South Mountain Transportation Corridor Study

Citizens Advisory Team
Draft Technical Report Summary

Cumulative and Secondary Impacts

What are cumulative and secondary impacts?

Federal guidance defines cumulative impacts as "the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). In more basic terms, cumulative impacts occur where several actions in an area combine to create an impact on a given resource greater than any one individual activity. An example of this is when individual cars added together in one general location lead to a traffic jam. Cumulative impacts result from spatial (geographic) and temporal (time) crowding of environmental impacts. The effects of human activities would accumulate when a second impact occurs at a site or in a region before the environmental system can fully rebound from the effect of the first impact.

Secondary impacts (sometimes referred to as indirect impacts) are "caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate and related effects on air and water and other natural systems" (40 CFR 1508.8). An example of this is when a new highway interchange is constructed, a cross street can attract development, such as a gas station.

The draft technical report follows two principles outlined by the Council of Environmental Quality (CEQ) guidance (1997) in considering secondary and cumulative analyses: (1) focus only on the effects and resources within the context of the proposed action; and (2) present a concise list of issues that have relevance to the anticipated effects of the proposed action or eventual decision.

Why study cumulative and secondary impacts in the Environmental Impact Statement (EIS)?

The Phoenix metropolitan area is growing rapidly and has been since the 1950s. The Valley has gone from a set of small agricultural towns to a major metropolitan area over the last 100 years. The rapid growth is expected to continue well into the future, which would result in cumulative effects on natural resources in the area, communities, residents, infrastructure and economic conditions. Evaluating cumulative impacts from the proposed action and other activities on various resources provides an understanding of the overall health, or condition, of each resource and the proposed action's contribution to effects on the resource. The proposed action may also result in impacts which occur elsewhere or later in time; therefore, secondary impacts are evaluated to identify if such effects are occurring.

The primary purpose of presenting these types of impacts in an EIS is specifically for public disclosure—to inform the public through this process the health of resources affected, the contribution of the action's impacts on the resources, and what other non-project related impacts are affecting the resources.

Cumulative and Secondary Impacts

What other activities are considered in evaluating cumulative impacts?

The definition of cumulative impacts requires consideration of past, present and reasonably foreseeable changes that could result in cumulative impacts when combined with the environmental effects of the proposed action. Specifically, activities are identified when, in combination with the potential impacts of the proposed action, they could result in substantial cumulative impacts. In accordance with precedence set by court cases, other projects deemed reasonably foreseeable were limited to those that are planned and/or funded. The following types of activities that could result in cumulative impacts were reviewed:

- Other highway projects
- Planned mass transit projects in the Study Area
- Major utility projects in the Study Area
- Other general development patterns

Other proposed transportation projects in the proximity to the Study Area include light rail on Interstate 10 (I-10), the I-10 Median and Outside Widening projects (State Route [SR] 303L to SR 101L [Agua Fria Freeway]), the I-10 Outside Widening project (SR 101L [Agua Fria Freeway] to I-17), the SR 801 project, the I-10 Corridor Improvement Study (SR 51 to SR 202L [Santan Freeway]) (local and express roads), and the Avenida Rio Salado project. No major utility projects were identified aside from local distribution system extensions to service existing growth.

What kind of impacts would occur from the proposed action?

Critical resources warranting secondary impact analysis are presented in this section. To address the potential impact severity, classifications in accordance with Federal Highway Administration (FHWA) guidance are presented in Table 1.

Table 1. Secondary and Cumulative Impact Severity Classification

Impact Category	Impact Classification	Description
Type[a]	Neutral or negative	Compares the final condition of a given resource with its existing condition (assumes that the expected impact occurs).
Severity	Minor, moderate or substantial	Considers the relative contribution of the proposed action to a given impact.
Duration	Temporary or permanent	Permanent is assumed unless otherwise noted.
[a] The project can have positive impacts		

Tables 2 and 3 summarize anticipated secondary and cumulative impacts, respectively, that can be reasonably foreseeable as they relate to the proposed action.

Cumulative and Secondary Impacts

Table 2. Secondary Impacts

Resource	Proposed Action Impact	Reasonably Foreseeable Impact	Impact Classification
Biological resources	Habitat loss from direct conversion to transportation use	Habitat loss from urban development	Neg/Mod
	Vehicle-animal collisions	Wildlife population reduction	Neg/Mod
	Loss of native vegetation	Increased rate of land conversion	Neg/Mod
Water resources	Loss and/or alteration of natural drainage features	Loss from urban development	Neg/Min
	Modification of groundwater tables from pumping to drain a depressed facility: eventual impact on the water table by removing this water from use	Groundwater drawdown from continued development	Neg/Mod
Air quality	Particulate matter due to construction activities	Reduced air quality from construction activities related to continued rapid urban growth in the region	To be included with air quality report summary
Cultural resources	Disturbance to known historic and prehistoric sites	Loss due to enhanced access to undisturbed land	Neg/Min
Land use	Conversion of agricultural land to other uses	Conversion from ongoing urban development	Neg/Min
	Land use ownership conversions	Conversion of zoned parcels to more intensive land uses	Neu/Min
	Alteration of community character	Change in character from ongoing urban development and its effect on community character	Neu/Min
Economic conditions	Enhanced movement of goods, materials, and services	Projected growth in land values and economic activity in study area	Neu/Min
Neu = neutral; Neg = negative; Min = minor; Mod = moderate; Sht-Trm = short-term			

Cumulative and Secondary Impacts

Table 3. Cumulative Impacts

Resource	Proposed Action Impact	Reasonably Foreseeable Impact	Impact Classification
Biological resources	Habitat loss from direct conversion to transportation use	Habitat loss from urban and transportation development	Neg/Mod
	Habitat isolation and fragmentation	Habitat loss and isolation from urban and transportation development	Neg/Mod
	Vehicle-animal collisions	Wildlife population reduction	Neg/Mod
	Loss of native vegetation	Future construction of residential, industrial, commercial and transportation projects	Neg/Mod
	Introduction of noxious weeds	Future nonfederal and nonstate-funded projects' contributions to the spread of invasive species; federally funded and state-funded projects' reductions in this spreading	Neu/Min
Water resources	Increased runoff and flushed contaminants from impervious surfaces	Increased runoff volumes from other projects and higher potential for pollutant discharges into receiving water bodies	Neg/Min
	Loss and/or alteration of natural drainage features	Loss from urban development	Neg/Min
	Modification of groundwater tables from pumping to drain a depressed facility	Future construction of residential, industrial, commercial and transportation projects	Neg/Min
	Increased demand on water availability	Ongoing development in the region	Neg/Min
Air quality	All predictable measures below federal and state standards; mobile source air toxics (MSATs) being evaluated	Reductions in on-highway emissions of air toxics due to attainment requirements and source emission requirements as established by air quality programs implemented by such agencies as the Maricopa Association of Governments and the Environmental Protection Agency	To be included with air quality report summary
Cultural resources	Disturbance to known historic and prehistoric sites	Enhanced access to undisturbed land; permanent loss due to proposed action and ongoing urban growth; preservation of some cultural resources in place as a result of the proposed freeway	Neu/Min

