problems similar to those articulated above for the primary standard. In addition, the proposed form of the SUM06 exposure index is not grounded in science. The preamble notes that, "the Administrator recognizes that there is no biological evidence of an effects threshold, and that the effects studies we see do not establish that the SUM06 index best accounts for all of the biologically relevant exposures." Given this conclusion, the agency should not make an arbitrary selection regarding the form of the secondary standard.

EPA focuses on a narrow range of welfare effects, which are themselves highly uncertain. Although the statute lists a range of welfare effects that may be considered, including economic values, personal comfort, and well-being, EPA bases its proposed alternatives largely on effects on vegetation. Visible foliar injury and crop growth/yield reductions are documented in controlled experiments, and foliar injury has been observed in national parks and wilderness areas. CASAC identified various concerns with the controlled experiments, including (1) baseline ozone levels lower than normal background concentrations overstate the effects of ozone on vegetation, (2) the concentrations and durations in the experiments were greater than would exist under the current standard, and (3) the design of the open-top chamber studies overstates effects. Field observations are difficult to evaluate, due to their uncontrolled nature. It is not clear from the preamble whether the observations of growth reductions and foliar damage control for other confounding factors, such as heat and insects. However, EPA does admit that studies of crops, seedlings and trees all "showed that sensitivity to O₃ varied significantly between tree type and growth strategy and between species and types within species."⁴⁰

⁴⁰ Preamble IV(A)(3)

In its April 4, 1996 closure letter on the secondary standard, CASAC observed that “given the crudeness of the risk assessment estimates, policy decisions cannot be based firmly on science.” Vegetation experts on the panel agreed that “plants appear to be more sensitive to ozone than humans.” Yet, they had divergent opinions on the recommended form and level for the secondary standard, and raised substantial concerns with the risk assessment.⁴¹

As a result, the Panel felt that the absolute values of the numbers in Tables VII-5a-VII-7 [of the Staff Paper] are highly uncertain estimates of crop losses and are a result of a propagation of uncertainties. They are rough estimates, and this should be explicitly stated in this discussion. The Panel believes, however, that these Tables can be of some use in identifying rough relative incremental benefits associated with a given NAAQS as long as it is recognized that small differences in benefits may have no significance because of these uncertainties.

Thus, even if the only welfare effect of concern to society were vegetation effects, it is unlikely that the proposed standards would have a significant impact.

3. EPA ignores important welfare effects.

Welfare effects, as defined by the act, include “effects on economic values and on personal comfort and well-being.” EPA’s narrow focus on vegetation effects ignores these, more generally recognized, welfare effects.

Economic values, personal comfort, and well-being will be negatively affected by the proposed secondary standards. This rule will impose enormous costs on

⁴¹The CASAC closure letter states: “The first issue is the level of uncertainty associated with the crop loss risk assessment presented in ... the Staff Paper. ... The estimates in these Tables should only be presented as rough estimates for a number of reasons. First, the dose-response functions are based upon open-top chamber studies... Two of the plant experts said that the open-top chamber experiments by their very design and execution produced results that overestimated the effects of ozone on plant yield. ... Second, the estimated exposures are based on a non-peer-reviewed, empirical model which has not been subjected to any performance evaluation. Third, the estimated exposures are then extrapolated to hypothetical scenarios where various secondary NAAQS are attained. Details of this extrapolation procedure are also insufficient to judge the appropriateness of the procedure. Fourth, the exposure estimates are then extrapolated to the entire coterminous U.S. using a Geographic Information System (GIS) which is based on an unpublished, non-peer-reviewed, internal EPA memorandum that contains insufficient details to adequately evaluate the GIS. The exposure estimates and the dose-response function estimates are then input into the economic models which introduce additional uncertainties. Furthermore, the losses are computed from an assumed 12-hr. background ozone concentration of 0.025 ppm which is too low and will over-inflate the crop loss estimates. A more reasonable 12-hr. daylight, summertime background is more likely closer to the 8-hr. background of 0.03-0.05 ppm.”

society. To achieve EPA's estimated vegetation benefits in the range of \$10 million to \$230 million,⁴² EPA estimates that the proposal would impose costs of \$600 million to \$2.5 billion. In addition to the large direct costs to comply (partially) with this rule, opportunity costs will mean a decline in economic growth and a diversion of scarce resources from other uses. EPA does not estimate the impact on economic growth for the significant number of areas that will be classified as nonattainment due to the continuing cost of restrictions associated with nonattainment status. As family wealth decreases, less money would be available for things that increase personal comfort, well-being, and health. Implementation of this rule will also involve many personal sacrifices affecting such individual decisions as the cars we drive, and whether we can enjoy outdoor barbecues and campfires.

4. EPA ignores offsetting effects on vegetation and other welfare categories.

EPA's exclusive focus on the harmful effects of ozone on vegetation preclude it from considering any beneficial effects of ozone. As discussed in Section III of these comments, tropospheric ozone has the beneficial effect of dispersing harmful ultraviolet radiation, which damages crops, fisheries, and materials. **We estimate in Appendix B that the offsetting UV-B damage from fully attaining a standard set equal to the primary standard will range from \$5.3 million to \$291.8 million.**

E. Conclusions Regarding EPA's Proposed Ozone Standard

EPA recognizes that in setting the primary and secondary NAAQS for ozone it must make a policy decision. EPA admits that its mandate is not a zero risk standard, yet it artificially circumscribes the factors it is allowed to consider in a way that precludes recognition of important tradeoffs. It is essential to recognize that these tradeoffs exist, whether or not EPA admits to them.

We offer the following conclusions with respect to EPA's proposed revision to the ozone NAAQS.

⁴² These are partial benefits of partial attainment reported in the RIA. The benefits EPA reports in the preamble are for full attainment of a more stringent standard than that proposed for the primary standard.

