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## Exhausting Options: *Assessing SIP-Conformity Interactions*

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PETER NELSON, AND SARAH J. SIWEK



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## *Preface*

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**E**nsuring a steady improvement in the quality of the air Americans breathe would be a much easier matter if other activities were not also highly valued and socially beneficial. Driving cars and generating electricity from fossil fuels, however, cause air pollution; and public policies are designed not only to help clean the air but also to ease road congestion and encourage economic growth.

Reconciling the dual goals of effectively planning for local transportation needs and meeting regional air quality requirements is the essence of the conformity process analyzed in this report. Local transportation planners and regional air quality officials have responsibilities that differ not only across legal and organizational lines but also from historic, budgetary, temporal, and spatial perspectives. The transportation conformity process, a requirement since 1977, has taken on new meaning since the 1990 Amendments to the Clean Air Act. With these amendments, mobile sources of air pollution (primarily cars, trucks, and buses, but also off-road emission sources such as trains, planes, and barges) also became subject to overall regional emissions budgets for identified pollutants such as ozone, sulfur dioxide (SO<sub>2</sub>), and particulates. And thus, emissions from these vehicles also became, for the first time, a significant issue for transportation planners.

Chapter One reflects on the twin objectives of transportation planning and improving air quality and provides needed historical context. Chapter Two describes the interaction of the State Implementation Plan (SIP) and transportation conformity processes, and, in Chapter Three, the usual ways in which discrepancies between the two kinds of plans are reconciled. Chapter Four considers the impacts of the problems that arise, and Chapter Five examines potential policy responses, from low-cost remedies that already exist to those that would require new funding or legislation. Chapter Six concludes.

Appendix A offers a summary of the principal elements of the transportation planning, air quality planning, and transportation conformity processes; readers unfamiliar with our subject may wish to read this summary first. Appendix B lists our interviewees and sources of information, and Appendix C is a glossary of abbreviations.

The authors acknowledge the advice and support of their project officer at the Federal Highway Administration, Cecilia Ho. We also thank all the people we interviewed for this report, including officials and other stakeholders in the six regions we visited as well as experts we talked to, who are listed in Appendix B. These people not only graciously gave us their time during the interviews, but many of them also commented on the case studies or the report. We would also like to thank Ken Adler, formerly with the Senate Committee on Environment and Public Works, who made available to us the results of the committee's survey of metropolitan planning organizations (MPOs).



# Exhausting Options:

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## *Introduction*

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**M**etropolitan transportation plans, which guide investment in surface transportation in the nation's metropolitan areas, are required to be in conformity with regional air quality plans in nonattainment and maintenance areas. This means that regional transportation planners must ensure that regional motor vehicle emissions do not exceed the fixed emissions target, or emissions budget, specified in the area's SIP to attain the National Ambient Air Quality Standards (NAAQS) under the Clean Air Act. This requirement holds not only for near-term emissions but also for emissions projected at least 20 years into the future. Transportation conformity<sup>1</sup> first appeared in the Clean Air Act Amendments of 1977 but attained its current significance only after the 1990 Amendments.<sup>2</sup>

The twin objectives of transportation conformity are to “coordinat[e] the transportation and air quality planning processes and ensur[e] that transportation plans and Transportation Improvement Programs (TIPs) are consistent with State Implementation Plans (SIPs)” (FHWA 2001). Conformity has become controversial over the past decade, in part because achieving one of the above objectives does not necessarily mean achieving the other.

By its nature, conformity involves an interaction between the transportation and air quality planning processes. There is a consensus that, on balance, this interaction is beneficial. The conformity rules are widely credited with opening lines of communications between air quality and transportation planners and embedding air quality considerations in transportation decisions.

In addition, many air quality professionals and environmentalists see conformity as subjecting on-road mobile pollution sources to the same local scrutiny that stationary sources have been subjected to for some time. In their view, the conformity determination also alerts transportation and air quality planners alike that the assumptions in a SIP may no longer be valid and that attainment may be in jeopardy.

However, there have also been calls to reform the conformity planning regulations because it is alleged that features of the process have been unnecessarily disruptive to both transportation and air quality planning. From many local transportation planners' perspective, the way conformity is structured has added significantly to their administrative burdens and given them new responsibilities for reducing transportation emissions without providing them the tools to do the job. From some air quality planners' perspective, transportation conformity issues may trigger time-consuming SIP revisions even though the actual air-quality benefits of these revisions may be minimal.<sup>3</sup>

A common complaint, particularly from the transportation planning perspective, is that some issues associated with SIP implementation have impacts that are first felt in the conformity process. In these situations, it is argued, local planning agencies shoulder an undue share of the burden for resolving issues that would be much more easily tackled in a different arena—the SIP process. At the root of this controversy are different beliefs about the ease with which local planning agencies are able to significantly reduce emissions using the policies at their disposal.

In this report we examine the SIP-conformity interaction from neutral territory, recognizing that, according to the Clean Air Act, transportation planning and project implementation are supposed to be affected by the requirement of demonstrating conformity. Based on detailed examination of transportation and air quality planning in six regions, together with other relevant information, we seek to document the types of issues that have arisen from interactions between the SIP and transportation planning processes and assess the impacts of those interactions on transportation plans and facilities. We also discuss policy responses, though we stop short of making recommendations.

### *The Historical Context*

When thinking about the conformity process, it is important to keep in mind the historical experience with air quality regulation in the United States. The Clean Air Act of 1970 set ambitious goals—the NAAQS—for achieving clean air throughout the country and established a dual strategy for reaching those goals. One element of that strategy was a series of federal measures designed to reduce emissions from both stationary and mobile sources. Among the mobile-source measures were technology-based emissions standards for new vehicles and standards on fuel composition. Over the next 30 years, these measures would reduce tailpipe emissions rates from new vehicles to about 5% of new-vehicle emissions rates in 1968 and significantly reduce evaporative emissions as well. Second, requirements were imposed on state and local authorities to prepare SIPs in case the federal standards for new mobile and stationary sources were not sufficient to achieve the air quality goals by the statutory deadlines (Melnick 1983).

When it became apparent by the mid-1970s that the difficulty of achieving the air quality goals had been seriously underestimated, the Clean Air Act was amended in 1977 and again in 1990. With the 1990 Amendments a new strategy emerged, setting deadlines for attainment of the NAAQS for ozone, CO, PM<sub>10</sub>, and NO<sub>x</sub>. These deadlines would be set far enough into the future that achieving them was a realistic goal, or so it was thought. At the same time, this new strategy established a process to ensure that the air quality goals would actually be reached.

The process contained several elements. The first was a mandate that SIPs chart a clear emissions-reduction plan to achieve national air quality standards within the new statutory time frames. Second, this plan had to be put in quantitative terms so that compliance could not be fudged. Third, failure to implement SIP measures would subject local and state governments to penalties high enough to serve as a compelling incentive to take the process seriously.

Fourth, SIPs would now treat on-road mobile sources much more like stationary sources. Prior to 1990, SIP emissions-reduction provisions concentrated primarily on nonmobile sources and contained very few provisions directed at mobile sources except for including transportation control measures needed to help demonstrate attainment. After the 1990 Amendments, the on-road mobile source sector would also be subject to an emissions budget. Just as each major sta-

tionary source had an emissions limit determined by state or local regulation, now local authorities would have to ensure that mobile source emissions remained within their budget.

Transportation conformity, which had been introduced in 1977 but hitherto not affected either transportation or air quality planning appreciably, was a particularly important component of this strategy. Most obviously, the new mobile source budget brought on-road mobile sources firmly within the purview of SIP preparation and implementation. Any unexpected increase in on-road mobile source emissions would have to be countered by compensating emissions reductions elsewhere in the mobile source sector. Conformity was also an important part of the act's enforcement mechanism. A conformity determination expires in at most three years, and if it expires without a new conformity determination, the area is in a conformity lapse. During a conformity lapse, only exempt projects (for example, safety projects), transportation control measures in approved SIPs, and projects or project phases that have received funding and approval prior to a lapse can proceed.<sup>4</sup>

Conformity will continue to be a large part of the transportation and air quality planning landscape. It is likely that the planned implementation of the tighter ozone standard and the new PM<sub>2.5</sub> standards will greatly increase the number of counties in nonattainment and subject to the SIP and conformity processes. In addition, the growing recognition of the role that particulate matter plays in adverse health outcomes will force a reorientation toward new emissions-reducing strategies, and in particular toward reducing emissions from previously ignored classes, such as off-road diesel sources.

### ***Our Approach***

To evaluate SIP-conformity interactions, the team performed six in-depth case studies of state and local regions required to demonstrate conformity. The preparation of the case studies required site visits to conduct interviews with representatives of the local MPO, state air quality agency, state department of transportation, the U.S. Environmental Protection Agency (EPA), Federal Highway Administration (FHWA), and local citizens' groups. Responses to a new survey, initiated by the Senate Environment and Public Works Committee, were also reviewed, as well as testimony from a July 30, 2002, hearing of that committee.

The empirical foundation of the report is a series of six case studies of the interaction between transportation and air quality planning. We investigated how conformity issues arose and were resolved in six areas around the country: Baltimore; Houston; Paducah, Kentucky; Portland, Oregon; Sacramento; and Washington, DC. Two of the areas, Portland and Washington, were chosen because they offer examples of a well-developed interaction between air quality and transportation planning. We also examined data describing the process of SIP review and ap-

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proval by EPA. We contacted representatives of state environmental agencies, MPOs, state transportation departments, FHWA and Federal Transit Administration (FTA) representatives, and representatives in EPA's regional offices and the Offices of Transportation and Air Quality (OTAQ) and Air Quality, Planning and Standards (OAQPS). We interviewed approximately 70 people in total.

Finally, we reviewed testimony and a survey of more than a dozen MPOs across the country on a variety of transportation conformity issues, conducted by the Senate Environment and Public Works Committee in July 2002. Included in the survey group were five of the six areas we studied: Baltimore; Washington, DC; Houston; Sacramento; and Portland, Oregon. The survey included questions related to several topics we discussed in our case study work, and in those cases, we draw upon the survey responses. The committee's work provides a rich source of data on the perspectives of MPOs on transportation conformity; unfortunately, there is no comparable survey of state air-quality planning agencies.

Our project shares the advantages and disadvantages of most case-study research. A case study of a decisionmaking process is primarily a detailed description of who the major actors and institutions were, what motivated them, what information and expertise they possessed, and what the outcomes were. Good case studies pay careful attention to the sequence of events and to the information that participants had and did not have at various points in the sequence. They recognize that outcomes are not inevitable and often can point to events or conditions that were crucial to the outcomes and would lead to different outcomes if conditions had been different.

Comparison of several case studies can reveal at least part of the range of possible outcomes and generate hypotheses about what is driving them. These hypotheses can then be tested in the broader population. However, drawing general conclusions from the case studies alone is a risky enterprise. Because individual case studies are rather costly, most case-study projects have very small sample sizes that do not permit statistical inference. In addition, small sample sizes often lead to nonrandom case selection, as researchers attempt to meet some predetermined distributional criteria; this tendency can also compromise the ability to make generalizations from case studies. One has to be particularly careful in selecting cases to make sure certain outcomes are included, for it is all too easy to draw unwarranted causal links from case study features to those outcomes. Nonetheless, case studies provide an important element of "ground truth" to the study of regulations and institutions, and are frequently the only way to capture important but not easily quantifiable aspects of those institutions.

The on-the-ground consequences of the problems that arise in achieving conformity appear to be relatively small, at least for the time being: mostly raising administrative costs, diverting the attention of transportation planners away from other valued activities, and occasionally resulting in high-cost, low-benefit approaches to reducing emissions. However, future problems may be more significant as the tighter ozone standard and the new standards for fine particulate matter (PM<sub>2.5</sub>) are implemented. EPA forecasts that the number of counties in nonattainment that are subject to new air quality planning processes and conformity processes will at least triple. Bringing in a large number of stakeholders and officials unfamiliar with the intricacies of the conformity process and the SIP process may lead to problems in the short term. Meanwhile, raising the requirements in areas already violating standards and familiar with the conformity and SIP processes can only heighten the concern about a toolkit empty of ways to meet transportation needs and air quality goals.

Among the issues identified were the following:

- difficulties identifying adequate control measures;
- a lack of consistency between the planning assumptions employed during the conformity analysis and those used to develop the SIP motor-vehicle emissions budget;
- the possibility for a similar lack of consistency as a consequence of the introduction of an updated mobile-emissions model (MOBILE6 or EMFAC);
- difficulties arising from a state's failure to fully implement a control measure committed to in the SIP;
- a difference in the planning horizons of air quality plans and transportation plans; and
- special challenges for isolated rural areas.

Areas can respond to these challenges through a variety of mechanisms:

- reexamining model assumptions and available data;
- changing the operation of existing facilities;
- canceling or delaying infrastructure projects;
- adding emissions-reducing projects; and
- revising the on-road mobile source budget in the SIP.

We found the actual on-the-ground impacts of these issues to be relatively modest, although some respondents cited large opportunity costs associated with dealing with SIP-conformity issues.

- There were few instances of project delays.
- The importance of interagency consultation was demonstrated in all the areas we studied.
- The conformity process imposes fairly large administrative burdens.
- In some areas, SIP-conformity issues resulted in the implementation of emissions-reducing projects.

A number of potential policy responses were suggested by interviewees or emerged from the team's own observations of conformity in practice. Some of these responses are currently available to state and local agencies:

- Expand the toolbox to include pricing policies directed at auto travel.
- Improve interagency consultation in SIP development.
- Use safety margins, if available, to help offset difficulties resulting from the requirement to use latest planning assumptions.
- Use intersector trading to extend the market for emissions reductions.
- Create out-year budgets in SIPs.
- Promote transportation control measure (TCM) substitution provisions in SIPs.

Other options require additional federal resources:

- Increase funding allocations for state and local agencies.
- Establish an information clearinghouse to share innovative strategies.

- Provide incentives for state motor vehicle and transportation departments to produce fleet-mix data that are more useful to metropolitan planning organizations and state air agencies.
- Develop a better set of planning and modeling tools to help local agencies with common tasks.

Finally, there is a set of reforms that would require legislative or regulatory change. These are likely to be very controversial and we make no recommendation on them, although we believe they merit discussion and debate:

- Align the transportation and SIP planning horizons.
- Align the transportation and SIP planning assumptions.
- Relax the latest planning assumption requirement with favorable trading ratios.
- Eliminate the false precision in conformity determinations.

These and other issues are reviewed throughout the remainder of the report and in the appendices.

■ ■ ■

## TWO

### *Interaction of the SIP and Transportation Planning Processes*

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It is not surprising that the SIP and transportation planning processes do not mesh perfectly. These two long-standing activities have their own requirements and orientation. Transportation plans must be updated at least every three years in nonattainment and maintenance areas, and TIPS must be updated every two years. Conformity determinations on TIPS and plans must be made at least every three years. Barring any unforeseen problems, these updates tend to occur on fairly predictable schedules.

In contrast the Clean Air Act intended that a SIP would be prepared just once, although it was recognized that revisions might be necessary. States are required to submit SIPs according to the schedule specified under the Clean Air Act Amendments. But once a specific SIP is approved, there is usually no requirement that it be updated within a specific time frame (although what are termed rate-of-progress SIPs may have to be revised if insufficient emissions reductions are being achieved). Therefore, it is possible that the SIP remains unmodified while a number of TIP and plan updates take place. This contrast between the nature of the two planning processes creates some complications in achieving transportation conformity.

In the course of our research, we identified six issues that have arisen concerning the interaction of the SIP and transportation planning processes and that the conformity process has to reconcile:

- difficulties identifying adequate control measures;
- a lack of consistency between the planning assumptions employed during the conformity analysis and those used to develop the motor vehicle emissions budget in the SIP;
- the potential for inconsistency as a consequence of the introduction of an updated mobile emissions model (MOBILE6 or EMFAC);
- difficulties arising from a state's failure to implement fully a control measure committed to in the SIP;
- a difference in the planning horizons of air quality plans and transportation plans; and
- special challenges for isolated rural areas.

## *Difficulties identifying adequate control measures*

Many of the transportation planners we spoke with complained that their toolbox is filled with high-cost or politically unacceptable approaches to demonstrating conformity and making progress toward cleaner air. On the other hand, representatives of stationary source interests feel they have been shouldering more than their share of the burden already. And air quality planners are skeptical of all these claims and speak of a failure of imagination, myopia, or motives that place air quality too far down the list of priorities.

To sort out these claims, it is appropriate to ask whether the emissions reduction options available specifically to the on-road mobile source sector and relative to those available to stationary sources are cost-effective—whether the cost per ton of emissions reduced is below some threshold or lower than options available elsewhere. A recent publication of the National Research Council (NRC 2001) on assessing experience with the Congestion Mitigation and Air Quality Improvement Program (CMAQ) provides much information bearing on this point. The report presents extended discussions and many new estimates of the cost-effectiveness of various mobile source measures, although it acknowledges the difficulties associated with measuring the effects of many CMAQ-funded projects on emissions and air quality (TRB 2002).

*Many of the transportation planners we spoke with complained that their toolbox is filled with high-cost or politically unacceptable approaches to demonstrating conformity and making progress toward cleaner air.*

The CMAQ-eligible options are generally those in the local planners' toolbox and appear again and again in conformity demonstrations. The results for this group show that of 19 options, only one, inspection/maintenance (I/M), lies entirely in the "cost-effective range" (under \$10,000 per ton of emissions of volatile organic compounds (VOCs) or their ozone-producing equivalent). For conformity purposes, technology-based measures such as I/M are specifically excluded from consideration as transportation control measures (TCMs). Other measures, such as telecommuting, transit, regional ride-share programs, and bicycle paths, encourage alternatives to single-occupancy vehicles and generally perform more poorly. Occasionally one of the studies examined would report cost-effectiveness estimates within the \$10,000 per ton range, but the majority of estimates were higher. This suggested to the NRC panel that a better-designed CMAQ-eligible measure might stand up better to other options for meeting emissions reduction and air quality goals.

In comparison, other mobile source options, which are technology-related, do far better as a group, with about half of the 16 options costing less than \$10,000 per ton. These include federal low-sulfur gasoline and diesel fuel standards, vehicle scrappage programs, and I/M. This group also includes alternative-fuel vehicle options, but they do not do well by this metric. These options are generally not within the purview of MPOs.

The NRC report concluded that stationary measures and non-CMAQ-eligible mobile source measures were roughly competitive. It also found that use of higher-cost mobile source measures may be warranted because the emissions may have significant human health effects: they occur close to the ground and in populated areas.

In some cases, the challenge for a region is finding cost-effective and feasible reductions from any sector. The challenge of identifying and implementing control measures in the SIP has loomed large for Houston and has significantly affected the conformity process. Several interview subjects spoke of Houston's efforts to meet the ozone standard by 2007 as "scraping the barrel." Ultimately, the most recent SIP (a combined post-1999 Rate-of-Progress and Attainment Demonstration plan) relies on an "enforceable commitment" to address a 56 tons-per-day (tpd) nitrogen oxides (NO<sub>x</sub>) shortfall left after all available control measures had been included. The SIP control strategy also includes a voluntary mobile emissions program for which the Houston Galveston Area Council, the local MPO, must generate 23 tpd of NO<sub>x</sub> reduction. Although the council has flexibility in achieving this reduction, it also faces a significant challenge because almost all available on-road emissions control measures have already been included in the SIP.

Houston's difficulty in developing SIPs has manifested itself in other ways as well. The near-constant updating of air quality plans has complicated the conformity process: three determinations were required in as many years. Professionals responsible for both SIP development and conformity determinations shared the view that the bunching of these deadlines had an adverse impact on the quality of each product. The frequency of SIP submissions arises because of the inadequacies of previous submissions, and the difficulty of identifying adequate control measures in general is a root cause of this problem.

Washington, DC, recently relied in part on a package of control measures to reduce the region's estimated NO<sub>x</sub> emissions and enable a conformity determination to a TIP amendment. The \$45 million package was estimated to reduce NO<sub>x</sub> emissions by 2.02 tpd, or approximately 500 tons a year. The measures vary widely in cost-effectiveness (from \$600 per ton per year to \$4.8 million per ton per year) with a mean cost of \$231,000 per ton per year of NO<sub>x</sub> reductions and a median cost of \$41,150. The most cost-effective measures were related to the telecommuting program and came in at under \$5,000 per ton of NO<sub>x</sub>. Other measures, such as the purchase of compressed natural gas (CNG) buses and improvements to pedestrian access in transit-oriented development areas cost over \$100,000 per ton. Because some measures have benefits besides reducing NO<sub>x</sub> emissions, they may still be attractive options for planners, even though they appear costly in terms of dollars per ton of NO<sub>x</sub> reduced. Additionally, the MPO's cost-effectiveness analysis was challenged by environmentalists for underestimating the potential emissions reductions from "smart-growth" initiatives.

Difficulties in identifying cost-effective TCMs appear not to be limited to our case study areas. One respondent in the Senate Environment and Public Works Committee survey indicated that other than more aggressive measures (e.g., no-drive days), no significant reductions can result from TCM implementation. Further, many areas responding to the survey mentioned technology-based measures as most cost-effective and promising, including retrofitting or replacing heavy-duty diesel trucks, no-idling programs at places where trucks congregate, reformulated gasoline, and other off-road and heavy-duty diesel programs. In addition, our interviewees in several areas mentioned accelerating the phase-in of federal requirements or imposing more-stringent requirements on heavy-duty vehicles and fuels. Importantly, these

*Professionals responsible for both SIP development and conformity determinations shared the view that the bunching of these deadlines had an adverse impact on the quality of each product.*

measures are rarely, if ever, within the purview of the MPO to implement, and most require regulations or legislation.

Although most of the areas indicated that TCMs play a role in attainment, our informants characterized the role as “small, minor, or very small”—in the range of 1–3% of needed reductions for attainment. One must be careful interpreting the information reported, however, because some areas reported the contribution of TCMs to on-road mobile source reductions and

others appear to have reported the role of TCMs relative to overall reductions needed to demonstrate attainment. The binary nature of the conformity test (a plan is either in conformity or out of it) means that seemingly small emissions reductions can have impacts on a region’s transportation program far out of proportion to their public health benefits.

It bears noting that some of the most promising measures for reducing emissions are generally not pursued by local officials. These include such economic-incentive approaches as gasoline taxes, mileage-based registration fees, vehicle scrappage programs, and congestion fees. Other studies have found that these approaches can be quite cost-effective, but recent experience indicates that political opposition to these types of policies is still strong.

Another approach for reducing emissions, land-use initiatives (e.g., “smart growth”), has attracted increased interest in recent

years and EPA has issued guidance on how to take credit for them in conformity determinations or SIPs. The ability of such initiatives to reduce emissions significantly is not yet well understood and is a source of controversy. In any event, there appears to be little potential for these strategies to yield major emissions reductions in the short term, which is where our case study areas were experiencing conformity challenges. Also, cars are expected to continue to become much cleaner, so by the time many smart-growth policies take effect, the emissions reduction potential from fewer vehicle miles traveled (VMT) will be lower. However, these strategies are pursued for many other reasons besides reducing vehicle emissions. Portland, Oregon, is an example of an area that has employed land planning as part of its strategy for meeting the conformity requirement. In addition, Sacramento has begun to use a land-use model (PLACES) to test alternative scenarios.

In addition, off-road diesel emissions are one of the largest remaining categories of potential emissions reductions and may be quite cost-effective. Off-road mobile sources are treated separately from on-road mobile sources, so an area wanting to take advantage of reductions from off-road controls for conformity purposes would first have to revise its SIP. This is a promising short-term strategy, but planned federal measures to address these reductions, while making it easier for areas to attain or maintain the new fine particulate standards, would reduce their impact in making up shortfalls in the conformity process once the new federal controls are in place (i.e., post-2006).

*Cars are expected to continue to become much cleaner, so by the time many smart-growth policies take effect, the emissions reduction potential from fewer vehicle miles traveled will be lower.*

## *Significant mismatches between SIP and conformity assumptions*

Because of federal requirements that the latest planning assumptions be used for all SIP revisions and conformity determinations, it is possible that the assumptions in the conformity analysis differ markedly from the assumptions used to develop the SIP and associated motor vehicle emissions budgets. This situation was recognized in the preamble to the November 24, 1993, conformity rule (58 FR 62210), which states, "It should be expected that conformity determinations will deviate from the SIP's assumptions regarding VMT [vehicle miles traveled] growth, demographics, trip generation, etc., because the conformity determinations are required by Clean Air Act Section 176(c)(1) to use the most recent planning assumptions." Many areas now have attainment SIPs in place, and inconsistencies between the planning assumptions used in conformity and those used to develop the SIP may arise because there is no requirement to update an approved attainment SIP. Moreover, there is no requirement to update SIPs based upon new emissions inventories or rate-of-progress SIPs (which are supposed to be completed every three years) or new vehicle fleet mix assumptions or models. Of course, regional and state air quality authorities may submit an updated SIP at any time through the SIP revision process, but they are often reluctant to do so: a SIP revision is generally regarded as a formidable undertaking.

Whether data inconsistencies cause significant problems depends on whether they increase emissions estimates and whether they are revealed late or early in the three-year conformity cycle. If data leading to increased emissions estimates come to light shortly before a conformity determination is required, then planners could have to scramble to find emissions reductions on extremely short notice. If the new data are revealed early in the cycle and no unforeseen events arise that require a plan or TIP update, then planners may have up to three years to find emissions reductions. If unforeseen events do arise, however, the region could find it difficult or impossible to make a conformity determination on their amended transportation plans, if the amendment includes new projects that would require new regional emissions analyses.

In the course of our research, we found that such mismatches caused problems in Baltimore; Washington, DC; and Sacramento.

**Baltimore, Maryland.** The controversy arising from the attempt to make a conformity determination for the Baltimore region in the latter half of 1999 illustrates the complications that can arise when the assumptions used to develop the on-road mobile source budgets in the SIP diverge from the assumptions used for a conformity analysis. The main issue in Baltimore was an inconsistency between 1990 vehicle registration data used to develop the SIP's motor vehicle emissions budgets and updated 1996 registration data available for the conformity determination that indicated higher-than-expected vehicle emissions. Relying on the emissions forecasts based on the newer data would have made it very difficult if not impossible for the MPO to meet its budgets for conformity because of the higher share of sport utility vehicles (SUVs) on the

*Regional and state air quality authorities may submit an updated SIP at any time through the SIP revision process but they are often reluctant to do so: a SIP revision is generally regarded as a formidable undertaking.*

road. The region's planners elected to use older data to maintain consistency with the planning assumptions used to develop the SIP, a decision that was opposed by local environmental groups. The conformity determination was delayed after EPA and FHWA officials indicated that relying on older data would likely result in federal disapproval. The situation was resolved through a speedy SIP revision that developed new budgets using updated vehicle registration data.

**Washington, District of Columbia.** A somewhat similar situation occurred in Washington, when updated fleet mix data showed that the proportion of trucks and SUVs on the road was much greater than what had been assumed in the recently approved SIP. However, in this case the difference was due not to changes on the ground but to the mischaracterization of some SUVs as cars and the underestimation of the share of VMT from heavy-duty trucks in the earlier data. When the MPO went to amend its plan and TIP in summer 2001, it found that projected NO<sub>x</sub> emissions from the on-road mobile sector were 8 tons over the budget for 2005. Although the MPO had to use the new data for conformity, there was no requirement that the SIP be updated, even though the mobile source budgets had been developed with the inaccurate data.

**Sacramento, California.** Sacramento's SIP for the ozone nonattainment area was last updated in 1994. The region was required to make its latest conformity determination in June 2002 and was able to do so; however, the MPO used the same vehicle fleet assumptions as in the 1994 SIP. This was a subject of controversy in the region and the state as a whole. Because the fleet data are embedded into the emissions factor model used in California, updating the vehicle mix data requires an update of the emissions factor model. Thus, updating the vehicle mix data is far more complicated than updating input assumptions.

Because of those complications and the statewide nature of the problem, FHWA advised the state in spring 2002 that no new conformity determinations requiring regional emissions analysis could be made in California after December 31, 2002, unless the vehicle fleet data were updated. The California Air Resources Board has initiated a process to update 23 SIPs in California in the next year using its newest version of the EMFAC model so that future conformity determinations can be made against emissions budgets that are consistent with updated SIPs. This means that after December 31, 2002, MPOs in the state's nonattainment and maintenance areas will be unable to make any changes, additions, or deletions to nonexempt projects in either the metropolitan transportation plan or the TIP until a new SIP for each area, with new motor vehicle emissions budgets, is prepared and found adequate by the EPA for conformity purposes. California MPOs are calling this a conformity "lockdown" and are anticipating that it could last up to two years.

### *Inconsistencies between models used for the SIP and the conformity analysis*

In each of the cases we examined there was considerable apprehension over the potential effects of MOBILE6 on the ability of MPOs to make conformity determinations. Most of the case study areas have now experimented with MOBILE6, and the main differences in emissions between MOBILE5 and MOBILE6 are as follows:

- MOBILE6 incorporates Tier 2 light-duty vehicle standards and new standards for heavy-duty diesel vehicles, which result in much lower emissions rates for new cars and trucks.

- MOBILE6 has lower “deterioration rates” governing the increase in emissions rates as vehicles age, leading to predictions of lower emissions from motor vehicles over time.
- MOBILE6 provides smaller benefits for I/M programs, consistent with the lower emissions rates of in-use vehicles.
- MOBILE6 has a flatter “speed-emission” curve for NO<sub>x</sub> from light-duty vehicles. That is, speed has a smaller effect on NO<sub>x</sub> emissions from these vehicles, resulting in lower emissions increases during acceleration or high-speed operation.
- MOBILE6 predicts significantly higher emissions of CO.