Table 3. Cumulative Impacts

Resource	Proposed Action Impact	Reasonably Foreseeable Impact	Impact Classification
Land use	Conversion of agricultural land to a transportation use	Conversion from ongoing urban development	Neg/Min
Land use (continued)	Loss of recreational lands	Ongoing residential, industrial and commercial development and other transportation and public infrastructure projects	Neg/Min
	Residential and business displacements	Proposed project and other transportation and public infrastructure projects' contribution to displacements	Neg/Min
	Land use ownership conversions	Ongoing residential, industrial and commercial development and other transportation and public infrastructure projects	Neu/Min
	Alteration to community character and cohesion		Neg/Min
Neu = neutral; Neg = negative; Min = minor; Mod = moderate			

How do the alternatives differ in cumulative and secondary impacts?

The action alternatives would have comparable effects. The various activities affecting resources and people in the Study Area and the proposed action can have localized variations at a project level, depending on the specific location of a given effect. However, applying a broader view to the cumulative and indirect effects on affected resource, each action alternative has comparable effects.

What if the project were not constructed?

If the South Mountain Freeway were not implemented, the incremental effects contributed solely by the proposed action would not occur. However, no action would not preclude other activities from affecting resources in a similar manner. Most cumulative impacts would result from ongoing conversion of land to more intensive human-based development. These effects, such as the permanent loss of cultural resources and the permanent loss of agricultural lands would occur without the proposed action in place.

Secondary effects would not occur as such effects must be tied directly to the proposed action.

What could be done to reduce cumulative or secondary impacts?

Disclosure of secondary and cumulative impacts does not require the project proponent to propose and implement mitigation to address such impacts. Project-specific mitigation as proposed to mitigate direct impacts inherently addresses reductions in reported cumulative impacts. However, impact disclosure primarily is for informative purposes. By disclosing these types of impacts, those concerned are provided a mechanism to contact responsible parties either contributing to such impacts or having regulatory authority pertaining to such matters. For example, the Environmental Protection Agency has enacted rules to reduce vehicle emissions at the national and regional levels. Local jurisdictions governing land development have enacted local zoning ordinances to control and regulate development.

Will the proposed action induce additional travel to occur?

Induced travel is a phrase often used to describe observed traffic volume increases occurring on a new highway after it is opened to traffic. The observation is prominent in areas where congestion is already evident (the Phoenix metropolitan area is a prime example) for the reasons summarized below.

The proposed action would be constructed where existing traffic congestion has already decreased travel speeds throughout much of the regional freeway system and the major arterial network. To avoid the congestion, over time, some travelers have diverted to alternative routes, changed the time they make their trips, switched to different travel modes, traveled to other destinations or decided not to make a particular trip at all. Because the proposed action would carry substantially more traffic before it would become congested, many of these travelers may switch to the new facility when opened to take advantage of decreased travel times. Some travelers using transit as a choice may also switch and further, some may choose to travel to a different (more distant) destinations (e.g., for shopping) or take a trip that they previously avoided altogether, because it was previously "too much trouble" to make. The behavior driving this switch is often associated with drivers' perception in resulting decreases in the generalized cost of travel, including both travel-time and out-of-pocket costs. However, it is commonly recognized the cause of this 'switch' is more complex; involving various travel behavior responses, evolving individual needs, residential and business location decisions and changes in regional population and economic growth.

Some induced travel would represent 'new trips' or 'induced demand.' However, most of the increase in traffic caused by induced travel is expected to come from trips already being made before the proposed action were put into operation (predictable traveler behavior accounted for in the travel demand forecasts conducted for the proposed action). The resulting traffic increase on the South Mountain Freeway is also expected to be largely offset by decreases in traffic volumes on parallel routes and at other times of the day. It is fully expected the net effect on daily vehicle miles of travel in the Valley as a result would be minimal. Examples in the Valley where this phenomenon has been experienced include the recent openings of the Pima Freeway in Scottsdale and Red Mountain Freeway in Mesa. Studies by the cities of Scottsdale and Mesa found substantial reductions in traffic volumes on parallel arterials within two miles of the freeways.

The results of both studies provide insight to general driver behavior. At the time of opening, both freeways represented to drivers a savings in time and/or cost in travel. Consequently, drivers moved from the arterial network to the freeway system. Over the course of time, it would be expected that some drivers would return to the arterial network as more vehicles traveled on the freeways. For the South Mountain Freeway project, a net reduction on the arterial network is anticipated through the design year 2030 as projected traffic volumes on the arterial network are projected to be less with the proposed action in place than without the proposed action.

For the proposed action, the minimal contribution to overall traffic use by induced travel is expected to have both positive and negative consequences (positive effects on the neighboring roadway network have been previously addressed). Changes in driving behavior leading to the use of the proposed action would be the result of perceived benefits which could include reduced total daily travel time and cost or an increased value associated with a new destination (e.g., a previously 'inaccessible' shopping area with more variety or lower costs).

As a negative consequence, each user of the proposed action would contribute to increased congestion on the freeway. As congestion grows on the new facility, the benefit attributable to potential travel time savings would be expected to decline. Congestion-related impacts (e.g., reduced air quality) would also increase over time. However, it is important to note the overall contribution to projected traffic volumes on the proposed action is anticipated to be minimal (some of which is accounted for in regional traffic models).

It is important to consider that improvements proposed for any type of transportation system (e.g., a new bus route, rail transit line or commuter rail service) would likely lead to changes in travel behavior, which in turn would lead to increased use of the particular system. It is the purpose of 'improvements' made to a given transportation system—to attract new users to the improvement. If this were not a primary goal, the improvement would not be effective nor warranted. For the proposed action, a goal is to attract users of other segments of the regional freeway system and the local arterial network, now and in the future, to the project to optimize, in part, the entire regional transportation system. Further, it is important to consider that as improvements are made to all transportation systems, cyclical benefits and impacts would occur. For example, as auto trips are diverted to transit (either due to direct improvements or increased congestion), traffic congestion on parallel highway facilities may lessen, at least temporarily. The resulting reduction in highway traffic congestion may, in turn, attract additional highway trips, similar to an increase in highway capacity.

The FHWA's current position relative to induced travel is consistent with the consensus of the transportation planning and travel behavior research community—induced travel is neither more nor less than the cumulative result of individual traveler choices and land development decisions made in response to an improved level of transportation service. Many of the travel choice decisions are accounted for in current travel forecasting models or land use transportation interaction models.