1. The proposed primary standard will not improve public health.

- At best, the proposed level of the primary standard will result in small changes in health for a small population of sensitive individuals. The vast majority of the population will experience no change in health.
- It is more likely that the proposal will actually harm public health, by increasing risks associated with ultraviolet radiation.
- When the costs of the proposal are considered, the negative impact on public health is even more dramatic. Poverty is a significant, if not the most important, determinant of childhood asthma, yet the huge costs of this proposal will put more children in poverty.

2. The proposed secondary standard will not improve public welfare.

- Even if one were to accept EPA's estimates, at best, the proposed NAAQS revision will reduce damage to vegetation by a small amount.
- Offsetting welfare effects, including increased UV-B damage to crops, fish, and materials, and reduced personal comfort and well-being, will swamp the expected net crop benefits of the proposal.
- Public welfare is more likely to be reduced substantially due to the huge costs and personal sacrifices involved in implementing the proposal.

3. More effective alternatives are available for addressing the potential ill effects of ozone.

- Non-regulatory approaches are available to achieve the public health benefits targeted by this rule. As CASAC recommended in its November 30, 1995 closure letter on the primary standard, public health advisories and other targeted approaches may be an effective alternative to standard setting.

Because there is no apparent threshold for responses and no "bright line" in the risk assessment, a number of panel members recommended that an expanded air pollution warning system be initiated so that sensitive individuals can take appropriate "exposure avoidance" behavior. Since many areas of the country already have an infrastructure in place to designate "ozone action days" when voluntary emission reduction measures are put in place, this idea may be fairly easy to implement.

- Research and education are more likely to target what experts believe to be the true reason behind the increasing incidence of asthma—poverty and poor living conditions.

4. EPA should not proceed with promulgation of the proposed standard.

- In light of CASAC’s conclusion that the proposed standard (level and number of exceedances) is not significantly more protective of public health than the alternatives examined, and the very real concern that implementation of this rule will actually harm public health and welfare, EPA should not proceed with its promulgation.
- There may be adequate basis for changing the *averaging time* and *form* of the standard. However, as the majority of EPA’s science panel concluded, scientific evidence suggests that a *level* more stringent than the current level is not necessary to protect public health. Moreover, since our analysis suggests that the current *level* of the standard already imposes social costs (both in terms of health and welfare) that exceed its benefits, EPA should not select a level and number of exceedances that is more stringent than the current standard.

In this section, we review the regulatory impact analysis (RIA) EPA has prepared for the proposed revision to the ozone NAAQS. EPA's own analysis of the benefits and costs of the proposal provide some startling conclusions, including (1) the costs of the rule are significantly greater than the benefits, and (2) many communities will find themselves unable to comply with the standard for the foreseeable future, even after bearing these considerable costs.

There are major flaws in the approach and assumptions used in the RIA. After adjusting for these flaws, we find that the net benefits of this proposal are even smaller than EPA's RIA predicts, and that, in fact, implementation of the proposal is likely to harm public health and welfare.

In section A, below, we summarize the major conclusions of (1) EPA's own analysis, and (2) our analysis of the benefits and costs of the proposal. In section B, we summarize the approach used in the RIA to estimate benefits and costs. In section C, we critique EPA's methodology and present the results of our analysis of the full impact of the proposal. We summarize our conclusions in section D.

A. Conclusions Regarding the Impact of EPA's Proposal

1. **EPA's own regulatory analysis finds that the costs of the proposal exceed the benefits.**

EPA expects partial compliance with the proposed standard to impose net costs (i.e., costs in excess of benefits) on Americans of between \$1.1 billion and \$6.2 billion each year. These net costs are over and above EPA's estimates of the annual net cost of partially complying with the existing standard, which is considerable—EPA estimates the costs of partially meeting the current standard will exceed benefits by between \$400 million and \$2.2 billion per year.

EPA anticipates a large degree of nonattainment. The number of areas unable to meet the standard remains large even after EPA (1) assumes all feasible control measures will be applied, and (2) classifies many areas that are modeled to be out of attainment as being able to achieve attainment. (These issue is discussed and analyzed in Appendix C.) Even with no change in the NAAQS, EPA estimates that between 39 million and 57 million people will live in non-attainment areas, and the agency does not describe how these areas will achieve

attainment. An additional 14 million to 32 million people would live in non-attainment areas under the proposed revised standard.⁴³

Questionable assumptions lead to an understatement of costs. The assumption that regional controls will be put in place by 2007, and that the costs of those controls are not attributable to the current or proposed ozone NAAQS, significantly affects the cost estimate. When EPA assumes implementation of a regional control strategy as its baseline, estimates of the annual costs of partially meeting the standard are between \$630 million and \$2.5 billion. EPA's cost estimates more than double (to between \$2.2 billion and \$6.3 billion) when EPA assumes a local control strategy (LCS) baseline. Benefits are also influenced by the choice of the baseline, although not as dramatically.

EPA's benefit estimates are uncertain, and EPA places its own best estimates at the low end of its range. Modeling, exposure, and valuation constraints make EPA's benefit estimates very uncertain. CASAC observed that due to the compounded uncertainties in the approach to estimating welfare effects, "small differences in benefits may have no significance..." EPA's best (i.e., most likely) estimate of the incremental health benefits of the proposed standard is at the low end of its range, between \$11 million and \$108 million.⁴⁴

The estimated benefit of reduced mortality, not the other health benefits EPA relies on to support its proposal, dominate its estimate of benefits. In explaining the broad range in the estimate of health benefits associated with the proposed standard, EPA notes that, "the high estimate of the range includes the results of the mortality category, which comprises greater than 98% of the total estimate..."⁴⁵ As discussed below, this estimate of reduced fatalities is based on a single study that was not discussed in the criteria document or staff paper, and thus not reviewed by EPA's science advisory committee (CASAC).