Most areas anticipate, as a result of those differences, that relative to MOBILE5, forecast emissions will increase in the near term and decrease in the long term. Conformity implications are therefore primarily in the short term.

There is no requirement under the conformity rule that the emissions model used for the conformity analysis match the model used to develop the SIP. With the recent introduction of MOBILE6 (and California’s updated EMFAC model), it is possible that some upcoming conformity analyses could rely on a different emissions model than was used in creating the motor vehicle emissions budgets in the SIP. This is because all SIPs developed prior to January 2002 were developed using another version of the MOBILE or, in California, the EMFAC model (with the exception of the San Francisco Bay Area ozone SIP submitted to EPA in fall 2001). There is widespread agreement among those we spoke with that such a situation is undesirable, especially if the newer models show higher emissions. Of particular concern to transportation planners is that the models must be used for all conformity determinations following a 24-month grace period after their official release. EPA has established this two-year grace period specifically to encourage areas to assess and revise their current SIPs to avoid future conformity issues once the new MOBILE model is required for conformity.

Although there is no corresponding requirement that the SIPs in all nonattainment and maintenance areas be updated with the newer model, there is such a requirement for serious (or worse) nonattainment areas that took credit for federal emissions controls (Tier 2 vehicles, heavy-duty engine regulations, low-sulfur fuel, etc.) in their most recent SIP submittals. These areas are required by EPA to submit an updated SIP within one or two years of the release of MOBILE6. Houston, Baltimore, and Washington, DC, are all areas that will be revising their SIPs with MOBILE6 as a result of this requirement. (Note: the SIPs in these areas specify EPA’s requirement for an update with MOBILE6 within one year of its release.) Depending on the interaction of SIP and conformity schedules, it is possible that a conformity analysis using MOBILE6 or EMFAC will be required for areas whose budgets have not been updated using the newer model (Eisinger et al. 2001).

One of the measures adopted by Houston to reduce NO<sub>x</sub> emissions was a 55-mph speed limit on all expressways in the region, a move that generated higher NO<sub>x</sub> emissions reductions under MOBILE5 than it does under MOBILE6. The new model has made this measure less appealing and Houston has recently requested a delay in the implementation of this SIP measure until May 2005.

MOBILE6 has already made its impacts felt in Washington, DC. Preliminary analysis using MOBILE6 shows an increase in NO<sub>x</sub> emissions of almost 50 tons for the attainment year of 2005 (VOC emissions dropped by about 10 tons). The NO<sub>x</sub> increase amounts to around 30% of the

on-road mobile NO<sub>x</sub> budget. Although this is a significant increase, the SIP is being revised on schedule for the next required regional emissions analysis, so the transportation sector may not be responsible for making up all of these emissions.

### *Inadequate implementation of SIP control measures*

In some cases, a control measure committed to in the SIP is not fully implemented and its impact is first felt in the conformity process. From the perspective of local transportation officials, the MPO pays the price for failures that occur outside its scope of influence and that should have been corrected through the SIP process. This issue came up with respect to vehicle inspection and maintenance programs in two of the areas we studied, Baltimore and Sacramento.

The partial implementation of I/M programs creates problems in the conformity process when the credits from a fully implemented I/M program are used to develop the on-road mobile source budgets and the program is subsequently reduced or weakened by legislative or state action. I/M is typically not under the MPO's control, and program changes often are made by a legislature not fully aware of the consequences. When control programs in the SIP have been

eliminated or changed, there are no specific requirements for updates. However, EPA indicates that its most likely course of action is to issue a finding of failure to implement, which would result in the imposition of sanctions within 18 months if the SIP is not revised to reflect the changes in control measure implementation. If an EPA finding is not forthcoming and the area needs to do a conformity determination, these areas may experience difficulty demonstrating conformity to a budget that contains emissions reductions credits that are no longer in place. Unless the SIP is revised accordingly, the issue may come to a head when it is time to make a conformity determination. This is a case where conformity

may necessitate a SIP update much sooner than anticipated or planned. Further, SIP updates take considerable time and resources to complete and may delay other transportation activities. In this instance, conformity becomes the mechanism for prompting SIP enforcement rather than a tool to ensure that the transportation sector does its part to keep its emissions from producing or worsening air quality violations.

**Baltimore, Maryland.** In two instances in Baltimore, I/M implementation became an issue for conformity. In May 1997, Governor Parris Glendening vetoed a bill passed by the General Assembly that would have made the program voluntary. Although the governor cited the health benefits of mandatory testing when vetoing the bill, many believe that the negative impacts on conformity also played a role in his decision. In spring 1999, the General Assembly voted to repeal the 2002 termination date of the I/M program. Baltimore's conformity determination (as well as its air quality plan) relied on the reductions from the program well past 2002, so the repeal was necessary for the MPO to meet its conformity requirements (as well as its attainment demonstration). The vote to repeal came after legislative testimony by EPA officials outlining the consequences of the sunset provision on transportation conformity and, subsequently, on federal transportation funds.

*I/M is typically not under the MPO's control, and program changes often are made by a legislature not fully aware of the consequences.*

**Sacramento, California.** If Maryland's experience provides an example of the role conformity can play in prompting a state to follow through on its commitments under the Clean Air Act, the case of Sacramento illustrates what can happen if steps are not taken to correct a weakened SIP control measure.

The 1999 Metropolitan Transportation Plan for the Sacramento region showed that while the plan met conformity requirements, the region barely passed for NO<sub>x</sub> emissions in 1999. During the public comment period, stakeholder groups challenged the validity of the data used in the conformity analysis. Specifically, the credits that were incorporated into the analysis for the state's Enhanced I/M program were questioned. It was generally known within the air quality community that the Enhanced I/M program adopted by the state legislature in 1994 (with final regulations issued in 1995) was less rigorous than assumed in the 1994 SIP.<sup>5</sup> EPA did not issue a finding of failure to implement, and no action was taken by the state or EPA to initiate a SIP revision. As a result, the U.S. Department of Transportation and the MPO were sued by environmental groups. The suit was ultimately settled out of court after lengthy negotiations. The lawsuit did not stop the conformity determinations from proceeding, but the California Air Resources Board (CARB) did agree to implement additional control measures to offset emissions reduction shortfalls from the I/M program.

In April 2000 CARB completed a study of control measures and provided revised control factors to each nonattainment area. In general, CARB found that the Enhanced I/M program was achieving about 30% of the benefits that had been projected earlier and used to develop the 1994 SIP. The Sacramento Area Council of Governments (the MPO) was able to make a conformity determination in April 2000 based on assuming credit for two measures adopted by CARB (control of combustion chamber deposits to reduce NO<sub>x</sub>, and additional reductions in reactive organic gases and NO<sub>x</sub> from cleaner-burning gasoline). Since 1999 had passed, the MPO did not need to make a determination on 1999 as an analysis year. Staff believe that they would not have been able to make the conformity determination had they been required to show conformity for 1999 with the new CARB control factors.

### *Mismatch in planning horizons*

A much-discussed point of contrast between the conformity process and the SIP process is the planning horizon required of each type of planning. Both transportation and air quality officials acknowledged this contrast. Because decisions on transportation infrastructure investment have impacts very far into the future, federal planning requirements mandate that local transportation plans—including demonstrations of conformity—extend at least 20 years. In contrast, air quality plans for nonattainment areas are required to look only to their respective attainment date.<sup>6</sup> The result is a planning horizon mismatch.

The importance of this mismatch has diminished substantially in the medium to long term for the regions we examined, thanks to new federal regulations such as the Tier 2 vehicle emissions standards, heavy-duty diesel engine standards, and low-sulfur fuels. Technologically related emissions reductions are now projected to more than offset VMT growth in many regions, especially for NO<sub>x</sub> emissions. And the new MOBILE6 model takes the new regulations into account. In our case study areas, therefore, the problems faced by planners were much more near-term than long-term. Nevertheless, many of the transportation planners and some air quality

officials expressed concern that the issue could reemerge as the new ozone and fine particulate standards are implemented.

Washington, DC, is an example of a region that faced difficulties meeting its VOC budget for years outside the SIP's time frame. To resolve its out-year difficulties, Washington established budgets for 2020 that used NO<sub>x</sub> substitution to allow an acceptable increase in VOC emissions and enabled the area to pass conformity in the out-years.

Portland, Oregon, has also established out-year budgets as a proactive approach to address the difference in transportation plan and SIP time frames.

Most of our interview subjects from both the transportation planning and the air quality planning communities acknowledged the emissions reduction benefits of the federal control measures for Tier 2 vehicles, heavy-duty diesel engines, and low-sulfur fuels and believe that these measures are very helpful to the conformity process in the mid to long term (7 to 20 years). Conformity issues, for the time being, appear to arise in the shorter term, when these measures are not yet phased in. For some areas, the out-years continue to be a concern; however, with MOBILE6, it appears that until 2025–30, growth in VMT is not expected to outpace continued emissions reductions, even without additional new technologies.

There was a significant difference of opinion among our interview subjects on the implications of the different time horizons. For many air quality planners and environmentalists, the longer planning horizon for transportation is crucial for ensuring that areas do not make irrevocable transportation investments that jeopardize their ability to meet air quality standards in the future. On the transportation planning side, there was considerable skepticism about the benefits of using unavoidably imprecise modeled estimates of transportation activity and air quality so far into the future. In addition, the logical benefits of planning long-term for both air quality and transportation was noted.

Although the mismatch in time horizons of the SIP and conformity processes was not a significant issue for the areas we visited, we heard concerns that it could emerge as a factor in the future. The reason involves future trends in emissions technology and VMT growth. In our case study areas and, we suspect, elsewhere as well, the effects of emissions-reducing regulations, such as Tier 2 vehicle standards, are expected to outweigh higher emissions from increasing vehicle miles traveled. Therefore, emissions are predicted to drop significantly in the near and medium term before beginning to creep back up once the impact of the new regulations is fully felt and the VMT effect begins to dominate. A region that develops its on-road mobile attainment budget for a year before the new regulations have their impact will have a substantial cushion and will not have to worry about staying within the out-year budget. However, if the region must develop its budgets for a year *after* the new regulations have their full effect, the budgets will be considerably lower because the budgets presuppose the regulations. In this case, long-term VMT growth could pose problems for regions trying to show conformity 20 years out.

### ***Special challenges for isolated rural areas***

The case of Paducah, Kentucky, illustrates the conformity challenges faced by isolated rural areas, which have different conformity requirements. By definition, an isolated rural area has no MPO, no metropolitan transportation plan or TIP, and a population of less than 50,000, and it

is not adjacent to a metropolitan area or within the same nonattainment or maintenance area as a metropolitan area. Conformity is required only when the area wants approval for a new nonexempt federal project. Also, isolated rural areas are not required to use network-based modeling and are not subject to the frequency requirements of the conformity rule. Limited availability of travel data and lack of a well-coordinated interagency consultation process were the primary challenges for Paducah. Although this case is not typical of the experience of all isolated rural areas, it provides an example of what can go wrong if state agencies are not proactive.

For the Paducah maintenance area, motor vehicle emissions budgets were developed using 1990s baseline data, which came from the Highway Performance Monitoring System (HPMS), the only data source generally available to isolated rural areas. The HPMS data, based on a statewide sampling technique that estimates and forecasts daily VMT, were intended for use not at the county level, but rather for high-level state and multistate reporting to FHWA. HPMS is best for higher functional-class highways (e.g., major highways, principal arterials) and diminishes in accuracy for the lower road classifications (e.g., minor arterials, local collectors). In addition, HPMS does not include county-specific local road volume data. The state department of transportation (DOT) usually conducts the conformity analysis in isolated rural areas, and in this case, it became clear that the budgets, which had been based on 1990 inventory data, did not allow for growth in travel. For this reason, this maintenance area had not been able to make a conformity determination for more than five years. Just last year, agreement among the agencies resulted in a SIP revision to slightly increase the NO<sub>x</sub> budgets to allow for some growth. The area recently made a conformity determination, which has been accepted by FHWA/FTA.

The limitations of HPMS data are one challenge for isolated rural areas; interagency consultation is another. Because there is no MPO, the state department of transportation usually takes the lead in establishing an interagency consultation process and facilitating communication among agencies. Many of those interviewed for the Paducah case expressed the view that an improved interagency consultation process from the beginning might have alleviated some, though not all, of the difficulties of resolving the local conformity issues. As a result of this case, a more robust interagency consultation process has been implemented in Kentucky, and the agencies most involved in conformity issues now meet regularly.



## THREE

### *How Conformity Issues are Typically Resolved*

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A region facing a conformity issue arising from one or more of the interactions described above can respond in several ways. These responses can place substantial burdens on MPOs, transportation agencies, and air quality agencies.

#### **Reexamine Existing Data or Collect New Data**

In Washington, DC, when new vehicle registration data in 2001 produced a NO<sub>x</sub> reduction shortfall of 8 tons of NO<sub>x</sub> for the 2003 conformity determination, the regional Transportation Planning Board conducted its own studies of heavy-duty vehicle use in the metropolitan area. These studies revealed that for some types of heavy-duty vehicles (e.g., school buses), emissions were greater than assumed, but in total, the new data reduced assumed heavy-duty engine NO<sub>x</sub> emissions by 2.74 tpd. An additional 1.17 tpd credit was taken for emissions-reduction programs enacted but not yet claimed for credit. Thus, nearly half the shortfall was made up by measures that did not require new emissions reductions.

#### **Change Existing Transportation Operations**

Houston enacted a reduction in speed limits, although the area has now proposed to delay its implementation until May 2005. Washington, DC, obtained emissions reductions from a signalization program and a program to intensify speed limit enforcement, to be included as part of the conformity determination.

#### **Delay or Delete Projects**

Delay of 123 lane-miles of highway construction in northern Virginia reduced the Washington, DC, metropolitan area's estimated 2005 NO<sub>x</sub> emissions by 0.8 tpd. The reason for delaying the projects was not conformity but a state budget shortfall, but the delay did help Washington solve the conformity problem that emerged in 2001. However, it is our impression that transportation planners do not often respond to emissions reduction shortfalls by removing or adding infrastructure. According to our interview subjects, conformity issues are more likely to influence project selection and timing at the screening level than knock out or delay projects that are already under way and whose cancellation would be very disruptive, not to mention politically unpopular.

### **Add Emissions-Reducing Projects and Policies**

Adding projects that reduce emissions is also possible, although some can be expensive and difficult to implement quickly for near-term emissions reductions. Baltimore added some Smart Growth measures to a regionally significant shopping center development, including enhanced transit and transportation demand management strategies. Washington, DC, adopted several measures, including purchase of natural gas buses and an expanded telecommuting program. Sacramento used CMAQ funds to help retrofit diesel trucks (reductions accounted for in the SIP, not the transportation plan or TIP). The conformity issue in Sacramento was resolved when the California Air Resources Board adopted measures to reduce emissions. In Houston, an “enforceable commitment” to reduce 23 tons of NO<sub>x</sub> through voluntary emissions reduction programs is included in the SIP and is the responsibility of the MPO.

### **Revise the SIP**

If making sufficient emissions reductions within the transportation sector is too difficult or insufficient, the MPO can request that the state or local air agency propose a SIP revision in the on-road mobile source budget. However, SIP revisions can impose heavy resource and political costs on the air agency, so there are strong incentives to be certain that local transportation planners have exhausted all available alternatives. SIP revisions can also take time, often one to two years. Nevertheless, according to EPA, approximately two dozen areas have resolved issues via a SIP revision since 1997.

In some situations, however, a SIP revision can be the easiest solution. For example, Baltimore ran into a conformity problem in 1999 shortly before the Maryland Department of the Environment was planning to prepare a revised Phase II SIP to include emissions reductions from new federal emissions reduction programs. The agency decided to move up its scheduled SIP revision to respond to the conformity problem that had emerged. This SIP revision was completed without controversy and in only six weeks, thanks largely to two special circumstances. First, the revised SIP was submitted in late 1999, making moot the requirement of meeting an emissions budget for 1999. In subsequent rate-of-progress milestone years, Baltimore was projected to have excess emissions reduction credits, especially after the incorporation of the new federal programs into the SIP, and these credits offset the increase associated with the updated planning assumptions. The excess credits could be allocated to the on-road mobile sector through a SIP revision. Second, all parties—the MPO, the state transportation and environmental agencies, and the regional EPA office—worked to expedite the SIP revision, and EPA allowed some activities that ordinarily were done in sequence to be performed in parallel.

The Baltimore case suggests that it is possible to get SIP revisions quickly to solve conformity problems, as long as it is not necessary to obtain emissions reductions from other sectors, air quality models do not need to be run, and the state and federal air authorities agree with this approach and are not faced with too many other “urgent” requests simultaneously.

*SIP revisions can impose heavy resource and political costs on the air agency, so there are strong incentives to be certain that local transportation planners have exhausted all available alternatives.*

## FOUR

### *Impacts of SIP-Conformity Interaction Problems*

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In the areas we studied, the direct effects of SIP-conformity interactions on completing projects or beginning new initiatives were reported to be relatively modest. However, many of the people we contacted cited indirect effects as far more important. For many transportation planners, conformity often becomes the driving force of transportation planning, elevating bureaucratic hurdles and one goal—improved air quality—above a more balanced consideration of myriad transportation and regional goals.

On the other hand, many air quality officials and environmentalists cited benefits from the SIP-conformity interaction, crediting it with promoting creative strategies for improving air quality and exerting a powerful disciplinary effect on both transportation and air quality policy.

A major point of contention among our subjects was whether the difficulties that have emerged are due to weaknesses of the conformity regulation itself or to problems at the local and/or state level, such as an inadequate interagency consultation process. However, the belief that the conformity process serves a valuable role in bringing disparate groups together was widespread, even among those who were very critical of certain elements of the process.

#### *Few instances of significant project delays*

In the areas studied for this report, there were no instances where SIP-conformity troubles resulted in cancellations of transportation projects. This is not to say that conformity in general has not influenced the mix of projects. Our interview subjects reported that the impacts of conformity were felt at the screening level: certain projects that might have gone forward in the previous regime never got past an initial evaluation. In addition, we found five projects that were delayed because of conformity issues.

**Paducah, Kentucky.** The lengthiest delay, although probably not the most serious, in our sample occurred in the rural maintenance area of Paducah. Failure to meet the  $\text{NO}_x$  budget in 2002 prevented Paducah from making a conformity determination<sup>7</sup> in 1996. Initially, this caused only minor inconvenience because the slow-growing region had no major highway projects on the schedule for federal funds. In 1998, the Kentucky Transportation Cabinet, on behalf of the Paducah area, wanted to proceed with a long-scheduled project. However, no conformity determi-

nation could be made. Ultimately, in late 2001, a SIP revision enabled the state to make a conformity determination, and the federal agencies concurred in summer 2002.

**Baltimore, Maryland.** The inability of the MPO to make its conformity determination using updated vehicle registration data resulted in a several months' delay of some minor road projects associated with a large shopping mall project.

**Washington, District of Columbia.** The MPO had to shelve its planned update of the TIP and plan after it found that corrected vehicle registration data would push the region well over its emissions budgets. A number of small projects were affected, the most significant being a widening and improvement of Route 28 in northern Virginia.

**Houston, Texas.** The Houston-Galveston region suffered a conformity lapse from November 1999 to June 2000, with the effect of delaying design and right-of-way acquisition for several significant projects.

### ***Better interagency consultation and communication***

One theme that emerged from our interviews was that most participants in the conformity process attributed greater scope for action to other actors than those actors attributed to themselves. For example, transportation planners believed that it was easier to revise a SIP than did air quality officials. Similarly, air quality officials believed that it was easier to get emissions reductions from project modifications, additions, or transportation demand management measures than did transportation planners.

This phenomenon suggests that consultation through the interagency process can help head off problems. And in fact, most of our interview subjects—from both the air quality and the transportation planning sides—agreed that conformity has improved communication between the players in transportation and air quality planning. In Baltimore, for example, the MPO has attempted to reduce the adversarial nature of its relationship with certain environmental groups—a problem exacerbated by the attempted use of old vehicle registration data for conformity purposes in 1999—and one of the MPO's subcommittees is now chaired by the executive director of a local environmental group.

In Sacramento, the state and regional air and transportation agencies are working in concert to resolve the current issues with updating vehicle data for use in conformity determinations. In addition, the MPO has created a forum so that interested parties can have greater access to the planning process through regular meetings.

### ***Large administrative costs for participating agencies***

A major complaint of the MPO representatives we interviewed concerned the large administrative burdens of conformity. Similar complaints were made by representatives of some state air and transportation agencies in our case studies. Understood in pure resource terms, such costs are fairly minor. To take one example, the Washington, DC, Council of Governments receives about \$7.8 million a year in federal planning funds for transportation planning. The budget devoted to conformity and mobile emissions analysis is around \$1 million a year. This number is

probably an underestimate because there are other budget items (notably transportation modeling) that are intertwined with the conformity process. Even so, this number is dwarfed by the Washington region's annual TIP expenditure, which is about \$2.7 billion per year.

But what makes the conformity effort significant, according to many of our interview subjects, is that it takes time away from other planning activities. The considerable time and resources that planners devote to conformity is time that cannot be spent on other planning activities, such as data collection and analysis, scenario testing, and corridor planning. Some transportation planners contend that conformity crises focus their attention on a very narrow issue—resolving short-term emissions budget issues—at the expense of a broader perspective. For example, in Houston, preparing two conformity determinations and three SIP submissions (plus two supplemental SIP submissions) in the span of 36 months has left the staff of the Houston Galveston Area Council feeling that one round has barely ended when the next begins—a sentiment echoed by their colleagues at the state and federal partner agencies.

Opportunity costs are elusive and difficult to quantify because much depends on what would have happened absent those costs. Our interview subjects expressed a variety of opinions on this issue. A complaint raised by many MPO officials we interviewed is that the resources directed

toward ensuring transportation conformity came at the expense of other planning goals, including the objectives of economic development, freight movement, equity, safety, and more recently, security.

On the other hand, environmentalists and some air quality officials expressed skepticism about whether much in the way of long-range planning (particularly with respect to environmental goals) would take place without the conformity framework. They also argued that MPO workloads have increased for other reasons besides conformity, as planning requirements have significantly expanded under ISTEA and TEA-21.

In any case, if the forgone planning activities are so valuable, why not simply devote more resources to planning, perhaps transferring them from another transportation budget?

One answer is that there are significant restrictions on the fungibility of resources available to MPOs, whose mainstay is planning funds that come to them by formula from FHWA and FTA. These planning funds make up approximately 0.08% of the total TEA-21 funding. Few MPOs have local revenues or taxing power, although MPOs could use National Highway System and Surface Transportation Program funds if so allocated by state departments of transportation.

Not all transportation planners thought that conformity analysis was crowding out other activities. In Washington, DC, we were told, the greatest funding need is for funds to do additional conformity analyses. One particular need is better vehicle fleet mix data; information today generally comes from the federal HPMS and from state vehicle registration data and is not well suited for estimating emissions or determining conformity. The Washington MPO has therefore commissioned studies of truck and school bus travel to improve regional estimates of heavy-duty vehicle traffic and emissions.

*The considerable time and resources that planners devote to conformity is time that cannot be spent on other planning activities, such as data collection and analysis, scenario testing, and corridor planning.*

### *New emissions reduction initiatives*

The administrative burdens of conformity can also affect the process in a positive manner. The additional meetings, plans, and reviews are not simply bureaucratic churning but opportunities to improve decisionmaking and introduce innovations. For example, a conformity challenge can put options on the table that might have been rejected out of hand because of their political undesirability. One could argue that by expanding the range of options that planners are forced to consider, the conformity process, even when it does not proceed smoothly, is beneficial.

The following emissions reduction initiatives arose from the interaction between the SIP and conformity processes.

**Baltimore, Maryland.** One element in the settlement of Baltimore's conformity problem was the inclusion of several Smart Growth and transit-friendly provisions in the design of the new Arundel Mills Mall.

**Sacramento, California.** The settlement of a conformity lawsuit in Sacramento led to two initiatives: the California Air Resources Board agreed to make up shortfalls in needed reductions, and the Sacramento Emergency Clean Air Transportation program was created. This program was intended to put new lower-emissions engines in heavy-duty vehicles and equipment, using \$70 million from CMAQ and the governor's Transportation Congestion Relief Program (a supplemental appropriation for transportation projects). Although the new Sacramento program did not help solve the conformity problem, public and legislative support for it can be, in part, attributed to the public awareness that the lawsuit created.

**Washington, District of Columbia.** The Washington MPO, the Transportation Planning Board, considered instituting parking charges as a way of reducing VMT growth, a policy that would likely never have received a second look if not for the conformity issue. As it turned out, the board rejected that option and solved its conformity problem by funding a package of transportation emissions reduction measures. These included the purchase of CNG buses for the public transit system and an initiative to improve traffic flow by adjusting traffic light synchronization.



## FIVE

### *Potential Policy Responses*

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Ideas for policy responses came from our interviewees and from our observation of the laws, regulations, and implementation of the SIP and conformity processes. We first discuss changes that we believe could be implemented at the MPO or SIP level, without further regulations. In fact, many of these responses have already been employed, so the first section can be seen as a survey of policies currently available to state and local agencies.

The second section discusses initiatives that the federal government could take to help areas resolve issues arising from SIP-conformity interactions. In an era of fiscal constraints, it is difficult to endorse new spending initiatives without considering competing priorities at EPA and FHWA. However, if new federal resources are to be deployed to help the SIP and conformity processes work more smoothly, this section lists areas where they are likely to be most effective.

Finally, we turn to a set of measures that would require changes in law or regulation. Many of these measures have been discussed by interest groups and are very controversial. The national association of air quality officials and many environmental groups believe that minimal changes to the conformity regulation are justified. On the other hand, national associations of transportation planners have recommended some significant legislative reforms. We present arguments for and against these proposals. We do not offer recommendations except to say they warrant consideration.

#### *Changes at the MPO or SIP Level*

Although their applicability varies from region to region, the following strategies already exist for areas facing difficulties from interactions between the SIP and conformity processes. One approach we discuss—intersector trading—does not fit easily into this category. In theory it is currently available to MPOs, but substantial questions remain about how to implement it. We believe that it offers much promise, but further research and guidance from EPA may be needed before it can be widely used.

#### **Include Pricing Policies Directed at Auto Travel**

As discussed above, transportation planners complain that their toolkit is filled with high-cost or politically unacceptable options. On this point we note that one major source of emissions reductions may have *negative* costs. Studies of the costs of motor vehicle use show, almost unani-

mously, that the social costs greatly exceed the private costs. The difference, little of which is paid by the motorist, includes the costs of infrastructure, congestion, accidents, and air pollution.<sup>8</sup> Even leaving out air pollution effects, some of these studies suggest that *at the margin*, the social costs of vehicle use exceed the private benefit. If so, then the cost of reducing the use of vehicles for marginal trips is negative.

The obvious, though infrequently used, policy approach for correcting such misallocations is fiscal. Although an optimum tax structure would contain a mix of instruments directed at the individual externalities (Proost and Van Dender 1999), much of the benefit of such structures could be captured by a single instrument. The most convenient single instrument for the purpose is the gasoline tax, and Parry and Small (2002) conclude that the optimum gasoline tax for the typical urban area in the United States is about twice the existing state and federal taxes. They also find that a VMT fee would be much more cost-effective than a gasoline tax. Unfortunately, these instruments are very unpopular, and one of the greatest unsolved problems of transportation policy analysis is devising a politically acceptable incentive-based program to deal with the social costs of vehicle use.

### **Improve Interagency Consultation in SIP Development**

We heard that interagency consultation often does not adequately involve transportation agencies in the development of SIPs and motor vehicle emissions budgets. Although the Clean Air Act Section 174 requires such coordination for SIP development, many of our interview subjects mentioned that the interagency consultation process does not work as well for SIP development as it does for conformity. Transportation agencies and air quality agencies could make it a priority to work together in the SIP development process and especially in the development of on-road mobile source budgets. In Houston, for example, MPO officials still have no role in setting mobile source emissions budgets. That job is for the Texas Commission on Environmental Quality, which prepares SIPs for every nonattainment area in Texas. Recently, the North Central Texas Coordinating Council (the MPO for Dallas-Fort Worth) formed a statewide SIP working group to begin to improve the interagency consultation process for SIPs. In Paducah as well, transportation planners say they play virtually no role in the SIP process.

In other areas, transportation planners are heavily involved in SIP development at an early stage. In Washington, DC, transportation and air quality planners are now working very closely together in developing the emissions budgets with the recently released MOBILE6 emissions model. This degree of interaction represents a departure from the past and has been spurred in part by the region's recent difficulties updating its plan and TIP because of issues with vehicle registration and VMT fleet mix data. In Sacramento, state and regional air and transportation agencies are working in concert to resolve the current issues with updating vehicle data for use in conformity determinations.

Having examined only six cases, we were unable to determine the extent of noninvolvement in SIPs by transportation planners. However, we did become convinced that there is no simple explanation for transportation planners' underparticipation. Possible explanations include bad working relationships between transportation and air quality planners, lack of invitations to SIP

*One of the greatest unsolved problems of transportation policy analysis is devising a politically acceptable incentive-based program to deal with the social costs of vehicle use.*

planning meetings, and failure by transportation planners to attend even when invited. However, the areas that seem to respond best to issues that arise from the conformity process have well-developed interagency consultation processes for both conformity and SIP development. It may be appropriate to reinforce this Clean Air Act requirement by ensuring that it is addressed in the interagency consultation procedures that become part of a “conformity SIP” and are therefore enforceable.

