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NEPA's Uncertainty Principle in the Federal Legal Scheme Controlling Air Pollution From Motor Vehicles

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The need to protect the public from the serious adverse health effects of motor vehicle emissions has been recognized as an important public health goal since the 1960s. Evidence of adverse health effects associated with vehicle emissions of carbon monoxide (CO), benzene, ozone, and lead was the primary driving force behind the enactment of the Air Quality Act of 1967, which set in motion the federal regulation of tailpipe emissions from motor vehicles. The environmental impacts of highways were also cited as a major factor behind the enactment in 1969 of the National Environmental Policy Act (NEPA).[1] The growing pall of pollution that shrouded most large U.S. cities contributed to the groundswell for action that lead President Richard M. Nixon to call for enactment of what became the Clean Air Act (CAA) of 1970,[2] and the leadership of the U.S. Senate Air Pollution subcommittee to add air pollutant control provisions to the 1970 Amendments to the Federal-Aid Highway Act (Highway Act).[3] Together, these three statutes provide the framework for all federal efforts, and most state programs,[4] to protect the public from the health effects of vehicle emissions.

Despite the enactment after NEPA of broad, regulatory statutes aimed at controlling emissions from motor vehicles and mitigating the adverse environmental effects of highways, NEPA continues to play an important role in decisions affecting the assessment and mitigation of impacts attributable to air pollution from vehicles and highways. One of NEPA's most important contributions may be the rule that requires agencies to fill major data gaps by obtaining new information needed to provide meaningful consideration of the comparative impacts of alternatives.

I. Health Effects of Highway Emissions

In a 2000 report to the U.S. Congress, the Federal Highway Administration (FHwA) estimated that the annual health costs of air pollution from transportation sources in the United States ranges from $40.443 billion to $64.6 billion.[5] This estimate did not include health costs for fine particles of particulate matter (PM) measuring 2.5 microns in diameter or smaller ($PM_{2.5}$)[6] or toxic air pollutants emitted by motor vehicles.[7] No other source of air pollution has a greater impact on the public health.

Since the FHwA's report to Congress, substantial new evidence has emerged showing that fine particles and toxic air pollutants such as benzene, 1,3 butadiene, formaldehyde, and the mix of pollutants contained in diesel exhaust are associated with significant additional impacts on public health. In 2000, the South Coast Air Quality Management District in California released a final report of its Multiple Air Toxics Exposure Study (MATES-II) that measured exposures to 30 toxic air pollutants at 22 locations in the Los

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1. 42 U.S.C. §§4321-4370d, ELR STAT. NEPA §§2-209.
2. *Id*. §§7401-7671q, ELR STAT. CAA §§101-618.
3. 23 U.S.C §109(h), (j).
4. Unrelated to federal law, local governments have undertaken programs to enhance local bus service, to provide free or heavily subsidized transit services to certain classes of users or in heavily trafficked zones, to expand rights-of-way reserved for bicycles, to convert transit vehicles to cleaner burning alternative fuels, to adopt land use plans that focus new development in corridors served by regional transit facilities, to relocate rail switch yards, and to create buffer zones near highways and airports. These local initiatives provide significant protection from the adverse health effects of air pollution from transportation sources, but are not within the scope of this Article.
5. FHwA, U.S. DEPARTMENT OF TRANSPORTATION (DOT), ADDENDUM TO THE 1997 FEDERAL HIGHWAY COST ALLOCATION STUDY FINAL REPORT (2000). The range of costs is the difference between the DOT's value of each life lost ($2.7 million) and the U.S. Environmental Protection Agency's (EPA's) value ($5.6 million). *Id*. tbl. 9, n.4.
6. In 1997, EPA promulgated a new national ambient air quality standard (NAAQS) for $PM_{2.5}$ based upon evidence that the most serious adverse health effects of PM resulting in premature death and hospitalization are caused by smaller particles associated with the products of fuel combustion.
7. EPA has identified 21 pollutants as mobile source air toxics (MSATs). 66 Fed. Reg. 17229 (Mar. 29, 2001).

Angeles air basin.[8] Using estimates of cancer risk developed for toxic air pollutants by the U.S. Environmental Protection Agency (EPA) and the California Air Resources Board, MATES-II found that cancer risk from the 30 air pollutants averages 1.4 cancers per 1,000 residents. Apportioning air pollution-related cancer risk by pollutant, MATES-II demonstrated that emissions from mobile sources account for 90% of the overall cancer risk attributable to air pollution in the five-county air district.

A new study designed to determine whether the proximity of 10 middle schools to major freeways in California's East Bay caused adverse health effects among school children aged 10 to 12 found a statistically significant greater prevalence of diagnosed asthma and bronchitis among students at schools most affected by motor vehicle emissions.[9] At each school, the study monitored concentrations of a number of motor vehicle-related pollutants, showing that $PM_{2.5}$ was 25% higher in a school yard 60 meters from a freeway than at monitors located a mile from the freeways.[10] A component of diesel exhaust measured at the schools was also shown to increase by as much as 55% with proximity to the freeways. Air quality at every school complied with national ambient air quality standards (NAAQS).

A study in the Bronx, New York, investigated truck traffic and PM in the neighborhood around the Hunts Point terminal where one in three children have asthma, and the hospitalization rate for asthma is 12 times the national average.[11] The reported carbon levels used as a surrogate for diesel emissions ranged at six sites from more than two to nearly seven times greater than the levels reported at the highest school site in the East Bay Children's Respiratory Health Study.[12] Carbon concentrations were found to correlate strongly with daily diesel truck traffic on the streets nearest the monitor.