⁴³ RIA Tables ES-2 and ES-3

⁴⁴ Note that EPA's *best estimates* of the total health benefits do not include mortality benefits. The low end of the range, \$11 million, is based on the epidemiological approach, an 0.08 ppm, 8-hr, 4 exceedance standard, and the regional control scenario. The upper end of the range, \$108 million depends on a clinical approach, local control strategy assumptions and an 0.08 ppm, 8-hr, 1 ex standard. (RIA Table E-22, E-23, E-25, E-26, E-28, E-29) The mean of the best estimates across 1 and 4 exceedance standards, clinical and epidemiological approaches, and RCS and LCS is \$42 million. EPA does not report best estimates for welfare benefits.

⁴⁵ See table IX-3 of the RIA.

2. **Correcting for biases and omissions in EPA's analysis, the negative health and welfare impacts of the proposal are even clearer.**

EPA's proposal may harm public health and welfare, regardless of cost. The potential impact of a change in the ozone standard on ultraviolet (UV-B) radiation raises serious questions about the net health and welfare effects of this proposal. **We estimate that the total impact of attaining the proposed standard would be to increase health risks and welfare damages by over \$100 million per year.** This is particularly disturbing in light of the enormous costs full attainment of this rule would impose on every aspect of our lives.

The full costs of meeting this standard are significantly higher than EPA's estimated costs of partial attainment. The full cost of attaining the **current** standard is likely to be between \$22 billion and \$53 billion per year. The proposed standards are estimated to impose additional costs in the range of \$54 billion to \$328 billion per year (in 1990 dollars).

The incremental benefits estimated for the alternative standards are relatively small, and based on an analysis that is fraught with uncertainties. The uncertain scientific basis on which EPA's health effect estimates rest raises serious questions about the advisability of revising the level of the NAAQS at this time.

B. Summary of EPA's RIA

EPA has determined that the proposed rule is a significant action as defined by Executive Order 12866. Accordingly it has prepared a draft RIA to accompany the rule. However, in accordance with EPA's interpretation of statutory prohibitions, "[n]either the draft RIA nor the associated contractor reports have been considered in issuing this proposal."

This section of our comments summarizes the methodology employed in the RIA for estimating the benefits and costs of the proposed rule and its results.

1. **Summary of EPA's methodology for estimating benefits.**

EPA is required under E.O. 12866 to evaluate the benefits of proposed regulatory actions. Chapter IX of its RIA addresses this requirement.

a) Alternatives examined

Although the Executive Order requires EPA to evaluate the impact of the proposal, it fails to do so. EPA estimates the benefits of four alternative standards, none of which is the proposed standard nor the two alternatives on which EPA requests comment. EPA suggests that benefits (and costs) of the proposed 8 hour, 0.08 ppm standard based on an average of the 3rd highest concentrations will fall within the range of benefits estimated for 8 hour, 0.08 ppm standards that allow 1 and 4 exceedances.⁴⁶ EPA also requests comments on a less stringent 0.09 ppm alternative, and a more stringent 0.07 ppm alternative, but does not analyze the benefits or costs of these alternatives. EPA asserts that benefits of the 0.09 ppm standard will be equivalent to the benefits estimated for the current 1 hour, 0.12 ppm standard, and that benefits of the 0.07 ppm standard will be equivalent to the benefits estimated for an 8-hour, 0.08 standard with one exceedance.⁴⁷ This assertion of equivalence is based on the fact that models predict the alternatives will have an equivalent number of areas that are classified as being in nonattainment, however. This does not necessarily imply equivalence in either benefits or costs because (1) different areas will be in nonattainment under each alternative, (2) there are different degrees of nonattainment under each alternative, and (3) different populations would be exposed in different nonattainment areas.

b) EPA's approach to estimating baseline 2007 concentrations

EPA's estimates of the benefits of each alternative are based on ambient concentrations of ozone in 2007. To estimate baseline concentrations in that year, EPA starts with 1987 meteorological data and 1990 monitoring data from which it projects an emissions inventory for 2007. Projected 2007 emissions reflect both (1) economic and population growth (which increase 2007 emissions compared to 1990 emissions), and (2) the estimated effects of CAA-mandated controls that will be put in place between 1990 and 2007 (which serve to decrease 2007 emissions).

EPA examines two baselines: its preferred "analytical baseline," which assumes regional controls are in place by 2007 (the regional control strategy or RCS

⁴⁶ In section III(A) of the RIA, EPA states that the benefits of the proposed standard (8H2AX-80) will fall within the range of benefits estimated for two analyzed alternatives—8H1AX-80 and 8H4AX-80.

⁴⁷ EPA asserts that "for analytical purposes, the 0.09 ppm alternative is similar to the current 1H1EX-120 standard, and the 0.07 ppm alternative provides a level of protection similar to the 8H1AX-80 form." RIA III(A)

baseline), and its local control strategy (LCS) baseline, based on the assumption that only local control strategies are in place.

To translate emissions into concentrations, EPA relies on its regional oxidant model (ROM), which models only the Eastern U. S. for a ninety-day period during the ozone season. ROM estimates concentrations at each monitor in the eastern U.S. in 1990 and 2007. By regressing estimated concentrations at existing Eastern U.S. monitor locations in 1990 against the 2007 concentrations at the same locations, EPA derives a coefficient representing the expected change in concentration over the period. This coefficient (.79) reflects the average expected change in concentration, and is applied to 1990 concentrations at all monitors (including those not covered by ROM) to project concentrations at all monitors in 2007.

These estimates of 2007 concentrations at existing monitors are then interpolated to estimate concentrations at the geographic center of each county in the forty-eight contiguous United States. (EPA refers to this regression and interpolation procedure as the “Centroid methodology”.)