### **Use Safety Margins to Offset Unforeseen Increases in Emissions**

One way of avoiding conformity problems is to build a safety margin into the mobile source emissions reductions in the SIP, so that unexpected increases in emissions can be handled without violating the motor vehicle emissions budget. Some MPOs already use a safety margin applied to the total budget. An aggregate safety margin could also be available to the mobile sources, but only after a SIP revision. Thus it would require more time and would not be under the control of the MPO. EPA and some state air quality officials observed that safety margins are a luxury for areas with serious emissions problems: if meeting the total emissions reduction target is difficult, there will be strong pressures on the SIP process to allocate all available emissions and not allow for safety margins. Additionally, the new eight-hour ozone and PM<sub>2.5</sub> standards may put additional pressures on budgets, further limiting the availability of a safety margin.

### **Use Intersector Trading for Emissions Reductions**

Currently, most nonattainment areas have an offset policy or a permit market for stationary sources. If a new source wants to locate in the area or an existing source wants to expand, it has to persuade another stationary source to reduce its emissions so that total emissions do not rise. Extending such markets to cover mobile sources is a potentially useful way of staying within the emissions budget. Most studies of emissions reduction strategies conclude that at the existing levels of emissions, the marginal costs of further emissions reductions are lower for stationary sources than for mobile sources. By purchasing emissions permits, the mobile source sector gains the leeway necessary to avoid exceeding its budget. Of course, it is also possible that emissions reductions are more costly outside the mobile source sector than in it. This would not change anything in principle, but mobile sources would now be potential sellers of emissions rather than purchasers. In fact, if some kind of trading scheme could be agreed upon in SIP preparation, it might help lay to rest the question of where the most cost-effective emissions reductions are.

The intersector trading approach may be attractive in principle, but significant questions remain about how it would work in practice, including determining which entity would purchase and hold the permits, what measures would ensure that the purchase of permits by the mobile sector would not jeopardize the region’s air quality goals, and how sellers would verify that emissions reductions are real and permanent. Quantifying emissions and emissions reductions may be more difficult to accomplish with mobile sources than with stationary sources.

### **Create Out-Year Budgets**

One possible remedy for the issue of inconsistent planning horizons for SIPs and transportation plans and TIPs is to develop out-year budgets in the SIP. This could allow some growth in the mobile source budget for those years (after the attainment date but within the transportation planning horizon) when there is no overlap between the SIP and the transportation plan.

Planning for stationary and area sources has generally extended to the attainment date, which is no later than 2007 (except for Los Angeles, for which it is 2010). There are also several maintenance areas that need to demonstrate conformity for years outside the SIP planning horizon. In addition, other sources, not just transportation, would have to accept and commit to emissions reductions in the future. In the past, technical innovation has usually delivered sufficient emissions reductions, but there is no guarantee that innovation will continue to deliver. Current EPA policy does not allow for assuming new technologies until and unless they are in place and committed to.

Political opposition to such extended planning may render this remedy infeasible. Nevertheless, several areas—including Portland, Oregon; Albuquerque; Richmond; Las Vegas; Salt Lake City; and Washington, DC—have established out-year budgets, so it is not out of the question. An important point to keep in mind, however, is that all of these areas relied on safety margins in the motor vehicle emissions budgets or excess reductions projected in the long term, and as noted, the existence of safety margins presupposes that excess reductions can be identified and allocated to on-road mobile sources in the SIP.

### **Promote TCM Substitution in SIPs**

Several metropolitan areas have included transportation control measures (TCMs) as part of the package of measures designed to achieve local emissions reductions to meet the budgets. Once in the SIP, they become legally enforceable and cannot be removed or revised without a SIP revision. In addition, new TCMs cannot be added to the SIP without a SIP revision, though they can be implemented as part of the transportation plan and credit for such measures can be taken in the conformity determination as long as their implementation and benefits are assured. Because TCMs involve changing travel behavior, the future emissions reductions attributable to TCMs are uncertain.

One measure that might help agencies avoid problems if TCMs do not perform as well as expected is a SIP provision that would permit the substitution of one TCM for another in the SIP, as long as emissions reduction quantities and timetables are met. This has been done in Portland, Oregon, and is under way in Texas. Although working through the SIP revision process is still required, once in place, this mechanism provides some flexibility for experimenting with TCMs. Some air quality professionals we spoke with said that without a substitution policy, there is a large incentive not to include TCMs in SIPs because of the repercussions for the conformity process and the air quality plan if the TCMs do not perform as well as expected.

### ***Federal Initiatives***

We identify a number of ways the federal agencies could smooth SIP-conformity interactions. We locate these activities at the federal level because they would apply to all states and economies of scale could be reaped.

### **Increase Funding Allocations for State and Local Agencies**

One of the major complaints we heard about the conformity process was that it drained resources away from other important planning activities at state and local levels. This problem can be remedied either by reducing burdens or by making more resources available for planning. The

burdens on MPOs have risen markedly over the past decade, so increases would seem justified (although as some environmentalists point out, nothing prevents CMAQ monies from being used for planning). Additionally, because many SIP-conformity issues are resolved by SIP revisions, they strain the state air quality agencies and EPA regional offices handling the revisions. Increases in funding for these agencies could make revisions less difficult and thus help resolve conformity issues expeditiously.

### **Establish a Clearinghouse for Innovative Strategies**

An information clearinghouse might be useful. However, we found that local officials have a fairly high level of awareness of the problems and solutions across the country. Sacramento is developing land use scenarios for its 2005 regional transportation plan after reviewing the program in Portland, Oregon. Houston is closely following Sacramento's program to invest in clean and retrofitted diesel engines. Most of our interviewees were aware of the Washington, DC, plan to substitute VOC for NO<sub>x</sub> reductions and of the problems Baltimore incurred by failing to use the most up-to-date fleet composition assumptions in making a new conformity determination. Nevertheless, since conformity is such a dynamic process, a clearinghouse of current information and practices would likely be useful to practitioners.

### **Give States Incentives to Produce Better Fleet Mix Data**

MPOs currently obtain fleet mix data and vehicle use data (for heavy-duty vehicles) from a number of state and federal sources, including HPMS and state vehicle registration data. For emissions data for various vehicle categories, they rely on federal emissions databases and, recently, vehicle emissions test data collected by state-operated I/M programs.

The new MOBILE6 model has expanded the number of individual vehicle classes to 16 (combined gas and diesel), whereas MOBILE5 only accounts for eight vehicle types. EPA has issued guidance that provides a method for users to disaggregate their existing vehicle fleet information into the 16 vehicle categories in MOBILE6 based on national defaults. However, some MPOs and state air agencies told us that they would prefer to use more locally specific data to estimate emissions, but their existing datasets do not have the required detail for MOBILE6. In addition, we were told that differences in formatting and data definition in various datasets have required manual data entry and conversion from one dataset to another in some cases.

It is not clear whether these problems can be easily resolved, but it might be helpful if EPA and FHWA conducted coordinated scoping studies of data problems and sought options that would address the data needs of MPOs more effectively. FHWA has recently initiated a "conformity scan" project targeted at identifying good practices in addressing latest planning assumptions and MOBILE6 issues. As scanning tours are completed, information is being posted on the recently created FHWA conformity Community of Practice Web site.<sup>9</sup>

### **Develop Planning and Modeling Tools to Help Local Agencies**

Despite EPA's and other organizations' efforts, there is considerable anxiety about the effect of new modeling tools on conformity. Although national default data are available for use with MOBILE6, areas are finding types of inputs where local data would be an advantage. In fact, EPA is developing an interface that will allow existing vehicle identification number (VIN) decoders to properly characterize vehicles and assign them to the 28 categories specified by MOBILE6.

## *Legislative Actions*

A debate is currently under way on changes to the conformity process through the reauthorization of TEA-21. In this section, we discuss two major proposals that have attracted discussion: shortening the conformity time horizon, and extending the conformity update requirement from a minimum of every three years to a minimum of every five years. We present the arguments for and against each of these proposals but make no recommendation on them. In addition, we present other possible reforms that policymakers might consider.

### **Align the Transportation and SIP Planning Horizons**

The practice of making decisions about current transportation investments on the basis of emissions projections 20 years hence has led some observers to propose aligning the planning horizons associated with both transportation and air quality planning. This can be done by either extending the planning horizon for SIPs to be consistent with those of transportation plans (which is allowed but not required under current law) or shortening the conformity time horizon (not possible under current law).

The option of shortening the conformity time horizon has attracted the most attention and has been endorsed by the American Association of State Highway and Transportation Officials (AASHTO) and the Association of Metropolitan Planning Organizations (AMPO). According to AASHTO, the “mismatch has placed an undue burden on the on-road mobile sector where there are very few measures remaining that can yield significant emissions reductions.”<sup>10</sup> AMPO adds that the difference in horizons “results in the transportation agencies, essentially becoming the long-term air quality planning organization, but without the authority to implement the types of programs (e.g., I/M, reformulated gasoline) needed to substantially reduce mobile source emissions.”<sup>11</sup> AASHTO proposes shortening the conformity horizon to 10 years or the attainment date, whichever is longer. For the remaining years of the transportation plan, regional emissions analysis would be required and emissions budgets would be compared with emissions projections, but the analysis would be for informational purposes only.

On the other hand, air quality officials and environmentalists say that the 20-year horizon is essential for capturing both the long-term impacts of highway projects and the full benefits of such policies as transit investment and land use planning. The national association of state air quality officers recently called for retaining the 20-year horizon for transportation, saying that it was “imperative to ensuring that the potential for growth in mobile source emissions is identified, the impact on air quality is assessed and adjustments to transportation plans are made accordingly.”<sup>12</sup> The group has not proposed extending the SIP planning horizon beyond the attainment year.

In the areas we studied, the longer time frame for conformity was not an insurmountable issue, although Washington, DC, had to devote considerable effort to devising a method for ad-

*The practice of making decisions about current transportation investments on the basis of emissions projections 20 years hence has led some observers to propose aligning the planning horizons associated with both transportation and air quality planning.*

addressing a VOC problem in the latter years of its transportation plan. Most MPOs acknowledged the emissions reduction benefits of the federal control measures for Tier 2 vehicles, heavy-duty diesel engines, and low-sulfur fuels and considered these measures helpful in the mid to long term (7 to 20 years). Conformity issues, for the time being, appear to be in the near term, before these measures are phased in. However, this situation applies mainly to NO<sub>x</sub> emissions, which was the major concern in most of the areas we examined. In addition, when the new eight-hour ozone standard is implemented, the situation could change.

### **Align the Transportation and SIP Planning Assumptions**

Several areas we studied experienced difficulties in making a conformity determination because of planning assumptions. The latest planning assumption requirement has led many to call for reforms that would ensure that conformity analyses are based on the same set of assumptions used to develop the motor vehicle budgets in the SIP. One option would be to require that motor vehicle emissions budgets in the SIP be updated whenever new planning assumptions or new emissions models are introduced and used for conformity. Subsequently, the conformity determination would be made on new budgets. Another option would be to require SIP updates on a regular basis, say every three or five years, in coordination with the transportation plan update. A similar proposal would interpret the latest planning assumptions as those contained in the SIP, provided that the SIP is updated on a regular basis, say, every five years.

All these proposals have the advantage of eliminating the kinds of apples-to-oranges comparisons that emerged in some areas we studied and would promote a more integrated planning process. However, the difficulty with synchronizing updates of SIPs and conformity determinations is that it either increases the frequency of SIP updates or lengthens the minimum period between conformity determinations. Increasing the frequency of SIP updates raises issues of resource scarcity at state air quality agencies and EPA and would place additional administrative burdens on staff. On the other hand, the idea of extending the minimum gap between conformity determinations, which would allow MPOs more time for data collection and model improvements, was criticized by some air quality officials and environmentalists. They argue that the longer period might make it more difficult to nip problems in the bud. According to the national association of state air quality officials, keeping the current minimum frequency “will ensure that sound data [are] generated and allow for timely improvement of motor vehicle emission estimates.”<sup>13</sup> Experience to date shows, however, that a nonattainment or maintenance area rarely waits the full three years to make a new conformity determination. The transportation programming process is dynamic, and many MPOs update their conformity determinations more frequently than the minimum to keep federal funds flowing into their plans and TIPs.

Clearly, there are many issues to be sorted out before making changes that remedy the problems arising from the use of latest planning assumptions. As our interviews suggest, reforms that would not worsen air quality or greatly increase administrative burdens would be welcomed by both transportation and air quality planners.

### **Relax the Latest Planning Assumption Requirement with Favorable “Trading Ratios”**

Even a region with a fresh conformity determination can run afoul of the requirement to use the latest planning assumptions if it needs to add a project requiring a conformity determination to its transportation plan or TIP. For example, if new data become available after the last

conformity determination but before the new project is incorporated into the plan or TIP, then the new conformity determination would have to be made with datasets inconsistent with those in the SIP. One way of dealing with this problem is to retain the existing deadline for the next conformity determination but allow an interim conformity determination to be made using the old data in the SIP (or in the most recent transportation plan update, if it is newer). If this is considered insufficiently protective of air quality, then an additional option would be to require any projected increase in emissions to be offset by other emissions reductions from transportation, at some multiple of the original emissions increase. This might not relieve MPOs of the additional effort of preparing a conformity determination, but it does allow them to defer the impacts of the large increase in modeled emissions that can occur when different planning assumptions are used.

### **Eliminate False Precision in Conformity Determinations**

More flexibility could be provided in the case of a conformity lapse. One approach is to tie the penalty to the degree of the problem—the percentage of emissions shortfall, for example. If the conformity determination fails by less than a specified percentage of needed reductions, the area might be given a grace period in which to demonstrate conformity. This would make the immediate consequence of a conformity problem less onerous, and transportation and air quality planners would have some time to identify cost-effective emissions reductions. A more transparent approach would be to build into the modeling exercises quantitative estimates of uncertainties and then make determinations of conformity on the basis of the degree of uncertainty that emissions will be no higher than the target value. A third option is not to declare an area in a lapse unless the conformity determination shows some percentage or more greater than the motor vehicle emissions budget. For this option, of course, the lapse determination point becomes the *de facto* budget.

Some environmental advocates told us that the precision was false on both sides of the motor vehicle emissions budget. Because of the uncertainties inherent in air quality modeling, meeting both the overall emissions budget and the motor vehicle budget in the SIP will not guarantee attainment, any more than failing to meet them guarantees nonattainment.

Another way of putting this is to say that there could be gains from trade: transportation planners would accept tighter emissions budgets in exchange for less drastic penalties when they are violated.



## *Conclusions*

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Our research suggests that several types of SIP-related difficulties complicate the process of making conformity determinations. The transportation sector bears the downside risk associated with such problems, through the threat of restricted federal funding from a conformity lapse. The central difficulty is that new information (about the vehicle fleet mix or the performance of I/M programs, for example) is often incorporated into the conformity process before it can be addressed in the state implementation plan. Absent a SIP revision, regional transportation planners have to scramble to find additional emissions reductions. They argue that many of the most effective measures are outside their control, although one promising approach—pricing policies directed at automobiles—has not been widely pursued, largely because of its political unpopularity.

In our case studies, the on-the-ground consequences of such difficulties appear to be relatively small, at least for the time being—mostly raising administrative costs, diverting the attention of transportation planners away from other valued activities, and occasionally resulting in high-cost, low-benefit approaches to reduce emissions.

The relatively minor consequences of SIP-conformity interactions could easily worsen with new regulations and legislation, however. Our concern is with the planned implementation of the tighter ozone standard and the new PM<sub>2.5</sub> standards, which may at least triple the number of counties in nonattainment and subject to the SIP and conformity processes (Figures A and B). These new nonattainment areas will be brought into the SIP process for the first time, raising administrative burdens at EPA, the U.S. Department of Transportation, state air and transportation agencies, and MPOs. Because the standards are tighter, emissions reductions to meet them will need to be greater, making it more difficult for many nonattainment areas to reach attainment.

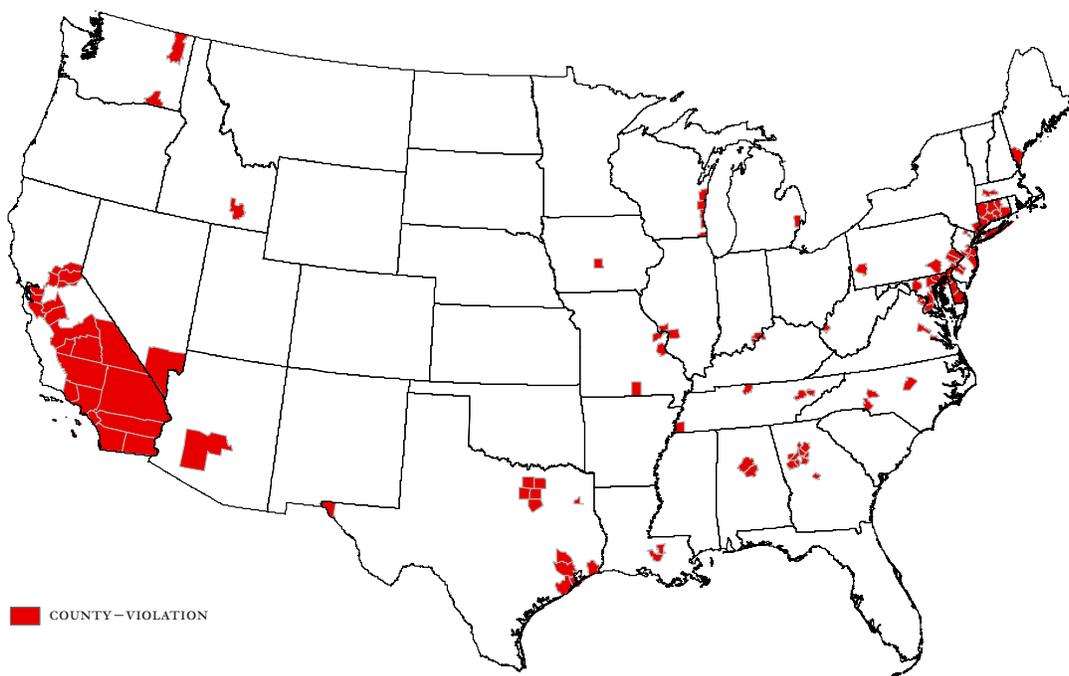
Bringing in a large number of stakeholders and officials unfamiliar with the intricacies of the conformity process and the SIP process will inevitably lead to problems in the short term. It would not be surprising if this exacerbated delays in the SIP approval process and the horizon mismatch problems. By moving the goalposts back for areas already violating standards and familiar with the conformity and SIP processes, planners' concern about an empty toolbox can only grow.

On the other hand, widening gaps between required and actual emissions reductions may increase the political feasibility of trying economic incentive approaches that have so far been

**FIGURE A.**

**Violations of any NAAQS, 1999**

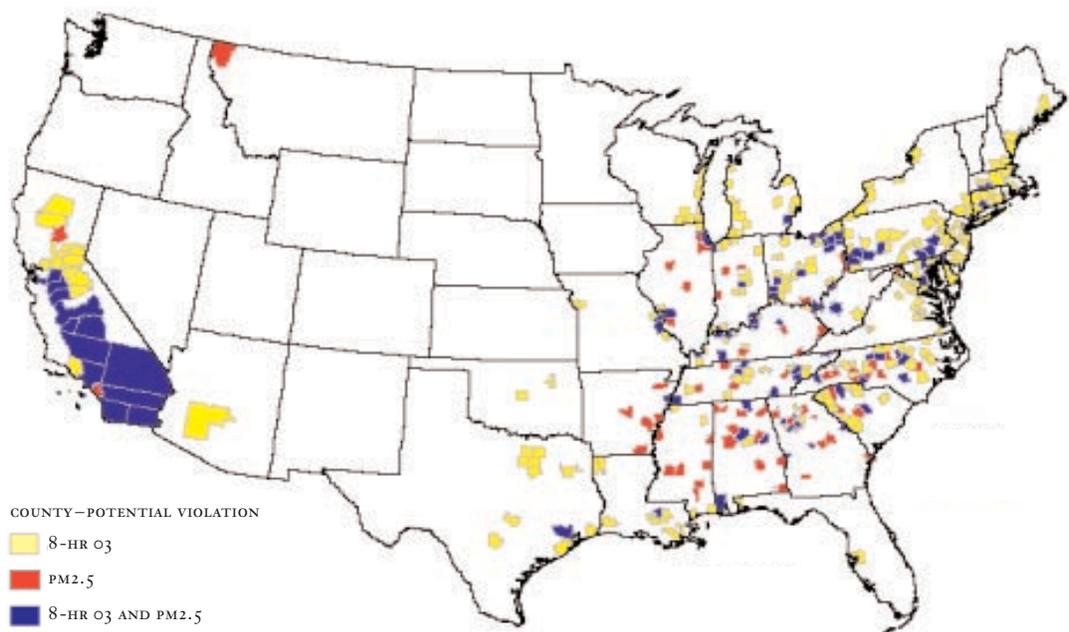
*Representing 121 counties and 75,000 inhabitants*



**FIGURE B.**

**Potential Violations of PM2.5 and 8-HR Ozone**

*Representing 407 counties and 136,000 inhabitants*



resisted. In addition, EPA is taking steps to ease the transition to nonattainment status and taking other steps to cushion the blow of tighter standards and their applicability to so many new areas. Such steps, together with the trend toward tighter emissions standards on vehicles (both on- and off-road), fuels, and stationary sources would alleviate some concerns.

Our message is that action is justifiable to reduce difficulties with SIP-conformity interactions as an insurance policy before many more areas enter this complex and controversial process and strains increase on those areas already participating. Several options are currently available to address many of the issues discussed in this report. A crucial finding is the importance of interagency consultation and planning for heading off problems. In addition, more support can be provided to state and local planning agencies for planning and data collection.

However, some issues may require revisions to existing law or regulation. One approach is to give planners the flexibility to quickly resolve issues without worsening air quality through intersectoral trading, which would allow MPOs to purchase emissions credits from other sources. Because questions remain about how trading would work in practice, future research into this topic is warranted. Other reforms involve either increasing the frequency of SIP updates or scaling back the frequency requirements of conformity. Although we do not endorse any particular reform, we note that the principal criterion for any change should be that it improves the process of transportation and air quality planning without undermining air quality.

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## Notes

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Winston Harrington, Alan J. Krupnick, and Peter Nelson are with Resources for the Future; Arnold Howitt and Jonathan Makler are with the Taubman Center for State and Local Government, John F. Kennedy School of Government, Harvard University; and Sarah J. Siwek is with Sarah J. Siwek and Associates.

- 1 “Conformity” is required by Section 176(c) of the Clean Air Act, which prohibits federal entities from doing anything in nonattainment or maintenance areas that do not conform with SIPs. In 1993, the Environmental Protection Agency (EPA) promulgated two sets of regulations to implement this section: Transportation Conformity Regulations applicable to projects funded or approved through 23 CFR Part 450 or 49 CFR part 613, and General Conformity Regulations, applicable to everything else. Since this report deals exclusively with transportation conformity, we use the term “conformity” as synonymous with “transportation conformity.”
- 2 For a brief description of the principal elements of the transportation planning, air quality planning, and transportation conformity processes, see Appendix A.
- 3 See, for example, the testimony of Lynn M. Terry, Deputy Executive Officer, Air Resources Board, California Environmental Protection Agency, U.S. Senate Committee on Environment and Public Works, July 30, 2002. [http://www.senate.gov/~epw/Terry\\_073002.htm](http://www.senate.gov/~epw/Terry_073002.htm). (Accessed January 14, 2003.)
- 4 For other violations of SIP requirements, such as the failure to meet a deadline for submitting a revised SIP or EPA disapproval of a submitted SIP, areas are given 24 months to correct the situation before transportation-funding restrictions commence. After 18 months, stationary source sanctions are imposed.
- 5 This is because the legislature exempted new cars from inspections for an additional two years (cars were already exempt from Smog Check until they were two years old), exempted cars older than the 1973 model year from inspection, and the cut points (at which a car would fail) were never set as tight as CARB had assumed when it made the SIP benefit projection for Enhanced I/M in 1994.
- 6 Once the area has three years of “clean” data, it can request a redesignation to maintenance. Once an area has been redesignated by EPA, a 10-year maintenance plan is put in place. (Maintenance areas are required to maintain the standards for 20 years, and they need to submit two 10-year maintenance plans.)
- 7 The frequency requirements for conformity determinations do not apply to rural areas, since they do not have transportation plans and TIPs. Technically, therefore, a rural area cannot fall into a lapse.
- 8 A survey commissioned by the Metropolitan Washington Council of Governments identified

nearly 40 studies of social costs in North America (K.T. Analytics 1997). Most of these studies conclude that the social costs of driving substantially exceed the payments by motorists, both in total and at the margin, and as a result, the use of motor vehicles substantially exceeds the social optimum. On a per-mile basis, for example, the aggregate value of excess costs identified in the studies surveyed by K.T. Analytics (1997) and Gomez-Ibanez (1997) ranges between 13 and 68 cents per mile. The scope and variety of transportation impacts that have been brought into the social cost framework are quite large, including parking, accidents, and the national-defense expenditures associated with defending the international oil trade, as well as a large number of environmental impacts, including air pollution, greenhouse gas emissions, and damage to wetlands and other sensitive areas from roadbuilding. See Gomez-Ibanez (1997) for a review of the differences in assumptions and definitions in selected studies and a discussion of how those differences affect the estimates.

- 9 <http://www-fhwa1.ornl.gov/cops/hcx.nsf/home?openform&Group=Transportation%20Conformity>. (Accessed January 14, 2003.)
- 10 AASHTO Reauthorization Position Paper, 1b-1 <http://transportation.org/community/reauthorization/policy/Planning%20and%20Conformity%20Position.pdf>. (Accessed January 14, 2003.)
- 11 AMPO, Transportation Air Quality Conformity, Timeframe Mismatch, [http://www.ampo.org/mpo\\_issues/aq/aq\\_timeframe.html](http://www.ampo.org/mpo_issues/aq/aq_timeframe.html). (Accessed January 14, 2003.)
- 12 The State and Territorial Air Pollution Program Administrators and the Association of Local Air Pollution Control Officials (STAPPA/ALAPCO), CMAQ and Transportation Conformity Principles for Reauthorization of TEA-21, October 1, 2002, <http://www.4cleanair.org/CMAQPrinciples.PDF>. (Accessed January 14, 2003.)
- 13 STAPPA/ALAPCO, October 1, 2002.

#### APPENDIX AND CASE STUDY NOTES

- 14 42 U.S.C. § 7511(a).
- 15 CAAA section 182(a)(3), CAAA section 182(a)(5).
- 16 CAAA section 176(c)(4)(B)(ii).
- 17 Moderate and below ozone nonattainment areas are not required to use travel demand models.
- 18 Some areas do not have motor vehicle emissions budgets and must do an emissions reduction test.
- 19 VMT estimates are taken from Howitt and Moore (1999) and *Conformity Determination of the 2001 Baltimore Regional Transportation Plan and the 2002–2006 Transportation Improvement Program*.
- 20 The role that conformity played in Glendening's decision is discussed in Howitt and Moore (1999).
- 21 Ibid.
- 22 *Baltimore Sun*, August 24, 1999, “7 Md. road plans in peril; State's failure to meet air-quality standards can delay U.S. funds; \$38 million at stake; Regional committee to weigh alternatives to reach compliance,” Marcia Myers, 1A.
- 23 *Federal Register*, June 10, 1999 (Volume 64, Number 111), Adequacy Status of Submitted State Implementation Plans for Transportation Conformity Purposes.
- 24 The recertification of the Transportation Steering Committee had been limited to one year because of insufficient public participation mechanisms and the lack of participation of elected officials.
- 25 See *Baltimore Sun*, August 22, 1999, “Arundel Mills shows myth of land-use control.” Letter to the editor from 1000 Friends of Maryland's Kristen Forsythe. 6B.
- 26 Transportation Steering Committee Air Quality Workshop. August 16, 1999. Slides 71–72.
- 27 Personal communication with MDOT and MDE staff.
- 28 Minutes of Baltimore Metropolitan Planning Organization Transportation Steering Committee, August 24, 1999.

