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### Publication Date

1991-11-01



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November 1991  
Working Paper, No. 22

**The University of California  
Transportation Center**

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**Improving Traffic Congestion by Regulating Employee Travel:  
A Phoenix Survey**

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## ABSTRACT

This paper documents the current efforts of transportation planning and air quality policies to reduce traffic congestion in metropolitan Phoenix. In metropolitan Arizona, the weakness of adopted land use controls, preference for single occupant commuting, and the importance of regional water and air quality issues guide transportation planning.

Adopted transportation and employee trip reduction measures include a 1985 metropolitan Phoenix referendum approving a one-half cent sales tax for construction of a 231-mile freeway addition and preparation of a metropolitan rapid transit plan, defeated on March 28, 1989. The 1988 Arizona Legislature Omnibus Air Quality bill mandates employee commuter distance and mode baseline studies yearly, completed employer trip reduction plans and a reduction of five percent of the average vehicle miles traveled in each of the next two years.

A pre-test survey documents potential problems with the current analysis approach. The employee baseline survey relies on stated or perceived distance which may not accurately measure average vehicle miles traveled. Analysis of a survey of 400 Arizona State University students compared their stated commuting distance with the actual distance as measured by straight-line and grid measurements.

Both technical problems and the lack of broad-based support for alternatives to single occupant commuting suggest that current metropolitan Phoenix planning efforts to reduce traffic congestion by regulating employee travel will be part of a long-term learning process.

## Introduction

In 1988 state air quality planning legislation initiated local innovation in regulating employee travel in metropolitan Phoenix, Arizona. This urban area ranks third among American cities in the severity of its carbon monoxide air pollution. Local conditions for support of mandatory travel control programs are not strong, however. Low population densities dominate; local traffic congestion has not reached the levels of gridlock; metropolitan jurisdictions do not have growth control policies to limit new road construction. Indeed, this progressive link of air quality improvement and travel regulation has the potential to improve current traffic congestion and offset future traffic congestion. The program's success in shifting individuals' work travel behavior will help metropolitan Phoenix adapt to rising economic and environmental costs.

This paper reports the current status of the employee travel reduction program and initial efforts to analyze its effectiveness. A brief review of environmental and transportation planning in metropolitan Arizona provides a context for discussion of the current travel reduction program. A pre-test survey analyzes current travel distances. This pre-test demonstrates the benefit of evaluating the trip reduction program's survey and analysis procedures. Additional program analyses are recommended.

### The Local Context for Transportation Planning

New facility construction is viewed as a way to solve most metropolitan Phoenix urban travel problems. This attitude appears contrary to the fiscal, political, and environmental constraints that have emerged in many other U.S. metropolitan areas and are beginning to emerge locally. Rapid population immigration and a mid-1980s construction boom supported the strong local growth ethic. Resistance to new transportation corridors on the part of neighborhood groups or communities with growth control policies occurs, but is not widespread. The most notable exception is the resistance of the Salt River-Maricopa Indian Community whose lands are adjacent to Scottsdale at the northeastern edge of the metropolitan area. The community's legal and political autonomy within the urban area have delayed, but not prevented, the siting and construction of a north-south freeway belt route link on their lands.

In this setting, regional environmental planning emerges as the major initiator of directed or planned urban change. State requirements that land developers have an assured 100-year water source have reinforced the importance of existing cities with their central water systems as local water providers. The Federal Environmental Protection Agency currently designates the Maricopa Association of Governments

Urban Planning Area as a non-attainment area for total suspended particulates, ozone, and carbon monoxide. These federal concerns provide the impetus for local air quality improvement. Since motor vehicles are the largest contributor to this problem, the Arizona Legislature and Maricopa County have committed themselves to developing programs to improve the performance of and reducing the number of vehicles on metropolitan roads. Employee commuting trips are one third of the 40 million miles driven daily in Maricopa County.

### Adopted Transportation and Employee Trip Reduction Measures

The Arizona State Legislature understands the link between air quality and traffic congestion improvement and supports the creation of a comprehensive transportation system for metropolitan Phoenix. The outcomes of two 1985 and 1989 referenda confirm the current and future importance of streets and freeways in local travel preferences, however.

In 1985, the legislature authorized an election in Maricopa County to approved a one-half cent sales tax addition to fund controlled-access highways, to develop a regional public transportation system plan and to increase funding for a regional bus system. Voters approved the 1985 sales tax authorization. The Regional Public Transportation Authority (RPTA) was created by the same election and required to prepare a regional public transportation system plan for submission to Maricopa County voters. Construction began on the 231-mile addition to the existing 31-mile freeway network. The sales tax funding was expected to generate \$5.6 billion dollars over a twenty-year period. The cost of completing the planned freeway system was estimated in 1988 at \$4.4 to 6.4 billion dollars as a result of rising rights of way acquisition costs and upgraded design standards.

The regional public transportation plan presented to Maricopa County voters in March, 1989, was required by the authorizing legislation to have the primary purpose of "the establishment of a regional rapid transit system." The secondary purpose was a regional bus system. The ValTrans plan emerged as a thirty-year, \$8.4 billion dollar proposal for a 103-mile automated, electric, light rail transit system with an elevated right of way. An regional bus system would expand the current fleet size of 350 to 1,500, provide regional service to a wide area with improved frequency, and provide express commuter and custom transit services. On March 28, 1989, the ValTrans proposal was defeated by a ratio of 2 to 1. Post-election analysis suggests that the negative vote reflected conservative fiscal attitudes at a time when the State and metropolitan area were experiencing economic decline and demands for increased public spending for completing the freeway system and for other public services, including prisons, health, and education.