EPA’s OZ-ONE computer model estimates changes in health effects and economic benefits due to estimated changes in ambient ozone. It uses a “quadratic rollback method” to estimate post-control concentrations for each NAAQS scenario. This rollback approach assumes that efforts to meet the standard in nonattainment areas during peak hours will result in pro-rated reductions in concentrations in attainment areas⁴⁸, and during off-peak hours.

c) EPA’s approach to estimating benefits of the primary (health based) standard

(1) Health Effects

EPA relies on human clinical studies and epidemiology studies to quantify the health effects of the change in ozone concentrations. Because the two approaches (clinical studies and epidemiology studies) represent different methods for calculating the same health effects, EPA does not sum their results, but uses them to define a range of health effects.⁴⁹ EPA quantifies and assigns dollar values to the following health effects: cough, pain upon deep inhalation, mortality, hospital admissions for all respiratory illnesses, hospital admissions

⁴⁸ Welfare, but not health, benefits are quantified for assumed air improvements in attainment areas.

⁴⁹ The clinical approach generally produces larger benefits, except when mortality is considered (for the high estimate of EPA’s range).

for pneumonia, and hospital admissions for chronic obstructive pulmonary disease (COPD).

(2) Valuation

With the exception of hospital admissions and mortality, valuations are based on contingent valuation surveys of individuals to determine their hypothetical willingness to pay to avoid an incident involving these effects (e.g., a day of coughing). For hospital admissions, EPA doubles the estimates derived from cost information (and used in previous analyses) to approximate willingness-to-pay. This “adjustment factor” is applied to cost-based values to correct a perceived understatement in willingness-to-pay.

d) EPA’s approach to estimating benefits of the secondary (welfare) standards

The RIA also quantifies and values effects of a reduction in ozone on commodity crops, and fruit and vegetable crops. It discusses qualitatively the effects on other welfare endpoints, including ecosystem effects, damage to urban ornamentals, materials damage, and visibility. EPA’s model uses statewide average changes in ozone concentrations (computed from the county-level concentrations described above) and exposure-response functions to predict changes in crop yield, and change in economic surplus by crop for each alternative standard.

e) Summary of annual health and welfare benefits

Table 1, below, presents the range of benefits estimated by EPA for the two analyzed standards that bracket the proposal. EPA expects that full attainment of the proposed standard will provide annual benefits of between \$76 million and \$2.8 billion assuming regional controls are already in place. Estimated from a baseline that does not assume regional controls, benefits of fully attaining the proposed standard range from \$109 million to \$3.8 billion.

EPA also estimates the benefits of partially meeting the standard (for comparison with its cost estimates). These range from \$12 million to \$1.5 billion under the regional control baseline, and \$54 million to \$2.1 billion under the local control baseline.

Table 1⁵⁰
Summary of Annual Health and Welfare Benefits
 Year = 2007
 (Millions; 1990 \$)
 (Estimates are incremental from the current standard)

| Ozone NAAQS | Regional Control Strategies Baseline | | Local Control Strategies Baseline | |
|--|---|-----------------------------------|--------------------------------------|--------------------------------|
| | Full Attainment Scenario | Partial Attainment Scenario | Full Attainment Scenario | Partial Attainment Scenario |
| .08 ppm, 8-hour, 4 ex. (less stringent) | \$76 - \$1,403 | \$12 - \$647 | \$109 - \$2,041 | \$54 - \$1,064 |
| .08 ppm, 8-hour, 1 ex. (more stringent) | \$202 - \$2,809 | \$69 - \$1,453 | \$200 - \$3,807 | \$123 - \$2,085 |

2. Summary of EPA's methodology for estimating costs.

EPA uses several steps to estimate the cost of the proposed standard. First, EPA projects concentrations by county to 2007, and determines baseline attainment status in that year. Second, EPA estimates the tons of ozone precursor pollutants (volatile organic compounds (VOCs) and nitrogen oxides (NOx)) that would have to be reduced in order to meet the standard. Third, EPA estimates the cost of the technologies necessary to reduce the pollutants by the necessary amounts.

The analysis is complicated by the need to convert ambient concentrations of ozone into the number of tons of pollutant that would need to be reduced. Furthermore, existing and anticipated control technologies are insufficient to achieve the emission reductions necessary to meet the proposed standard in many areas in the foreseeable future. EPA chose to exclude from its inventory of possible controls those with costs that exceed a certain threshold per pound of pollutant reduced. All these steps are discussed in more detail below.

a) Estimating ambient concentrations and attainment status in 2007

To determine the number of tons of ozone precursors that must be reduced to achieve the proposed standard, EPA establishes the year 2007 as its analytical baseline. The RIA assumes that ambient ozone concentrations in that year reflect the full and vigorous adoption and implementation of a number of air pollution

⁵⁰ This is a reproduction of RIA TABLE IX-7.

regulations and initiatives that are currently proposed or being discussed. For instance, EPA assumes that the following are in place and fully effective:

- all Title I VOC and NO_x Reasonably Available Control Technology (RACT) standards,
- Title II mobile source inspection/maintenance programs,
- Title III air toxic controls,
- Title IV Acid Rain NO_x controls, and
- Resource Conservation and Recovery Act (RCRA) treatment storage and disposal facility (TSDF) and landfill regulations.

Overall, EPA assumes actions expected under the 1990 amendments to the Clean Air Act (CAAA) will reduce emissions of VOCs in the year 2007 by an additional 6.3 million tons per year⁵¹ and NO_x by an additional 8.3 million tons per year over their current levels.⁵² The costs of achieving these reductions are all included in EPA's baseline and, thus, are not attributed to this rule.