- 29 Letter “Regarding: Assumptions for Baltimore Transportation Conformity Analysis” to Regina Aris and Craig Forrest from Baltimore Regional Partnership, August 18, 1999. <http://www.balto-region-partners.org/doc29.htm>. (Accessed January 14, 2003.)
- 30 TSC minutes.
- 31 Ibid.
- 32 Ibid.
- 33 *Baltimore Sun*, August 2, 1999, “Old data to stay in road plans; Pollution issue ignored; Decision is denounced.” Marcia Myers, 1B.
- 34 *Federal Register*, November 16, 1999 (64 FR 62196). Adequacy Status of Submitted State Implementation Plans for Transportation Conformity Purposes: Phase II Ozone Attainment SIPs for the Baltimore Area and Cecil County.
- 35 *Federal Register*, Tuesday, February 22, 2000 (65 FR 8701). Adequacy Status of Motor Vehicle Emissions Budgets in Submitted State Implementation Plans for Transportation Conformity Purposes; Maryland; Phase II Plan for the Baltimore Ozone Nonattainment Area.
- 36 Personal communication with MDOT officials.
- 37 U.S. Court of Appeals for the Fourth Circuit, *1000 Friends of Maryland, Petitioner, v. Carol M. Browner*, in her official capacity as Administrator, U.S. Environmental Protection Agency; no. 00-1489.
- 38 EPA and DOT Joint Guidance on Use of Latest Planning Assumptions in Conformity Determinations, January 18, 2001. <http://www.epa.gov/otaq/transp/conform/confasum.pdf> or <http://www.fhwa.dot.gov/environment/cnfpplngg.htm>. (Both sites accessed January 14, 2003.)
- 39 See <http://www.epa.gov/otaq/transp/landguid.htm>. (Accessed January 14, 2003.)
- 40 “Metropolitan transportation plan” in Houston is synonymous with RTP, or regional transportation plan elsewhere, referring to the long-term plan developed by the MPO. That terminology is adopted and used in this discussion.
- 41 PLEASE NOTE: Developments may have occurred since the time of writing (April 2002) that influence the statements of fact, chronologies, and presentations contained herein. The best attempt was made to include the most up-to-date information through ongoing input from interviewees during the writing and editing process.
- 42 On September 1, 2002, the Texas Natural Resource Conservation Commission changed its name to the Texas Commission on Environmental Quality (TCEQ). We use TCEQ for consistency purposes.
- 43 For a more detailed history of State Implementation Plans in Houston, refer to Chapter VI (Ozone Control Strategy), Section A (Introduction) of the December 20, 2000 SIP submission by TCEQ.
- 44 Unless otherwise noted, all discussions refer to NO<sub>x</sub> emissions
- 45 The Clean Air Act gives EPA the authority to develop and implement a federal implementation plan if the state is unable to submit a SIP that satisfies EPA and the act.
- 46 The Houston Planning partners refer to the SIPs submitted in 1998, 1999, and 2000 as Phase I, II, and III, respectively. That terminology is adopted for this section of the discussion.
- 47 U.S. District Court for the Northern District of California, San Francisco Division, January 10, 2000.
- 48 U.S. EPA Memorandum from Robert E. Larson to Jack Broadbent, Direct Air Division, EPA Region 9, December 7, 2001.
- 49 U.S. Department of Transportation, Federal Highway Administration, Federal Transit Administration, February 1, 2002, letter to Governor Gray Davis.

- 50 California Health and Safety Code, Division 26, Part 3, Air Pollution Control Districts.
- 51 Sacramento Area Metropolitan Transportation Plan, 1999.
- 52 Clean Air Act, Public Law 101-549, November 15, 1990, Section 182(g)(3).
- 53 Section 93.110.
- 54 The emissions analysis may not include for emissions reduction credit any TCMs or other measures in the applicable implementation plans that have been delayed beyond the scheduled date(s) until such time as their implementation has been assured. If the measure has been partially implemented and it can be demonstrated that it is providing quantifiable emissions reduction benefits, the emissions analysis may include that emissions reduction credit.
- 55 For this requirement, see 42 U.S. C. 7506(c)(1)(B)(iii); 40 CFR 93.110; and a memorandum jointly issued by the U.S. Environmental Protection Agency and the U.S. Department of Transportation, "Use of Latest Planning Assumptions in Conformity Determinations," January 18, 2001.
- 56 Leslie T. Rogers, FTA, and Michael G. Ritchie, FHWA, April 8, 2002 letter to Mr. Michael Kenny, CARB, Subject: Use of the Latest Planning Assumptions — Vehicle Age and Fleet Mix Data
- 57 Leslie T. Rogers, FTA, and Michael G. Ritchie, FHWA, May 2, 2002 letter to Mr. Michael Kenny, CARB, Subject: Use of Latest Planning Assumptions in Conformity Determinations.
- 58 Memorandum from G.T. Helms, EPA's Office of Air Quality Planning and Standards, to Marcia Spink, EPA Region III.



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## APPENDIX A

### *An Introduction to Transportation and Air Quality Planning Processes*

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#### *The Local Transportation Planning Process*

Metropolitan transportation planning is reasonably easy to describe, although in practice it requires a high degree of analytical sophistication. The first step is a regional forecast of population, land use, and economic activity. This in turn is used to generate a forecast of regional travel demand through the use of a network-based travel demand model or other estimating technique. Revenues from existing funding sources for transportation are projected. Planners then develop alternative investment scenarios, test those plans using a detailed regional transportation model, and select the one that best meets regional objectives. The process of developing a consensus on regional objectives is the responsibility of the metropolitan planning organization (MPO). The regional travel demand model allocates this demand to the existing and planned transportation network, producing estimates of the levels of traffic on transportation facilities in the region by travel mode (highway, mass transit, etc.). Federal regulations, largely initiated by ISTEA and TEA-21, substantially expanded the requirements of the metropolitan transportation planning process. These requirements are spelled out in 23 CFR Part 450 and 49 CFR Part 613. We have already touched on the elements of transportation planning that figure most prominently in this report, and now we summarize those elements.

#### **Metropolitan Transportation Plan**

ISTEA and now TEA-21 (PL 105-178, June 9, 1998) require the development of statewide and metropolitan transportation plans that include, at a minimum, a 20-year planning horizon (forecast period). In a metropolitan area, the plan presents a framework for the development of the regional transportation system over the next 20 years. It must be updated every three years in air quality nonattainment and maintenance areas. MPOs are the public agencies responsible for meeting the transportation conformity requirements in metropolitan areas.

#### **Transportation Improvement Program (TIP)**

The planning process in metropolitan areas must produce a detailed transportation improvement program (TIP) identifying the projects that will be implemented during at least the next three-year period. The TIP must be consistent with the transportation plan and must be updated at least every other year. For the first three years it must specify which projects will be undertaken each year. In general, projects that are not included in the TIP cannot be undertaken with federal aid (e.g., highway trust funds, federal transit funds) unless the TIP is amended.

### **Financial Constraint**

The transportation plan must include a financial plan that is consistent with reasonably available and projected revenues over the plan horizon. Revenues must cover both construction of new facilities *and* operation and maintenance of existing ones. If revenues from customary sources are insufficient, then new revenue sources and a strategy for ensuring that they materialize must be identified in the plan. The TIP must include a financial plan that identifies existing revenue sources for the projects in the TIP. In nonattainment and maintenance areas, this includes an available and secure funding source for all projects in the first two years. This is commonly referred to as the fiscal constraint requirement for the TIP.

### **Public Outreach**

ISTEA and TEA-21 envisioned a proactive public involvement process that would ensure a broad base of public support for transportation investments. In addition, ISTEA and TEA-21 emphasized the importance of multimodal transportation investments. MPOs are required to provide adequate opportunity for involvement by public officials and citizens at all stages in the planning process. In addition, at a minimum, at least one formal meeting must be held each year during the plan or TIP development process.

### **Conformity**

In nonattainment and maintenance areas, the plan and the TIP must be in conformity with regional air quality plans. In practice, this means that the estimate of emissions from the planned transportation system must not exceed the motor vehicle emissions limit, or budget (MVEB), in the applicable SIP. Transportation plans and TIPs must demonstrate consistency with all applicable budgets that have been established for each Clean Air Act requirement for each pollutant and standard. It is therefore possible for plans to be concurrently subject to emissions budgets from more than one SIP element (e.g., an attainment SIP and a rate-of-progress SIP) and more than one pollutant. The MPO makes the conformity determination, which must be concurred in by FHWA and FTA.

### **Three-Year MPO Certification**

The Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) must jointly certify the transportation planning process used by each MPO in transportation management areas (urbanized areas with populations of more than 200,000) no less than once every three years. The MPO certification process is in fact the review process that ensures that the planning process, including certain elements of the conformity process (e.g., fiscal constraint, public involvement), meet federal requirements.

### ***The State Implementation Planning Process for Air Quality Planning***

State implementation plans (SIPs) are the responsibility of the state air quality, environmental, or health agency, although in some situations a local or regional entity assumes responsibility for some elements of SIP planning. For example, in the Washington, DC, metropolitan area, SIP preparation is the responsibility of a regional board with representation from local govern-

ments, state environmental agencies in Maryland and Virginia, and the environmental agency in the District of Columbia. Uniquely, some members of the regional air quality board are also members of the MPO board. Nevertheless, the agencies in Maryland, Virginia, and the District of Columbia have final responsibility for the SIPs.

A SIP actually contains many elements, each responding to a particular requirement in the Clean Air Act. For example, a SIP might include specific regulations and permitting requirements for one major source of pollution. We now summarize the most important features of air quality planning.

**15% reasonable further progress SIP.** In accordance with the 1990 Clean Air Act Amendments, all moderate and above ozone areas were required to develop a 15% reasonable further progress (RFP) SIP (also referred to as a 15% rate-of-progress SIP) and include measures to demonstrate interim progress toward attainment of the NAAQS for ozone between 1990 and 1996.

**9% rate-of-progress SIP.** In serious, severe, and extreme ozone nonattainment areas, a 9% rate-of-progress (ROP) SIP was due by November 15, 1994, which showed a reduction of 3% on average for each consecutive three-year period after 1996 (when the 15% RFP SIP requirement would be met) until the area's attainment date. The purpose of the 9% ROP and the 15% RFP was to ensure that incremental progress toward attainment was realized for the nation's most severe air quality nonattainment areas.

**Attainment SIPs.** Moderate and above ozone nonattainment areas were required to make an air quality attainment demonstration by November 15, 1994, using photochemical dispersion modeling or another EPA-approved analytical method. An attainment demonstration provides specific reductions in emissions needed to attain the NAAQS by the mandated attainment dates for ozone, CO, and PM10.

**Maintenance plans.** Once a nonattainment area can show three years of "clean" data, it can request that EPA designate it as a maintenance area, according to the Clean Air Act section 107(d)(3). To be redesignated, the area must have a maintenance plan that shows how it will continue to attain the standard. Maintenance plans are submitted for two 10-year periods, with the first plan due prior to redesignation and the second 10-year plan due eight years into the first 10-year maintenance period.

Like transportation planning, the fundamental steps of air quality planning are easy to describe but difficult to execute.

### **Emissions Inventory**

Regional air quality planning begins with identifying all significant emissions sources in the region and estimating their current emissions rates. The Clean Air Act<sup>14</sup> requires periodic preparation of emissions inventories that are comprehensive and accurate and reflect the current level of actual emissions from all sources in a nonattainment area. All ozone and carbon monoxide nonattainment areas were to develop inventories and submit them to EPA every three years until redesignation as an attainment area. This three-year requirement was intended to ensure that changing circumstances in emissions rates, sources, or technologies could be reflected in SIPs on a regular basis. The three-year inventory requirement<sup>15</sup> is also linked to the three-year conformity requirement<sup>16</sup> and the three-year transportation plan update requirement. Inventories

are due on a fixed schedule running from the enactment of the 1990 Amendments, whereas conformity is due at a minimum within three years since the last determination that meets the requirements for the three-year update (i.e., a determination that includes a regional emissions analysis covering a 20-year time frame).

Inventories are used as inputs to various models that help explain emissions rates of various sources, air quality characteristics in large areas, and so forth. Emissions factor models are used in air quality planning for transportation to generate estimates of emissions rates in grams per mile by mode for specific analysis years. These rates are multiplied by aggregate vehicle miles traveled (VMT) to get estimates of aggregate emissions. The emissions estimates are prepared for the base case—the emissions estimates assuming no additional emissions reduction efforts—plus any policy or regulatory scenarios under consideration.

### **Emissions Budgets**

A SIP includes the maximum total emissions of each pollutant that are consistent with meeting the goals of the SIP. For an ROP or RFP SIP, the emissions must show a steady 3% reduction per year over the required period. For the attainment SIP, planners must find an aggregate emissions level (also considered a limit or cap on emissions) that, when projected in the regional air quality model, allows the ambient standards to be met. There are explicit limits on emissions from on-road motor vehicles (the motor vehicle emissions budget, or MVEB). Although the total allowable emissions are determined by the projected air quality level using urban airshed modeling, air quality planners have some discretion over the motor vehicle emissions budgets (MVEBs tend to be based on certain levels of emissions reductions over time). However, the more emissions allowed for on-road mobile sources, the less are available for other types of sources. The ensuing apportionment process is necessarily contentious because it determines what emissions reductions are to be required from each source. The four major sources are stationary (power plants, refineries, etc.), area (dry-cleaners, paint manufacturers), off-road mobile (airplanes, ships, trains, jet skis, construction equipment), and on-road mobile (cars, trucks, buses).

### **New Source Review**

New source review is the process by which stationary sources seeking to build new facilities or expand existing ones obtain the necessary permits. Some EPA officials consider it comparable in purpose to the conformity process for on-road mobile sources. The analysis and planning look ahead to the attainment date for a nonattainment area. Therefore, the analysis must show that total emissions, including emissions from the new plant, will meet the attainment level in the attainment year.

### **Frequency of SIP Submittals**

As required by the Clean Air Act, states submit SIPs to EPA within three years after the promulgation of (or revision to) a NAAQS. Depending on the pollutant and an area's classification, the state may have to submit several types of SIPs (e.g., rate of progress, attainment) for different Clean Air Act requirements by the deadline established in the act. Once areas attain a particular ambient air quality standard, they can choose to develop a maintenance plan for that pollutant and apply for redesignation as a maintenance area. In addition, states may submit revisions to SIPs at any time as needed.

### **Failure to Implement a SIP**

If a state cannot meet its commitments to implement the EPA-approved SIP strategies, it takes corrective action, through a SIP revision if necessary. EPA will most likely issue a finding of failure to implement that would impose sanctions within 18 months if the SIP is not revised. As a last resort, EPA can issue a “SIP-call,” requiring the state to submit SIPs on a schedule set forth by EPA.

### **SIP Review and Approval**

The SIP approval process is complex. Once a complete SIP is submitted to EPA, the agency has 12 months to make a determination. Possible outcomes include full approval or disapproval, partial approval, and conditional approval. EPA can allow states up to 18 months to make revisions to deficient SIPs before imposing penalties.

### ***The Conformity Process***

The conformity process is intended to integrate air quality and transportation planning so that federally funded or approved transportation projects, programs, or plans do not move forward if they will undermine a state’s obligations to meet and maintain the NAAQS. In particular, conformity seeks to ensure that the activities of the transportation sector do not:

- create a new air quality violation;
- increase the frequency or severity of an existing air quality violation; or
- delay timely attainment.

This is achieved through a periodic conformity “determination,” a finding made by the metropolitan planning organization (or the state department of transportation in rural areas) and subsequently by the U.S. Department of Transportation (FHWA and FTA). Determinations must be made at least every three years on the metropolitan transportation plan and TIP in nonattainment and maintenance areas.

A conformity determination requires that the projected emissions from the planned transportation system as detailed in the plan and TIP be estimated for the entire plan period (i.e., at least 20 years). The relevant emissions budgets are those in the most recently approved SIP, or in the case of submitted SIPs, those that have been deemed adequate by EPA for conformity purposes. The budgets are the estimate of future emissions in specific years given the control measures outlined in the SIP that are consistent with achieving its purpose (e.g., attainment, maintenance, rate of progress). However, for conformity purposes, the SIP can explicitly allocate a safety margin (if one is available) of excess emissions to the motor vehicle emissions budgets to allow for additional growth in the on-road transportation sector. The safety margin is the amount by which the total projected emissions from all sources of a given pollutant are less than the total emissions that would satisfy the applicable requirement for reasonable further progress, attainment, or maintenance.

### **Regional Emissions Analysis**

The central analytical feature of transportation conformity is the modeling process used to estimate future emissions from on-road mobile sources within a nonattainment or maintenance

area. Two types of models are generally used: travel demand models<sup>17</sup> and emissions factor models. The travel demand model produces estimates of the levels of traffic and the types of facilities (e.g., highways, transit, major arterials) used in the area. These estimates are made for specific, required analysis years in accordance with the conformity rule. In all cases the last analysis year is the final year of the transportation plan, which must be at least 20 years in the future. (Note: Many areas are now planning until 2025 or 2030.) The outputs of the travel demand modeling process are then used to estimate emissions through the use of emissions factor models, as discussed above.

The emissions factor models produce emissions estimates for specific analysis years. These emissions are compared with motor vehicle emissions budgets in the SIP.<sup>18</sup> SIPs may establish budgets for certain years, and for each year a SIP establishes a budget, the estimated emissions from the planned transportation system as depicted in the transportation plan and TIP must not exceed the budget. Budgets are established for each pollutant or precursor (e.g., NO<sub>x</sub> and VOC, CO, PM<sub>10</sub>) for which the area violates the standards. The MOBILE model is the EPA-approved emissions factor model for all states except California, which uses the EMFAC model for nonattainment and maintenance areas.

### **Interagency Consultation**

Interagency consultation is central to the entire transportation conformity process. It serves as the underpinning for conformity determinations and as the primary mechanism for ensuring early coordination and negotiation among all parties affected by transportation conformity, including state and local air agencies, the MPO, the state department of transportation, and other interested parties. Each state must establish interagency consultation procedures in a “conformity SIP.” The conformity SIP includes the criteria and procedures for demonstrating conformity. The interagency consultation process must be legally enforceable through either regulation or a legally binding memorandum of understanding. Consultation must occur as stipulated in the conformity SIP. Each time the conformity rule is amended, the interagency consultation procedures in the conformity SIP must adopt pertinent changes.

### **Conformity Lapses**

Conformity determinations must be updated at least every three years. However, there are also 18-month conformity requirements (“triggers”) for certain SIP actions (e.g., EPA approval of a SIP with a new motor vehicle emissions budget, or the addition, revision, or deletion of transportation control measures) and the transportation planning requirement for a two-year TIP update that might require conformity more often than every three years. If the MPO and FHWA/FTA do not make a conformity determination for a nonattainment or maintenance area before the current one expires, a conformity lapse ensues. Under a conformity lapse, only certain types of transportation projects, such as safety projects and transportation control measures included in approved SIPs, may proceed. Conformity lapses begin immediately, whereas the penalties for failing to observe SIP requirements are imposed 18 months after EPA invokes sanctions on stationary sources. If deficiencies are not corrected within 18 months, stationary source sanctions are imposed and, after 24 months, highway funding sanctions begin.

## APPENDIX B

### *List of Interviewees*

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Tad Aburn, Maryland Department of the Environment	Mike Clifford, Transportation Planning Board, Washington, DC
Regina Aris, Baltimore Metropolitan Council	Norm Covell, Sacramento Metropolitan Air Quality Management District
Tom Ballou, Virginia Department of Environmental Quality	Tom Diggs, EPA, Region 6
Gene Bandy, Baltimore Metropolitan Council	Kathleen Donodeo, Washington Metropolitan Area Transit Administration
Jon Behnam, EPA, Region 6	Sylvia Dugre, EPA, Region 9
Lynorae Benjamin, EPA, Region 4	Bernadette S. Dupont, Federal Highway Administration, Kentucky Division
Laura Berry, EPA, Ann Arbor	Wayne Elson, EPA, Seattle
Harvey Bloom, Baltimore Metropolitan Council	Heather Evans, Texas Natural Resource Conservation Commission (now Texas Commission on Environmental Quality)
Rob Bostrom, Kentucky Transportation Cabinet	Diane Franks, Maryland Department of the Environment
Nat Bottigheimer, Maryland Department of Transportation	Gordon Garry, Sacramento Area Council of Governments
Mike Brady, California Department of Transportation	John Gowins, Kentucky Department of Environmental Protection, Division for Air Quality
Lona Brewer, Kentucky Department for Environmental Protection, Division for Air Quality	Steve Guhin, Sacramento Area Council of Governments
Jacob Brostoff, 1000 Friends of Oregon	Mike Hogle, Metro Portland, Oregon
Mark Brucker, EPA, Region 9	Leila Holmes Cook, EPA, Ann Arbor
Jose Campos, Federal Highway Administration, Texas Division	
John Carr, Kentucky Transportation Cabinet	
Alan Clark, Houston Galveston Area Council	

Glenn Jilek, Federal Highway Administration, Kentucky Division	Joan Rohlfs, Metropolitan Washington Air Quality Council
Marsha Kaiser, Maryland Department of Transportation	Joel Schwartz, Reason Foundation, Member, California Inspection and Maintenance Review Committee
Rudy Kapichak, EPA, Ann Arbor	Howard Simons, Maryland Department of Transportation
Ron Kirby, Transportation Planning Board, Washington, DC	Lynn Soporowski, Kentucky Transportation Cabinet
Mike Koontz, Federal Highway Administration, Eastern Resource Center	Angela Spickard, EPA, Ann Arbor
Bob Kramer, EPA, Philadelphia	Kanathur Srikanth, Virginia Department of Transportation
Karen Kwiterovich, Baltimore Metropolitan Council	Rick Stevens, Washington, DC, Metropolitan Area Transit Administration
Annette Liebe, Department of Environmental Quality, Portland, Oregon	Brent Sweger, Federal Highway Administration, Kentucky Division
Ron Maertz, Sacramento Metropolitan Air Quality Management District	Doug Thompson, California Air Resources Board, Sacramento
Cynthia Marvin, California Air Resources Board, Sacramento	Lily Wells, Houston Galveston Area Council
John Mason, Transportation Planning Board, Washington, DC	Dave Williams, Oregon Department of Transportation
Margie McAllester, Texas Natural Resource Conservation Commission (now Texas Commission on Environmental Quality)	Earl Withycombe, Environmental Coalition of Sacramento
Carroll Nixon, Texas Department of Transportation	Gregory Witt, Kentucky Transportation Cabinet
Bob O'Loughlin, Federal Highway Administration, Western Resource Center	Dave Young, Sacramento Area Council of Governments
Fred Patron, Federal Highway Administration, Oregon Division	Wayne Young, Texas Department of Transportation
Meg Patulski, EPA, Ann Arbor	
Dan Pontious, Baltimore Regional Partnership	
Kay Prince, EPA, Region 4	
Jeff Pulverman, California Department of Transportation, Sacramento	■ ■ ■
Michael Replogle, Environmental Defense	
Mike Roberts, Federal Highway Administration, Southern Resource Center	

## APPENDIX C

### *Glossary of Abbreviations*

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<b>AASHTO</b> American Association of State Highway and Transportation Officials	<b>ICG</b> Interagency Consultation Group (Maryland)
<b>AMPO</b> Association of Metropolitan Planning Organizations	<b>I/M</b> inspection and maintenance
<b>BMC</b> Baltimore Metropolitan Council	<b>KYTC</b> Kentucky Transportation Cabinet
<b>BRTB</b> Baltimore Regional Transportation Board	<b>LUTRAQ</b> Land Use, Transportation, and Air Quality model (Oregon)
<b>CAAA</b> Clean Air Act Amendments (1977, 1990)	<b>MDOT</b> Maryland Department of Transportation
<b>Caltrans</b> California Department of Transportation	<b>MDE</b> Maryland Department of the Environment
<b>CARB</b> California Air Resources Board	<b>MPO</b> metropolitan planning organization
<b>CMAQ</b> Congestion Mitigation and Air Quality Improvement Program	<b>MTP</b> metropolitan transportation plan (equivalent to regional transportation plan, RTP)
<b>CNG</b> compressed natural gas	<b>MVEB</b> motor vehicle emissions budget (limit)
<b>CO</b> carbon monoxide	<b>MWAQC</b> Metropolitan Washington Air Quality Committee
<b>COG</b> Council of Governments (Metropolitan Washington, DC)	<b>NAAQS</b> National Ambient Air Quality Standards
<b>DAQ</b> Division of Air Quality (Kentucky)	<b>NRC</b> National Research Council
<b>DEQ</b> Department of Environmental Quality (Oregon)	<b>NO<sub>x</sub></b> nitrogen oxides
<b>ECOS</b> Environmental Coalition of Sacramento	<b>OAQPS</b> Office of Air Quality, Planning and Standards
<b>EPA</b> U.S. Environmental Protection Agency	<b>ODOT</b> Oregon Department of Transportation
<b>FHWA</b> Federal Highway Administration	<b>OTC</b> Ozone Transport Commission
<b>FTA</b> Federal Transit Administration	<b>PM<sub>10</sub></b> particulate matter measuring 10 microns or less
<b>HGAC</b> Houston Galveston Area Council	<b>PM<sub>2.5</sub></b> particulate matter measuring 2.5 microns or less
<b>HPMS</b> Highway Performance Monitoring System	

<b>RFP</b> reasonable further progress SIP	<b>VMEP</b> voluntary mobile emissions program
<b>ROG</b> reactive organic gases	<b>VMT</b> vehicle miles traveled
<b>ROP</b> rate-of-progress SIP	<b>VOC</b> volatile organic compound
<b>RTP</b> regional transportation plan	<b>WMATA</b> Washington Metropolitan Area Transit Authority
<b>SACOG</b> Sacramento Area Council of Governments	
<b>SIP</b> State Implementation Plan	
<b>SMAQMD</b> Sacramento Metropolitan Air Quality Management District	
<b>SO<sub>2</sub></b> sulphur dioxide	
<b>SUV</b> sport utility vehicle	
<b>TCEQ</b> Texas Commission on Environmental Quality (as of September 1, 2002)	
<b>TCM</b> transportation control measures	
<b>TERP</b> Texas Emissions Reduction Plan	
<b>TIP</b> Transportation Improvement Programs	
<b>TNRCC</b> Texas Natural Resource Conservation Commission (until September 1, 2002)	
<b>TPB</b> Transportation Planning Board (National Capital Region)	
<b>tpd</b> tons per day	
<b>TxDOT</b> Texas Department of Transportation	
<b>U.S. DOT</b> U.S. Department of Transportation	
<b>VADEQ</b> Virginia Department of Environmental Quality	

## CASE STUDY ONE

### *Baltimore, Maryland*

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#### *Abstract*

The controversy arising from the attempt to make a conformity determination for the Baltimore region in the latter half of 1999 illustrates the complications that can arise when the assumptions used to develop the on-road mobile source emissions budgets in the SIP diverge from the assumptions used for a conformity analysis. The main issue in Baltimore was an inconsistency between the vehicle registration data used to develop the SIP's budgets and updated registration data available for the conformity determination that indicated higher-than-expected vehicle emissions. Using the emissions forecasts based on the new data would have made it very difficult, if not impossible for the MPO to meet the budgets, which had been based on older data, and make a conformity determination. The region's planners were unsure which data the conformity regulation required them to use: the most up-to-date vehicle registration data or the data used to develop the motor vehicle emissions budgets. They elected to use the older data to maintain consistency with the planning assumptions used to develop the SIP, a decision opposed by local environmental groups. The conformity determination was delayed after EPA and FHWA officials indicated that relying on older data would likely result in federal disapproval. The situation was resolved through an expedited SIP revision that updated the motor vehicle emissions budgets with 1999 data.

#### *The Area*

The Baltimore planning area is identical to its nonattainment area and comprises Baltimore City, the city of Annapolis, and the surrounding counties of Anne Arundel, Baltimore, Carroll, Harford, and Howard. The area is relatively slow growing; population in the region increased approximately 7% from 1990 to 2000 (from 2.34 million to 2.51 million). Between 1990 and 2002, daily vehicle miles traveled in the region increased from 49,900,000 to 67,419,500. By 2025, daily VMT is forecast to rise by more than 20% from 2000 levels, to 82,627,900.<sup>19</sup>

## *The Institutions*

The officially designated MPO for the Baltimore metropolitan area is the Baltimore Regional Transportation Board (BRTB), which was known as the Transportation Steering Committee prior to 2000. BRTB members include elected officials representing the area's jurisdictions as well as the Secretary of the Maryland Department of Transportation. The Secretary of the Maryland Department of the Environment and the Secretary of the Maryland Department of Planning also serve as nonvoting members. Administrative and technical support to the BRTB is provided by the Baltimore Metropolitan Council (BMC), the regional coordination organization for local officials of the Baltimore region. Baltimore updates its transportation improvement program every year, although TIP modifications are not usually significant enough to warrant a new regional emissions analysis.

The lead agency for SIP development is the Maryland Department of the Environment (MDE). SIPs are prepared by the staff of MDE's Air and Radiation Management Administration. For conformity determinations, the workload is shared by BMC and MDE. BMC staff run the transportation model to produce the needed traffic volume and speed data inputs. These inputs are then used by MDE's Mobile Sources Division to run the MOBILE motor vehicle emissions factor model and test projected emissions against the SIP budgets.

The Maryland Department of Transportation (MDOT) is the consolidation of six modal administrations: Motor Vehicles, Aviation, Transportation Authority (responsible for toll facilities), Port Authority, Maryland Transit Administration, and State Highway Administration. MDOT is one of the largest Maryland agencies, with nearly 10,000 employees and an annual capital and operating budget in excess of \$2 billion. The nature of MDOT's programming process limits the degree of control that the MPO has on funding of transportation projects because priority setting takes place through direct discussion between the localities and MDOT. Each year, MDOT prepares its draft transportation program and presents it to the state's counties and Baltimore in 24 meetings throughout the fall (the Secretary's Annual Capital Program Tour). Local and county transportation officials have the opportunity to comment at these meetings. The final plan is approved by the governor and presented to the General Assembly for approval in January.

The Interagency Consultation Group (ICG) is the forum where most discussion of Baltimore's conformity issues, such as planning assumptions, takes place. The ICG is comprised of representatives of MDE, MDOT, and the BRTB. Nonvoting participants of the ICG include representatives from federal agencies such as FHWA and EPA. Representatives of local city and county agencies and environmental groups often attend as well.