Will the proposed action lead to unplanned growth?

Unplanned growth is often termed urban sprawl. Generally, the reference is made in the context of the rapid and uncontrolled urban growth onto previously undeveloped land—usually on the outskirts of an existing urban area. Construction of projects like the proposed action is pointed to as a major contributor to urban sprawl. Freeway projects are often cited as making land at the urban fringe more accessible and therefore more attractive for development.

But as with issues surrounding induced growth, the relationship between transportation improvements and land development is complex. Land accessibility in a particular area as a result of a freeway project may make land more attractive for development, but other factors such as utility infrastructure, quality of public services, land acquisition and development costs, economic conditions and entitlement costs contribute major roles in determining where and how development would occur. And in fact, in many cases, new development being attracted to one part of a metropolitan region often represents development that has been redirected from other parts of the region.

The proposed action would occur in an already quickly urbanizing area (most noticeably in the Western Section of the Study Area). As such, the proposed action would not provide new or substantially improved access to a large undeveloped geographic area. The proposed action would occur in an area planned for urban growth as established in local jurisdiction land use planning activities for as much as the last 20 years. The purpose of the project is not to promote economic development but to respond to a growing need for additional transportation capacity as a result of Valley growth occurring now and as projected into the future.

Are the conclusions presented in this summary final?

Findings relative to impacts could change. Potential changes would be based on outcomes related to the following issues and will be presented to the public as part of publication of the Draft EIS, Final EIS and, if an action alternative were selected, in the final design process. The issues include:

- refinement in design features through the design process
- updated aerial photography as it relates to rapid growth in the Western Section of the Study Area
- ongoing communications with the City of Phoenix, Gila River Indian Community (GRIC) and other stakeholders to finalize measures to minimize harm to the South Mountains
- ongoing communications with the GRIC regarding granting permission to study action alternatives on GRIC land
- ongoing consideration of public comments
- potential updates to traffic forecasts as regularly revised by the Maricopa Association of Governments
- New previously unavailable data, studies, or analytical methods that would provide further insight to impact analysis and add value to the decision making element of the EIS process
- potential changes regarding updated census data
- regularly updated cost estimates for construction, right-of-way acquisition, relocation and mitigation

Even with these factors possibly affecting findings, the study team anticipates effects would be equal among the alternatives and, consequently, impacts would be roughly comparable. This assumption would be confirmed if, and when, such changes were to occur.

Cumulative and Secondary Impacts

As a member of the Citizens Advisory Team, how can you review the entire technical report?

The complete technical report is available for review by making an appointment with Mike Bruder at 602-712-6836 or Mark Hollowell at 602-712-6819.

Public Comments

Why request public comment in the Environmental Impact Statement (EIS) process?

As part of the National Environmental Policy Act (NEPA), requirements are established for public input during the preparation of an EIS. On this study, the Arizona Department of Transportation (ADOT), with the concurrence of the Federal Highway Administration (FHWA), has established an extensive public involvement plan, soliciting input throughout the process. The purpose of seeking public input is to assist the study team in identifying any new data pertinent to the EIS process and to gauge the understanding of the study status. Over the course of time, public issues and concerns regarding a project can change and seeking input throughout the process provides awareness of changes to the study team.

What are the goals of this public involvement program?

The goals of this public involvement program are to:

- Obtain public input to assist in a well-planned and researched EIS for the proposed action
- Provide ongoing information on the study and obtain input from the primary stakeholders and broader public
- Identify key issues and concerns of the public and ensure that these are appropriately considered during the process
- Develop and implement a process that maintains an open and continuing communication among the public, ADOT, FHWA and the study team
- Use multiple communication tools to effectively engage the public as a whole, thereby ensuring equal access to the NEPA process

How has the public been involved during this process?

Due to the importance of the proposed freeway to the region's transportation network, the potential impacts, and the level of public interest, ADOT and FHWA developed and implemented a comprehensive, inclusive and adaptive public involvement strategy for this project. This effort represents one of ADOT's most extensive public involvement programs undertaken in the Phoenix area. The following sections summarize activities since 2001.

More than 200 presentations have been made to community groups, homeowners' associations, chambers of commerce, village planning committees, trade associations, Citizens Advisory Team meetings and other interested parties.

Ten public meetings have been held. Fifteen days prior to each meeting, display advertising was placed in *The Arizona Republic*, the *Ahwatukee Foothills News*, the *Gila River Indian News*, the *Tribune*, *La Voz* and the *West Valley View*. (A total newspaper circulation of approximately 260,000 carried an announcement of each public meeting.)

One meeting notice flier and four newsletters have been distributed throughout the Study Area in the following quantities (per distribution per meeting): 28,500 door hangers;5,000 inserts in the *Gila River Indian News*;and 28,000 inserts in the *Ahwatukee Foothills News*. In addition, newsletters and fliers were sent to over 4,500 individuals on the project mailing list. In

November 2008, a newsletter updating the public about the study will be distributed to the Study Area and mailing list.

A study Web site (www.ValleyFreeways.com or www.SouthMountainFreeway.com) and e-mail address (ADOT@PolicyDevelopmentGroup.com) was provided so that the public could receive the latest study information and provide feedback. Approximately half of the comments that have been received were submitted electronically through the Web site or by e-mail. Over 5,000 comments have been received.

More than 790 news articles have been published in the region's newspapers.

A study hotline number (602.712.7006) was established so that the public could provide feedback on the study. The hotline is checked daily, with messages forwarded to the appropriate individuals for a response. Over 480 calls have been received.

What are the issues that have the highest public concerns?

This document summarizes public comments received from November 2005 to October 2008. Previous documents have summarized the comments received prior to November 2005. Comment topics were categorized by the study team as being related to the alternatives, community, construction, design, environment, process, right-of-way and miscellaneous:

- Alternatives—comments that identified an alternative preference (including No-Action) or specifically related to the Eastern or Western sections
- Community—comments regarding area issues, such as economics, relocations, growth, character and cohesion, facilities and services
- Construction—comments related to potential project cost and schedule
- Design—comments related to proposed interchanges, operations and safety
- Environment—comments concerning air and noise pollution, health concerns, traffic, energy, utilities, land use, water, floodplains, geology, visual, farmlands, secondary and cumulative Impacts
- Process—comments concerning the public, agency and alternatives screening processes
- Right-of-way—comments concerning properties and facilities in the Study Area and the right-of-way process
- Miscellaneous—other comments received

Below is a summary of the frequently received questions and comments regarding each of the identified issues. Please note that additional specific comments and questions were received and are considered throughout the NEPA process.