Measurements of lung function in large cohorts of school children who were followed for eight years in 12 California communities demonstrate large deficits in three measures of lung function among students living in the communities with the highest pollutant concentrations compared with comparably aged students in communities with the lowest pollutant concentrations.[13] By age 18, when most lung growth has been completed, these reductions in lung function were expected to remain throughout the lifetime and contribute to future health complications.[14] The motor vehicle-related pollutants elemental carbon and nitrogen dioxide were two of the three pollutants most strongly correlated with this adverse health outcome. In the most polluted community in the study, the eight-year elemental carbon concentration was comparable to the carbon level reported in the school yard closest to a freeway in the East Bay Children's Respiratory Health Study, and more than five times less than the highest carbon levels measured in the Hunts Point neighborhoods adjacent to truck routes. These studies demonstrate that children in neighborhoods adjacent to freeways and major truck routes are at significantly greater risk of life-long health impairment from asthma and reduced lung function.

New research aimed at attempting to find an explanation for fatal cancers among children before age 16 also found a strong correlation between the proximity of the residence of the mother to highways (less than one kilometer) during fetal development and the first months following birth.[15]

These and other recent field research demonstrate that the emissions control programs adopted under the CAA for gasoline and diesel vehicles do not protect against adverse health effects attributable to motor vehicle emissions from large numbers of vehicles such as occur on heavily trafficked highways, interchanges, truck and bus terminals, airports, or seaports. Decisions to site and/or expand major highways, interchanges, and diesel vehicle terminals have significant public health consequences that must be taken into account when comparing alternatives under NEPA and for the purpose of determining whether a project is in "the best overall public interest" under the Highway Act.

II. Strategies for Protecting the Public From Exposure to Hazardous Concentrations of Air Pollution From Motor Vehicles

The control of emissions from motor vehicles falls under two general approaches:

> (1) Reducing emissions at the source by the following:
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> - limitations on emissions from vehicles that are based upon the application of emission control technologies;
> - the modification of engine design and the combustion characteristics of traditional fuels to reduce pollutant formation; and/or
> - the conversion of gasoline and diesel-fueled vehicles to less-polluting or nonpolluting energy sources; and
>
> (2) Reducing aggregate emissions in any locale or region by reducing total vehicle travel through the implementation of transportation controls and/or land use strategies that do the following:
>
> - encourage personal travel by multiple occupant vehicle modes, walking, or bicycling rather than single occupant vehicles;
> - reduce trip lengths by bringing origins and destinations into closer proximity;
> - consolidate freight shipments onto larger platforms, e.g., truck to rail or barge, and encourage

8. South Coast Air Quality Management District, Multiple Air Toxics Exposure Study-II (2000), *available at* http://www.aqmd.gov/matesiidf/matestoc.htm.

9. Janice J. Kim et al., *Traffic-Related Air Pollution Near Busy Roads: The East Bay Children's Respiratory Health Study*, 170 Am. J. Respiratory & Critical Care Med. 520 (2004).

10. *Id.*, tbl. 2 (average $PM_{2.5}$ measured at school closest to a freeway was 15 micrometers per cubic meter ($\mu g/m^3$) compared to 12 $\mu g/m^3$ at regional air district monitors).

11. T. Suvendrini Lena et al., *Elemental Carbon and $PM_{2.5}$ Levels in an Urban Community Heavily Impacted by Truck Traffic*, 110 Envtl. Health Persp. 1009 (2002).

12. *Compare id*. tbl. 4 *with* Kim et al., *supra* note 9, tbl. 2.

13. J.W. Gauderman et al., *The Effect of Air Pollution on Lung Development From 10 to 18 Years of Age*, 351 New Eng. J. Med. 1057 (2004).

14. *Id.* at 1063.

15. E.G. Knox, *Childhood Cancers and Atmospheric Carcinogens*, 59 J. Epidemiology Community Health 101 (2005).

freight transport by less-emitting modes of shipment; and

- reduce travel demand.

The public health consequences of motor vehicle emissions can also be lessened by reducing exposure to motor vehicle emissions by separating populations from "hot spot" areas where emissions are highly concentrated such as the isolation of truck and bus depots from residential neighborhoods, the relocation of rail switch yards to unpopulated areas, and the creation of open space buffer zones along major freeway rights-of-way, truck routes through densely populated areas, and near large airports and seaports.

III. Protecting Public Health From Motor Vehicle Emissions Under Federal Law

NEPA's role in federal decisionmaking today can be understood only within the context of the overall statutory scheme created by the various statutes that interact to create the framework for protecting the public from the adverse effects of air pollution. While NEPA does not provide substantive law to apply, it does operate by providing an important framework for decisionmaking not supplied by the substantive statutes.

A. Programs to Reduce Emissions at the Source

Under federal law prior to the 1990 Amendments to the CAA, most efforts to control motor vehicle emissions focused on requiring vehicle manufacturers to develop technological controls designed to reduce emissions at the source.[16] These regulatory programs under the CAA focused almost exclusively on the adoption of tailpipe standards for three pollutants—CO, nitrogen oxides (NO_x), and volatile organic compounds (VOCs)—and the reduction of lead in vehicle fuels.[17]

1. Control of NAAQS Pollutants

Since enactment of the 1990 CAA Amendments, lead is banned in on-road vehicle fuels,[18] EPA has undertaken more comprehensive regulatory initiatives to reduce emissions from new light- and heavy-duty gasoline and diesel vehicles,[19] alternative-fuel fleets can be required by states in some ozone nonattainment areas,[20] reformulated gasoline that reduces benzene emissions in addition to VOCs and NO_x is required in severe ozone nonattainment areas,[21] and transportation agencies have been required to focus on the impact that future transportation system expansions will have on achieving the reductions in metropolitanwide vehicle emissions needed to attain NAAQS for motor vehicle-related pollutants.[22] All of these initiatives, except for reformulated gasoline, are expressly limited to emissions that contribute to ambient concentrations of the motor vehicle-related NAAQS pollutants (CO, ozone, NO_x, PM_{10}, and $PM_{2.5}$.