## *Air Quality and Compliance History*

Under the 1990 Clean Air Act Amendments, Baltimore was classified as a severe ozone nonattainment area and a moderate carbon monoxide nonattainment area (it was redesignated a CO maintenance area in 1995). Baltimore's ozone attainment date is 2005. As in many other eastern metropolitan regions, transport of ozone from upwind areas plays a large role in Baltimore's air quality problem. Issues concerning transported pollution were a major reason that Baltimore and other areas were not able to meet the November 15, 1994, statutory deadline to submit the re-

TABLE 1.1

*MVEBs for the Baltimore Nonattainment Area:  
Phase I Attainment Plan*

Milestone Year	VOC (tpd)	NO <sub>x</sub> (tpd)
1999	61.8	111.5

Source: Phase I Attainment Plan for the Baltimore Nonattainment Area and Cecil County, December 1997.

TABLE 1.2

*MVEBs for the Baltimore Nonattainment Area:  
Phase II Attainment Plan*

Milestone Year	VOC (tpd)	NO <sub>x</sub> (tpd)
1999	69.8	115.7
2002	51.0	99.0
2005 ROP and attainment	47.6	94.7

Source: Phase II Attainment Plan for the Baltimore Region and Cecil County, April 1998.

quired rate-of-progress plan and attainment plan. EPA responded to these delays by developing an approach that separated the required SIP submittals into two phases. Phase I plans were due in 1995, and Phase II plans were due in mid-1997.

MDE submitted the following plans to EPA during the 1990s:

- The 15% reasonable further progress plan to reduce emissions from VOCs by 15% from 1990 to 1996 was submitted to EPA in 1995 and received final approval on February 3, 2000.
- The Phase I Attainment Plan was submitted on December 24, 1997, and contained the first 9% rate-of-progress budgets for the 1999 milestone year. The motor vehicle emissions budgets in the Phase I plan are listed below. The plan was approved by EPA on September 26, 2001.

The Phase II Attainment Plan, which was submitted on April 24, 1998, contained the 2005 attainment demonstration and the rate-of-progress demonstrations for 2002 and 2005. The plan also revised the budgets for 1999. The motor vehicle emissions budgets are listed below. The attainment demonstration received EPA approval on October 30, 2001.

### *Conformity*

Before the vehicle registration data issue arose, the primary examples of SIP-conformity interactions in Maryland involved the state's vehicle inspection and maintenance program. In May 1997, Governor Parris Glendening vetoed a bill passed by the General Assembly that would have made the I/M program voluntary. Although the governor cited the health benefits of mandatory testing when vetoing the bill, many believe that the negative impacts on conformity also played a role in his decision.<sup>20</sup> In spring 1999, the General Assembly voted to repeal the 2001 termination date of the I/M program. Baltimore's conformity determination and its SIP relied on the reductions from the program well past 2001, so the repeal was necessary for the MPO to meet its air quality requirements.

Baltimore's problems in fall 1999 stemmed from an inconsistency in the vehicle registration data used to develop the SIP's on-road mobile source emissions budget and the vehicle registration data available for planners preparing for a 1999 conformity determination on significant amendments to the current transportation plan and TIP.

In April 1998, MDE submitted its Phase II SIP for the Baltimore nonattainment area. The motor vehicle emissions budgets were based on the projected on-road mobile emissions for each

milestone year, assuming anticipated control strategies would be implemented. The budgets therefore were derived from what was forecast by the travel demand and MOBILE emissions models for the target years. The composition of the vehicle fleet plays a significant role in determining projected emissions because different types of vehicles have different emissions per mile (“emissions factors” in the parlance of modelers). For example, older cars emit more than newer cars, and SUVs emit more than small cars.

The motor vehicle emissions budgets in the Phase II SIP were based on forecasts that relied on 1990 vehicle registration data. In late 1997, as MDE officials were developing the Phase II SIP, consideration was given to using newer data for preparing the motor vehicle emissions budgets. Model runs conducted for the vehicle emissions inspection program revealed that 1996 registration data showed the percentage of SUVs in the fleet was rising, implying higher emissions for the fleet as a whole.<sup>21</sup> Between 1990 and 1996, the total number of vehicles in the region rose just 8%, but the number of SUVs nearly doubled.<sup>22</sup> MDE considered using the newer data for preparing the budgets in the Phase II SIP but was concerned about using assumptions that were inconsistent with its other (15% and Phase I) air quality plans.

One option would have been to update all the air quality plans using 1996 data, but in the judgment of MDE air quality planners, this would have been extremely difficult to do by the April 1998 deadline for Phase II. MDE was faced with a particularly heavy workload at that time because staff were concurrently updating the 15% and Phase I plans. Therefore, MDE elected to use 1990 data in the Phase II SIP and wait to update the vehicle registration data with a SIP revision at a later date.

On April 28, 1999, EPA found the post-1996 rate-of-progress motor vehicle emissions budgets (for 1999, 2002, and 2005) in the Phase II Attainment Plan adequate for the purposes of determining transportation conformity.<sup>23</sup>

During summer 1999, Baltimore’s transportation planners were preparing the conformity analysis. The normal schedule called for a decision on modeling parameters in early spring, with draft analyses commencing in late spring. Results would have been presented in June, in time for a July determination.

However, the process was delayed. The MPO was making changes to its modeling process and having to account for lower emissions credits from I/M, corresponding to the state’s delay in the start of mandatory testing. Thus changes in the modeling process, new assumptions regarding I/M, and updated vehicle registration data all worked to increase modeled estimates of on-road mobile source emissions beyond what had been predicted just a few years earlier.

At the same time, environmentalists in Maryland were watching the situation closely, having expressed dissatisfaction with the transportation model used for conformity and with the MPO’s planning process, which they said was insufficiently open.<sup>24</sup> An additional issue for environmental groups was a large development project, the Arundel Mills Mall, scheduled to begin construction in the upcoming year. The groups argued that the project would dramatically increase vehicle miles traveled in the region, produce sprawl, and worsen the region’s air quality.<sup>25</sup>

BMC and MDE staff conducted a series of draft conformity analyses based on a variety of assumptions, including using 1990 and 1996 vehicle registration data as inputs. The results of these analyses were presented at an August 16, 1999, air quality workshop of the Transportation Steering Committee. The updated data resulted in a dramatically higher level of emissions. The

emissions levels for both NO<sub>x</sub> and VOC based on 1996 vehicle registration data were much higher than Baltimore’s on-road mobile emissions budgets for the near-term years (2000–05), making it very difficult to meet the rate-of-progress budgets. The differences amounted to about 7 tpd of VOC and 11 tpd of NO<sub>x</sub> in 2002.<sup>26</sup> In the opinion of the state’s transportation and environmental officials, these additional emissions would have been difficult if not impossible to reduce from the on-road mobile source sector alone within such a short time.<sup>27</sup>

The region’s officials were unsure how to proceed. In their view, two requirements of the conformity regulations appeared to contradict each other. The first requirement is that transportation planners use the most recent planning assumptions. Section 93.110 of the conformity regulation reads,

*Assumptions must be derived from the estimates of current and future population, employment, travel, and congestion most recently developed by the MPO or other agency authorized to make such estimates and approved by the MPO. The conformity determination must also be based on the latest assumptions about current and future background concentrations.*

The second requirement holds that certain assumptions for regional emissions analysis be consistent with those in the SIP. According to Section 93.122,

*The ambient temperatures used for the regional emissions analysis shall be consistent with those used to establish the emissions budget in the applicable implementation plan. All other factors, for example the fraction of travel in a hot stabilized engine mode, must be consistent with the applicable implementation plan, unless modified after interagency consultation . . .*

TABLE 1.3

**Affected Projects**

1	Interstate 695 (Baltimore Beltway), from Interstate 97 to Route 10, in Anne Arundel County: <i>median widening.</i>
2	Arundel Mills Boulevard and Route 295, in Anne Arundel County: <i>construction of interchange.</i>
3	Route 7 (Philadelphia Road), from Campbell Boulevard to Route 43 (White Marsh Boulevard), in Baltimore County: <i>widening, reconstruction.</i>
4	U.S. 29, from Interstate 70 to Route 100, in Howard County: <i>planning for adding auxiliary lanes.</i>
5	U.S. 29 at Hopkins-Gorman Road, in Howard County: <i>construction of interchange.</i>
6	Route 32, from U.S. 29 to Broken Land Parkway, in Howard County: <i>widening.</i>
7	U.S. 1, from Route 175 to Business Parkway, in Howard County: <i>center turn lane.</i>

Source: MDOT cited in *Baltimore Sun*, August 24, 1999, “7 Md. road plans in peril; State’s failure to meet air-quality standards can delay U.S. funds; \$38 million at stake; Regional committee to weigh alternatives to reach compliance,” Marcia Myers, p. 1A.

To the region’s officials it was not evident whether vehicle registration data counted as a planning assumption or a regional emissions assumption. If the consistency requirement trumped the latest planning assumption requirement, the MPO could use the older data and make its conformity determination, allowing projects to proceed. If, on the other hand, the planning requirement superseded the consistency requirement, the conformity determination would be jeopardized. The failure to move ahead with the determination would have affected seven projects, including the start of work related to the Arundel Mills Mall. The affected projects are listed in Table 1.3.

To determine the appropriate method, the MPO researched the policies of 27 other MPOs. According to the research, 25 of the 27 MPOs were using planning inputs that were consistent with those used in the SIP. This research did not address whether other

TABLE 1.4

*Options for 2000–04 TIP-Conformity Methodology*

OPTIONS	IMPLICATIONS
1 Proceed with 1990 vehicle registration data and MINUTP (consistent with the planning assumptions in the current SIP for air quality).	No projects further delayed.
2 Proceed with 1996 vehicle registration data and TP+ (inconsistent with the planning assumptions in the current SIP; include possible emissions reduction strategies to mitigate the emissions shortfall).	Some projects to be delayed.
3 Offer a 30-day public comment period on the planning assumptions for the options listed in 1 and 2 above	Some projects to be delayed.
4 Defer for 1–2 months to conduct additional research, review what other MPOs are doing, and obtain concurrence from federal agencies.	Some projects to be delayed.
5 Defer for 5–7 months until new Phase II SIP budgets are found adequate.	Some projects to be delayed.
6 Defer TIP-conformity one complete cycle.	Some projects to be delayed.

Source: Minutes of Baltimore Metropolitan Planning Organization Transportation Steering Committee, August 24, 1999.

MPOs were forgoing the use of newer data. Based on the survey of the practices of other MPOs, MDOT's representative supported keeping the older data.<sup>28</sup>

On August 18, a representative of the Baltimore Regional Partnership, a local environmental group, sent a letter to Regina Aris, chair of the Interagency Consultation Group, and Craig Forrest, chair of the Transportation Steering Committee, arguing against the use of the older data for the conformity analysis. The group warned, "Any conformity finding or project approval flowing from such a finding, relying on the obsolete data, could be subject to legal challenge."<sup>29</sup> At an August 19 meeting of the ICG, six options were discussed, ranging from proceeding with the conformity determination using 1990 data and the older modeling platform to deferring the TIP amendment and conformity determination for a full year. One option was to wait until a revised Phase II SIP with updated budgets was found adequate. During summer 1999, however, EPA had informed MDE that it would find the attainment budgets inadequate for conformity. To have adequate budgets, the SIP would have to be revised to include credits from the national low-emitting vehicle (NLEV) programs and 2004 heavy-duty vehicle diesel standards. It was estimated that waiting for a SIP revision would require a five- to seven-month delay. The list of options and their implications are presented in Table 1.4.<sup>30</sup>

The recommended option of the ICG was to offer a 30-day public comment period on the appropriate set of data inputs to use (Option 3), which would have resulted in at least a two-month delay in the determination.<sup>31</sup>

At a meeting of the Transportation Steering Committee on August 24, all six options were presented for discussion. Representatives of environmental groups attending the meeting raised objections to using the older vehicle data, but state officials argued that consistency with the SIP was accepted practice at other MPOs, even though the situation in Baltimore was some-

what different since newer data had become available. The committee voted to go ahead with Option 1—using 1990 data for the conformity determination. The motion passed unanimously with the City of Baltimore abstaining.<sup>32</sup>

By this time, however, the issue had received a considerable amount of public attention, with a series of articles in the *Baltimore Sun*, the major local newspaper. Federal officials immediately expressed concern that the use of older data was not allowed by the conformity rule. In a letter to federal highway officials, EPA Regional Administrator Michael McCabe wrote, “Use of anything other than the most recent data would receive considerable public criticism, invite possible adverse comment, and would almost certainly be challenged in court. [The decision] could actually delay rather than expedite” future projects.<sup>33</sup>

Maryland and Baltimore officials then asked EPA and FHWA for guidance on whether using older data was in fact justified under the conformity rule. Both agencies agreed that they could not support using the older data. The relevant section of the conformity rule was section 93.110, which requires the use of the latest planning assumptions. In summary, both EPA and U.S. DOT agreed that the conformity rule and the Clean Air Act require the use of the latest available data—the 1996 registration data. The decision was made to delay conformity and postpone the inclusion of \$37 million worth of new projects into the TIP.

With the conformity determination put off, state and local officials opted to pursue a SIP revision. MDE officials had anticipated revising the Phase II SIP in the near future to incorporate needed emissions credits from NLEV and 2004 heavy-duty Diesel Engine standards. On October 26, 1999, MDE received formal notification from EPA that the motor vehicle emissions budgets in the 1998 SIP submission had been found inadequate and the SIP would have to be updated to include NLEV program and 2004 heavy-duty Diesel Emissions inspection program to have an adequate budget for conformity.<sup>34</sup>

On November 9, 1999, MDE submitted new motor vehicle emissions budgets based on even newer 1999 data (Table 1.5). The SIP revision was submitted to EPA for parallel processing on December 3 and formal submission was made on December 21. Two factors worked to lessen the difficulty of revising the SIP on such short notice. First, the on-road mobile emissions problem was most acute for 1999. By the time the SIP revision was submitted for approval in December 1999, there was no need to amend the 1999 budgets because the conformity target had passed. The closest milestone year was now 2002. Second, for the post-1999 milestone years, the original plan showed excess emissions credits for the air quality plan as a whole, even though the motor vehicle emissions budgets needed to be revised.

MDE could rearrange its credits without having to impose new restrictions on other sectors and still meet its rate-of-progress and attainment goals. Paradoxically, because the new budgets reflected both new initiatives and updated vehicle data, Baltimore now had a higher mobile source budget despite the imposition of new motor vehicle emissions measures.

On February 22, 2000, EPA’s finding that Baltimore’s updated motor vehicle emissions budgets were adequate for conformity was published in the *Federal Register*.<sup>35</sup> The Transportation

TABLE 1.5

*Revised MVEBs Using 1999 Vehicle Registration Data*

Milestone Year	VOC (tpd)	NO <sub>x</sub> (tpd)
2002	54.0	112.6
2005	48.6	104.1

Source: Modification to the Phase II Attainment Plan for the Baltimore Nonattainment Area and Cecil County: Revising the Mobile Source Emission Budgets, November 9, 1999.

Steering Committee, now renamed the Baltimore Regional Transportation Board, therefore could proceed with its conformity determination on its new TIP and amended plan in March with federal approval in May. The entire situation was resolved within seven months. The delay had minimal effects on the ground, affecting only the start of a few minor projects.<sup>36</sup> As part of the resolution to the conformity situation, private investors and state and local agencies worked together to implement transit and other VMT-reducing measures at the Arundel Mills Mall project. MDE subsequently modified the motor vehicle emissions attainment budgets one more time to account for the addition of federal Tier 2 vehicle and fuel standards.

The SIP revision did not go unchallenged in court, however. In April 2000, 1000 Friends of Maryland, a local environmental group, filed suit against EPA challenging its adequacy finding, arguing that the Clean Air Act required the state to redo its photochemical grid modeling if it changed its budgets. On September 11, 2001 the United States Court of Appeals for the Fourth Circuit ruled in favor of EPA.<sup>37</sup>

### *Lessons Learned*

Prompted by the Baltimore case, on January 18, 2001, EPA and U.S. Department of Transportation issued a joint guidance memorandum on the use of latest planning assumptions.<sup>38</sup> It states that conformity determinations based on assumptions more than five years old should include a written justification for not updating existing data with more current information. The guidance directly addresses the issue of vehicle registration data, clarifying that conformity determinations must rely on the “most recent vehicle registration data that is *available* for conformity analyses.” The phrase *available for conformity analyses* distinguishes between data that have been quality-checked and are in the proper format, and raw vehicle data that are not sufficiently reliable for use in the analysis.

One concern is that this guidance may force local environmental officials to continually revise SIPs to enable MPOs to make conformity determinations. This is particularly true if the use of newer planning data results in very large increases in the near-term years. Many of the transportation planners we interviewed said that it is difficult to get large emissions reductions in the short term through land use measures or increased transit investment. If that is the case, pursuing a SIP revision is the major option for avoiding a lapse.

If SIP revisions become the major way of responding to the budget problems created by using the latest planning assumptions, then the conformity process will be driving the SIP process rather than the air quality plan driving conformity. For this reason, some, especially in the transportation community, have advocated assigning safety margins to the mobile budgets in regions where such margins are available. Many air quality planners, however, are reluctant to allocate safety margins to the transportation sector because they fear it will reduce the incentives for transportation planners to rein in emissions growth.

In Baltimore, the MPO has made strides in improving relations with the local environmental community; the executive director of a local environmental group is now chair of the Emissions Mitigation Strategies Committee of BRTB. The committee examines different strategies and ranks them according to such criteria as emissions reduction potential, equity, and cost-effectiveness.

Maryland has applied the smart growth idea to the air quality process through the Smart Growth and Innovations SIP, which takes advantage of certain credits allowed by EPA for air quality purposes (detailed in EPA's policy guidance "Improving Air Quality through Land Use Activities"<sup>39</sup>). The Smart Growth SIP was to be submitted in 2002 for EPA review and approval.

The individuals interviewed agreed that communication between officials and representatives of public interest groups has improved since 1999. All parties in the regional transportation planning process have learned from the experience and are more adept at identifying emerging issues and challenges in reaching conformity.

■ ■ ■

## CASE STUDY TWO

### *Houston, Texas*

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#### *Abstract*

As Los Angeles' rival for the dubious title of America's Smoggiest City, Houston offers an opportunity to observe a metropolitan area whose strong regional growth, meteorology, and vast highway network have created a nearly intractable ground-level ozone problem. Although there have been extensive challenges in SIP development and also a handful of legal actions, planners at the MPO have managed to keep their metropolitan transportation plans<sup>40</sup> and TIPs moving forward, demonstrating conformity at every turn. The open lines of communication that have helped them thus far will need to perform even better to guide them through what lies ahead.

#### *The Area* <sup>41</sup>

The dominant characteristic of Houston is its size: 12,500 square miles, thirteen counties, and more than 4 million residents (Figure 1). The Consolidated Metropolitan Statistical Area is the jurisdiction of the Houston Galveston Area Council of Governments (HGAC) and includes three urban centers: the City of Houston (which is primarily in Harris County), Galveston, and Texas City. Historically, the region has been supported by the energy industry, which has brought with it cycles of dramatic booms and busts. Houston is also home to NASA's Johnson Space Center. To insulate itself from the economic turbulence of the energy sector, Houston has attempted to diversify its economy. Drawing on the high-tech culture surrounding the energy industry and NASA, Houston has deliberately developed into a dominant center of biotechnology research and other high-tech fields.

The energy sector has also diversified, and Houston is now the site of geotechnical engineering on a par with the level of refining and production activities in Galveston and Texas City. Most of the refineries are located along the 52-mile manmade Houston Ship Channel, which connects Houston with the Gulf of Mexico near Galveston. On a total tonnage basis, the Port of Houston is the second largest port in the country. Substantial freight rail infrastructure serves the port landside.

Houston's pattern of urban expansion is strongly related to its economy. During the second half of the 1970s and most of the 1990s, the region grew substantially, adding population to an ever-expanding metropolitan area. As Figure 2 illustrates, the portion of Harris County outside the Houston city limits grew the fastest throughout the second half of the 20th century. This trend is expected to continue as the region's population reaches 6 million over the next 20 years.

Growing population, increasingly dispersed around the region and accompanied by an expansion of regional highway infrastructure, has produced a dramatic increase in vehicle miles traveled. The current regional transportation plan anticipates 45.97% more VMT in 2022 than

FIGURE 1: MAPS OF HOUSTON, TEXAS

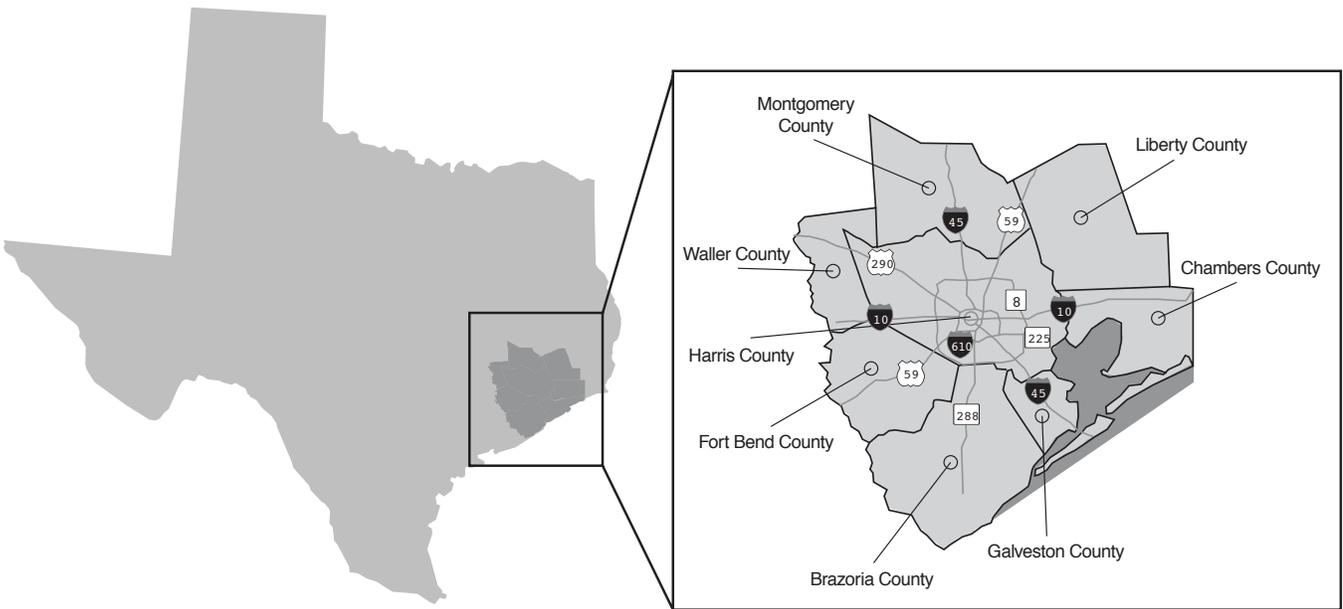
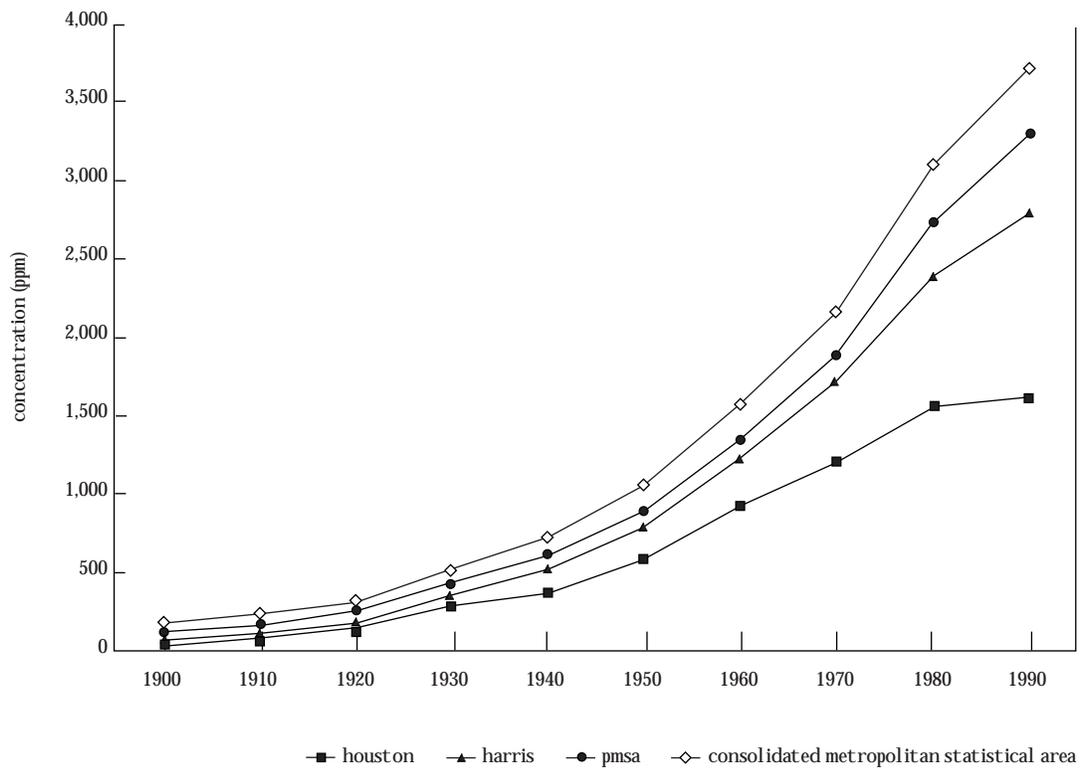


FIGURE 2: DEMOGRAPHIC TRENDS



in 2000 and has planned a 49.42% increase in lane miles of highway to accommodate that growth. Table 2.1 relates anticipated population, VMT, and highway growth over the horizon years of the current regional plan: 2000, 2007, 2015, and 2022.

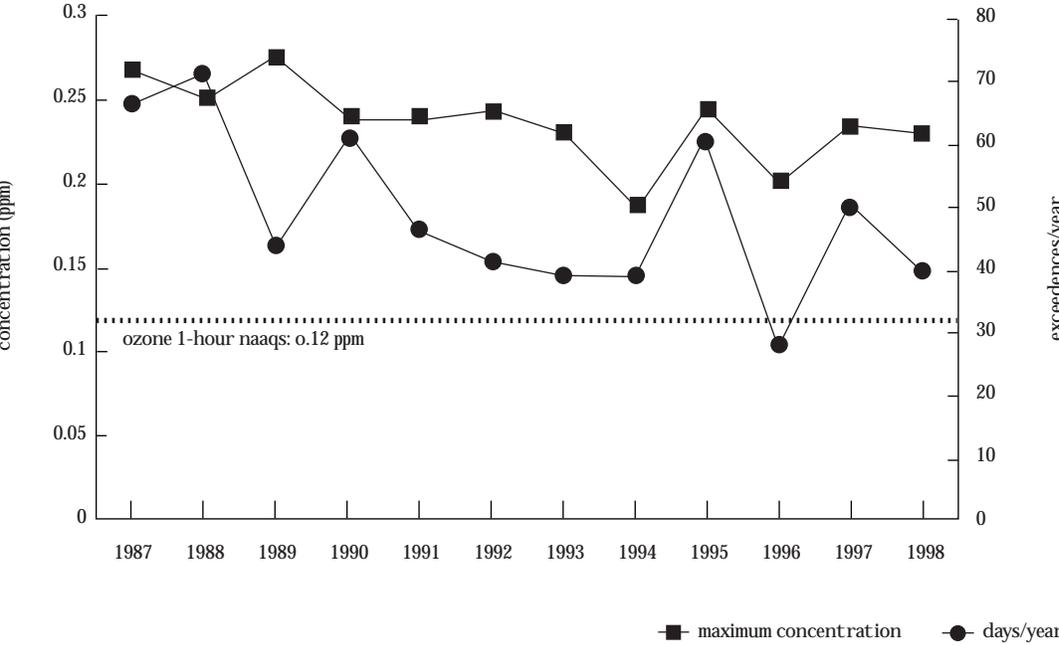
The impact of this growth on air quality is comparable to the pattern seen in metropolitan areas around the country: advances in vehicle and fuel technology have brought about reductions that largely offset substantial growth in VMT. Figure 3 illustrates both the progress Houston has made and the challenges that remain. Although the frequency of violations has decreased significantly over the past 15 years, the low of 30 days in one year (1996) is much higher than the three days in three years needed to demonstrate attainment several years from now. Note that the eight-county nonattainment area for ozone is a subset of the 13-county metro area served by the Houston Galveston Area Council.

**TABLE 2.1**

*Projected Population, Travel, and Highway Growth in Houston*

YEAR	POPULATION	VMT (MILLIONS)	LANE MILES	CENTERLINE MILES
2000	4,459,900	115.6	17,192	6,361
2007	4,910,700	129.4	22,148	6,613
2015	5,509,900	149.3	24,410	6,908
2022	6,089,300	168.7	25,689	7,079
Percentage change, 2000–22	36.53%	45.97%	49.42%	11.29%

**FIGURE 3: POLLUTION AND OZONE VIOLATION TREND, 1987–98**



## *The Institutions*

**Houston Galveston Area Council (HGAC).** HGAC is the metropolitan planning organization for the eight-county area surrounding the City of Houston. It is a multifunction agency that includes transportation and air quality planning divisions. As the MPO, HGAC produces the metropolitan transportation plan (MTP), the transportation improvement program (TIP), unified planning work program (UPWP), and conformity determinations. HGAC, like the state air and transportation agencies, is capable of running MOBILE, the Environmental Protection Agency's motor vehicle emissions factor model, to perform conformity analyses of its plans and programs. HGAC has several committees that direct policy and staff investment, including the Regional Air Quality Planning Committee, which includes public and private sector delegates who work on Houston's attainment of the ozone standard.