EPA's analytical baseline also includes the strict application of Title I subpart (2) requirements and implementation of a regional NO_x strategy in the 37 Eastern states. The RIA states, "[t]he staff believes that these [regional NO_x] efforts will be in place in the year 2007, and because they are being undertaken to attain the current ozone NAAQS, they should be included in the analytical baseline of this RIA."⁵³ The RIA refers to this baseline as its "Regional Control Strategy" or RCS.

EPA developed a second "Local Control Strategy" or LCS baseline, which it considers to be an upper bound on the costs. The difference between the two baselines is that RCS includes a 0.15 pounds-per-million BTU cap on NO_x emissions from utilities and other combustion boilers, and a California-style low emission vehicle (LEV) program applied to each county in the Eastern U.S. (the "ROM domain") prior to the identification of areas where local ozone controls are still needed.⁵⁴ These measures do not appear to be mandated by any statutory authority.

Assumptions regarding what controls are included in the baseline have an important impact on EPA's cost estimates. Any and all costs of controls used to

⁵¹ RIA Table 4-1

⁵² RIA Table 4-2

⁵³ RIA IV(B(3))

⁵⁴ RIA IV(B(3))

achieve baseline emission levels are not included in the cost of achieving the current ozone NAAQS, nor the proposed revisions. As discussed below, the greater the reductions EPA assumes are achieved by other actions by 2007, the lower the ambient concentrations of ozone, and the lower will be EPA's estimate of the cost for States and cities to meet the standard proposed in this rule.

b) Estimating the reductions in pollutants

Once EPA has estimated baseline ambient ozone concentrations in 2007, it attempts to determine the reduction in pollutants in each area necessary to achieve each of the four alternative standards analyzed.⁵⁵ EPA determines the reductions needed based "on the expertise of its air quality modelers," who rely on a combination of models, including the ROM model which is limited to the Eastern United States, and its UAM (Urban Airshed Model), which predicts air quality in specific metropolitan areas.⁵⁶

c) Cost of compliance

Once EPA has determined where emissions would have to be reduced and by what amounts, it applies control measures to the areas the model predicts will be out of attainment. EPA's inventory of control measures includes:

- Controls on stationary point sources, such as
 - selective catalytic reduction on utility and industrial boilers,
 - controls on surface coating,
 - bans on open burning,
- Controls on stationary area sources, including
 - cutting back on asphalt,
 - restricting pesticide applications, and

⁵⁵ As stated above, none of the four alternatives in the RIA reflect the proposed standard nor alternatives described in the preamble.

⁵⁶ "For areas outside the ROM domain, the analysis relied upon advice from air quality modelers and air chemists to establish targets for each eight hour alternative standard. For identified nonattainment areas which had no ROM or UAM modeling, targets were assigned for these 'new' areas that were similar to the targets in 'similar' nonattainment areas which had been modeled, using geographic characteristics as a measure of similarity." RIA V(C)

- applying controls on residential water and space heaters and small combustion sources.
- Requirements for on and off-road motor vehicles (such as lawn and garden equipment, as well as marine vessels and recreational vehicles), including
 - emission standards and
 - reformulated gasoline.

Appendix D to these comments reproduces EPA's Table C-1, which lists incremental control measures and potentially affected source categories.

Each control measure in EPA's inventory is applied in order of cost-effectiveness (that is, the one with the lowest per-ton costs first and ascending to most expensive last) until the area is determined to be in attainment or until additional pollution reduction technology is "unavailable." EPA chose not to include in its inventory of available control technologies those for which the costs-per-ton of precursor emissions reduced is greater than \$30,000 to \$80,000 per ton.⁵⁷

The cost of each technology used is then totaled up to determine the cost by county of attempting to meet the standard in the base year (2007). EPA did not attempt to estimate costs other than the direct costs of applying pollution control technology.

Table 2 summarizes EPA's estimated costs of meeting the current standard and of attempting to meet the two options that most closely bound the proposed standard (under both the "RCS" and "LCS" assumptions).

⁵⁷ Note that EPA's exclusion of the more expensive control measures from its cost estimates in this RIA does not reflect any policy decision that these measures will not, in fact, be required to meet the standard.

Table 2
EPA's Estimated Cost of Partial Attainment

| Standard | Range of Estimated Annual Costs to Achieve Partial Attainment (Billions of 1990\$) | |
|---|---|--|
| | With Regional Controls (RCS) | Without Regional Controls (LCS) |
| Current Standard 0.12 ppm, 1 hour, 1 ex. | \$1.2 billion | \$2.3 billion |
| 0.80 ppm, 8 hour, 4 ex. (less stringent than proposal) | \$0.6 billion above cost of current standard | \$2.2 billion above cost of current standard |
| 0.80 ppm, 8 hour, 1 ex. (more stringent than proposal) | \$2.5 billion above cost of current standard | \$6.3 billion above cost of current standard |

EPA estimates that the incremental cost of the proposed standard is likely to be between \$600 million a year (the estimate for the less stringent option assuming regional controls) and \$6.3 billion a year (the estimate for the more stringent option assuming no regional controls). EPA does not estimate costs associated with the secondary standard on the assumption that the primary standard will be binding in most of the country.⁵⁸

3. Comparison of EPA's estimated costs and benefits

EPA's estimates of the benefits and costs of partially meeting the current ozone NAAQS and the proposed alternative are presented in Tables 3a (using EPA's RCS baseline) and 3b (under the LCS baseline). The results are striking. **To achieve partial attainment with the existing NAAQS, EPA predicts that Americans will have to pay between \$400 million and \$2.2 billion each year more than they will receive in health and welfare benefits. EPA estimates that partial compliance with the proposed standard will impose costs in excess of benefits of up to \$6.2 billion more each year.**

⁵⁸ RIA VI(B)(2)