<u>Alternatives</u>

- Support of one of the alternatives (W55, W71, W101, E1)
- Support of the No-Action Alternative
- Support of another alternative (such as on Gila River Indian Community [GRIC] land)

Public Comments

Community

- Concern that the freeway would cause an increase in traffic congestion on local streets.
- Does ADOT account for the lost homeowner's association fees from properties that they purchase?
- What should be expected for the loss of property taxes due to ADOT purchasing properties?
- The freeway would lock in Ahwatukee causing degradation to the community.
- How do impacts to residences in this area compare to those for the other freeways that have been recently constructed?

Construction

- Why wasn't this freeway constructed years ago, when there wasn't as much development in the area?
- When would construction begin and how long would it last?
- What procedures does ADOT follow when blasting rock near residential neighborhoods?
- What would be done with the excess material from the excavated rock from the South Mountains?

Design

- What is the profile option that ADOT is recommending (aboveground, belowground or surface level) and would it affect noise levels and visual quality?
- The level of engineering design is not adequate to determine the feasibility of the project;the freeway should be designed to 100 percent to determine the full extent of the impacts.
- When will information be released to the public regarding the drainage data and the proposed locations for retention or detention basins?
- Where would the interchanges be located for this proposed freeway?
- Where would the noise walls be located?
- Would rubberized asphalt be used on the freeway?
- Would any utilities need to be relocated, and if so, where?
- Could a parkway be considered along the proposed alignment, rather than a freeway?
- How many lanes would this freeway contain, six or ten?
- High-occupancy vehicle lanes should be included in the initial construction and not added later.

Public Comments

Environmental

- This freeway would cause increased air, noise and light pollution to the area.
- What would be the health effects of a freeway in this area with the South Mountains trapping some of the air pollution in Ahwatukee?
- What are the health and noise impacts of having this proposed freeway adjacent to several schools on Pecos Road?
- How much would noise increase in the Study Area?
- Would this freeway impact any cultural sites?
- How were the cultural sites identified?
- Why would ADOT propose an alternative that would require excavation in the South Mountains?
- The proposed freeway should not be constructed in the Phoenix South Mountain Park/Preserve.
- What is the definition of a Section 4(f) facility?
- Can the list of identified hazardous materials sites in the Study Area be provided to the public?
- Would this freeway impede Salt River water flow?
- What level of flood protection was evaluated?
- What would ADOT do to accommodate wildlife?

Process

- Can the public make formal comments on the study before ADOT and FHWA make their recommendation on this proposed freeway?
- What is the Maricopa Association of Governments' role in this process?
- When is the next public meeting scheduled?
- Request for ADOT to present the latest study information at a homeowner association meeting.
- ADOT did not take the SMCAT Western Section alignment recommendation into account when they selected the W55 Alternative as the preliminary preferred alternative.

Right-of-way

- Would the proposed freeway alignment impact a particular property (or a property that someone is considering purchasing)?
- What is the ADOT right-of-way purchasing process and are property owners given fair market value for their land?

Public Comments

- What is ADOT doing for those individuals who can't sell their homes because of the location to the proposed freeway?
- Is ADOT maintaining the properties that they have already purchased in the Study Area?
- When purchasing property, how does ADOT compensate the loss of homeowner association dues?
- What are ADOT's criteria for early buy out of properties that are located in the proposed right-of-way?
- How does ADOT compensate owners of wells in the proposed right-of-way?
- Why isn't ADOT preventing development in the proposed right-of-way?
- Does ADOT compensate property owners for a loss of visual quality, due to a freeway or noise wall related to a freeway?
- Does a home adjacent to a freeway lose property value?

Miscellaneous

- When will the Draft EIS be released for public review?
- When will the decision, regarding whether this freeway will be constructed, be made?
- Information regarding development on GRIC land is not being incorporated into the study. Concern that ADOT is making decisions on this freeway without all the necessary information.
- Is this proposed freeway a part of the CANAMEX Corridor?
- Concern that the proposed freeway will be a truck bypass route.
- How is this freeway being funded?
- How are increases in energy costs affecting this proposed project?
- What is the latest projected total cost?
- How often is the information in the working copy of the Draft EIS updated?

Public Comments

What is the relevance of this information?

The understanding of public comment is an integral component of the NEPA process. This document summarizes public comments received from November 2005 to October 2008. The study team will continue to use public input to "mold" the scope of this study. Additionally, ADOT and FHWA will continue to seek input from the public, agencies and jurisdictions regarding the proposed freeway through the EIS process, and, if an action alternative is selected in the Record of Decision, through the design phase and construction.

What opportunities will be offered to the public when the Draft and Final EIS is released for public review?

During the public release of the Draft EIS, there will be a 90-day public comment period (a 45-day comment period is the minimum requirement).The public comments received during the comment period will be evaluated and addressed in the Final EIS. The public will also have the opportunity to comment on the Final EIS. When this document is released for public review, the public will have a 60-day public comment period to submit their final comments (a 30-day comment period is the minimum requirement). Copies of the Draft EIS and Final EIS will be made available to the public during the comment period through a variety of methods, including online access through the project Web site and advertised information repositories (e.g., libraries, FedEx/Kinkos)

As a member of the Citizens Advisory Team, how can you review the entire technical report?

The complete technical report is available for review by making an appointment with Mike Bruder at 602-712-6836 or Mark Hollowell at 602-712-6819.

The following questions or issues were brought forward as part of recent South Mountain Citizens Advisory Team (SMCAT) meetings and designated as parking lot issues because the study team needed to conduct research to address the question or issue accordingly. In addition, questions submitted on blue question cards by SMCAT members and the public are answered below. Each comment received on a blue question card is written in this document as submitted. Each parking lot issue is addressed by presenting the question asked, followed by the Arizona Department of Transportation's (ADOT) written response.

This document is divided into three sections. The first section lists the questions from the August 12 meeting that a member of the CAT requested additional clarification in the ADOT responses. The subsequent sections contain ADOT responses to a carry-over question from the August 12 meeting and a new question from the September 25 meeting.

Questions addressed from the August 12 meeting with revised responses

Topic	SMCAT member/public question	ADOT response
Economic impacts	What should be expected for the loss of home values and the associated loss of property taxes and tax revenues for the state, city and schools?	The annual loss of property tax revenue due to the conversion of land to a transportation use was reported in the Economics Draft Technical Report Summary. Based on existing land uses in the E1 Alternative the impact for the City of Phoenix would be $199,646. Using the same assumptions and current tax rates for other tax districts, the annual loss of property tax revenue for the following groups were also calculated. • Maricopa County—$96,444 • Maricopa County Community Colleges—$92,234 • Tempe Union High School District—$227,809 • Kyrene Elementary School District—$308,198 • Flood control—$16,596 • Central Arizona Water Conservation—$12,141 • Fire—$643 • Library—$4,286 • Health Care—$10,392 • East Valley Institute of Technology—$6,070 (continued on next page)