**Texas Commission on Environmental Quality (TCEQ).**<sup>42</sup> As the state environmental agency, TCEQ has the responsibility for developing all state implementation plans for nonattainment regions in Texas, including the Houston-Galveston area. Although TCEQ is located in the state capital, Austin, about 200 miles west, representatives are active on technical and policy committees of HGAC. TCEQ runs MOBILE during development of the SIP with assistance from the Texas Transportation Institute as an active technical consultant.

**Texas Department of Transportation (TxDOT).** TxDOT, which is also headquartered in Austin but has a district office in Houston, is responsible for the construction, management, and operation of the state's highway system. Whereas MPOs in Texas develop transportation plans for their jurisdictions, TxDOT is responsible for planning for all parts of the state not covered by those plans—a very large area. Through its headquarters in Austin, the department assists each MPO, including Houston's, with conformity determinations. For this purpose, TxDOT has developed technical proficiency running the MOBILE model even though its simulations are informational and not used directly for any regulatory purpose. TxDOT officials also participate on the MPO's committees in addition to providing interagency consultation.

**Environmental Protection Agency.** EPA Region 6 is headquartered in Dallas, approximately 300 miles north of Houston. Given a mission to protect public health and the environment in a way that balances emissions reductions among the various source sectors, EPA's primary role is approval of state implementation plans and adequacy findings for the motor vehicle emissions budgets used to determine conformity in the nonattainment areas. EPA representatives attend meetings in Houston, although the distance is sometimes an obstacle. The regional staff is capable of analyzing MOBILE but is not actively involved in its operation in Texas.

**Federal Highway Administration.** FHWA, taking the lead in the U.S. Department of Transportation for its partner the Federal Transit Administration, is responsible for certifying each MPO and its required planning products: the MTP, TIP, UPWP, and conformity determinations. In the conformity context, FHWA ensures that HGAC has satisfied all the requirements for interagency consultation, public outreach, and timely completion of transportation control measures and other SIP requirements under the Clean Air Act and its amendments. Although it is not responsible for operating the MOBILE model, the Texas division of FHWA takes an active role in analyzing many of the data inputs that affect the model outcome. FHWA helps the

MPO fulfill its responsibilities so that federal investment in regional mobility, accessibility, safety, productivity, and environmental stewardship proceeds smoothly.

**Texas State Legislature.** In Texas, the legislature has become involved in the air quality aspect of transportation planning by passing legislation authorizing the Texas Emission Reduction Program. The program created an additional source of emissions reductions in Houston.

**Other institutions and advocacy groups (nongovernmental).** During the past few years, advocacy groups have assumed a prominent role in Houston's transportation and air quality planning arenas by filing lawsuits about the air quality and transportation plans as well as conformity determinations. Environmental interests have been represented by local organizations, such as the Galveston Houston Association for Smog Prevention (GHASP) and prominent national groups, such as Environmental Defense and the Sierra Club. At the same time, business groups have been active, particularly the Greater Houston Partnership, which includes the City's Chamber of Commerce. Other coalitions, such as the Business Coalition for Clean Air and the West Houston Association, have addressed specific issues as well.

One final group is the Grand Parkway Association, a nonprofit corporation authorized by TxDOT to guide development of a major infrastructure initiative around the city. The association is funded by the state and several county governments and is governed by a board of directors appointed by the Texas Transportation Commission. Because of the controversy surrounding the Grand Parkway itself, the association has sometimes been a prominent participant in negotiations over transportation programming and conformity.

### *Air Quality and Compliance History* <sup>43</sup>

Between 1990 and 1998, urban airshed modeling for Houston indicated that ozone should be addressed through VOC control strategies. The modeling suggested that reductions in NO<sub>x</sub> would actually increase ozone formation. For this reason, Houston was given a temporary NO<sub>x</sub> waiver that was renewed periodically until December 31, 1997. During this period, conformity determinations presented a moderate and manageable challenge. In the transportation planning forum, only one project, the Grand Parkway, was scaled back—as much because of fiscal constraints and wetland concerns as for air quality issues. Most planners recognized that the end of the waiver would make conformity determination more challenging, but in the meantime, transportation plans continued to include new construction.

Simultaneously, Texas was having significant difficulty implementing major on-road mobile source emissions control programs. During the 1990s the SIP relied on employee trip reduction and enhanced inspection and maintenance programs—federal regulatory measures that were either repealed or substantially scaled back in the face of opposition from political leaders, business advocates, and others.

By 1997, enhanced airshed modeling, produced by an intensive data-gathering initiative known as the COAST study, revealed that although moderate reductions in NO<sub>x</sub> would increase ozone, major reductions would be necessary to attain the ozone standard. As a result, TCEQ did not reapply for a Houston NO<sub>x</sub> waiver for 1998 and began focusing its attention on NO<sub>x</sub> as well as VOC control strategies in the first of a series of SIPs that introduced significant reductions of NO<sub>x</sub> emissions. These emissions limits represented the test most planners had been anticipating.

After the NO<sub>x</sub> waiver expired on December 31, 1997, several SIPs were prepared for the Houston-Galveston nonattainment area. On May 19, 1998, TCEQ submitted to EPA its post-1996 rate-of-progress SIP. It included motor vehicle emissions budgets of 132.68 tpd for VOC and 283.01 tpd for NO<sub>x</sub>.

TCEQ next submitted its attainment demonstration on November 15, 1999—a new deadline created by EPA to allow the state to correct deficiencies of the post-1996 ROP SIP. EPA published an adequacy finding for the budgets from the attainment demonstration, 79 tpd for VOC and 195 tpd for NO<sub>x</sub>, on June 14, 2000 (65 FR 37368). These budgets were subsequently found inadequate on May 9, 2001, in conjunction with the settlement of SIP litigation (July 5, 2001, 66 FR 25420). The inadequacy finding halted the 18-month time clock initiated by the November 15, 1999, submission. Through the settlement, the MVEB from the attainment ROP SIP took effect: 79 tpd for VOC (no change) and 156 tpd for NO<sub>x</sub>.

On April 19, 2000, TCEQ made a submission to supplement the November 1999 attainment demonstration, making six enforceable commitments to address concerns raised by EPA in its December 16, 1999, partial approval and disapproval of that submission. The attainment demonstration was subsequently revised, supplemented by, and included in the post-1999 rate-of-progress SIP by TCEQ on December 20, 2000. The post-1999 ROP SIP was further supplemented by a follow-up SIP on September 4, 2001. This combined attainment demonstration and ROP SIP received full EPA approval on November 14, 2001 (66 FR 57160).

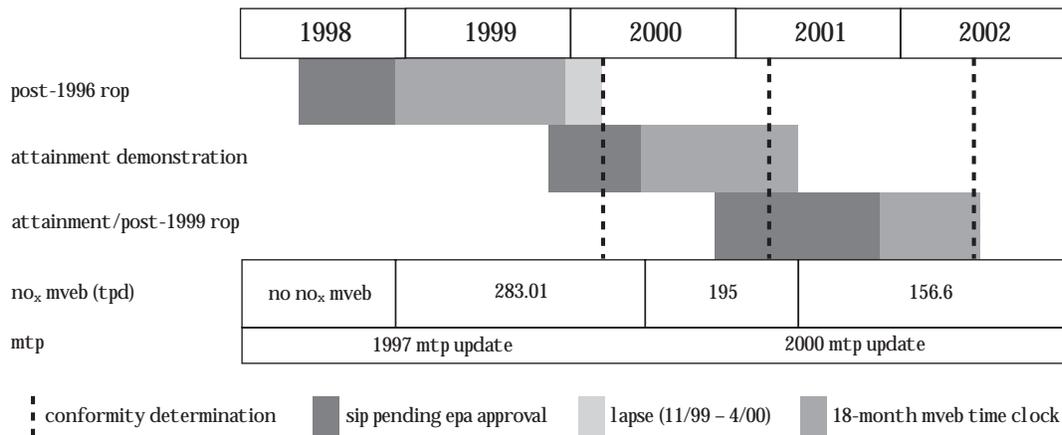
Despite significant reductions in emissions, the attainment demonstration provided by TCEQ falls short of the emissions level needed to achieve attainment, by 56 tpd NO<sub>x</sub>. As a result, the attainment demonstration and ROP SIP includes an enforceable commitment to implement sufficient measures to address this shortfall by a midcourse review in May 2004; TCEQ must also demonstrate 25% progress (14.4 tpd reductions) by December 2002.

## *Conformity*

The Houston Galveston Area Council has demonstrated a keen ability to keep its transportation plans on schedule throughout the ISTEA era. Metropolitan transportation plans have been adopted every three years, each time passing the mandatory conformity determination test. Prior to adopting its “Vision 2022” MTP in April 2000, Houston experienced a brief conformity lapse due to an expired 18-month window following the May 1998 adoption of the post-1996 ROP SIP. Because the previous MTP had been adopted in October 1997, the 18-month clock prompted HGAC to compress its plan development by about eight months to limit the impact of the lapse. The lapse might have been altogether avoidable, but there was significant miscommunication regarding whether the post-1996 ROP SIP required a new determination. Because it was able to anticipate the lapse and because the lapse occurred in winter, HGAC was able to mitigate the impact of the suspended funds.

HGAC responded differently in spring 2001, when the 18-month clock initiated by the November 1999 submission of the attainment demonstration SIP prompted a new determination. Because Vision 2022 had been adopted and conformed only one year earlier, HGAC chose to perform a redetermination of the same plan. The determination was ultimately moot, however, because EPA found the budget inadequate and eliminated the clock; thus the U.S. Department of Transportation never had to act on this determination. Prompted by the same court settle-

FIGURE 4: TIMELINE GRAPHIC (1998-2002)



ment and the 18-month time clock initiated by the December 20, 2000, SIP submission, a conformity determination was completed for Houston on June 4, 2002, for HGAC’s 2002 update of Vision 2022, this time to the attainment and ROP level—an MVEB of 156 tpd NO<sub>x</sub>.

Houston’s efforts to coordinate transportation and air quality planning have been challenged by conflicts between calendars from the respective fields. Figure 4 illustrates how transportation plans, air quality plans, and conformity determinations have overlapped in the past five years.

The focal point of this timeline is spring 2001. At this time, HGAC was obliged to perform a conformity determination within 18 months of the November 1999 submission of the attainment demonstration SIP. Because it had adopted and shown conformity for the Vision 2022 MTP in March 2000, HGAC chose to perform a redetermination of that plan in March 2001, which it did successfully. However, the adequacy review for the budgets contained in the post-1999 ROP SIP submitted in December 2000 was under way at that same time. The confluence of these SIP, transportation, and conformity timelines produced frustration and controversy and ultimately litigation, which are addressed in the section that follows.

## The Challenges

### The SIP Shortfall and Enforceable Commitments

The first source of SIP-related controversy emerged when TCEQ adopted the post-1999 rate-of-progress state implementation plan in early December 2000 and submitted it to EPA on December 20, 2000. This SIP identified projected overall emissions of 1,284 tpd NO<sub>x</sub> 44 in the attainment year, 2007. The plan identified 910 tpd of reductions from all sources for overall allowable emissions of 374 tpd, allocating 156 tpd as the MVEB. TCEQ recognized, however, that additional reductions, in the amount of 56 tpd, would be required to achieve attainment. It addressed this by including an enforceable commitment in the SIP to implement 25% of the necessary measures by December 2002 and 100% by May 2004. Texas identified potential mea-

asures and programs that require further development. The SIP included new strategies for reducing NO<sub>x</sub> in the Houston region:

- 90% reduction from stationary sources (subject to change following scientific evaluation);
- I/M dynamometer testing throughout eight nonattainment counties, except for late-model (1996+) cars, which would be tested with on-board diagnostics;
- California standards for large spark ignition engines;
- clean diesel for 110 counties in eastern Texas;
- reductions from airport ground equipment;
- ban on commercial lawn service in the mornings during ozone season;
- speed limit reductions to 55 miles per hour;
- voluntary mobile emissions programs;
- ban on construction activity between 6 A.M. and noon (repealed); and
- requirement for updated construction equipment (repealed).

*The construction activity rule and Senate Bill 5.* The first reaction to the rules was a challenge by contractors and construction workers to the measure that prohibited highway construction activity between 6 A.M. and noon. In response, the Texas legislature passed Senate Bill 5, which instructed the TCEQ to repeal the construction rules and established the Texas Emissions Reduction Plan (TERP) in May 2001. This legislative action relied primarily on an increased tariff on car registrations transferred from out of state to provide a monetary incentive for owners of heavy-duty and off-road construction equipment to replace their fleets with cleaner stock. The benefits of TERP are comparable to the 17 tpd reduction anticipated from the construction activity shift measure.

An injunction filed against use of the registration fees, which account for two-thirds of the bill's revenue stream, has made the prospects for TERP's achieving its objectives uncertain. If the program survives but with limited funding, it is unlikely to achieve the reduction goals for which it was given credit by EPA when the agency approved the SIP in October 2001. If it turns out that TERP's emissions reduction impact was overestimated, TCEQ will have to compensate with other control measures.

*The 90% reduction rule and stationary source "upsets."* Another lawsuit against TCEQ addressed the 90% stationary source reduction rule. Several business coalitions—some established and some ad hoc—argued that such a deep reduction would excessively damage economic health in the region. Moreover, they suggested that “upsets”—brief, unreported releases of emissions in substantial quantities—and highly reactive volatile organic compounds could account for much of the needed reductions. In fact, quantifying and controlling these upsets could both justify lowering the percentage of reduction and address some or all of the 56 tpd shortfall. To settle the lawsuit, TCEQ agreed to evaluate the science on which the Houston SIP is based to determine whether an adjustment to the 90% requirement is warranted, and the stationary sources agreed to work with the agency to control emissions from the upsets.

***Bike lanes and transportation control measure failure.*** Environmental advocacy groups also challenged the SIP by filing two lawsuits against EPA. The first demanded that EPA reject the post-1999 ROP SIP and issue a federal implementation plan.<sup>45</sup> The environmentalists argued that the existence of a shortfall and TCEQ's immediate inability to identify the measures it would use to satisfy its enforceable commitment should compel EPA to intervene. The second suit alleged SIP failure over a controversial TCM issue: a portion of a bike lane was not reinstalled after construction activity required a temporary closing. The litigants stated that even relocation of the bike lanes violated the TCM rules, by which the bike lanes were used for emissions reduction credit. Both of these SIP lawsuits are still pending.

### **Overlapping Timelines and Budgets** <sup>46</sup>

The second major area of controversy between 1998 and 2001 occurred because of overlapping timelines for SIPs, MTPs, and conformity determinations. The critical events in this period included the following:

- The attainment demonstration Phase II SIP was submitted by TCEQ on November 15, 1999, with a NO<sub>x</sub> budget of 195 tpd, which was found adequate on June 14, 2000.
- In April 2000, HGAC adopted Vision 2022, its update of the metropolitan transportation plan. The 283.01 tpd NO<sub>x</sub> budget from the post-1996 ROP Phase I SIP was the basis of the conformity determination.
- The post-1999 ROP Phase III SIP was submitted by TCEQ on December 20, 2000, with a NO<sub>x</sub> budget of 156.7 tpd; it was approved (and therefore adequate) on November 14, 2001.
- In March 2001 HGAC performed a conformity redetermination of Vision 2022 based on the attainment demonstration NO<sub>x</sub> budget of 195 tpd to satisfy the 18-month clock initiated in November 1999.

The important feature is that at the time of the redetermination of the MTP in March 2001, EPA was in the middle of its adequacy review of the Phase III MVEBs. Therefore, the public was fully aware that new, tighter budgets were imminent. In fact, HGAC acknowledged the status of the Phase III SIP and MVEBs in the conformity redetermination report but, citing the rules, stated it was obliged to use the Phase II budgets at this time and would perform a new determination once the Phase III budgets had been found adequate.

Nevertheless, environmental groups petitioned for court review of EPA's adequacy finding, demanding that the redetermination be revised using the Phase III budgets. The parties settled out of court with several highlights. The Phase II MVEBs were found inadequate, eliminating the pending requirement to show conformity to the 195 tpd. Because of EPA's action, the region avoided any threat of lapse and the active budgets reverted to the Phase I level of 283.01 tpd (to which conformity had been demonstrated in April 2000). However, the 18-month time clock for Phase III budgets began in December 2000, requiring a determination to that budget by June 2002. The settlement allows TCEQ to submit the Phase III budget of 156.6 tpd as both ROP and attainment budgets. For HGAC, the MTP remained unchanged with the redetermination discarded; attention subsequently shifted to the new determination based on the new 156.6 tpd NO<sub>x</sub> budget.

## Looming Challenges

During winter 2001–02, EPA gave final approval to the attainment demonstration and rate-of-progress SIP (November 14, 2001), including attainment and ROP budgets for use in conformity determinations. In the late winter, HGAC performed public outreach for its redetermination of Vision 2022, the MTP originally adopted in March 2000. According to materials presented to the public, projected emissions in 2002, 2005, 2007, and beyond would be below the budgets approved by EPA in November. This was the first time that the 156.6 tpd NO<sub>x</sub> budget had been used in a conformity determination, and in December 2001, our interview subjects expressed considerable anxiety about the prospects for passing.

Also during that winter, the newest version of EPA's motor vehicle emissions factor model, MOBILE6, was released (January 29, 2002; 67 FR 4254). The policy guidance issued by EPA gives all nonattainment and maintenance areas that use MOBILE, including Houston, a two-year grace period before the new version of the model must be used for conformity determinations. Also, the Houston-Galveston area SIP includes an enforceable commitment to update the motor vehicle emissions budgets within two years. In fact, Texas agreed that no determination will be made in the second year until the budgets have been revised with MOBILE6, because of concerns about the veracity of Tier 2 benefits estimated using MOBILE5, which are included in earlier SIPs.

Each party that deals with the model in Houston, particularly TCEQ, has indicated significant apprehension about the data demands of MOBILE6. Results of preliminary runs of the model, shared during interviews and at the Transportation Research Board in January 2002, seem consistent with expectations. For example, differences in fleet characteristics and dynamics diminish the benefits of I/M, but the reductions from lowering speed limits to 55 mph throughout the region and targeting heavy-duty diesel engines have been enhanced. Overall, each party is braced for whatever changes MOBILE6 brings over the next few years.

There are also several major anticipated transportation and air quality events. On the transportation side, HGAC has developed a full update of its metropolitan transportation plan and demonstrated conformity with the most recent MVEBs from the attainment-ROP SIP. The 2002 update of Vision 2022 satisfies the requirement to update the plan every three years and the commitment to redo conformity with the new budgets by June 20, 2002. Updating Vision 2022 has temporarily suspended work on Vision 2025, previously intended for adoption in 2003, which will expand the MTP and extend the planning horizon. On the air quality side, TCEQ will be implementing MOBILE6 and addressing the 56 tpd NO<sub>x</sub> shortfall with deadlines in December 2002 (25%) and May 2004 (100%). The May 2004 date is a full midcourse review, made as an enforceable commitment in the SIP. Some view Vision 2025 as HGAC's first opportunity to create a plan with recent SIP developments, especially the latest MVEBs. Although their recent success demonstrating conformity for the updated Vision 2022 and the 156 tpd NO<sub>x</sub> budget assuages some of this concern, there is considerable uncertainty surrounding how the shortfall will be addressed and what impact that might have on transportation plans and conformity budgets.

Finally, implementation of new eight-hour ozone and 2.5-micron particulate matter NAAQS—promulgated by EPA in 1997 but delayed by litigation, development, and review—is likely to have major effects on air quality planning in Houston and around the country in the next few years. Although the timing is still uncertain, the reality of new nonattainment areas

around Texas and greater difficulty for existing nonattainment areas presents a clear challenge, particularly to state and federal officials. A common view shared by interviewees was that the new standards will further tax their staff resources for assisting, reviewing, and guiding transportation and air quality plans.

### *Lessons Learned*

The two most pressing questions for transportation and air quality planners in Houston seem to be how MOBILE6 will affect the planning timeline and how TCEQ will be able to achieve adequate reductions to address the shortfall. Aspects of the past three years' experience provide some insight into how TCEQ and its partners might approach these challenges.

The controversy over construction activity and accelerated purchase of Tier 2 and Tier 3 diesel demonstrated that SIP measures need to be politically viable in addition to technically sound. The construction industry, which is well organized and has relatively high public visibility, was effective in lobbying the Texas legislature to revoke the rules, while a very similar rule imposed on commercial lawn services was not threatened. Even though the construction-related rules, which relied on shifting but not reducing work, accounted for more than 18 tpd NO<sub>x</sub> reduction—a major portion of the 56-tpd shortfall in the SIP—TCEQ could not overcome the political opposition.

That controversy, which required the development of additional control measures to substitute for the revoked rules, eroded already-limited political support for addressing the air quality problem. Houston's air problem is significant: violations per year and actual concentrations rival those in Los Angeles. Because the attainment date, 2007, is now only four years away, large reductions must be achieved in a short period of time. Thus the necessary pollution control measures generate substantial stakeholder opposition. As the political costs rise, decisionmakers may be even less supportive. Implementation of the environmental speed limit has been dogged by this issue since its adoption.

In addition to producing a shortfall, the inadequate supply of viable control measures has forced TCEQ to produce additional SIPs: a "gap closure" SIP in April 2000 and a supplemental SIP in September 2001. Currently, the agency faces December 2002 and May 2004 deadlines specifically because of the shortfall. Some planners in the region assign some of the blame for this outcome to the abundance of SIP submissions. They assert that already-tight staff resources at each of the agencies were further burdened by SIP deadlines in three consecutive years. In other words, the phased SIP approach, which succeeded in helping areas progress and avoid federal implementation plans in the mid-1990s, made it more difficult for Houston to identify adequate control measures, and the two extra SIPs only compounded the problem.

Available reductions are further constrained by the risk-averse stance taken by EPA and other potentially liable agencies on transportation control measures. The bike lane lawsuit in Houston, in combination with comparable experiences with litigation around the country, has made EPA and HGAC aware of the potential for litigation that could interfere with air quality and transportation plans. Clearly, planners in the Houston case employ a calculus in which the prospect of litigation outweighs the potential reductions from a TCM. For this reason, Houston, among other nonattainment areas around the country, has explicitly resisted adopting TCMs

in its SIP. EPA and HGAC assert that the lawsuits, undoubtedly intended to improve air quality planning, have resulted in fewer control measures.

The SIP lawsuits brought by both environmental and business advocates in Houston highlight the critical issues in the past three years: the impact of the crunch created by five SIPs in a short period and, separately, the inability to identify control measures for the remaining 56 tpd. To address the shortfall, TCEQ is working with EPA on some relatively experimental and speculative control measures, such as addressing the urban heat island phenomenon. Although reductions from this kind of approach are uncertain, the agencies hope to achieve some reductions from these measures and avoid litigation.

There are other explanations for the shortfall and the challenge of planning in Houston. Transportation planners especially voice frustrations with the MOBILE model and the difficulty of explaining to their constituents why air quality modeling activities can hold up transportation plans. They also face technical challenges related to modeling protocol and data issues.

Specifically, these planners are frustrated by trying to replicate the modeling protocols employed by TCEQ in generating the SIP and MVEBs. All parties, including TCEQ, recognize that complications arise because of the sequence in which each control measure is modeled. One problem seems to be insufficient communication between TCEQ and its transportation partners. What formal or mandatory consultation channels do exist, via the conformity rule or the Texas conformity SIP, appear inadequate to the task in Houston's case.

Moreover, consensus is that better communication would improve planning by easing the burden of each exercise. Specifically, addressing interagency involvement in the SIP development process might benefit the upcoming rounds of plans. For example, as MOBILE6 is brought online, open communication among TCEQ, TxDOT, and HGAC might help coordinate technical matters, such as the sequence of modeling control measures, as well as coordinate deadlines. Already, TCEQ has made public its need for six to nine months to reformat data inputs, a requirement that allows HGAC to anticipate one of the pressures it will face while making the transition to MOBILE6.

Houston has a hard row to hoe. Transportation planners are subject to intense scrutiny by constituents who remain unsympathetic to the balancing of transportation and air quality goals. Air quality planners have also borne scathing public attacks as they seek to create a control strategy. Responding to such attacks has pulled resources away from the primary tasks, aggravating a very difficult situation. Although Houston's SIP problems are being reduced or eliminated, the interagency partners must be continually innovative in dealing with timeline mismatches; improved consultation and communication are at the heart of the solution.

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## CASE STUDY THREE

### *Paducah, Kentucky*

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#### *Abstract*

The area around Paducah has experienced one of the longest conformity problems of any area since the transportation conformity rule was first issued in 1993. Isolated rural ozone maintenance areas have different conformity requirements than metropolitan areas. By definition, such an area has no MPO, no transportation plan or TIP, a population of less than 50,000, and is not adjacent to a metropolitan area or within the same nonattainment or maintenance area as a metropolitan area. Conformity is required only when the area wants approval for a new federal-aid project: if an area never needs approval of a new federal-aid transportation project, it never has to demonstrate conformity. Also, isolated rural areas are not required to redemonstrate conformity to meet the three-year frequency requirements, as indicated in section 93.104(b), (c) and (e). These requirements apply only to areas that have plans and TIPs (and not to areas that do not have plans and TIPs, such as isolated rural areas).

The issue in Paducah was inability to determine conformity on the U.S. 68 project by passing the budget test using its maintenance plan motor vehicle emissions budgets for NO<sub>x</sub> in 2002. The budgets were developed using early 1990s baseline data that had been submitted to the state Division of Air Quality (DAQ) by the Kentucky Transportation Cabinet (KYTC), the state department of transportation. The source of the information that KYTC provided to DAQ was FHWA's Highway Performance Monitoring System data, which use a statewide sampling technique to estimate and forecast daily VMT. The two state agencies were unaware at the time that the HPMS data, which was used to establish 1990 baseline emissions inventory, would later be used to set the on-road motor vehicle emissions budgets. The conformity rule was released in November 1993, and when the maintenance plan was approved in 1995, neither agency had had much experience with the conformity process. In addition, communication between them was lacking.

As an isolated rural maintenance area, network-based travel demand modeling is not required for the Paducah area. Isolated rural areas often rely solely on the use of HPMS data, because it is often the only source of data available for use in the regional emissions analysis. Some isolated rural areas have begun to identify additional data sources. For example, in Pennsylvania, the state maintains a road management system that provides more robust data than HPMS. The conformity rule provides for the use of best available data in all areas; for many isolated rural areas HPMS is the only data available. After a prolonged period of not being able to make a conformity determination, the Kentucky Transportation Cabinet invested heavily in improving its procedures for estimating and forecasting VMT. Ultimately, this work enabled KYTC to make the case for a SIP revision to the maintenance plan budgets, which in turn enabled the area to make a conformity determination for U.S. 68, a federal nonexempt project.

For isolated rural areas that are or may become nonattainment or maintenance areas, the Paducah case provides valuable insights into data issues associated with the SIP and conformity processes and shows how the processes are inextricably linked to the data for estimation of baseline inventories and future VMT. It is also an example of the importance of interagency consultation and cooperation in resolving SIP and conformity issues.

### *The Area*

The Paducah isolated rural ozone maintenance area is in southwestern Kentucky at the border of Illinois; it comprises Marshall County and a portion of Livingston County. Nearby Paducah has a population of about 27,300. This is a very rural area bordering the Land between the Lakes State Park. The counties are divided by the Tennessee River, with Livingston County lying at the northern end of the maintenance area. Two major interstate highways run through the region: I-24, which traverses the northern part of Marshall County, and the Purchase Parkway (formerly a toll road). U.S. highways 60, 68, 45, 64I, and 62 also cross the area.

### *The Institutions*

The Kentucky Transportation Cabinet (KYTC) is the lead transportation agency in the Commonwealth of Kentucky, and since Paducah is an isolated rural area, with no metropolitan planning organization, the KYTC performs the conformity analysis. The Kentucky Division for Air Quality (DAQ) is the agency with lead responsibility for SIP development. The county governments are not regularly involved in the interagency consultation process but did contact state legislators and encouraged their involvement to help determine conformity in the area. FHWA and EPA were very involved in this case and provided technical assistance through the process. FHWA provided technical assistance to KYTC on analytical issues, and EPA took expeditious action when DAQ submitted a SIP revision request.

### *Air Quality and Compliance History*

The Paducah area—Marshall County and a portion (17%) of Livingston County—was classified as a marginal ozone nonattainment area under the Clean Air Act Amendments of 1990. EPA designated the Paducah area nonattainment under the one-hour ozone standard effective January 6, 1992. The attainment date was November 15, 1993. Effective April 10, 1995, EPA approved both DAQ's request for redesignation to maintenance and the Paducah area maintenance plan. The maintenance plan contained emissions inventories and projections for VOCs and NO<sub>x</sub> from all sources for the 1990 base year, 2002, and every three years in the interim (1993, 1996, and 1999). Many areas, including Paducah, later interpreted these emissions projections as the motor vehicle emissions budgets for the purposes of conformity. Approximately 4% of the VOC emissions and 33% of the NO<sub>x</sub> emissions in the maintenance area come from on-road mobile sources; more than 90% of the VOCs and 53% of NO<sub>x</sub> emissions come from point sources.