Table 3a
Comparison of Benefits and Costs
Regional Control Strategy Baseline
 (Billions of 1990 \$)

| Alternative NAAQS | Annual Benefits | Annual Costs | Net Benefits (Costs) |
|--|------------------------|---------------------|-----------------------------|
| 0.12 ppm, 1- hour, 1 ex. (current standard) | \$0.1 - \$0.8 | \$1.2 | \$(0.4) - \$(1.1) |
| 0.08 ppm, 8-hour, 4 ex. (less stringent) | \$0 - \$0.6 | \$0.6 | \$0 - \$(0.4) |
| 0.08 ppm, 8-hour, 1 ex. (more stringent) | \$0.1 - \$1.5 | \$2.5 | \$(1.0) - \$(2.4) |

Table 3b
Comparison of Benefits and Costs
Local Control Strategy Baseline
 (Billions of 1990 \$)

| Alternative NAAQS | Annual Benefits | Annual Costs | Net Benefits (Costs) |
|--|------------------------|---------------------|-----------------------------|
| 0.12 ppm, 1- hour, 1 ex. (current standard) | \$0.1 - \$1.1 | \$2.3 | \$(1.2) - \$(2.2) |
| 0.08 ppm, 8-hour, 4 ex. (less stringent) | \$0 - \$1.1 | \$2.2 | \$(1.1) - \$(2.4) |
| 0.08 ppm, 8-hour, 1 ex. (more stringent) | \$0.1 - \$2.1 | \$6.3 | \$(4.2) - \$(6.2) |

C. Comments on EPA's RIA

EPA emphasizes in the preamble of the rule that the selection of the level of the ozone NAAQS is a policy judgment. A good policy judgment must be guided by an unbiased and clearly articulated presentation of the range of alternative standards and their impacts on health and welfare. **This RIA does not provide adequate information with which to make a good policy decision.** Moreover, the RIA does not meet the fundamental requirements of President Clinton's Executive Order 12866, which requires analyses to inform decision-makers of the consequences of alternative actions.

The RIA does not analyze either the proposed standard, nor the two alternatives on which the public is asked to comment. More importantly, it does not consider important costs and public health considerations. Key assumptions bias the results. In the face of the many uncertainties encountered in this analysis, EPA makes inconsistent assumptions in estimating benefits and costs. For example, EPA's assumptions about the number of areas that can attain alternate standards lead to an understatement of the costs of partial attainment. However, EPA makes no corresponding adjustments when estimating the benefits of bringing noncompliance areas partially into attainment.

Below we evaluate and comment on the RIA EPA has prepared for the proposed revision to the ozone NAAQS. We review EPA's benefit estimates in section 1, and present the results of our own analysis regarding the health and welfare effects of the proposal. In section 2, we comment on EPA's cost estimates and summarize our own estimates of the full cost of compliance. Appendices A, B, and C provide more detail on the analyses we conducted to adjust EPA's estimates of benefits and costs.

1. EPA overstates the health and welfare benefits of the proposal.

As presented in section B, above, EPA estimates that the proposed standard will provide health and welfare benefits in the range of \$12 million to \$2.1 billion per year. In evaluating EPA's reported range of benefits, it is important to consider the following points.

a) The scientific basis for the health and welfare risks is weak.

There is much uncertainty in the current scientific understanding of the effects of ozone on health and welfare. EPA's analysis necessarily makes numerous assumptions in the face of these uncertainties, some of which may have

important implications for the resulting benefit estimates. On balance, EPA's assumptions are likely to result in an overstatement of benefits.

As EPA's Clean Air Science Advisory Committee (CASAC), which advised EPA on the scientific foundation for the ozone NAAQS policy, stated: "there are still many gaps in our knowledge and large uncertainties in many of the assessments."⁵⁹ The many assumptions that have to be made to quantify and then value health and welfare effects necessarily introduce large uncertainties in the results.

The Executive Summary and Chapter IX of the RIA discuss the gaps in EPA's understanding of ozone effects, but assert that limitations in the analysis serve to understate benefits.⁶⁰ A review of the RIA and supporting analysis suggests that, while there are factors which may cause benefits estimates to be understated (such as EPA's inability to quantify and value uncertain health and welfare effects), there are also many assumptions that result in the overstatement of benefits. For example, EPA's "rollback" approach to estimating post-control air quality is likely to overstate air quality improvements during off-peak periods. Its assumptions regarding meteorological conditions in the year 2007 may also overstate baseline air quality and, therefore, the benefits of meeting the standard. Further, EPA's reliance on a single study that found evidence of mortality effects, despite the existence of at least eleven studies that did not, and despite the fact that this study has not been reviewed by CASAC, is likely to overstate the upper end of the range of estimated benefits. For welfare benefits, CASAC questioned several methods and assumptions which are likely to overstate benefits.

These and other uncertainties in EPA's benefit and cost analysis are discussed in more detail Appendix A.

⁵⁹ CASAC Closure on the Primary Standard Portion of the Staff Paper for Ozone. November 30, 1995.

⁶⁰ For example, in discussing the general limitations of the analysis, the Executive Summary states: Analyses, and therefore results, continue to be limited by the inability to monetize certain health or welfare benefits - such as protection against loss of lung function, or ecosystem damage. Comparisons of such incomplete benefits to the more quantifiable and usually more complete control costs can be misleading.

This statement is certainly misleading with respect to this particular analysis because the RIA (1) only estimates the direct costs of partially attaining the standard, and (2) omits important categories of costs.

b) EPA relies on questionable methods for valuing health effects.

Values estimated by contingent valuation (CV) techniques, in which people are asked hypothetical questions about how much they are willing to pay to avoid certain effects, are used in this analysis. This approach is controversial because of its tendency to overstate benefits. As discussed in Appendix A, direct measures of the value people attribute to health effects are superior to values based on hypothetical questions.