Topic	SMCAT member/public question	ADOT response
Economic impacts (continued)	What should be expected for the loss of home values and the associated loss of property taxes and tax revenues for the state, city and schools?	It is not possible to assign a monetary value for the change in property values of individual homes with the freeway constructed. Many variables contribute to home values including location, comparative pricing, economic conditions, growth markets and personal preferences. Studies to assess freeway effects on home values have had variable conclusions. In general, homes located closest to the freeway are negatively impacted while homes located farther away are positively affected. The net result is a non-impact on the total property tax revenues. A case study done by the Arizona Transportation Research Center on US 60 (Superstition Freeway) is attached.
	What about the loss of the community's desirability due to the freeway "locking in" the community? It would be a degradation to the entire Ahwatukee community.	It is not possible to determine a monetary value for changes to the desirability of a community. Similar to home values, many variables contribute to a community's desirability.
	What about the cost of air quality and the health issues created for residents and schoolchildren?	Air quality impacts associated with the Action and No-Action alternatives will be discussed at the SMCAT air quality panel meetings. A discussion of whether those impacts are quantifiable will be included.
	What about the loss of value of the South Mountain Park and the ridgelines, which would be destroyed?	The real estate value of the parkland is included in the right-of-way cost estimate. It is ADOT's policy to not publish individual property information because the appraisal and acquisition process is still pending. The South Mountains as a natural resource are not assigned a monetary value. Their importance as part of a public park, as a historic site, and as a traditional cultural property are addressed in detail in the Section 4(f) evaluation in the DEIS.
	What about the loss of value and future tax revenue on state trust land? There should be an amount for the value of the state trust land, which will be devalued.	ADOT would compensate the State Land Department for the acquisition of its property. This cost is included in the right-of-way portion of the project cost estimate. It is ADOT's policy to not publish individual property information because the appraisal and acquisition process is still pending.

Topic	SMCAT member/public question	ADOT response
Economic impacts (continued)	ADOT has put a monetary figure on time. Can they put a monetary value on vision or view? Do you have a value that takes this into account? The loss of monetary value is huge for the people who are left behind.	It is not possible to assign a monetary value for the change in vision or view for individual properties with the freeway constructed. Many variables contribute to the value of a view that would be subjective in nature based on individual preferences. A general discussion of visual impacts is presented in the Visual Resources Technical Report Summary. The methodology used quantifies the impact through assignment of numeric values to visual quality and character to allow for meaningful comparison of impact. However, it is not the intent of the National Environmental Policy Act (NEPA) to comprehensively assign monetary value to impact analyses. Several aspects of the environment (i.e., social conditions and visual quality) typically require a qualitative assessment of impacts because of the variables associated with variations in human perception.

Questions addressed from the August 12 meeting

Topic	SMCAT member/public question	ADOT response
Traffic projections/ economics	Where can I get the detailed projected traffic volume data (cut-line analysis) for the South Mountain Freeway? This would be the traffic volume on which the $400 million per year in time savings at $16.25 per hour is based. Please provide enough source reference for a Freedom of Information Act request. I think it would be interesting seeing some of that cumbersome data.	Traffic data related to the South Mountain Freeway was previously presented to the CAT during the December 2007 meeting. A cut-line graphic as well as other traffi-related sources are included in the meeting materials and presentation. The economic analysis (travel time savings) was based on the statistical output from the Maricopa Association of Governments' (MAG) regional travel demand model. The comparison was between the region's hours of traffic delay with and without the proposed freeway. The model output showed that there would be over 47 million less hous of delay in 2030 with the proposed freeway. A person's time was estimated at $16.25 per hour. 47 million hours times $16.25 per hour equals $772 million. This value was then discounted to today's dollar (3%/year) to get the $400 million per year savings. Due to the proprietary software used and the complexity of the system, MAG is not able or obligated to release the full travel demand model. References and materials related to the model (socioeconomic data, plots, volumes) are available from the MAG Web site (http://www.mag.maricopa.gov) or can be requested from MAG (contact Bob Hazlett, bhazlett@mag.maricopa.gov). The MAG model is regularly reviewed by peer agencies and the U.S. Environmental Protection Agency. It continually receives high marks within the industry.

Questions addressed from the September 25 meeting

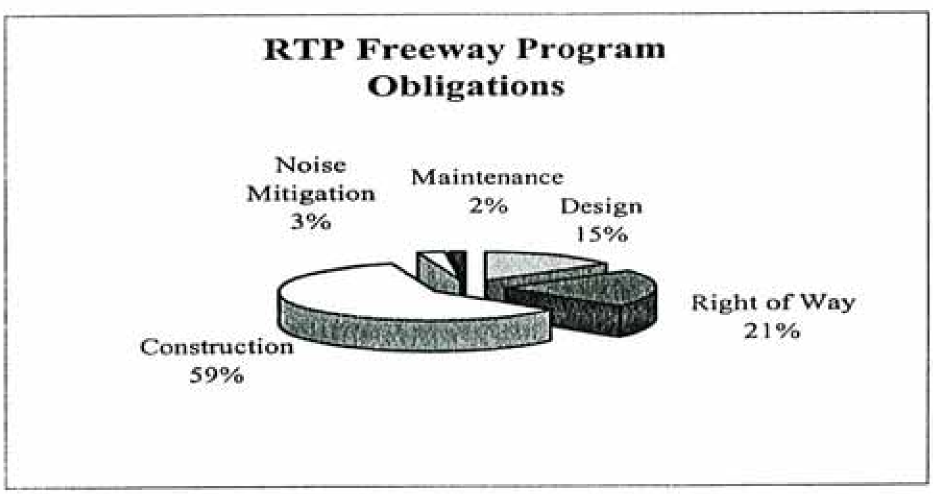
Topic	SMCAT member/public question	ADOT response
Cost Estimate	Can you provide us with the current costs to construct this freeway with 10 lanes, rather than 6?	*The cost to widen from the interim 6-lane freeway to the ultimate 10-lane freeway is still being developed as part of the Design Concept Report development.* The recently awarded construction project to widen the median of I-10 (Papago Freeway) between Sarival Avenue and SR 101L by two lanes cost approximately $13 million per mile. The conditions (adding 1 general purpose lane and 1 HOV lane, long river bridge at Agua Fria River, at-grade/elevated profile) are similar to the second phase proposed for the South Mountain Freeway. Given that, the second phase (median widening) of the 22-mile South Mountain Freeway would cost approximately $300 million.

Obligations

Obligations by phase and corridor are listed in the table below. These figures are through June 30, 2008. Regional Transportation Plan Freeway Program (RTPFP) obligations since the last certification increased $336 million, from $1,171 million to $1,507 million.