More stringent tailpipe standards for light-duty vehicles took effect beginning with the 2004 model year. These standards are expected to achieve significant reductions in NO_x and VOC emissions over the next 20 to 30 years as older, dirtier vehicles are replaced by new vehicles meeting the new standards.

More stringent tailpipe standards for heavy-duty on-road vehicles and national sulfur-in-fuel standards will take effect in 2007.[23] These standards will require significant reductions in NO_x, VOC, and PM emitted by new gasoline and diesel-fueled trucks and buses. But these emission standards are not based upon levels needed to protect public health. Rather, vehicle emissions are to be reduced "to the greatest degree of emission reduction achievable through the application of technology" that EPA determines to be feasible and available taking cost into consideration.[24]

The rate of reductions in national emissions from these types of vehicles will depend heavily on the rate at which existing heavy-duty vehicles are replaced in service by new vehicles meeting the new standards. There is significant uncertainty whether EPA's initial modeling analysis (1999), which assumed an average life of 300,000 miles for existing heavy-duty vehicles, is correct. More recent estimates suggest that engine replacement and other techniques may extend vehicle life to 800,000 miles. If vehicles currently in use are not scrapped sooner than later, projected reductions in total fleet emissions may be delayed by a decade or more compared to estimates published by EPA in the diesel rule.

2. Control of Mobile Source Air Toxic Pollutants

In addition to the pollutants governed by NAAQS, the 1990 Amendments added new authority for EPA to regulate emissions of toxic air pollutants emitted by motor vehicles that are associated with significant adverse health effects such as benzene, 1,3 butadiene, aldehydes, and diesel particulate matter (DPM).[25] EPA identified 21 of these pollutants as mobile source air toxics (MSATs), including 6 "priority" MSATs.[26] In 2001, EPA decided not to adopt regulations limiting emissions of these pollutants based on the finding that no feasible technological means are available to achieve additional emissions reductions beyond the reductions expected from compliance with emissions limitations already in effect for motor vehicles.[27]

This authority to reduce MSAT emissions could be used to require the retrofit of existing diesel vehicles with available PM traps to achieve significant reductions in diesel PM and other MSATs without waiting for fleet replacement, but EPA denied requests from nine states to exercise this authority.

16. 42 U.S.C. §§7521-7590.
17. 40 C.F.R. pts. 85, 86, and 80.
18. 42 U.S.C. §7545(n).
19. Control of Air Pollution From New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements, 66 Fed. Reg. 5001 (Jan. 18, 2001) (heavy-duty diesel vehicles).
20. 42 U.S.C. §7511a(c)(4).
21. *Id*. §7545(k).
22. *Id*. §7506(c).
23. 40 C.F.R. pt. 86.
24. 42 U.S.C. §7521(a)(3)(A)(i).
25. *Id*. §7521(l).
26. 66 Fed. Reg. at 17229.
27. *Id*.

B. Limiting Aggregate Emissions in Metropolitan Areas and Local Hot Spots

The CAA and Highway Act have provisions that require in some circumstances or otherwise encourage the adoption of measures designed to prevent health threats from air pollution emitted by the congregation of large numbers of motor vehicles in metropolitan regions and in localized "hot spots."

1. CAA Provisions Governing Aggregate Vehicle Emissions

Strategies to reduce vehicle emissions by means other than reducing direct emissions from vehicles have been adopted by the states as part of their plans to implement NAAQS under the CAA[28] and by metropolitan planning organizations as part of their plans for regional transportation systems.[29] NAAQS for ozone are violated in most medium to large metropolitan areas, and NAAQS for $PM_{2.5}$ is violated in many large cities. Motor vehicle emissions typically contribute one-half of the precursor pollutants that contribute to ozone, and from one-third to one-half of the $PM_{2.5}$. The CAA requires these regionwide NAAQS violations to be addressed by state implementation plans (SIPs), which limits aggregate emissions to the levels needed for attainment of NAAQS. SIPs are required to set a "motor vehicle emissions budget" based on the maximum level of motor vehicle emissions needed for attainment.[30]

Where emissions from highways cause local violations of NAAQS (referred to as hot spots), those violations are also required to be remedied by measures adopted into the state's plan to implement NAAQS. The CAA "conformity" provision, added to the CAA in 1990, links SIP emissions budgets and control measures to the transportation planning process to ensure that transportation system improvements implement the requirements of SIPs.[31] These provisions, however, do not apply to pollutants not governed by NAAQS, such as the 21 MSAT pollutants EPA has designated, or to pollutants governed by a new NAAQS until one year after an area has been designated nonattainment for the pollutant.[32]

2. The CAA and Transportation System Design

Since 1990, the CAA requires that metropolitan planning organizations account for the emissions consequences that will result from planned future additions to the metropolitan transportation system.[33] The Act requires an emissions assessment to show that the planned system will not result in future emissions that will cause or contribute to new violations of NAAQS or interfere with timely attainment of applicable NAAQS. This requirement applies to the impact of cumulative changes in the transportation system on aggregate emissions of regional pollutants such as ozone, and also to the impact on local air quality caused by direct emissions from facilities where vehicle emissions are concentrated, i.e., major highways, interchanges, and truck/bus/rail terminals.