Values attributed to reduced mortality dominate the upper bound of EPA's benefit range. Given the weak foundation for EPA's estimates of ozone-induced mortality, these values should be excluded from EPA's analysis.

c) EPA ignores negative impacts on health and welfare.

Ozone (both in the stratosphere and in the troposphere) affects the dispersion and penetration of ultraviolet B (UV-B) radiation. Reductions in ground-level (tropospheric) ozone as a result of a revised ozone NAAQS will cause total column ozone to decrease, increasing the penetration of UV-B rays.

The last paragraph of the RIA states that "no attempt to quantify this potential effect, which is expected to be small, has been made in this analysis." However, a review of EPA's analysis of UV-B effects (for this rule and previous rules) indicates that **the negative health benefits (or health costs) associated with the UV-B effects of the proposal could exceed the health benefits EPA attributes to ozone reductions by almost \$250 million per year.**

In Appendix B, we attempt to quantify and value the harmful effects of the increase in UV-B radiation that would result from the proposed change in the ozone NAAQS. Our analysis is based solely on methods, models and data used by EPA in previous analyses of the benefits of reducing chemicals that affect stratospheric ozone. It suggests that implementation of the proposal will result in between 2,000 and 11,000 new cases of nonmelanoma skin cancer; 130 to 260 new cases of cutaneous melanoma, 25 to 50 melanoma caused deaths, and 13,000 to 28,000 incidents of cataracts. As shown in Table 4, we estimate that the costs of these health effects (or "disbenefits" in EPA's terms) range from \$333 million to \$1.3 billion (1990 dollars). These estimates are consistent with estimates made by others.⁶¹ We estimate that the negative welfare effects on commercial fisheries, commodity crops and polymers will range from \$6.3 million to \$347.2 million per year.

⁶¹ See Lutter & Wolz and Frazier.

Table 4
Net Benefits of Ozone NAAQS
(Millions 1990 \$)

| | | Lower Bound | Best Estimate | Upper Bound |
|-------------------------------|-------------------------|------------------|------------------|-------------------|
| Health | NAAQS RIA | \$4.0 | \$85.7 | \$3,197.0 |
| | Offsetting UV-B effects | \$333.1 | \$367.5 | \$1,310.1 |
| | Net Benefits | \$(329.1) | \$(281.8) | \$1,886.9 |
| Welfare | NAAQS RIA | \$72.0 | \$207.5 | \$610.0 |
| | Offsetting UV-B effects | \$6.3 | \$92.8 | \$347.2 |
| | Net Benefits | \$65.7 | \$114.7 | \$262.8 |
| Total (health and welfare) | NAAQS RIA | \$76.0 | \$293.2 | \$3,807.0 |
| | Offsetting UV-B effects | \$339.4 | \$460.2 | \$1,657.3 |
| | Net Benefits | \$(263.4) | \$(167.0) | \$ 2,149.7 |

2. EPA's estimate of costs is flawed.

The RIA estimates that the cost of partially attaining the proposed standard will range from \$600 million to \$6.3 billion a year (in 1990 dollars). In order to understand this estimate it is important to consider the following points.

a) EPA's estimates are highly uncertain.

There are significant uncertainties involved in estimating the costs of the proposal. EPA's cost estimates include assumptions that may significantly bias the estimates both up and down. On balance, as discussed in Appendix A, EPA's assumptions are likely to result in an understatement of costs.

b) EPA understates the number of areas that will be out of attainment.

EPA's cost estimate assumes that counties that achieve only 75% of the reductions necessary to meet a standard of 0.092 ppm will incur no further costs

associated with compliance. Since, in reality, EPA's proposal would require states and cities to make the necessary reductions in pollution to fully meet the 0.08 ppm standard to be classified as in attainment, these assumptions significantly understate the costs of meeting the proposed standard. (Note that EPA considers an eight-hour standard of 0.09 ppm similar to the current standard.⁶² So, this RIA is evaluating the cost of partial compliance with a standard—0.092 ppm—that is actually **less stringent** than current regulations.)

c) EPA's estimate omits important categories of costs.

Costs of the proposed standard include offsetting health and welfare costs ("disbenefits"), costs to Federal facilities, and costs to States, cities, EPA, and regulated entities to administer and comply with the new standard, yet EPA's estimate does not include any of these. EPA also does not estimate the detrimental impact on economic growth for the significant number of areas that will be classified as nonattainment.

d) EPA's baseline includes costs that are better characterized as incremental.

All EPA's cost estimates (for achieving the current ozone NAAQS as well as the proposed alternatives), are incremental to a baseline in 2007. The definition of this baseline strongly influences the cost estimates, because the costs of emission reductions that are attributed to the baseline do not appear as incremental costs of either the current standard nor the proposed standard. To the extent EPA overestimates the effectiveness of other regulations and discretionary measures in its baseline, the actual costs of this new standard will be underestimated. There is reason to believe EPA's analytical baseline includes (1) overestimates of the effectiveness and implementation of new regulations put in place prior to 2007 and (2) emission reductions from actions that in fact are related to the current and proposed ozone NAAQS.

e) The RIA presents estimates of costs (and benefits) for a single year: 2007.

EPA does not suggest that this "snapshot" approach reflects the expected annual costs (or benefits) of the proposed standard. Rather, EPA selected 2007 because by then it expects "most of the mandatory CAAA requirements will have fully taken effect and most areas currently in violation are required to achieve attainment with the current NAAQS standard by this year."⁶³ An estimate of the

⁶² RIA I(B)

⁶³ RIA Executive Summary

present value of the expected costs of the proposed standard and alternatives, as recommended in President Clinton's guidance regarding economic analysis of federal rules,⁶⁴ would be far more informative both for assessing potential costs and for comparing costs with expected benefits.

f) The costs of full attainment are not calculated.