Regional Transportation Plan Freeway Program Obligations
Through June 30, 2008
(dollars in millions)

Corridor	Design	Right of Way	Construction	Noise Mitigation	Maintenance	Total
I-10, Papago & Maricopa	$21.2	$12.8	$117.5	$0.0	$0.0	$151.5
I-10 Reliever (SR801)	$0.0	$15.0	$0.0	$0.0	$0.0	$15.0
I-17, Black Canyon	$12.1	$92.2	$267.3	$0.0	$0.0	$371.6
SR51, Piestewa	$3.5	$0.0	$47.6	$0.0	$0.0	$51.1
US60, Grand Ave	$5.5	$1.0	$6.1	$0.0	$0.0	$12.6
US60, Superstition	$2.3	$0.0	$123.7	$0.0	$0.0	$126.0
SR74	$0.0	$1.0	$0.0	$0.0	$0.0	$1.0
SR85	$32.1	$19.9	$44.2	$0.0	$0.0	$96.2
SR87, Duthie-Martin	$2.5	$0.4	$21.5	$0.0	$0.0	$24.4
SR88, Apache Trail	$0.2	$0.0	$0.2	$0.0	$0.0	$0.4
US93	$0.0	$10.3	$32.3	$0.0	$0.0	$42.6
101L, Agua Fria	$0.7	$0.0	$26.4	$0.0	$0.0	$27.1
101L, Pima	$8.6	$4.0	$132.2	$0.0	$0.0	$144.8
101L, Price	$5.0	$0.0	$55.6	$0.0	$0.0	$60.6
SR153, Sky Harbor	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
202L, Red Mountain	$4.3	$0.0	$7.7	$0.0	$0.0	$12.0
202L, Santan	$0.0	$0.0	$0.5	$0.0	$0.0	$0.5
202L, South Mountain	$8.3	$12.0	$0.0	$0.0	$0.0	$20.3
SR303L, Bob Stump Memorial Parkway	$46.1	$95.4	$0.0	$0.0	$0.0	$141.5
Williams Gateway	$0.0	$24.3	$0.0	$0.0	$0.0	$24.3
Systemwide	$77.5	$22.7	$9.2	$50.6	$23.3	$183.3
TOTAL	$229.9	$311.0	$892.0	$50.6	$23.3	$1,506.8



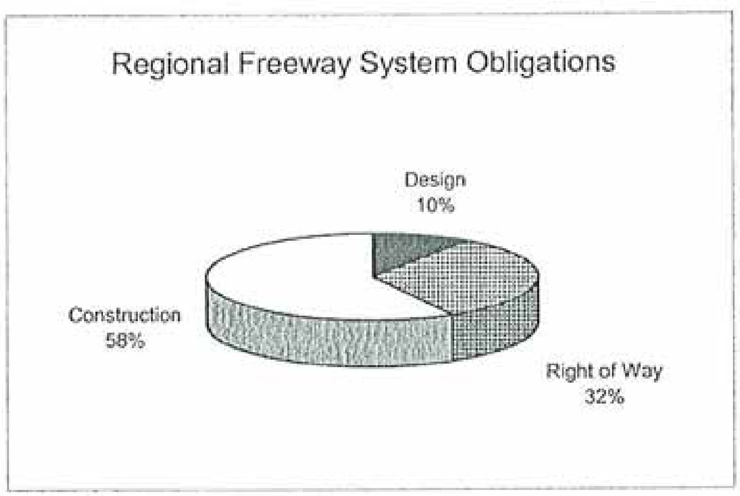
Obligations

Obligations by phase and corridor are listed in the table below. These figures are through June 30, 2007 and include obligations made prior to 1986 using 15% controlled access monies. Regional Freeway System obligations since the last certification increased $37 million, from $5.696 billion to $5.733 billion.

Regional Freeway System Obligations
Through June 30, 2007
(dollars in millions)

Corridor	Design/Utility	Right of Way	Construction	Totals
Agua Fria	$64.1	$260.0	$356.7	$680.8
Bob Stump Memorial Parkway (303L)	$4.6	$1.6	$6.7	$12.9
Grand Ave	$24.0	$71.8	$145.9	$241.7
Hohokam	$22.2	$61.1	$105.7	$189.0
Paradise*	$4.1	$33.1	$0.0	$37.2
Pima	$117.9	$500.0	$694.7	$1,312.6
Price	$53.6	$59.0	$208.1	$320.7
Red Mountain	$82.3	$364.0	$827.0	$1,273.3
Santan	$45.9	$303.5	$676.1	$1,025.5
Sky Harbor	$9.4	$18.2	$34.0	$61.6
South Mountain	$11.1	$32.0	$43.3	$86.4
State Route 51	$27.0	$146.8	$205.7	$379.5
System Wide	$85.2	$21.0	$5.9	$112.1
Total	**$551.4**	**$1,872.1**	**$3,309.8**	**$5,733.3**

* Paradise Corridor was deleted from the Regional Freeway System and right of way was sold.



Paper No. 03-2150

Impact of Highways on Property Values
Case Study of Superstition Freeway Corridor

Jason Carey and John Semmens

The effects of freeway development on land use and property values were examined. A case study was prepared for the Superstition Freeway (US-60) corridor in Mesa and Gilbert, Arizona. Among the findings were the following observations. First, access benefits are transferred from highway users to nonusers through changes in property values. Freeway construction may have an adverse impact on some properties, but in the aggregate, property values tend to increase with freeway development. Second, freeways do not affect all properties' values in the same way. Proximity to the freeway was observed to have a negative effect on the value of detached single-family homes in the US-60 corridor but a positive effect on multifamily residential developments (e.g., condominiums) and most commercial properties. Finally, the most important factor in determining negative impact on property values appears to be the level of traffic on any major roads in the proximate area, which implies that regional traffic growth is more significant than the presence of a freeway per se.

Freeway development can have an impact on highway users and nonusers alike, and most opposition to freeway development has traditionally come from existing residential property owners. Although all highway benefits are derived from lower transportation costs, they can also be represented as changes in the real incomes (i.e., value of environmental amenities, safety, and other goods not normally provided in the marketplace) of individuals, which may in turn be capitalized into asset values such as the value of land (*1*). Property owners who oppose freeway development often feel that they will be adversely affected by environmental consequences of freeways (e.g., noise and air pollution) that may not be offset by their gains from lower transportation costs.

This research was intended to examine the impact of freeways on property values by examining the case of the Superstition Freeway in the Phoenix, Arizona, metropolitan region. Property sales data were used to estimate the net impact of the Superstition Freeway on a sample of properties in the freeway corridor.

BACKGROUND AND METHODOLOGY

The Superstition Freeway was constructed along the $\frac{1}{2}$-mi street alignment between Southern Road and Baseline Road. Construction began in 1969 and was completed to Power Road in east Mesa in 1985. The freeway was widened from four to six lanes in 1983 to 1984. The freeway is a depressed design with limited access at increments of approximately 1 mi. The depressed design typically has been associated with the most positive impact on surrounding residential land values (*2*). Depressed-grade freeways not only are less visible to surrounding properties but also provide an added buffer for freeway noise and air pollution, both of which have been shown to disperse in an upward pattern from depressed sites (*3, 4*).