Recent legislation focuses on improving air quality and improving traffic congestion by changing individual travel behavior on the street and freeway system. The 1988 Arizona Omnibus Air Quality Bill provides four programs to improve urban air quality: oxygenated fuels, increased vehicle emissions testing, a clean air program, and the trip reduction program (TRP). This focuses on the largest component of daily travel. Employee commuting trips account for one third of the 40 million miles traveled daily in Maricopa County.

The Trip Reduction Program (TRP) affects Maricopa County employers with 100 or more full-time employees at a single worksite. Each employer must initiate travel reduction strategies in an effort to encourage employees to share the ride to work. Each employer is required to (1) participate in a survey and reporting effort that provides a baseline against which attainment of trip reduction targets will be measured in each of the next two years, (2) designate a Transportation Coordinator, and (3) prepare an approvable travel reduction plan.

Employers are expected to implement all travel reduction measures they consider necessary to attain these employee participation goals in alternative modes or commuter trip vehicle miles travel reductions per regulated work site. A total 10% reduction in the proportion of employees commuting by single occupancy vehicles is the goal to be achieved over the next two years. This proportion will be determined from the annual survey, with an expected 5% reduction in the first year and an additional 5% reduction in the second year. The baseline for participation in alternative modes will be based on the proportion of employees commuting by single occupancy vehicles. The baseline for vehicle miles traveled (VMT) shall be average VMT per employee not residing on the worksite.

#### Evaluation of the Average Vehicle Miles Traveled Standard

The specific development and analysis of these legislative standards provides one area of internal trip reduction programs evaluation that focuses on the accurate measurement of trip reduction targets. Confirmation that the level of single occupant commuting is accurately reported is of similar interest. Potentially, understatement of the level of carpooling could occur if employees in carpools with family members are not included and only carpools with nonfamily members are identified. The legislation defines a carpool as "two or more persons traveling in an automobile, truck or van to or from work." A second program evaluation area not considered in this paper would examine the employer trip reduction plans and the mix of measures adopted to reduce single occupant commuting and vehicle miles traveled.

The program's use of average vehicle miles traveled (VMT) provides a measurable standard of effort for the program as a whole and for individual firms. But accurate measurement of VMT has



important implications for the level of effort required from individual employers and the program as a whole. If the VMT figure calculated from the baseline survey is above the actual VMT, an employer will be trying to achieve a higher level of employee trip reduction than required by law. If the VMT figure calculated from the baseline survey is below the actual VMT, an employer will receive an underestimate of the extent of the employee trips and will be attempting to meet a lower level of trip reduction than the law requires. Aggregation of these individual employer requirements may effect the program's total level of activity.

The accuracy of individual trip distances can be evaluated using three measures. Statements of trip distance obtained by survey research through participant questionnaires are actually distance as perceived by the survey respondent. While a respondent may be assumed to be attempting to give accurate information, individuals can be expected to vary in their knowledge of actual trip distances. When the actual trip route is not known, it is also unclear whether a respondent is stating trip distance as traveled on the street network or is stating distance as a straight-line between residence and work. When residence and work sites are known, straight-line and grid distances can be independently calculated. Average vehicle miles traveled can then be compared for perceived, straight line, and grid distance measurements.

Fortunately, these calculations can be made using information from the baseline survey now being distributed. The survey collects perceived distance information in a question on how far the employee lives from work and also requests the major cross streets near residence and work. While these intersections differ from the actual residence and work addresses and can be expected to differ from perceived, they provide trip origin and destination points that allow fairly accurate measurement of straight line and grid distances.

The findings presented here are necessarily preliminary but demonstrate a method to verify one element of the overall program evaluation for the first year of the Trip Reduction Program. A September, 1989, pre-test of the three distance measures for VMT used surveys of 400 students in Geography courses at Arizona State University who drive to campus. The sample was proportionally distributed between undergraduate and graduate students. Students who never bring a vehicle to campus were omitted from the survey. When the distance means are compared using the comparison of means test, they are statistically similar. These results indicate that perceived and grid distance measures are statistically similar and that measure may be used without underestimating or overestimating VMT.

This methodology will be extended to a large sample from the expected 1/2 million to 3/4 million surveys to be received. While VMT for individual employers cannot be identified in the current baseline survey to protect employer confidentiality, trip distances can be compared for all employers and employers in the different size categories of 500 or more employees and 100 to 500 employees. Trip distances will

be compared for different travel modes (always drive alone, occasionally drive alone, carpool), for male and female employees, travel frequencies, and metropolitan residential and work locations. If this aggregate analysis suggests trip distance variations, future analysis may be able to focus on the individual employer level.

### Conclusion

#### Will this program achieve the expected trip reduction improvement results?

Impact of non-work trips not measured.

Pisarski notes that non-work trips have grown, compared to work trips.

Impact of flex-time on total trip number and length unknown (may encourage additional travel).

Interviews with individuals now using flex-time may indicate local impact.

Expectation that the program is part of long-term learning process well started elsewhere but unfamiliar here.

Level of carpooling activity low; numbers of employers involved low in past; numbers of employees in carpools low in past.

Municipal general plans and zoning regulations reflect their low-density suburban character. The City of Phoenix's Urban Village Plan recognizes the city's multinucleated character by designating nine higher-density cores surrounded by low-density development. The metropolitan area's 1985 estimated residential density is calculated to intensify only slightly to by 2005.

Smart transportation may be a way to do better future land planning in Phoenix without requiring redevelopment at densities that are locally unacceptable but encourage core developments at appropriate locations. Transportation is one area where individual learning has to occur fast and behavior has to change fast to deal with current and future problems.