### *Conformity*

In 1998 KYTC was unable to make a conformity determination for a project in the Paducah area because the 2002 motor vehicle emissions budget for NO<sub>x</sub> was exceeded by 0.4 tpd (the total

NO<sub>x</sub> budget is 2.77 tpd). A high-priority project on U.S. Route 68 was included in the state transportation plan, and in early 2000 the failure to make a conformity determination began to affect this project. No other projects have been affected. Specifically, the U.S. 68 project involves a 15- to 17-mile section including a replacement bridge over Kentucky Lake with approximately 2,000 feet of the project lying within the maintenance area. The segment affected by the conformity situation included the bridge and approximately 1.2 miles of roadway; it was delayed from early 2000 until the resolution of the conformity issue in late spring 2002.

In late 2001, KYTC was able to make a conformity determination for the U.S. 68 project using the revised SIP maintenance plan budgets for Paducah. FHWA/FTA approved the conformity determination in spring 2002. As Table 3.1 shows, the SIP budget revisions allowed for more emissions from transportation sources, thereby enabling KYTC to make a conformity determination. The conformity rule does not require network modeling in isolated rural areas; instead, statewide average data from the Highway Performance Monitoring System were used to estimate and forecast daily vehicle miles traveled. In the early 1990s DAQ requested VMT and speed data from KYTC, which provided estimates and forecasts generated from HPMS (it is noteworthy that this was the first attempt by KYTC to estimate and forecast VMT at the county level). The data were subsequently used by DAQ to develop the maintenance plan motor vehicle emissions projections and were later interpreted as motor vehicle emissions budgets. When KYTC performed the regional emissions analysis for conformity, it discovered that the daily VMT figure in the Paducah area was 20% higher than that reflected in the SIP motor vehicle budget for NO<sub>x</sub> in 2002, which had been based on the 1990 inventory.

Several attempts were made to reestablish conformity, including developing vehicle speeds for roadway classifications, investigating whether the hot and cold start fractions were appropriate, splitting VMT by vehicle class, and looking for measures that had been implemented or committed to but not taken into account in the conformity analysis. None of these efforts enabled KYTC to make a conformity determination for the U.S. 68 project.

In early 2000, KYTC made the case to DAQ that revising the SIP motor vehicle emissions budgets was necessary to update the 1990 baseline inventory, which it considered outdated. KYTC believed that an updated baseline inventory and reasonable estimates of VMT growth based on HPMS data would permit a conformity determination for the Paducah isolated rural maintenance area. KYTC demonstrated that the inventory on which the motor vehicle emissions budgets were developed—although the best available data at the time—had underesti-

**TABLE 3.1**

*Paducah Area MVEBs (tpd)*

POLLUTANT	1990	1993	1996	1999	2002	2004
VOC budget	3.16	2.96	3.05	2.72	2.67	2.67
VOC budget revised August 20, 2001	5.23	3.45	3.12	3.10	3.13	3.17
<i>Difference</i>	<i>2.07</i>	<i>0.49</i>	<i>0.07</i>	<i>0.38</i>	<i>0.46</i>	<i>0.50</i>
NO <sub>x</sub> budget	3.07	2.98	3.03	2.84	2.77	2.76
NO <sub>x</sub> budget revised August 20, 2001	3.82	3.80	3.53	3.57	3.68	3.71
<i>Difference</i>	<i>.75</i>	<i>.82</i>	<i>.50</i>	<i>.73</i>	<i>.91</i>	<i>.95</i>

Source: Federal Register, 43488, Vol. 66, No. 161, Monday, August 20, 2001.

mated future growth. HPMS sample data, KYTC argued, were never intended for use at the county level, but rather were collected for high-level state and multistate reporting to the FHWA. Such data were accurate for the higher functional class of roadways, such as principal arterials and major highways, but less so for lower road classifications like minor arterials and local collectors. In addition, HPMS data did not include county-specific local road volumes, and KYTC argued that VMT should be redistributed across rural counties more accurately than had been done for the maintenance SIP budgets.

On January 27, 2001, KYTC requested a motor vehicle emissions budget revision. DAQ had initially rejected the request for a budget revision because it was expecting to revise the SIP to accommodate the new eight-hour ozone standard requirements; it sought to defer a SIP revision until the eight-hour standard designations had been made. (At the time, a delay in implementation of the new eight-hour ozone standard was not anticipated.) Shortly thereafter, DAQ agreed to revise the SIP and updated it in consultation with KYTC. The SIP revision was submitted to EPA on June 14, 2001. After receipt of comments from EPA and requests for additional justification for updating the VMT data, on August 20, 2001, the *Federal Register* notice was posted by EPA to approve the revised motor vehicle emissions budgets for NO<sub>x</sub> and VOCs. The budgets were effective as of October 19, 2001.

A number of modeling improvement efforts are under way in Kentucky as a result of the conformity difficulties that Paducah experienced. KYTC has developed a statewide traffic model and has undertaken efforts to enhance county sub-area level of detail. Models developed for small urban area transportation studies have also been expanded in scope to include the entire county in situations where air quality is a potential issue. These models are calibrated to HPMS data.

To improve the accuracy of county-level VMT estimates derived from HPMS, particularly those for local roadways, KYTC has initiated two major efforts. One is a procedure to estimate county-specific average daily traffic volumes for local roads. KYTC invested \$650,000 in a research effort to obtain sample traffic volume data on roads and streets classified as functionally local so that a rural minor collector to local ratio can be determined. The rationale is that the factors that differentiate traffic on local roads and streets in different counties will affect traffic on collector facilities in a very similar way. The mechanics of the approach involve the application of an equation to compute the average daily traffic for collector facilities within that same county. This approach has been validated by research being conducted by KYTC in conjunction with the Kentucky Transportation Center and the University of Kentucky. KYTC's second major effort is to improve estimates of local road mileage; it is spending \$3 million to inventory all roads in the state using global positioning system (GPS) technology.

As we found in all six case studies, the level of effort required to do SIP revisions is substantial, and resistance to doing SIP revisions is formidable. It took KYTC more than a year to make a compelling case for a SIP revision and a great deal of analysis to document why the data on which the motor vehicle emissions budget was based needed to be updated. The initial lack of good interagency consultation between KYTC and DAQ was mentioned by many of those interviewed as a confounding problem in this case and a contributing factor to the agencies' inability to agree on the need for a SIP revision in a timelier manner. To improve communications between agencies within the state, the FHWA division office has taken the lead in organizing monthly conference calls among KYTC, DAQ, EPA, and FHWA to discuss issues of mutual concern. Quarterly meetings between KYTC and DAQ have been held since the conformity process

began in 1993. KYTC has also discussed the possibility of funding a position at DAQ to facilitate more expeditious review of information related to transportation conformity issues.

### *Lessons Learned*

Two principal lessons emerged from the Paducah Area case study: first, air quality and transportation planners and modelers should be aware of the limitations of HPMS data and the benefits of improved local data, and second, the importance of ongoing interagency consultation (including keeping analysis and documentation straightforward) cannot be overlooked.

Limitations of the HPMS dataset for VMT and speeds were an issue for Paducah, and KYTC has taken steps to ensure that better data will be available on a county-by-county basis in the future. Where network-based modeling is not required, HPMS is most often the only available dataset transportation agencies have to estimate VMT. As this case shows, when the budget is outdated or when new inventories show that the old budget is in error, a SIP revision should be done. KYTC saw that using HPMS data, which are based on statewide sampling techniques, for local VMT estimates could cause significant conformity issues.

Transportation professionals need to be more involved in the development of SIPs and the motor vehicle emissions budgets in particular. In this case, KYTC and DAQ did not communicate about the use of the data and may not have been aware of the implications for transportation conformity. Failure to provide for adequate growth in VMT and the subsequent use of outdated VMT estimates prevented the Paducah area from determining conformity on the U.S. 68 project for several years.

A more effective interagency consultation process could have brought the key agency staff together earlier, and all parties would have been aware of data issues from the start. The regular monthly meetings being held between the state and federal agencies, including KYTC and DAQ staffs, should help. Our interview subjects also commented on the need for clearer communication: they noted that justification for updating data should be presented in a straightforward manner so that it is readily understood by reviewing agencies, and that SIP revisions, conformity determinations, and supporting documentation should all be clear and understandable. KYTC staff observed that an overlap of roles and duplication of responsibilities developed during the SIP revision process because participants' roles and responsibilities had not been well defined. The consequence was that agencies other than KYTC became heavily involved in the procedural details of VMT estimation and forecasting. This level of involvement generated a perceived need for elaborate explanation and documentation of intricate and complex details that were not well understood by everyone involved. The result was delay in the SIP revision process. Had roles and responsibilities been well defined, much of the confusion and misunderstanding arising from a lack of communication between partners might have been avoided.

Isolated rural areas are required to do conformity determinations only when they have a federally funded or approved project that is ready for implementation. This may be once every several years in small rural nonattainment or maintenance areas. In this case, the conformity delay did not affect the area until the U.S. 68 project was ready for implementation in 2000. At that time, the conformity situation became a point of contention and the agencies made many futile attempts to resolve the conformity issue without revising the SIP. Eventually, a SIP revision was required, and the agencies worked successfully together to put the SIP revision in place.

## CASE STUDY FOUR

### *Portland, Oregon*

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#### *Abstract*

Unlike other cases examined in this report, Portland has had no difficulties making conformity determinations, except for one minor problem in 1994. What is of interest is the measures Portland has adopted to avoid conformity problems and the way Portland has been able to use conformity to further its smart growth planning agenda.

#### *The Area*

The Portland metropolitan area consists of three counties in Oregon—Clackamas, Multnomah, and Washington—plus Clark County in Washington State. The jurisdiction of the metropolitan planning organization consists of the three Oregon counties only. The city of Portland is almost entirely in Multnomah County. To the west is Washington County, a rapidly growing employment center with many high-tech firms. Clackamas, to the east and south, is primarily residential.

#### *The Institutions*

The MPO in Portland is the Metropolitan Service District, or Metro. Unlike most MPOs, Portland Metro is a true regional government, with an executive officer directly elected regionwide, plus a directly elected council of seven members, each representing and elected by a specific district. Its responsibilities include transportation and land use planning for the metropolitan area, acquisition and management of parks and open spaces, and operation of regional facilities, such as the regional solid-waste disposal system, the Oregon Convention Center, and the Oregon Zoo. To carry out these responsibilities, Metro has authority to ask voters to approve property, sales, or income taxes. The Metro council also has the power to adopt “niche taxes” of limited applicability. These taxes may be adopted without voter approval but are subject to review by a citizen tax-review committee. Currently, the only niche tax, an excise tax on Metro goods and services, is used to support planning operations and overall governance duties.

Portland Metro also has extensive regulatory authority to implement the long-range transportation and land use plan. For example, Metro establishes and enforces minimum-density targets for each residential community in the region, limits on the maximum size of retail buildings, and limits on parking.

Other important government organizations are the Oregon Department of Transportation (ODOT) and the Oregon Department of Environmental Quality (DEQ).

## *Plans*

Since the 1980s the Portland metropolitan area has been a leader in what is now called smart growth. In response to a bypass proposal shown in the regional transportation plan, the Oregon Department of Transportation was asked by Metro to take the lead in the planning for what became known as the Western Bypass. As an alternative to several proposed highway-oriented solutions, the land use watchdog group 1000 Friends of Oregon developed LUTRAQ (Land Use, Transportation, Air Quality), a decision process designed to explore ways to integrate land use and transit projects. The goal was to determine whether a mix of such projects could make the proposed expressway bypass unnecessary. LUTRAQ concluded that integrated land use and transit planning could accommodate anticipated growth with lower emissions than the alternatives. The LUTRAQ strategy became adopted as a formal alternative for consideration in the study for the Western Bypass.

Currently, the guiding planning document in the Portland area is the 2040 Growth Concept, adopted in 1995. The Growth Concept discusses how the Portland region can accommodate population growth of 1.1 million over the next 50 years while maintaining the quality of life in the region. The prime objective was to locate urban growth as much as possible on land already considered urban, so as to make land use more efficient; to increase density by infill on existing land; and to preserve the rural land that separates neighboring towns. Two of the most important elements were an urban growth boundary defining the limits of urban development, to be shifted out only as needed for population growth, and minimum density requirements for each community in the metropolitan area, designed to ensure that the anticipated growth in population and employment could be accommodated within the urban growth boundary.

Along with this development pattern, the plan envisioned a transportation system heavily reliant on mass transit, with highway projects largely focused on improving the efficiency of the existing regional infrastructure. In planned growth areas where commerce and intra- and inter-urban travel could not be accommodated by transit, a few new expressway projects were proposed and adopted as part of the 2040 plan's future transportation system. To implement the Growth Concept, a 2040 functional plan written in 1997 identified specific regulations governing (among other things) housing and employment accommodation, regional parking policies, transportation design requirements, and performance targets. The 1997 regional transportation plan (RTP), later replaced by the 2000 RTP, was an element in the functional plan.

## *Air Quality History*

Pursuant to the 1990 Clean Air Act Amendments, Portland was classified in 1990 as a marginal nonattainment area for ozone and a moderate area for CO. It petitioned to be reclassified as in attainment in 1996 and was redesignated by EPA as a maintenance area for both ozone and CO.

## *Conformity History*

Portland's experience with conformity was quite different from that of the other five areas we examined. In the first place, Portland has not had a lapse or even the threat of a lapse since its earliest conformity determination in 1994, when confusion about the proper assignment of pro-

jects to the baseline or action scenarios led to a conformity lapse. (Since all current projects were exempt or grandfathered, Portland decided to accept a lapse for one year.)

The conformity process and the interagency consultation requirement allowed DEQ to participate actively in the transportation planning process. DEQ used this opportunity to gain a full understanding of the process and in particular the transportation models used. DEQ officials believe this knowledge is the key to effective participation. They also noticed the importance of the financial constraint and were influential in defining the method for determining the financial constraint. Their method is very conservative and leads to revenue projections that are lower than those used elsewhere, which reduces transportation spending plans.

The lack of serious air quality problems in the Portland area means that Metro and DEQ can take steps to make sure that conformity problems do not arise. DEQ has been aggressive in its role in conformity since the rule was first released. For example, it was DEQ that pushed through an interagency consultation agreement. DEQ also devised out-year motor vehicle emissions budgets. To avoid the planning horizon mismatch, the MVEBs were allowed to increase in the out-years to allow for growth in vehicle emissions. DEQ has played a very active role in transportation planning in general and conformity in particular. Its staff has a good understanding of the analytical elements of the conformity process and especially how modeling assumptions can affect conformity determinations.

Finally, Metro has used air quality regulations to help further its own planning agenda. Several of its smart growth planning measures, including the urban growth boundary, have been designated as transportation control measures and have been put in the SIP. Inclusion in the SIP means that these measures have to be enforced even if the region meets the air quality standards. The MPO tied its own hands in this way to make it more difficult for the smart growth measures to be repealed if the political climate changes.

## *Conclusion*

Portland's unusual combination of features deserves recapitulation. First, the MPO has significant powers in addition to its planning authority—power to ensure local land use is consistent with regional plans, and power to impose taxes to carry out its activities—and its executive officer and legislative council are directly elected rather than appointed by local or state governments. Second, it has developed an integrated land use and transportation plan and is using its extensive land use controls to limit growth to those areas specified in the plan. Most importantly, it has established a growth boundary, such that areas within the boundary must accept a share of the regional growth, and growth in areas beyond the boundary is severely limited. Third, the air quality authority participates fully in transportation planning, and the interagency consultation process works well.

Given the close working relationship between Metro and DEQ, it is probably no accident that Portland has had little difficulty making conformity determinations.

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## CASE STUDY FIVE

### *Sacramento, California*

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#### *Abstract*

The implementation of SIP control measures can affect the transportation conformity process whether or not the measures are the responsibility of (or are funded by) the MPO or other stakeholders in the interagency consultation process. Sacramento, a severe ozone nonattainment area, illustrates a case where the failure to achieve the level of emissions reductions assumed in the 1994 ozone attainment SIP for the state enhanced I/M program became an issue in the conformity process. An important lesson was that early consultation on issues, including updating information such as SIP control measures and their implementation, is essential to a smooth conformity process.

In January 2000 the Sacramento Area Council of Governments (SACOG), the MPO for the region, was sued by the Environmental Council of Sacramento, the Sierra Club, and the No-Way LA Coalition<sup>47</sup> over the use of the SIP assumptions for the I/M program in the 1999 conformity analysis. Plaintiffs claimed that updated emissions reduction estimates, which resulted from 1997 state legislative changes to the enhanced I/M program, should have been used. At the time, CARB was in the process of reviewing all control measures from the 1994 SIP, as is its practice every five years. Once the review was completed, CARB issued new control factors for each nonattainment area in the state. The case was settled in September 2001, SACOG made a new transportation conformity determination on the regional transportation plan in July 2002 and on the regional transportation improvement program in October 2002, and public awareness of air quality issues was enhanced. The court also ordered SACOG to provide the plaintiffs advance notice of certain actions and a chance to comment on important documents. SACOG was able to make a conformity determination based on assuming credit for two measures adopted by CARB (control of combustion chamber deposits to reduce NO<sub>x</sub> and additional reductions in reactive organic gases, such as VOCs, and NO<sub>x</sub> from cleaner-burning gasoline). CARB documented that these two measures made up the difference between the estimates of the I/M program's effectiveness in the 1994 SIP and its actual effectiveness. Another outcome of this case (though not the driving force) was the adoption of a voluntary diesel emissions reduction program for heavy-duty trucks, with \$70 million in funding. The program is a SIP commitment and has reductions credited for 2002 and 2005.

Updates to models and data remain an issue in this case study area. SACOG was concerned that an update of the EMFAC model would have to be used for transportation conformity in 2002; the most recent SIP (1994 ozone SIP) motor vehicle emissions budget was developed with EMFAC7E, an earlier version. Another issue that emerged during this study was the use of latest planning assumptions. These two issues are especially closely related in California because

the emissions factor model has embedded fleet data, and fleet data are a critical component of latest planning assumptions.

In late 2001, EPA notified CARB that EMFAC2000 was approved for use only in the San Francisco area and that for conformity purposes, the emissions model for other areas would be EMFAC7F or G (depending upon which version had been used in SIP development) until a newer version of EMFAC was approved and a grace period provided.<sup>48</sup> Then, a second, related issue arose. FHWA/FTA indicated that “since the EMFAC7F/G model [did] not reflect the most currently available data on vehicle age and fleet mix,”<sup>49</sup> the affected areas had to find a way to incorporate the most current vehicle age and fleet mix into their conformity determination. FHWA/FTA notified CARB that after December 31, 2002, no new conformity determinations that required regional emissions analysis would be made using outdated vehicle age and fleet data.

The emissions factor issue is paralleled by the recent release of MOBILE6: now all states will be required to transition from MOBILE5b to MOBILE6 within two years for conformity purposes. There is no corresponding requirement, with some exceptions, for the updating of the applicable SIP prior to use of the model for transportation conformity.

Improved interagency consultation is one outcome of the case study, and the environmental groups that originally sued are now more active in transportation planning and conformity issues.

### *The Area*

EPA defines the Sacramento serious ozone nonattainment area as Sacramento County, Yolo County, Solano County (a portion), Placer and El Dorado Counties (except mountain portions), and part of Sutter County adjacent to Sacramento County. This nonattainment area includes five air quality management districts, as created in the California Health and Safety Code.<sup>50</sup> (The metropolitan planning area also includes Yuba County and a part of Sutter County, which are a separate nonattainment area.) The current population is slightly more than 1.8 million, having increased 25% during the 1990s. In 2022, population is projected to be 2.7 million, excluding the Tahoe basin area. Employment in the six-county area, excluding the Tahoe basin area, is projected to reach 1.26 million by 2022. Between 1997 and 2022, employment in the region is projected to increase by 70.5%, and VMT is projected to increase at a rate of 2.1% per year. Approximately half the growth in the region will occur in the unincorporated area of Sacramento County and the cities of Sacramento and Roseville. The greatest percentage growth rates will occur in three cities in Placer County—Lincoln, Loomis, and Rocklin.<sup>51</sup>

### *The Institutions*

The officially designated MPO for the Sacramento region is the Sacramento Area Council of Governments (SACOG), whose members include six counties and 16 cities: El Dorado, Placer, Sacramento, Sutter, Yolo, and Yuba counties and the cities of Lincoln, Rocklin, Roseville, Citrus Heights, Folsom, Galt, Isleton, Sacramento, Live Oak, Yuba City, Davis, Winters, Woodland, Marysville, West Sacramento, and Wheatland. The lead agency for SIP development is CARB with support from the regional air districts: the Sacramento Metropolitan Air Quality

Management District (SMAQMD), the El Dorado County Air Pollution Control District, the Feather River Air Quality Management District, the Placer County Air Pollution Control District, and the Yolo-Solano Air Quality Management District.

### *Air Quality and Compliance History*

In 1990 Sacramento was classified as a serious ozone nonattainment area, a moderate CO nonattainment area (subsequently redesignated as a maintenance CO area), and a PM10 area according to the scheme specified in the Clean Air Act Amendments of 1990. The ozone attainment date for the Sacramento region was November 15, 1999. The first SIP produced in the region was the 1993 rate-of-progress SIP that showed how a 15% reduction in reactive organic gases (ROG is synonymous with volatile organic compounds, VOCs) would be achieved between 1990 and 1996. This plan was followed by the development of the Sacramento Regional Ozone Attainment Plan, adopted by the five regional air districts that constitute the nonattainment area and submitted to EPA on November 15, 1994. The ozone attainment plan included the post-1996 rate-of-progress demonstration and reductions of an average of another 3% per year through the attainment date. The Sacramento Regional Ozone Attainment Plan is part of the EPA-approved California state implementation plan. Under the California Clean Air Act the districts in the Sacramento region were required to submit a triennial update to the 1991 California air quality plans by December 31, 1994. The November 1994 ozone attainment plan was intended to satisfy both federal and state air quality planning requirements.

The 1990 Clean Air Act Amendments allow a serious nonattainment area more time to meet the standards, until 2005, if it “bumps up” to a severe classification.<sup>52</sup> Since the bump-up option would involve several additional requirements, every possible strategy for reaching attainment by 1999 was explored during 1990–95. Nevertheless, no set of feasible controls could be identified to provide the needed emissions reductions by 1999. The problem was that the benefits of new emissions control measures and anticipated new federal programs would not be realized by 1999. These new measures included a local program of restrictions on industries and a program to accelerate the rate of vehicle turnover. Even with these efforts, an additional 40 tpd of NO<sub>x</sub> reductions would be required for the area to meet the federal standards in 1999.

Analysis showed that by 2005, the ability to provide the needed emissions reductions would improve significantly. State and federal measures were estimated to deliver between 25 and 30 tpd of new NO<sub>x</sub> reductions. It was projected that the shortfall of 10 to 15 tpd could be met through a joint Sacramento Air District—California Air Resources Board mobile source strategy for the Sacramento region. Given the magnitude of the reductions needed for attainment (38% ROG and 40% NO<sub>x</sub> reductions from the 1990 baseline) and the timetables for new measures, 2005 was determined to be the earliest possible attainment date for the Sacramento region. Accordingly, Sacramento’s nonattainment status was reclassified (as requested by the state) to severe in 1995.

In 1990, Sacramento County accounted for about 60% of the area’s total emissions, with the remaining distributed among Placer, El Dorado, Yolo, and Solano counties. The portion of south Sutter County in the nonattainment area accounted for 1% of the region’s total emissions. In 1990, on-road mobile sources contributed 50% of total ROG emissions. In 2005, emissions from on-road vehicles are projected to be 23% of total ROG emissions. In 1990, 72% of NO<sub>x</sub> emis-

sions were from on-road mobile sources, and in 2005, 65% of NO<sub>x</sub> emissions are projected to come from on-road mobile sources. Tables 5.1 and 5.2 show the existing and projected emissions from all sources for ROG and NO<sub>x</sub>, respectively.

### *Conformity History*

In June 1999, SACOG invited public comment on its 1999 metropolitan transportation plan (MTP) and 1999 transportation improvement program (TIP) and the associated transportation conformity analysis. The 1999 MTP for the SACOG region showed that the plan met conformity requirements but barely met the NO<sub>x</sub> emissions budget in 1999. The regional motor vehicle emissions budget for 1999 was 77.91 tpd of NO<sub>x</sub>; the total NO<sub>x</sub> forecast for the 1999 MTP was 77.87 tpd, a difference of 0.04 tpd (or 80 pounds).

During the public comment period, stakeholder groups challenged the validity of the data used in the conformity analysis—specifically, the credits that were incorporated into the analysis for the state’s enhanced inspection and maintenance program. The enhanced I/M program adopted by the state legislature in 1994 (with final regulations issued in 1995) was less rigorous than assumed in the 1994 SIP because in 1997 the legislature exempted new cars from inspections for the first four years, exempted cars older than the 1973 model year from inspection altogether, and weakened the cut points at which a car would fail the inspection. Those challenging the data requested that new control factors (more current than those used in the SIP) be used because of the expected shortfall in emissions reductions from the I/M changes. The con-

formity rule, section 93.122(a), requires that credit be taken only for regulatory measures that are adopted and for approved SIP measures that are actually implemented. Also, since the conformity rule requires use of the latest planning assumptions,<sup>53</sup> SACOG asked for, and received, assurances from CARB that the data used in the 1999 conformity determination were the most recent.

CARB was in the process of reviewing all the control measures in the 1994 SIP, as is its practice every five years. CARB said it was reviewing data to see whether the enhanced I/M program was delivering the expected results and indicated that it would have results from its review in fall 1999. Those results showed significant shortfalls in emissions reductions from the I/M program compared with estimates in the 1994 SIP. CARB had already adopted measures to address the I/M shortfall, including control of combustion chamber deposits to reduce NO<sub>x</sub> and additional reductions in ROG and NO<sub>x</sub> from

**TABLE 5.1**

#### *ROG Emissions (tpd) in Sacramento Ozone Nonattainment Area*

	1990	1999	2005
<b>Total emissions</b>	<b>222</b>	<b>176</b>	<b>167</b>
Stationary	88	97	106
Mobile	134	79	61
On-road mobile	110	56	38
Off-road mobile	24	23	23

Source: Sacramento Area Regional Ozone Attainment Plan, December 28, 1994.

**TABLE 5.2**

#### *NO<sub>x</sub> Emissions (tpd) in Sacramento Ozone Nonattainment Area*

	1990	1999	2005
<b>Total emissions</b>	<b>164</b>	<b>131</b>	<b>124</b>
Stationary	12	14	15
Mobile	151	117	109
On-road mobile	118	85	80
Off-road mobile	34	32	29

Source: Sacramento Area Regional Ozone Attainment Plan, December 28, 1994.

cleaner-burning gasoline. With assurances from CARB, SACOG proceeded to approve the 1999 MTP and 1999 TIP and on July 15, 1999, submitted the MTP, TIP, and associated conformity determination to FHWA/FTA. On July 28, 1999, FHWA/FTA found the MTP and TIP conforming and approved the incorporation of the TIP into the state transportation improvement plan.

On September 10, 1999 the Environmental Council of Sacramento (ECOS), No-Way LA, and the Sierra Club filed a 60-day notice of intent to sue SACOG, Caltrans, CARB, and the U.S. Department of Transportation FHWA/FTA. In the notice of intent, the plaintiffs said that they had advocated the use of updated and accurate emissions estimates, based on current control measure data, in the conformity analysis, and that their input had been ignored by the transportation planning agencies.

On January 10, 2000, the plaintiffs filed a lawsuit and made five claims for relief: (1) transportation projects do not meet conformity criteria; (2) the projects in the plan and TIP do not come from transportation plans and TIPs that meet statutory and regulatory conformity requirements; (3) SACOG and Caltrans unlawfully approved transportation projects not in conformity with the applicable SIP; (4) the U.S. Department of Transportation had violated the Administrative Procedures Act; and, (5) environmental assessments and categorical exclusions violated the National Environment Policy Act. The plaintiffs attached a list of 59 highway projects to which they objected, for a total value of \$427 million in escalated dollars. The plaintiffs sued because they wanted current control program data used with accurate emissions estimates in the conformity assessments on the 1999 MTP and TIP. The plaintiffs' claims also applied to the conformity determinations made on April 20, 1998, and August 7, 1998. They argued that the 6.09 tpd NO<sub>x</sub> adjustment, including 5.24 tpd for the enhanced I/M program, was in error and needed to be updated to reflect actual levels of participation in and emissions reductions from the program. They argued that section 93.122(a)(2) of the conformity rule<sup>54</sup> precluded taking credit for measures that were not fully implemented or not achieving the emissions reductions assumed earlier. They also sought more public participation in plan development.

During the CARB review of control measures, but after the conformity determination was approved, SACOG and SMAQMD learned that the enhanced I/M program was not being applied in the entire nonattainment area: it was being implemented only in the urbanized portion of the nonattainment area, and 21% of the area's cars were not subject to the I/M program requirements. The assumption of NO<sub>x</sub> emissions reductions was thus reduced from 5 tpd to 4 tpd in 2005.

In April 2000, CARB completed its study of control measures and provided revised control factors to each nonattainment area. In general, CARB found that the enhanced I/M program was achieving about 30% of the benefits that had been projected earlier and used in the development of the 1994 SIP, so CARB committed to the implementation of I/M program enhancements. In April 2000, SACOG found that the MTP and TIP still met the conformity requirements. In July 2000 the plaintiffs requested a summary judgment and were denied.