Several impact mitigation strategies were implemented during construction of the Superstition Freeway. These include a vegetated right-of-way barrier between freeway and residential property lines, a barrier wall 8 to 10 ft high for noise mitigation and privacy for abutting residential locations, and pedestrian walkways connecting abutting neighborhood parks and school sites in some neighborhoods (*5*). During subsequent widening and improvements, the Arizona Department of Transportation adopted the policy of raising or reconstructing existing noise walls along the corridor, or adding new noise walls as necessary, to mitigate noise (*4*).

Properties to be examined for this study were selected from a property sales database from the most recent records on file at the Maricopa County Assessor at the time of collection. Properties were selected from the metropolitan area on the basis of distance from the Superstition Freeway. Sufficient paired sample data were available only for two subsets of residential properties: (*a*) detached single-family homes and (*b*) condominiums. Insufficient data were available for comparison of price appreciation for vacant (unimproved) land and commercial properties.

SUPERSTITION FREEWAY CASE STUDY RESULTS

Property sales data were collected for parcels located in an area from Price Road to Power Road (12 mi west to east), within 5 mi north or south of the Superstition Freeway (Figure 1). Sales results were subcategorized according to property type and zone. Zone A refers to properties on streets immediately adjacent to US-60. Zone B refers to properties located within $\frac{1}{2}$ mi of US-60, exclusive of properties classified as Zone A. "Major street" refers to properties in the control zone (Zone C) that were located on major mile streets. These streets generally exhibit the largest amount of traffic of surface streets in the metro area. Table 1 summarizes the number of transactions recorded for each property type. Sales recorded for nonresidential locations were limited to the impact area (Zone B) and control area (Zone C). No nonresidential sales records for Zone A were identified in the sample.

Due to the small number of nonresidential sales recorded and the scarcity of data related to these transactions, only general comparisons were made for commercial and industrial property classes. The larger numbers of recorded transactions for residential properties and the completeness of residential data sets allowed for greater detail in the analysis of results.

J. Carey, 4304 East Campbell Avenue, #2030, Phoenix, AZ 85018. J. Semmens, Arizona Transportation Research Center, 206 South 17 Avenue, mail drop 075R, Phoenix, AZ 85007.

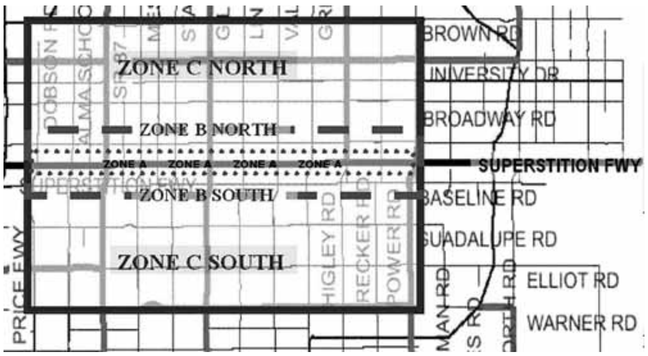


FIGURE 1 Superstition Freeway corridor study area. (Source: Maricopa Association of Governments, 2003.)

Detached Single-Family Housing Sample Results

The effects of freeways on the value of detached single-family residential properties have been among the most documented of property value effects related to freeway development. Previous research methods used in the comparison of residential properties have ranged from simple comparisons of average price per square foot (*5*) to multivariate regression models (*3, 6*). Because the sample of residential properties in the Superstition Freeway corridor was sufficiently large, multiple methods were used to compare the properties selected for the study.

Detached Single-Family Housing Descriptive Statistics by Zone

The sample distribution of structure size was quite similar for all zones, with average home size ranging from 1,545 ft^2 to 1,571 ft^2. The range of structure size increased with the zone sample size, Zone C having the largest range of values and Zone A the smallest. However, all structure-size measures for the three zones were generally similar, and a *t*-test revealed no statistically significant difference in home size between pairs of zone locations.

Homes in the control zone tended to be oldest at the date of sale, as measured by the difference between the sale date and the year the home was built. Average age at date of sale was 6.2 years for properties in Zone A and 6.7 years for Zone B, whereas homes in Zone C averaged 8.3 years of age. Median structure age was 5 years in both Zone A and Zone B, while median structure age in Zone C was 7 years. Statistically, no age difference was observed between structures in Zone A and Zone B, but a significant difference was observed between structures in the impact zones and the control zone.

Despite the difference in structure age, average and median adjusted residential sales prices recorded for the three zones were highest in Zone C. No statistically significant difference in adjusted price was observed between Zones A and B. However, Zone C average sales prices were sufficiently higher than those in the impact zones to be statistically significant at a 95% level of confidence. These results tend to match the earlier Tempe findings (*5*), with properties in Zone C selling for a larger amount per square foot and properties in Zone A selling for the least per square foot, in most years observed.

However, sales price per square foot is not an ideal measure of value. Many other factors can influence sales price. Multiple variables acting in tandem can offset the effects of others. To determine the net effect of a given variable, such as location, on housing price, a more sophisticated analysis must be undertaken.

TABLE 1 Property Sales Transactions by Zone and Type

Property Type	Zone A	Zone B	Zone C	Total
Residential				
Detached single-family	403	1,896	1,358	3,657
Condominiums	124	214	271	609
Vacant land	2	3	3	8
Nonresidential				
Office and financial	0	3	21	24
Retail and services	0	8	47	55
Restaurants	0	7	6	13
Apartments	0	4	16	20
Industrial	0	1	1	2
Agricultural	0	1	15	16
Total sales records	529	2,137	1,738	4,404

Sales Price Regression Results for Detached Single-Family Homes

Regression analysis was used to determine the net effect of individual variables on housing prices when all other variables were held constant. Three regression analyses were run. The first identified properties by zone, specifying Zone A (adjacent) and Zone B (impact area) as property characteristics, with Zone C left as the control. The first analysis thus attempted to identify any net effect on property value associated with location by zone.

The second analysis attempted to determine whether net effects (e.g., noise, access) from the freeway were comparable with the net effects of large, heavily traveled surface streets. The second regression used only properties in Zone A and Zone C, but split Zone C into "traffic-affected" properties located on major thoroughfares (i.e., mile-grid streets) and a "traffic-insulated" control zone. Because some freeway impact on property values was assumed to exist for the properties located in the impact area (Zone B), Zone B was excluded from the street-based analysis to avoid the possibility of confounding results by mixing the impacts of multiple "environmental" variables. Regression results for the "zone-based" and "major streets" analyses are shown in Table 2.