Regional motor vehicle emissions are required to conform to the "motor vehicle emissions budget(s)" established by each SIP for a metropolitan area.[34] When vehicle emissions exceed a SIP's budget, new highway projects cannot be added to the regional system until remedial actions are taken to reduce vehicle emissions, or a SIP is revised to allow additional emissions from vehicles.

3. Conformity and Transportation Project Air Quality Impacts

EPA currently requires that "hot spot" analyses to assess the impact of vehicle emissions on air quality near a transportation facility only be performed for CO and PM_{10}.[35] In its 2003 draft rule to implement the $PM_{2.5}$ NAAQS, EPA initially proposed to exempt transportation projects, e.g., major freeway expansions, new interchanges, diesel truck/bus depots or terminals, from any "hot spot" analysis for both $PM_{2.5}$ and PM_{10} emissions.[36] In response to strong objections from several states and public interest organizations, EPA has since published a revised proposal containing options for regulation as well as the original no-action proposal.[37] If no hot spot requirement is established for transportation projects that emit PM sufficient to cause violations of either PM NAAQS, then such projects will not be identified in most cases. Even where projects are predicted to cause PM NAAQS violations through the NEPA process or state environmental review requirements, the conformity requirement that mitigation measures sufficient to prevent NAAQS violations be adopted prior to project approval would not apply.

EPA initially proposed not to regulate because it found no evidence that emissions from transportation facilities cause violations of the $PM_{2.5}$ NAAQS. Evidence of the impacts of transportation project emissions on PM concentrations is limited but growing. A study cited by EPA in its *Health Assessment Document for Diesel Engine Exhaust* reported concentrations of $PM_{2.5}$ at a curbside bus stop in Manhattan ranging from 13.0 to 46.7 micrograms per cubic meter ($\mu g/m^3$).[38] Based on this study, EPA concluded: "The relevance of the Manhattan bus stop concentrations and potential exposure for large urban populations provide strong motivation for further studies in the vicinity of such hot spots."[39] A study of diesel PM at a transit bus garage con-

28. 42 U.S.C. §§7410, 7502(c), 7511a.

29. 23 U.S.C. §134(g).

30. 40 C.F.R. §93.101 ("motor vehicle emissions budget" defined).

31. 42 U.S.C. §7506(c); 40 C.F.R. pt. 93.

32. In the case of $PM_{2.5}$, NAAQS were promulgated in 1997, but review of transportation projects for conformity to NAAQS will not be required until 2006, one year after EPA finally designates areas that exceed NAAQS.

33. 42 U.S.C. §7506(c). *See* Environmental Defense Fund v. EPA, 167 F.3d 641, 29 ELR 20631 (D.C. Cir. 1999).

34. 42 U.S.C. §7506(c)(2)(A); 40 C.F.R. §93.118(a), (b).

35. 40 C.F.R. §§93.116, 93.123.

36. Transportation Conformity Rule Amendments for the New 8-Hour Ozone and $PM_{2.5}$ National Ambient Air Quality Standards and Miscellaneous Revisions for Existing Areas, 68 Fed. Reg. 62689 (Nov. 5, 2003).

37. Options for $PM_{2.5}$ and PM_{10} Hot-Spot Analyses in the Transportation Conformity Rule Amendments for the New $PM_{2.5}$ and Existing PM_{10} National Ambient Air Quality Standards, 69 Fed. Reg. 72140 (Dec. 13, 2004).

38. U.S. EPA, Health Assessment Document for Diesel Engine Exhaust (2002) (EPA 600/8-90/057F), *available at* http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=29060.

39. *Id.* at 2-99.

ducted by the District of Columbia showed that local diesel vehicle traffic on northwest 14th Street, a major urban arterial, contributed approximately 1.0 $\mu g/m^3$, and that DPM emissions from the buses exiting and entering the bus garage contributed another 1 $\mu g/m^3$ to the average regional concentrations of DPM measured at residential locations more than 300 meters from the bus garage and at least one block away from 14th Street.[40] The East Bay Children's Respiratory Health Study provides strong evidence that emissions from a major freeway contribute as much as 3 $\mu g/m^3$ to $PM_{2.5}$ measured at a middle school 60 meters from the traffic lanes.[41] Emissions from truck traffic in the South Bronx has been shown to add nearly 5 $\mu g/m^3$ of elemental carbon to local PM concentrations.[42] Virtually all DPM is less than 2.5 micrograms in diameter.

These data suggest that emissions from heavily trafficked freeways and other major sources of diesel vehicle emissions will likely cause or contribute to violations of NAAQS for $PM_{2.5}$. If EPA fails to adopt hot spot conformity rules that require transportation agencies to identify projects where mitigation measures will be necessary to protect the public from violations of NAAQS for $PM_{2.5}$, then the only protections will be under the Highway Act and NEPA.

C. Mitigating Air Pollution Impacts Under the Highway Act

Unlike the CAA programs, the Highway Act is not limited to listed pollutants. It requires that alternatives to highways be assessed to determine the costs of alternatives or mitigation measures that would "eliminate or minimize" the "possible adverse effects" of all highway pollutants. The costs of measures that avoid or mitigate "such adverse impacts" are to be compared with the mobility benefits of the proposed highway project to determine the course of action that is "in the best overall public interest."[43]

This provision has been largely ignored by transportation agencies. The adverse impacts of highway emissions on public health have never been quantified in any environmental impact statement (EIS) or record of decision (ROD). Mitigation measures or alternatives available to eliminate or minimize such health impacts have never been identified, nor have the costs of implementing such measures been estimated for comparison with the mobility benefits of a project. Even though the FHwA has submitted a report to Congress that uses sophisticated methods to estimate the $40 to $68 billion annual public health cost of the adverse effects of air pollution from highways, it has never applied such analytical methods to determining the costs of adverse health effects associated with individual projects. Nor has the FHwA developed any criteria for determining how the adverse health effects of air pollution are to be weighed in determining whether a project is "in the best overall public interest."