Some transportation agency staff interviewed for this project believed that a general anti-highway sentiment coupled with a smart growth agenda had motivated the lawsuit; others thought it was motivated by opposition to specific road projects. One such project was the Watt Avenue Bridge. Plaintiffs had sued the Sacramento County Board of Supervisors twice to block the bridge project without success. One of the plaintiffs' representatives we interviewed indi-

cated that challenging the transportation conformity determination, which included the project, was their last opportunity to block the project. While acknowledging that opposition to specific road projects was the principal motivating factor in the lawsuit, this environmental group representative also noted that attaining the federal clean air standards at the earliest possible date was also a motivating factor.

In part as a result of the lawsuit and the need to make further NO<sub>x</sub> reductions to attain the standard, SMAQMD and SACOG are participating in an ambitious effort to reduce NO<sub>x</sub> emissions from heavy-duty vehicles and equipment. A public-private partnership was established between the Cleaner Air Partnership and its sponsors, the Metropolitan Chamber of Commerce and American Lung Association of Sacramento, Emigrant Trails, the Sacramento Metropolitan Air Quality Management District, and the Yolo-Solano Air Quality Management District. An incentive program has been implemented to repower heavy-duty trucks by putting lower-emitting engines into older vehicles and to retrofit existing engines to operate at lower emissions levels. The state legislature adopted enabling legislation, and the governor's Traffic Congestion Relief Program contributed \$50 million to this program. In addition, SACOG allocated \$20 million of its CMAQ funds to this program, for a total of \$70 million. The Sacramento Emergency Clean Air and Transportation program began in fall 2000 and Phase II began in May 2001. Its goal is to achieve a 2 tpd reduction in NO<sub>x</sub> by 2002 and an additional 3 tpd by 2005. The credits for this program are included in the attainment SIP and assisted the area in making its attainment demonstration for 2005.

### *Modeling Issues*

During our discussions, agency staff brought up another issue of major concern. In 2001, the San Francisco nonattainment area was using the new version of the California emissions model (EMFAC2000) to update its ozone SIP and motor vehicle emissions budget. To ensure consistency between SIP motor vehicle emissions budgets and conformity analysis, CARB had sought to persuade EPA to adopt a policy of approving the new emissions model on a region-by-region basis as new conformity determinations were made.

SACOG's concern was that San Francisco's use of EMFAC2000 for its SIP and conformity determination would trigger a two-year phase-in of the model for all other areas in the state, because of the requirement to use the latest emissions model and latest planning assumptions in conformity determinations.<sup>55</sup> In addition, EPA has the discretion to allow areas 3 to 24 months to transition to new models once approved. This would mean that unless a SIP revision was done using EMFAC2000, the Sacramento region would have to use the new model for conformity purposes even though its 1994 SIP had been prepared using EMFAC7F. In short, a budget prepared with an earlier model would be compared with a regional emissions analysis based on a different model—one approved for the San Francisco Bay Area only. Transportation agencies were concerned because EMFAC2000 generally shows higher emissions. This issue has implications not just in California but for all other states as well, now that EPA has released MOBILE6.

Both the transportation and the air quality officials we interviewed felt strongly that the conformity determination should be done using the same tools as were used to develop the SIP and create the motor vehicle emissions budgets. To do otherwise would undermine the credibility of

the SIP itself—or at the least, show that the SIP needed to be updated. Nevertheless, as of July 2001, the transportation and air quality agency officials we interviewed indicated that the prospects for a SIP revision for the Sacramento area within the two-year phase-in period were not high. This was because of CARB's very heavy workload and the priority for SIP revisions in other areas of the state. In addition, interviewees indicated significant resistance to doing a SIP revision. Some felt that the SIP process should drive conformity and not vice versa. Revising a SIP each time planning assumptions and vehicle mix data are updated, for example, is burdensome and a resource drain on the environmental agencies. Although a SIP update may not necessarily be required, most of those interviewed felt that changing assumptions would make passing emissions budgets more difficult, and therefore a budget revision would be needed. In addition, some of those interviewed were reluctant to reopen the SIP for fear that other issues could be raised about the attainment strategy for other emissions sources. Finally, there was concern that reopening a SIP might result in failure to reach agreement among all sources on an attainment strategy.

On January 12, 2002, EPA released its policy on the use of EMFAC2000 in California. In the Federal Register notice, EPA approved the use of EMFAC2000 for estimating ozone emissions only in the San Francisco Bay Area. EPA also indicated its intent to approve EMFAC2001 (or a subsequent version), which will resolve technical issues with EMFAC2000, for use statewide at a future date and with a grace period for use in conformity determinations. CARB has not requested EPA approval of EMFAC2002, but after EPA makes such an approval, there will be a two-year grace period.

Subsequently, in April 2002,<sup>56</sup> FHWA/FTA notified the state's nonattainment and maintenance areas that because of the conformity rule (section 93.110) and the joint EPA-U.S. Department of Transportation guidance on latest planning assumptions (issued January 18, 2001), areas must use updated vehicle mix data for conformity determinations. Furthermore, in a May 2, 2002 letter,<sup>57</sup> FHWA and FTA advised CARB that after December 31, 2002, no new conformity determinations that require regional emissions analysis will be approved unless newer data are used. CARB is currently updating more than 20 SIPs using the newest model, EMFAC2002. As these SIP revisions are completed and EPA finds the budgets adequate, areas can then use the new budgets and EMFAC2002 in conformity determinations. SACOG officials and others throughout the state have begun to call this a conformity lockdown.

### ***Lessons Learned***

The Sacramento case study provides a number of lessons and implications for other areas. One lesson relates to whether the SIP control measures are implemented by the MPO or stakeholders in the conformity process. As the Sacramento case shows, transportation conformity can be compromised if the measures are not implemented or not implemented on schedule, or if the emissions reductions from such measures fall short of SIP projections. In this case, no SIP revision was submitted even though the state legislature changed the I/M program in 1997 and it was common knowledge as early as 1995 that the enhanced I/M program was not achieving the reductions committed to in the 1994 ozone SIP. The state could have corrected the I/M program and NO<sub>x</sub> controls, but instead the control factors were updated as a result of a lawsuit that challenged the conformity assumptions—specifically the reductions assumed from the I/M pro-

gram. The state did agree to bolster the I/M program to make up a portion of the shortfall in emissions reductions. MPOs and other stakeholders in conformity should be attentive to the implementation of SIP measures, regardless of which entity is directly responsible, because as this case shows, the conformity process can be challenged in court and used to correct SIP implementation failures. Further, the failure to implement SIP measures may place additional burdens to reduce emissions on the on-road mobile sector.

Another lesson from this case study is that new modeling tools can complicate the comparisons between emissions budgets developed using different assumptions and emissions factors. In Sacramento, the travel demand model used for conformity purposes is now two generations newer than the travel model used in the development of the 1994 ozone attainment SIP. Given the required schedules for transportation plan and TIP updates and the conformity requirement to use latest planning assumptions and latest emissions models, SIP assumptions are inevitably going to become outdated; however, they do not all necessarily create problems. Further, the integration of transportation and air quality planning, as envisioned in the 1990 Clean Air Act Amendments, becomes less and less feasible if different assumptions are used for each planning process.

The third lesson from this case is that even if fleet data are very difficult to update—in this case because of how they are represented in the emissions factor model—it is essential that latest assumptions be used each time a conformity determination is made.

Finally, better consultation between agencies on both the I/M issues and EMFAC-related planning assumptions might have lessened the impact of the situation in Sacramento.

One benefit of the lawsuit in Sacramento was the formation of the Transportation Roundtable, which meets monthly and includes 55 members from businesses, environmental organizations, labor, and other stakeholders. Those interviewed, including a representative of one of the groups that filed the lawsuit, pointed to the Transportation Roundtable as a useful forum for interested parties to participate in the transportation planning process. In addition, several of those interviewed complimented SACOG for its thoroughness in preparing conformity determinations and in the high quality of planning documents in the region.

Interviewees also mentioned that the Sacramento Emergency Clean Air and Transportation voluntary program for heavy-duty diesel emissions reductions would not likely have been implemented or received \$70 million in funding had the conformity lawsuit not been filed against SACOG. Several people mentioned that public and political support for the program is essential and that because of fortuitous timing, the \$50 million in state funds to get the program up and running became available. This, in turn, prompted SACOG to allocate \$20 million in CMAQ funding to match state funds for the program. The SIP had committed to NO<sub>x</sub> reductions in 2002 and 2005 based on the program's being funded and implemented. This would have been required even in the absence of a lawsuit.

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## CASE STUDY SIX

### *Washington, District of Columbia*

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#### *Abstract*

The fast-growing national capital region presents a case in which multiple jurisdictions must coordinate their efforts and work together to reconcile transportation and air quality plans. A serious ozone nonattainment area where attempts to improve air quality are complicated by downwind transport, metropolitan Washington was reclassified as severe in 2002. In developing the Phase II SIP, planners explored a wide variety of measures to close the gap between budgeted and expected emissions in the out-years. EPA's new vehicle and fuel standards helped reduce the scale of the VOC problem. Then, because the region had substantial excess NO<sub>x</sub> credits in the later years, it sought—and received EPA's permission—to convert some of those credits to VOC credits through a NO<sub>x</sub>-VOC substitution.

The region faced another challenge when it was discovered that the number of trucks and SUVs on area roads had been seriously underestimated when developing the SIPs on-road mobile budgets. The result was an 8-ton excess of NO<sub>x</sub> emissions for the 2005 attainment year and a delay in planned amendments to the TIP. Transportation planners eventually found the reductions the region needed without resorting to a SIP revision. A reanalysis of the assumptions in the transportation model enabled them to reduce the excess by almost half. For fiscal reasons, Virginia delayed construction on 123 lane-miles of highway. Planners took credits for previously implemented programs that had not been accounted for in the original emissions estimates. And the MPO found funding for expanded telecommuting programs, traffic signalization improvements, the purchase of CNG buses, and smart growth initiatives.

#### *The Area*

The Washington, DC, transportation planning area encompasses the jurisdictions of the Metropolitan Washington Council of Governments (COG): the District of Columbia; Frederick, Montgomery, and Prince George's counties in Maryland; Arlington, Loudoun, Fairfax, and Prince William counties in Virginia; and the Virginia cities of Alexandria, Falls Church, Manassas, and Manassas Park. The region's population was roughly 4.5 million people in 2000 and is expected to rise to 5.6 million by 2020. This actually represents a slowing in the growth of the region; from 1960 to 1990, the average annual population growth rate was 1.9%. In comparison, growth is expected to average around 1.2% per year between 1990 and 2020. Growth in the region's core (the District, Arlington, and Alexandria) is expected to be relatively modest. The greatest absolute growth is forecast for the inner suburban jurisdictions (Montgomery, Prince George's, and Fairfax counties and the cities of Rockville, Fairfax, and Falls Church). The highest growth in percentage terms is expected to occur in the outer suburbs. Between 2001 and 2025, VMT is forecast to increase 46%.

## *The Institutions*

The National Capital Region Transportation Planning Board (TPB) is the metropolitan planning organization for transportation in the Washington, DC, metropolitan area. The TPB was created in 1965 in response to federal legislation requiring the creation of official planning organizations for metropolitan areas. TPB members include representatives from the 18 local jurisdictions that make up the Council of Governments, the Washington, DC, Virginia, and Maryland departments of transportation and the Washington Metropolitan Area Transit Authority (WMATA).

The multijurisdictional nature of the region poses significant coordination challenges for transportation and air quality planning. Because of the complicated nature of the planning process in the Washington area, a regional air quality planning entity, the Metropolitan Washington Air Quality Committee (MWAQC), was established to prepare the air quality plan, or SIP. MWAQC derives its authority under the Section 174 of the 1990 Clean Air Act Amendments and has been certified by the governors of Maryland and Virginia and the mayor of the District of Columbia. Washington is unique in that the state air agencies have agreed to share planning responsibilities with the local governments in the metropolitan region. For conformity, TPB staff runs the transportation model, but MWAQC and Maryland Department of the Environment staff run the MOBILE emissions model.

MWAQC members are representatives of the state air agencies and elected officials from COG jurisdictions as well as officials from Charles, Calvert, and Stafford counties, which are not part of COG but are in the region's ozone nonattainment area. A significant advantage of the MWAQC structure is an improved understanding of air quality issues among the region's elected officials. In addition, as part of COG, MWAQC meets in the same building where the Transportation Planning Board meetings are held. MWCOG staff provides the technical support to both boards, a fact that greatly facilitates communication between the region's air quality and transportation planners. The memberships of MWAQC and TPB have overlapped, another factor that enhances planning coordination. In practice, MWAQC develops and approves a recommended SIP for each of the region's major jurisdictions, Maryland, Virginia, and the District. The SIPs are submitted for approval by the jurisdictions, then to EPA for approval. Each SIP contains the same motor vehicle emissions budgets for the entire nonattainment area. One concern among local planners is that if the nonattainment area expands greatly following the implementation of the eight-hour ozone standard, the viability of an organization like MWAQC will be threatened simply because it will be difficult for members from outlying areas to attend meetings.

## *Air Quality and Compliance History*

The metropolitan Washington ozone nonattainment area was classified as serious and originally had a 1999 attainment date. Like some other areas, the region successfully petitioned for an extension to 2005 because transported pollution hindered efforts to achieve attainment. EPA's decision to grant this extension without redesignating the area as severe was the subject of a successful legal challenge from the Sierra Club. On July 2, 2002, a three-judge panel of the U.S. Court of Appeals for the DC Circuit ruled unanimously that EPA was incorrect in not designating the region as a severe nonattainment area.

The Washington carbon monoxide maintenance area consists of the District, Arlington County and Alexandria in Virginia, and parts of Montgomery and Prince George's counties in Maryland.

The District's 15% rate-of-progress plan for the region received full approval from EPA in August 1999. Maryland and Virginia's plans for the region received full approval in July and October 2000, respectively. The submittals for the post-1996 rate-of-progress plan, the attainment demonstration, and the extension request are contained in Tables 6.1, 6.2, and 6.3.

The post-1996 rate-of-progress plan, the attainment demonstration, and the extension request were approved by EPA in January 2001.

## *Conformity*

In late 1999, the region's planners realized that the region would have difficulties meeting its NO<sub>x</sub> and VOC budgets for the target years of 2020 and 2025. The proposed attainment budgets for 2005 at that time were 104.5 tpd for VOC and 177.3 tpd for NO<sub>x</sub>. Tables 6.4 and 6.5 show the projected emissions for 2005–25. As can be seen, meeting the VOC budget in 2020 and 2025 is likely to be especially difficult.

Planners analyzed the effectiveness of a set of transportation emissions reduction measures (TERMs). The TPB had previously evaluated 21 TERMS for use in case of difficulty achieving conformity. Taken together, all these TERMS would have cost \$20 million per year and would have reduced VOC emissions by 0.6 tpd and NO<sub>x</sub> emissions by 1.3 tpd. TPB staff analyzed an additional set of (politically unpalatable) measures: mandatory employer transit and high-occupancy-vehicle (HOV) subsidies and mandatory reductions in employee vehicle trips. These measures would have cut an additional 5.6 tpd of VOCs in 2025—still not enough to make conformity. Staffers had also previously analyzed alternative land use scenarios, including an option that combined dense development inside the Beltway with transit, HOV lane investment, and pricing policies, including a \$30-a-month parking tax and road tolls. This package yielded major reductions: 5.0 tpd of VOCs and 9.7 tpd of NO<sub>x</sub> in 2020. However, staff noted that “the feasibility and public acceptability of these measures are uncertain at best.”

One option discussed by air quality planners was building an explicit safety margin into the motor vehicle emissions budgets, by assigning excess emissions credits for the plan as a whole to the on-road mobile budgets. This strategy would have alleviated the NO<sub>x</sub> issue because of the dramatic NO<sub>x</sub> emissions reductions expected from point sources in later years. However, the maximum safety margin available for the VOC budget was just 5.0 tpd, not even a third of the reductions needed to pass conformity for 2025. The safety margin option was rejected by MWAQC.

As it turned out, EPA's approval of Tier 2 vehicle and low-sulfur fuel standards in December 1999 greatly reduced the difficulty of meeting the on-road mobile budgets. The new vehicle and fuel standards had a dramatic effect on projected NO<sub>x</sub> emissions and greatly reduced the scale of the VOC problem, although it did not eliminate it for 2020 and 2025. The new standards also slightly lowered the proposed on-road mobile budgets because of lower projected on-road mobile source emissions in the attainment year. The new proposed budgets were now 101.8 tpd for VOC and 161.8 tpd for NO<sub>x</sub> in 2005. Projected VOC emissions for 2020 were 104.8 tpd, or 3 tons over the limit. However, projected NO<sub>x</sub> emissions for 2020 were now just 113.3 tpd, almost

TABLE 6.1

*Post-1996 ROP Plans*

	DISTRICT OF COLUMBIA	MARYLAND	VIRGINIA
Initial submittal dates	November 3, 1997	December 24, 1997	December 19, 1997
Amendment dates	May 25, 1999	May 20, 1999	May 25, 1999

TABLE 6.2

*Attainment Demonstrations*

	DISTRICT OF COLUMBIA	MARYLAND	VIRGINIA
Initial submission	April 24, 1998	April 24, 1998	April 29, 1998
Amendment dates	October 27, 1998	August 17, 1998	August 18, 1998
Supplemental dates	February 16, 2000	February 14, 2000	February 9, 2000
Supplemental dates	March 22, 2000	March 31, 2000	March 31, 2000

TABLE 6.3

*Attainment Date Extension Request*

	DISTRICT OF COLUMBIA	MARYLAND	VIRGINIA
Initial submission	September 3, 1999	July 16, 1999	September 20, 1999
Supplemental dates	February 16, 2000	February 14, 2000	February 9, 2000

TABLE 6.4

*Projected Washington, DC, Motor Vehicle VOC Emissions, 2005–25*

YEAR	BUDGET (TPD)	PROJECTED EMISSIONS (TPD)	DIFFERENCE (TPD)
2005	104.5	102.8	-1.7
2010	104.5	100.6	-3.9
2020	104.5	112.5	+8.0
2025	104.5	121.4	+16.9

TABLE 6.5

*Projected Washington, DC, Motor Vehicle NO<sub>x</sub> Emissions 2005–25*

YEAR	BUDGET (TPD)	PROJECTED EMISSIONS (TPD)	DIFFERENCE (TPD)
2005	177.3	175.0	-2.3
2010	177.3	165.0	-12.3
2020	177.3	177.8	+0.5
2025	177.3	183.2	+4.9

50 tons below the budget. For 2005, projected VOC emissions in the conformity analysis were now 100.8 tpd and NO<sub>x</sub> emissions were expected to be 161.0 tpd.

To achieve the 3 tpd reduction needed in projected VOC emissions for the 2020 conformity analysis year, MWAQC investigated the possibility of setting out-year budgets using a NO<sub>x</sub> substitution procedure. Because the region had substantial excess NO<sub>x</sub> credits in the later years, it would be possible to convert some of those credits to VOC credits. MWAQC staff worked closely with EPA on this issue because this type of substitution had never been used for establishing out-year budgets for conformity purposes. The justification for a NO<sub>x</sub>-VOC substitution was an EPA policy that allows a similar substitution in rate-of-progress plans. Reductions in NO<sub>x</sub> mobile emissions are more likely to lead to reductions in ozone levels than equivalent reductions in VOC emissions.

On January 10, 2000, EPA issued guidance on the appropriate way to implement a NO<sub>x</sub>-VOC substitution.<sup>58</sup> For Washington, NO<sub>x</sub> could be traded off with VOCs at a ratio of 1.64:1. MWAQC approved revised out-year budgets at its February 3, 2000, meeting, and the three jurisdictions submitted the revisions to EPA in March. EPA announced that the budgets were adequate for conformity in the July 3 *Federal Register*. The budgets are listed in Table 6.6. The region submitted its conformity determination on the 2000 constrained long-range plan and 2001–06 TIP in October 2000, and the U.S. Department of Transportation approved the determination.

TABLE 6.6

*Washington, DC, MVEBs*

TARGET YEAR	VOC TPD	NO <sub>x</sub> TPD
2005	101.8	161.8
2015	107.2	130.0
2020	116.0	130.0

***The Vehicle Data Issue***

During summer 2001, MWAQC requested that TPB staff use updated 1999 vehicle registration data for the upcoming conformity determination on the 2002–07 TIP and amendments to the 2000 Constrained Long Range Plan. At the June 20 meeting of the TPB, Ron Kirby, the Director of Transportation Planning, announced that the newer data showed major “anomalies” including very sharp increases in the number of heavy-duty gas vehicles in Virginia counties.

Upon further examination, it was apparent that the newer data were indeed accurate. The seemingly unrealistic increases stemmed in part from a mischaracterization of light and heavy-duty trucks as passenger cars in Virginia in 1996. The newer data showed a much higher share of SUVs on the road. In addition, in some counties a higher share of the VMT mix was now apportioned to heavy-duty diesel vehicles, whose NO<sub>x</sub> emissions factor is about 10 times that of light-duty vehicles. On July 18, the TPB was informed that emissions modeling with the new data revealed that the area would exceed its NO<sub>x</sub> attainment budget by 8 tpd in 2005. The TPB voted unanimously to put the air quality analyses of the 2001 constrained long-range plan and the 2002–07 TIP on hold. The board also voted to create a task force to study the situation and issue recommendations.

One issue that was raised briefly was whether the flaws in the 1996 data would jeopardize the approval of the attainment demonstration, which had been based on those data. However, EPA determined that the data used in preparing the SIP were the best available at that time, and therefore the SIP could not be challenged on data deficiencies.

Because the region’s conformity determination of the 2000 constrained long-range plan and 2001–06 TIP had been approved by the federal agencies in January 2001, it was not faced with

an imminent lapse and had almost three years to resolve the problem. Of course, any projects added in that period would have to be exempt projects under the conformity rule so that the transportation plan and TIP would not require a new regional emissions analysis.

TPB staff was able to reduce the excess emissions to less than 4 tpd of NO<sub>x</sub> through two methods. First, adjustments were made to the VMT mix on local roads. In the opinion of TPB planners, the original analysis substantially overestimated the share of large vehicles (particularly heavy-duty diesel) on local roads. This change alone reduced the problem by 2.74 tons. Second, credit was taken for emissions-reducing initiatives that had been in place but unclaimed for air quality purposes. It's important to note that these calculations had not as yet received federal approval as part of a conformity determination and were potentially overoptimistic. The reductions are displayed in Table 6.7.

TABLE 6.7

**Reductions in Excess NO<sub>x</sub> Emissions (tpd) as Calculated by TPB Staff**

Excess emissions of NO <sub>x</sub> for 2005 as of July 18, 2001	8.000
<i>Technical corrections (VMT mix)</i>	- 2.740
<i>Emissions reductions from previously committed programs</i>	- 1.166
<i>Governor's programs</i>	- 0.324
<i>TERM revisions</i>	- 0.466
Revised excess	3.304

TABLE 6.8

**TERM Packages and Their Costs**

TERM PACKAGE	EMISSIONS REDUCTION (TPD NO <sub>x</sub> )	COST (MILLION \$)
Cost-effectiveness	3.4157	12.7
One-time investment	3.309	49.7
Congestion reduction	1.832	57.9
Revenue raising	3.531	(1,074.0)

The reductions are displayed in Table 6.7.

The task force described several options for reducing the remaining excess emissions in its draft report, released December 13, 2001. The options fell into two categories: packages of TERMS to be added to the transportation plan and TIP, and revisions to the SIP. The task force looked at packages based on a variety of perspectives, including low-cost (e.g., telecommuting), one-time investment (e.g., CNG buses), congestion reduction (e.g., ITS and transit), and revenue generating (e.g., parking impact fees). The budgetary costs and emissions reductions from the four TERM packages are presented in Table 6.8. (The last option had negative budgetary costs since it consisted of measures that would raise revenue for local governments.)

The task force identified 10 TERMS as primary candidate measures that, taken together, more than offset the NO<sub>x</sub> overage for 2005. They presented them to TPB as a potential menu to use to achieve the target reductions.

The SIP revision options included waiting for a SIP revision and new budgets using MOBILE6, NO<sub>x</sub> trading between the mobile sector and stationary sources, Ozone Transport Commission (OTC) measures (such as paint can regulations), placing the voluntary emissions reduction program Clean Air Partners into the SIP as a transportation control measure, and a VOC-NO<sub>x</sub> substitution.

**MOBILE6 revision.** Because Washington's air quality plan relied on a MOBILE5-based analysis of Tier 2 standards for attainment, the region committed to revising its budgets using the MOBILE6 motor vehicle emissions factor model within a year after its release. This option would have meant waiting for the release of MOBILE6 and the subsequent new budgets before performing a new conformity analysis.

**Intersector trading.** MWAQC's technical advisory committee examined whether a transportation entity could purchase NO<sub>x</sub> credits from a stationary source and determined that although this was a viable approach, there were unresolved questions concerning cost, availability of credits, and length of time credits would be needed. But the committee also concluded that it could be a cost-effective method of meeting conformity without changing the mobile source budgets.

**OTC measures.** The technical advisory committee was concerned about using these to pass conformity, because that was not the reason for their development. Their use would also require the District of Columbia and Virginia to pass new regulations.

**Clean Air Partners.** Concern was raised about whether placing this program in the SIP could jeopardize the region's air quality plan. Planners feared that if the program failed to deliver the committed emissions reductions, the status of the SIP could be adversely affected.

**VOC-NO<sub>x</sub> substitution.** Unlike the earlier situation, TPB now faced an excess of NO<sub>x</sub> in the near term (2005). VOCs could be traded off for NO<sub>x</sub> credits at a ratio of 0.61 to 1. In 2005, an estimated 5.9 tpd of VOCs were available for trade and only 2 tpd were needed to make up the 3.3 tpd NO<sub>x</sub> overage. It was estimated that this revision would take substantially less time than a MOBILE6 revision.

At the December 19, 2001, TPB meeting, the board opted to take a two-pronged approach. It voted to release a comprehensive list of transportation plan and TIP TERMS for public comment and also to send a letter to MWAQC requesting that the committee initiate the process of preparing a SIP revision with particular focus on the VOC-NO<sub>x</sub> substitution, credit for the Clean Air Partners program in the SIP, and the OTC measures. The purpose of the two-pronged approach was to keep the region's options "open," according to the chair of the conformity task force. Several board members expressed a preference for a SIP revision over a TERM package, given the difficulty of securing additional funding from the state transportation agencies.

MOBILE6 was released for use in January 2002. At its January 23, 2002, meeting, MWAQC voted to move toward revising the SIP using MOBILE6 budgets instead of a SIP revision based on VOC-NO<sub>x</sub> substitution, the Clean Air Partners program, or OTC measures. Because it appeared that funding for TERMS would not be forthcoming from the region's transportation agencies, it seemed that the TPB would wait for the SIP revision. One complication was that although the region's conformity determination on the 2000 constrained long-range plan and 2002-07 TIP extended through January, 2004, a new TIP needed to be adopted by January, 2003. The proposed solution to this was to develop a 2003-08 TIP that was consistent with the current conforming plan and relied on the previous regional emissions analysis as allowed for under the conformity rule.

This was the decision that the TPB was prepared to adopt at its February 20, 2002, meeting. However, as the board was preparing to vote on that measure, MDOT's representative announced that Maryland Governor Parris Glendening had pledged to commit funding for TERMS. The announcement caught the rest of the board by surprise and prompted complaints from some members that they had been given inadequate notice. In particular, representatives from Virginia expressed doubt that they would be able to obtain money for TERMS without forgoing much-needed local investments. However, the board voted unanimously to go ahead and attempt to secure funding for TERMS and develop a new TIP and amendments to the plan. At the same

time it voted to pursue the development of a TIP that relied upon the previous regional emissions analysis in case TERMS funding fell short.

The TPB was eventually able to find the needed reductions without resorting to a SIP revision. Projected NO<sub>x</sub> emissions in 2005 were about 1 tpd under the budget, a dramatic reduction from the 8-tpd excess originally forecast. A large portion of the reduction came from changes in the estimated share of heavy-duty diesel vehicles on local roads. In addition, planners took some credit for previously implemented programs that had not been accounted for in the original emissions estimates. Budgetary problems in Virginia meant that the state had to delay some of its planned road improvements and take 123 lane-miles out of the TIP. This resulted in a reduction more than 0.8 tpd of NO<sub>x</sub> for 2005, demonstrating that in some cases at least, delaying or eliminating road projects can have a significant effect on projected vehicle emissions, even in the short term.

Finally, the TPB was able to secure \$45 million of funding for TERMS that reduced projected 2005 NO<sub>x</sub> emissions by just over 2 tpd. The package included expanded telecommuting programs, traffic signalization improvements, the purchase of CNG buses, and smart growth initiatives. The measures vary widely in terms of their cost-effectiveness. The most cost-effective measures were related to the telecommuting program and came in at under \$5,000 per ton of NO<sub>x</sub>. Other measures, such as the purchase of CNG buses and improvements to pedestrian access in transit-oriented development areas cost more than \$100,000 per ton. On July 31, the TPB approved the conformity determination for 2002 amendments to the constrained long-range plan and the 2003–08 TIP.

### *Lessons Learned*

The two most important lessons of the Washington, DC, experience are that conformity problems can crop up suddenly even if an area does everything “right,” and that with creativity, sufficient resources, time, and determination, the hurdles can be overcome.





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