EPA's cost estimates are for partial attainment of the current and proposed standards. One quarter to one-third of the population of the United States lives in areas that are not projected to meet the proposed standard by 2007.⁶⁵ Furthermore, the proposed standard is unattainable in many areas for the foreseeable future. In Los Angeles, for instance, even a permanent ban on gasoline-powered automobiles would not bring the area into compliance with the proposed standard.⁶⁶

Our analysis of the full costs of the proposal is presented in Appendix C and highlighted here.

Using EPA assumptions regarding (1) the marginal costs of compliance, and (2) the number of areas that will not attain the standard in 2007 under EPA's partial attainment scenario, we believe that a lower bound on the full cost of attaining the current standard is between \$17.7 billion and \$65 billion per year. EPA's data suggest that the proposed standard will cost at least an additional \$9.1 billion to \$83.1 billion each year.

After making adjustments to correct for EPA's understatement of the number of areas out of compliance with the current and proposed standard in 2007, **we estimate that the full cost of attainment will be on the order of \$21 billion to \$53 billion for the current standard, and additional \$54 billion to \$328 billion to comply with the proposed standard each year.**⁶⁷ To put these costs in perspective, the lower end of the range is greater than the state of Oregon's entire gross state product⁶⁸ in 1990. (It was \$53 billion.) The combined gross product of all six New England states was \$327 million in 1990 — less than the upper bound of this range.⁶⁹

⁶⁴ *Economic Analysis of Federal Regulations Under Executive Order 12866*, January 11, 1996 states, "To the fullest extent possible, benefits and costs should be expressed in discounted constant dollars."

⁶⁵ RIA, Table ES-2

⁶⁶ See discussion in Appendix C.

⁶⁷ The calculations and information used to derive these estimates are described in Appendix C.

⁶⁸ Gross State Product (or GSP) is the state equivalent of GNP.

⁶⁹ Statistical Abstract of the United States. Table No. 703.

These cost estimates, large as they are, may still understate the impact of the proposed NAAQS because they suggest that the proposed 0.08 ppm standard, is, in fact, attainable. It is not. The true costs of an unattainable standard include the opportunity cost associated with nonattainment, or a decline in the rate of economic growth. Predicting the effect of a regulation on economic growth, and consumption and production opportunities is very difficult to do with any degree of accuracy, and yet it is important that EPA at least recognize the opportunity cost of this proposal. We estimate that a shift in manufacturing establishments to other countries as a result of the large degree of nonattainment expected under the proposal would reduce gross domestic product by roughly \$80 billion per year.

D. Recommendations for EPA Action

Based on our review of EPA's RIA, and our own analysis of the benefits and costs of the proposed action, we make the following recommendations.

- 1. Health benefits are so uncertain that the statute does not compel EPA to revise the standard.**

The uncertain scientific basis on which EPA's health effect estimates rest raises serious questions about the advisability of revising the level of the NAAQS at this time. EPA need not rush into a decision based on inadequate information.

- The incremental benefits estimated for the alternative standards are relatively small, and based on an analysis that is fraught with uncertainties.
- The assumptions made in the face of these uncertainties, and how those assumptions affect estimates of benefits, should be articulated more clearly. This is essential if policy makers are to have an adequate basis on which to make decisions regarding appropriate regulatory action, and if the public is to have a meaningful basis for comment.

Given the scientific uncertainty regarding air quality effects of the standards, and the resulting health and welfare impacts, EPA faces a difficult task in attempting to characterize and quantify the effects of alternative standards. However, EPA need not rush into a decision based on inadequate information. The majority of CASAC indicated that a level equivalent to the current standard is protective of public health. In its closure letter, CASAC expressed the opinion that the scientific community is now ready to frame the questions that need to be resolved. It encouraged EPA and the scientific community to continue the research necessary to resolve the uncertainties inherent in the current analysis.

2. EPA's should not proceed with a standard that is likely to harm public health and welfare.

The potential impact of a change in the ozone standard on ultraviolet radiation raises serious questions about the net health and welfare effects of this proposal. As proposed, EPA's new standards may actually harm public health and welfare, regardless of costs.

The proposed change in the ozone standard will increase the damage associated with ultraviolet radiation, including malignant and non-melanoma skin cancers, cataracts, and damage to crops and marine organisms. Based on previous analyses conducted by EPA, it appears that these effects could dwarf the positive benefits EPA attributes to the proposed standard.

Our analysis (described in Appendix B) suggests that the net impact on health will be a cost to Americans of \$282 million each year. EPA's estimates of the welfare benefits of the proposed standard are approximately halved when UV-B damages are considered. The total impact of attaining the proposed standard would be to increase health risks and welfare damages by \$167 million per year. This is particularly disturbing in light of the enormous costs full attainment of this rule would impose on every aspect of our lives.

EPA has a responsibility for setting NAAQS that protect public health and welfare. To fulfill that responsibility it cannot ignore important health and welfare effects which can be readily, and reliably, quantified.

3. EPA's policy judgment should recognize the high costs of the standard and the impact of those costs on public health and welfare.

EPA's estimate of the partial costs of attainment are high, especially relative to benefits. By EPA's own estimates, the costs of partially attaining the proposed standard will exceed the benefits, costing Americans between \$1.1 billion and \$6.2 billion each year. EPA's consideration of the health and welfare effects of the standard should consider these impacts.

The full costs of attainment are likely to be significantly higher. We estimate that the full cost of attaining the current standard will be on the order of \$21 billion to \$53 billion per year. An additional \$54 billion to \$328 billion would be incurred to comply with the proposed standard each year. These enormous costs will take their toll on the health and welfare of the American public, and EPA should recognize that impact in making its policy judgment regarding the level and form of the standard.