Litigation to require the FHwA to perform the "public interest" analysis for a major highway expansion is now pending in the U.S. Court of Appeals for the Ninth Circuit.[44] The Sierra Club is asking the court to enforce this provision by vacating the FHwA's approval of the expansion of U.S. Route 95 in Las Vegas until the relevant factors under the statute are addressed. If the court grants the requested relief, the FHwA and the states will, for the first time, be required to identify the alternatives to highways and/or the mitigation measures that can eliminate any significant risk to public health from highway emissions. The Highway Act does not expressly require that the alternative modes or mitigation measures that can eliminate or minimize adverse effects be adopted, but the FHwA's implementing regulation does require that mitigation measures be adopted as part of the ROD.[45] A ruling in favor of plaintiffs will likely require a public accounting of the adverse health consequences emissions from the highway and the adoption of adequate mitigation measures or an explicit explanation by the FHwA for why the transportation benefits of the project outweigh the adverse health effects likely to be experienced by nearby populations.

D. NEPA and the Highway Act Both Require Review of Transportation Projects for Health Impacts of Air Pollution

The FHwA is responsible for preparing an EIS for new or expanded highway projects. NEPA requires disclosure to decisionmakers and the public of any significant effect that a federally funded or approved activity will have on the human environment,[46] a comparison with alternatives that have less impact on the environment, and consideration of other measures that may mitigate unavoidable impacts.[47] Adverse impacts on health are "significant."[48] NEPA, standing alone, does not require that mitigation measures be adopted or implemented.[49]

Most highway EIS contain an emissions analysis for suspected CO hot spots, and some include a qualitative assessment of site-specific controls for construction-related PM_{10} emissions (dust and soil). No federal EIS has ever evaluated the impact of highway emissions on local concentrations of $PM_{2.5}$ or MSATs or attempted to characterize the public health consequences of exposure to air pollutants from the project.[50] The failure of the FHwA to perform an analysis of $PM_{2.5}$ and MSAT emissions from the proposed expansion of U.S. Route 95 in Las Vegas from 6 to 10 lanes, and to disclose the health risks attributable to exposure to those pollutants that are likely to be experienced by nearby populations, is now the subject of litigation pending in the Ninth

40. Versar, Inc., The Impact of the Northern Bus Garage on Local Air Quality, A Report to the Washington Metropolitan Area Transit Authority (2003).

41. Kim et al., *supra* note 9.

42. *See* Lena et al., *supra* note 11.

43. 23 U.S.C. §109(h).

44. Sierra Club v. Department of Transp., 310 F. Supp. 2d 1168 (D. Nev. 2004), *appeal pending*, No. 04-16155 (9th Cir.).

45. 23 C.F.R. §771.105(d).

46. 40 C.F.R. §§1502.1, 1508.27.

47. *Id.* §§1502.14, 1502.16, 1508.25(b).

48. *Id.* §§1508.8, 1508.27(b)(2).

49. Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 19 ELR 20743 (1989).

50. An analysis of the health risks associated with emissions of toxic air contaminants was included in the EIS for the South Orange County Transportation Infrastructure Improvement Project, §7, at 7-14 to 7-21 (Dec. 24, 2003). The FHwA contends this analysis was included to satisfy the environmental review requirements of the California Environmental Quality Act, but not NEPA.

Circuit.[51] If plaintiffs are successful, future highway projects will be subject to an emissions and health risk analysis for $PM_{2.5}$ and MSATs.

In the early years of NEPA and the Highway Act, state highway departments and the FHwA were successfully challenged under both statutes for their failure to assess the adverse effects of air pollution on surrounding communities.[52] The FHwA does not dispute this duty in the U.S. Route 95 litigation. Nor does the FHwA argue that the adverse health effects associated with public exposure to $PM_{2.5}$ and MSATs are not "significant" within the meaning of NEPA.

Instead, the FHwA argues: (1) it has adequately disclosed the effects of air pollutants in an EIS by modeling the future concentrations of one motor vehicle pollutant—CO; (2) tools for modeling the expected concentrations of other pollutants are not sufficiently developed to provide reliable results; (3) even if community exposures to highway emissions can be predicted, cancer risk and other adverse health effects cannot be reliably estimated; and (4) new tailpipe standards adopted by EPA in 2000 will achieve future reductions in motor vehicle emissions.

None of these defenses are addressed specifically by requirements of the CAA or the Highway Act. The ambient air and health impacts of MSAT emissions are not required to be assessed under the CAA because the Act only regulates the stationary and mobile sources that directly emit MSAT emissions and not indirect sources such as highways.[53] Ambient concentrations of air pollutants emitted from highways that are governed by NAAQS are regulated under the conformity provisions of the Act, but not toxic air pollutants.[54] But the ambient concentrations of $PM_{2.5}$ are not regulated pursuant to conformity because Las Vegas has not been designated as a nonattainment area for $PM_{2.5}$.[55]

Under the Highway Act, the FHwA is required to determine the "possible adverse effects" of "air pollution" for the purpose of identifying alternatives or mitigation that can "eliminate or minimize" such effects.[56] The FHwA is obviously granted discretion to determine which pollutants are associated with possible adverse effects, but in this case it would appear to be arbitrary and capricious to omit from the mitigation analysis and the public interest test those pollutants that EPA has found to be harmful to human health.

EPA determined that the pollutants ignored in the FHwA's environmental review pose very serious health threats. Of the pollutants emitted by motor vehicles, $PM_{2.5}$ is perhaps the most deadly. Two years before the U.S. Route 95 EIS, EPA promulgated NAAQS for $PM_{2.5}$ based on evidence that these smaller particles contribute most to

> serious health effects (e.g., mortality, exacerbation of chronic disease, increased hospital admissions) in sensitive populations (e.g., the elderly, individuals with cardiopulmonary disease), as well as significant adverse health effects (e.g., increased respiratory symptoms, school absences, and lung function decrements) in children. Moreover, these effects associations are observed in areas or at times when the levels of the current PM[10] standards are met.[57]

EPA has listed 21 pollutants as MSATs that cause chronic adverse health effects, such as cancer, and acute effects from short-term exposures (hours or days), such as asthma attacks.[58] Congress listed benzene, 1,3 butadiene, and formaldehyde as mobile source-related air toxics in the 1990 CAA Amendments when it required EPA to set vehicle emission standards for toxic pollutants emitted from mobile sources.[59] By July 1999, EPA had included these three statutory MSATs and 10 other mobile source-related pollutants on a list of 33 priority pollutants targeted for control under EPA's Integrated National Urban Air Toxics Strategy.[60] This strategy "established a list of urban [hazardous air pollutants] which pose the greatest threats to public health in urban areas, considering emissions from major, area and mobile sources."[61] EPA observed that "mobile sources are an important contributor to the urban air toxics problem."[62] Based on these findings of harm to public health, the FHwA bore a heavy burden to explain why it would not include these pollutants in an analysis of the "possible adverse effects" of "air pollution" under the Highway Act or its analysis of significant effects under NEPA. Both statutes require an assessment of the adverse effects of pollutants known to cause harm. But the FHwA offered no explanation in the EIS, response to comments, or the ROD for omitting them from the analysis.

E. NEPA Plays Central Role in Addressing Areas of Uncertainty

NEPA's essential, if not exclusive role, is in the directives prescribing how agencies must treat major issues that affect choices among alternatives when they are fraught with uncertainty. The FHwA's remaining reasons for not including $PM_{2.5}$ and MSATs in an EIS rely primarily on the role uncertainty plays in the assessment of environmental impacts. Case law defining an agency's obligation to consider uncertainty under the Administrative Procedure Act does not require that agencies attempt to resolve or minimize uncertainty. But even the limited obligations of "reasoned decisionmaking" require more than a mere declaration of uncertainty as an excuse for not considering the serious adverse health effects associated with highway emissions. The U.S. Supreme Court has made clear that an agency must do more than simply declare that there are uncertainties without explaining how those uncertainties justified its decision.

> Recognizing that policymaking in a complex society must account for uncertainty, however, does not imply that it is sufficient for an agency to merely recite the terms "substantial uncertainty" as a justification for its

51. Sierra Club v. Department of Transp., 310 F. Supp. 2d 1168 (D. Nev. 2004), *appeal pending*, No. 04-16155 (9th Cir.).
52. Lathan v. Volpe, 350 F. Supp. 262, 2 ELR 20545 (W.D. Wash. 1972), *aff'd*, Lathan v. Brinegar, 506 F.2d 677, 4 ELR 20802 (9th Cir. 1974); D.C. Fed'n of Civic Ass'ns v. Volpe, 459 F.2d 1231, 1 ELR 20572 (D.C. Cir. 1971).
53. 42 U.S.C. §§7412(k), 7521(l).
54. *Id*. §7506(c)(1), (2).
55. *Id*. §§7506(c)(5), 7507(d)(1).
56. 23 U.S.C. §109(h).
57. National Ambient Air Quality Standards for Particulate Matter, 62 Fed. Reg. 38652, 38657 (July 18, 1997).
58. 66 Fed. Reg. at 17229.
59. 42 U.S.C. §7521(l).
60. Integrated Urban Air Toxics Strategy, 64 Fed. Reg. 38706 (July 19, 1999).
61. *Id.* at 38714.
62. *Id.* at 38706.

> actions. The agency must explain the evidence which is available, and must offer a "rational connection between the facts found and the choice made."[63]

NEPA establishes a more precautionary approach that demands an investment of agency resources to resolve uncertainty.

> If the incomplete information relevant to reasonably foreseeable significant adverse impacts is essential to a reasoned choice among alternatives and the overall costs of obtaining it are not exorbitant, the agency shall include the information in the environmental impact statement.[64]

When information such as the number of annual deaths, hospitalizations, life-long impairment of lung function, and the increased prevalence of asthma among school children are relevant to the choice between a highway expansion or a rail transit alternative, NEPA imposes on an agency a duty to obtain missing information to resolve, or at least reduce, uncertainty regarding the magnitude of these impacts unless either "the overall costs of obtaining it are exorbitant or the means to obtain it are not known."[65]

The current version of 40 C.F.R. §1502.22 replaces the pre-1986 requirement that when relevant information was not available the agency should undertake a worst-case analysis. When the Council on Environmental Quality (CEQ) repealed the worst-case analysis requirement, it explained that the purpose for adopting the requirement to obtain missing information was to "improve the quality of the EIS and the decision which follows, and, hence strengthen environmental protection, in conformance with the purpose and goals of NEPA."[66] The CEQ expected that "[t]he new requirement will provide more accurate and relevant information about reasonably foreseeable significant adverse impacts."[67]

In the U.S. Route 95 decision, the FHwA merely cited uncertainties in characterizing health risks as reasons for ignoring the health impacts of emissions from the highway rather than triggering a duty to resolve these uncertainties. It undertook no investigation to inform itself or the public of the magnitude of the health risks presented by emissions from the expanded highway. Instead, it identified weaknesses in the data collection tools available to assess these risks as the reason for not considering these health impacts. The FHwA did not assert that the means of obtaining better information are not known or that the costs of obtaining the information are exorbitant.

1. The Availability of Modeling Tools to Estimate Exposures and Health Risks

The FHwA's contentions that modeling tools are not available to determine expected future exposures to the public of highway emissions, and to assess likely health risks, were made after the litigation commenced in post-decisional statements filed with the Ninth Circuit, but were never exposed to public comment or review by other agencies with expertise such as EPA or the National Environmental Institute of Health.

EPA released a revised emissions factor model, MOBILE6.2, that provides estimated emissions rates for $PM_{2.5}$ and the six most hazardous MSATs from 16 classes of motor vehicles under four driving conditions, including freeway driving.[68] EPA approved this model for regulatory applications when the CAA requires estimates of vehicle emissions for SIP development and conformity determinations. Other models have been developed to model the dispersion of highway emissions in the atmosphere for the purpose of predicting ambient concentrations in nearby neighborhoods.[69]

Despite the availability of these tools for estimating public exposure to emissions, the FHwA argued to the district court that the models were deficient in various technical respects that call into question the precision and accuracy of the emissions estimates for MSATs and likely ambient concentrations.[70] The FHwA did not attempt to determine the magnitude of the range of error that would result from application of these models, or whether the models are biased, i.e., tend to err in one direction such as by overpredicting rather than underpredicting.

The FHwA did explain to the district court that it was engaged in "short-term research [that] is a component of a comprehensive strategy to address MSAT."[71] This research program included elements designed to address the alleged deficiencies in the EPA models, including "an evaluation of EPA's Mobile6.2 model."[72] But the FHwA made no commitment to complete this work as part of an effort to resolve the uncertainties that it claimed were the basis for not assessing health impacts of motor vehicle emissions in the U.S. Route 95 decision.

With respect to a rationale for its alleged inability to determine health risks if future pollutant concentrations could be reasonably estimated, the FHwA focused exclusively on the uncertainty associated with the lack of an EPA-approved unit risk factor for diesel PM.[73] EPA had used unit risk factors published in its Integrated Risk Information System as the basis for estimating the population risks that were used to select the 33 toxic air pollutants (including 13 MSATs) for regulation under the Integrated Urban Air Toxics Strategy.[74] The FHwA offered no explanation why the risk factors developed by EPA for these 13 MSATs could not be used to estimate population risks.

63. Motor Vehicle Mfrs. Ass'n of the United States v. State Farm Mut. Auto Ins. Co., 463 U.S. 29, 52, 13 ELR 20672 (1983) (citations omitted). International Harvester Co. v. Ruckelshaus, 478 F.2d 615, 642, 3 ELR 20133 (D.C. Cir. 1973) (regulation in the face of uncertainty requires weighing the "nature and the consequences of risk of error").
64. 40 C.F.R. §1502.22(a).
65. *Id*. §1502.22(b).
66. NEPA Regulations; Incomplete or Unavailable Information, 51 Fed. Reg. 15618, 15624 (Apr. 25, 1986).
67. *Id.*
68. Official Release of the MOBILE6.2 Motor Vehicle Emissions Factor Model and the December 2003 AP-42 Methods for Re-Entrained Road Dust, 69 Fed. Reg. 28830 (May 19, 2004).
69. The state of dispersion modeling for highway emissions was recently reviewed by Rob Ireson at the January 9, 2005, meeting of the Transportation Research Board. *See* Committee on Transportation and Air Quality, *Dispersion Modeling for Mobile Source Air Toxics Exposure*, *at* http://www.trbairquality.com/airtoxicsworkshop.htm (last visited Feb. 16, 2005).
70. Declaration of Michael J. Savonis, Attachment to Government's Brief, Sierra Club v. Department of Transp., 310 F. Supp. 2d 1168 (D. Nev. 2004) (No. 04-16155).
71. *Id.* at 11, ¶ 19.
72. *Id*.
73. *Id.* at 5-6, ¶ 9-10.
74. 64 Fed. Reg. at 38714.

EPA has not, however, determined a unit risk factor for estimating cancer and other health risks attributable to exposure to diesel PM because of unresolved uncertainty in the evidence of its carcinogenic potency.[75] The FHwA focused exclusively on this uncertainty as its sole reason why it could not estimate overall health risks. The FHwA did not acknowledge that EPA has expressed no doubt regarding its conclusion that "diesel exhaust PM is of special concern because it has been implicated in an increased risk of lung cancer and respiratory disease in human studies."[76] The FHwA also ignored the U.S. Department of Health and Human Services National Toxicology Program, which designated diesel exhaust particles as "reasonably anticipated to be a human carcinogen" in its *Ninth Report on Carcinogens*.[77]

Based on these areas of uncertainty, the FHwA concluded that it was justified in not preparing an air emissions analysis or health risk assessment because it was the opinion of agency staff that "the relationship between transportation activities and health implications from MSAT emissions is nascent and still in the realm of basic research."[78] There is no uncertainty regarding some kinds of foreseeable health impacts including cancer, asthma attacks, and other effects of diesel emissions. Only the magnitude of the effect is in doubt. In this situation the impacts associated with the high and low estimates of risk within the range could be considered. If the research data suggests that the range of uncertainty in cancer risks is a factor of three, e.g., 30 to 90 cancers, this would provide a basis for comparing the health impacts of the highway versus a transit alternative since the threefold range would apply to estimates of cancers for both alternatives.

2. Declining Future per Vehicle Emissions

The FHwA's last argument relies on EPA's predicted trends for aggregate emissions from heavy-duty diesel vehicles during the period between 2007 and 2025. Based on the estimated 90% reductions in PM emissions expected to be achieved by new trucks and buses designed to meet the final diesel emission standards, EPA predicted that national aggregate fleet emissions would decrease significantly by 2020, and that by 2030 nearly all of the nation's current fleet of diesel vehicles would be replaced by engines meeting the new standards.

The FHwA acknowledged these trends would not determine whether vehicle emissions would necessarily decrease in a highway corridor where daily vehicle trips were predicted to increase. In the U.S. Route 95 corridor, daily vehicle trips were estimated to grow by 38% between 1999 and 2020 as a result of expanding capacity from 6 to 10 lanes.[79] Whether emissions would ultimately begin to decline in a corridor as a result of EPA's standards for diesel engines that take effect for the 2007 model year will depend on the elimination of current diesel vehicles. Diesel emissions would not drop for many years after 2007 until the replacement of older, dirty vehicles exceeded the rate at which new vehicle trips were being added to the corridor. In the meantime, the public in the corridor would continue to be exposed to increasing emissions. Indeed, the FHwA admitted in its letter refusing to prepare a supplemental EIS to address these health impacts that the addition of four more lanes could increase exposures for some period because vehicles would be closer to neighboring homes and to the three public schools located adjacent to the highway right-of-way.[80]

F. U.S. Route 95 Case Tests the Scope of Agency Duty to Resolve Uncertainty

The stakes in the U.S. Route 95 litigation are large for public health and the future of the nation's transportation program. The plaintiff, the Sierra Club, seeks to have highway projects compared with transit alternatives on the basis of the public health consequences of each option. The state of Nevada seeks to move ahead with a major expansion of the highway that serves the fastest growing suburban area in the nation's fastest growing metropolitan area. The Sierra Club asked that an alternative considered in the planning process, i.e., an extension of the new monorail serving the casino "strip," be compared with the highway based upon public health impacts. The EIS compared the highway/bus option with the monorail alternative based upon construction and operating cost,[81] but not on the basis of their public health costs or their impacts on human life. This is certainly the kind of information that NEPA and the Highway Act intended to be available to decisionmakers and the public before choices are made. The comparisons can be made now using imperfect modeling tools, or the transportation agencies can wait to approve transportation projects until the uncertainties inherent in the use of imperfect models are resolved. But defeating the purpose of NEPA by ignoring the public health impacts of harmful pollutants from transportation projects should not be a permissible option.

IV. Conclusion

The CAA programs designed to protect the public health from the hazards of the six criteria pollutants may be adequate to protect the public from the adverse effects of those pollutants emitted from motor vehicles if emissions of large aggregations of vehicles are controlled through effective "hot spot" regulations, but these programs are not adequate to protect against the cumulative and synergistic effects of complex array of pollutants emitted from motor vehicles. The latest research linking childhood cancer deaths, increased prevalence of asthma and bronchitis among middle school aged children, and reduced lung function among children through age 18 to the mix of pollutants emitted from motor vehicles makes clear that regulating only criteria pollutants does not provide adequate protection from the

75. U.S. EPA, *supra* note 38.

76. 66 Fed. Reg. at 5021.

77. National Toxicology Program, Ninth Report on Carcinogens (U.S. Department on Health and Human Services 2001), *available at* http://ehis.niehs.nih.gov/roc/toc9.html.

78. Declaration of Michael J. Savonis, Attachment to Government's Brief at 14, ¶ 24, *Sierra Club* (No. 04-16155).

79. *Id*. at 7, ¶ 11 ("local trends may be different, and in some cases very different from national trends").

80. Letter from John Price, FHwA Nevada Division Administrator, to Pat Gallagher, Sierra Club 3 (July 17, 2000).

81. The approved highway estimated cost is $872.9 million, compared to an estimated cost of between $770 and $835 million for the Guideway Alternative. *Compare* Estimated Annual Project Costs for the Locally Preferred Alternative, Final EIS, tbl. 6-8 (FHwA Nov. 19, 1999), *with* Alternative Strategy 2, Final EIS, tbl. 4-11.

full array of vehicle emissions. In most of the studies linking adverse health effects to the pollutants emitted from vehicles, NAAQS were not being violated.

The public health purpose of the CAA may require that EPA list new criteria pollutants for the adoption of additional national standards that will be adequate to protect against the dangers of the mix of hazardous pollutants emitted from motor vehicles. But until fully protective national standards are in effect to govern the design of transportation systems and projects, the public interest test in the Highway Act and the disclosure requirements of NEPA provide important tools to guide decisionmaking when choices are being made regarding large public investments in transportation systems and the siting of highways, interchanges, and terminals in proximity to schools, day care centers, hospitals, residential areas, and recreation facilities. These decisions are now being made without being informed by the evidence that motor vehicle emissions are causing serious harm to our children and other sensitive populations.

Now that evidence has emerged to show that the health impacts of vehicle emissions are highly significant from a public health perspective, the rigorous application of the uncertainty rule under NEPA is an essential requirement to ensure that decisionmakers and the public are as well informed of the public health consequences of their actions as they can be, given the rapidly unfolding state of the science. The limits of what can and should be known about emissions, their dispersion in the atmosphere, and their impacts on exposed populations have not been reached. NEPA requires that the best scientifically available tools be applied to make intelligent choices. With our children's lives and futures at stake, making decisions without obtaining the best information available from the modeling and predictive tools now available, is not tolerated by NEPA.