Both regression models had nearly the same explanatory value, as measured by the *r*-squared statistic. The zone-based and street-based regression analyses both explained approximately 80% of the variation in prices for detached single-family homes. Despite a smaller sample size, the overall explanatory value of the regression comparing Zone A and control zone properties located on major through streets was nearly the same as that of the zone-based comparison. However, the smaller sample for the latter analysis also resulted in a larger standard error.

The street-based model had a comparable explanatory value ($r^2 = 0.789$) to that of the zone-based model ($r^2 = 0.795$), but the smaller sample led to larger fluctuations in variable coefficients. Despite these differences in sample size and significance, however, comparable results were reached using the street-location regression. Most coefficients had values similar to the results of the zone-based analysis, although confidence intervals tended to be slightly larger and thus somewhat less reliable.

Structure depreciation, represented by housing age at date of sale, was found to have a deleterious effect on home value. Reduction in housing price due to depreciation was estimated at $613 current dollars per year of age. Housing location was also found to

TABLE 2 Regression Coefficients for Detached Single-Family Housing

Variable	Coefficient[1]	Standard Error	*t*-Stat	*P*-Value[2]	Confidence Interval	
					Lower 95%	Upper 95%
Zone-Based						
Intercept	0	N/A	N/A	N/A	N/A	N/A
Bldg. Sq. Ft.	$40.86	$0.96	42.5341	0.000000000	$38.98	$42.75
Lot Sq. Ft.	$2.26	$0.11	20.6043	0.000000000	$2.05	$2.48
Pool Sq. Ft.	$13.80	$1.48	9.3119	0.000000000	$10.89	$16.70
Bath Fxtrs.	$2,498.41	$222.76	11.2158	0.000000000	$2,061.67	$2,935.15
Age	-$613.36	$35.50	-17.2796	0.000000000	-$682.95	-$543.77
Porch/Patio	$2,090.60	$558.40	3.7439	0.000184003	$995.78	$3,185.41
Air Cond.	$25,073.99	$1,799.29	13.9355	0.000000000	$21,546.27	$28,601.71
Evap. Cool	$24,264.22	$3,246.40	7.4742	0.000000000	$17,899.28	$30,629.17
Quality Good	$10,307.53	$836.62	12.3205	0.000000000	$8,667.25	$11,947.82
Carport	$2,670.10	$630.64	4.2339	0.000023529	$1,433.65	$3,906.54
Garage	$5,604.54	$610.42	9.1814	0.000000000	$4,407.74	$6,801.34
Zone A	-$6,299.45	$790.83	-7.9656	0.000000000	-$7,849.96	-$4,748.93
Zone B	-$3,245.93	$502.53	-6.4591	0.000000000	-$4,231.21	-$2,260.66
Street-Based						
Intercept	0	N/A	N/A	N/A	N/A	N/A
Bldg. Sq. Ft.	$42.21	$1.45	29.1580	0.000000000	$39.37	$45.05
Lot Sq. Ft.	$2.20	$0.17	12.6102	0.000000000	$1.86	$2.55
Pool Sq. Ft.	$12.80	$2.26	5.6622	0.000000017	$8.37	$17.23
Bath Fxtrs.	$3,126.73	$340.08	9.1940	0.000000000	$2,459.72	$3,793.74
Age	-$565.28	$52.05	-10.8597	0.000000000	-$667.37	$463.19
Porch/Patio	$1,708.27	$928.29	1.8402	0.065902361	-$112.40	$3,528.94
Air Cond.	$18,803.58	$2,773.99	6.7785	0.000000000	$13,362.90	$24,244.25
Evap. Cool	$18,259.28	$4,290.32	4.2559	0.000021922	$9,844.59	$26,673.97
Quality Good	$7,970.00	$1,302.20	6.1204	0.000000001	$5,415.97	$10,524.04
Carport	$3,309.60	$1,008.81	3.2807	0.001055849	$1,331.01	$5,288.19
Garage	$6,201.22	$965.28	6.4243	0.000000000	$4,308.00	$8,094.44
Zone A	-$6,573.78	$861.99	-7.6262	0.000000000	-$8,264.42	-$4,883.13
Major Street	-$3,521.83	$1,490.44	-2.3629	0.018239645	-$6,445.07	$598.59

[1] Coefficient refers to the estimated dollar effect associated with a one-unit change in the variable when all other variables were held constant.
[2] Based on a 95% level of confidence, *P*-values less than 0.05 were considered statistically significant.

be a significant determinant of sales price, with homes in the impact area selling for less than comparable homes in the control area. The impact of location was more pronounced for homes abutting the Superstition Freeway than for homes in the remainder of the ½-mi impact area. Homes in Zone A sold for an estimated $6,300 less in current dollars relative to comparable properties in the control zone. Homes in the remaining impact area (Zone B) sold for an estimated $3,246 less than control zone properties, all other variables being equal.

The regression model results suggest that proximity to the Superstition Freeway does have a negative impact on property values for detached single-family residences. At a 95% level of confidence, developed residential properties abutting the freeway could be expected to incur a reduction in value of $4,749 to $7,850 in current dollars, based on location. Homes in the broader impact area (Zone B) incurred a discount to constant value ranging from $2,261 to $4,231 in current dollars at a 95% level of confidence. Although these results do not guarantee that proximity to the freeway had a negative impact on residential property values, the results strongly suggested that this was the case for sampled homes having characteristics within the ranges measured.

While homes in proximity to the freeway sold for less than homes in the control area, the question remained as to whether some unmeasured variable, unrelated to the freeway, accounted for the observed variation in sales prices by zone. To clarify the results obtained by the first regression, the second analysis was run using only abutting properties (Zone A) and control zone properties (Zone C). However, control zone properties were subdivided into homes located on major surface streets and those located on smaller streets. The former were identified according to the mile-grid streets in the metropolitan area and were hypothesized to suffer some of the same environmental effects attributed to the freeway. The latter category was assumed to be a control area insulated from these effects.

Both Zone A and major street property locations were found to sell at a statistically significant discount to control area properties. Zone C properties located on major streets were estimated to sell for $3,522 less than comparable properties in the control area. The *p*-value measured for the major streets variable was considerably larger than the *p*-value for Zone A but was well within the range of 95% confidence. Nonetheless, this produced a relatively larger range of coefficients for the confidence interval. The negative effect of a major street location was between $599 and $6,445 in current dollars at a 95% level of confidence. However, these results, as well as the traffic analysis, suggested that traffic volumes and the accompanying noise and air pollution were in fact the determinants of the price differential observed for impact area residential properties.

The longer-term effects of this impact were examined using appreciation indexes of changes in actual sales price for single-family housing prices. An index of price appreciation was created for each detached single-family residence for which repeat sales could be identified. The original value of each parcel was scaled to a value of 1.00, and subsequent sales were assigned index values relative to the change from the starting price using the following formula:

$$\text{INDEX}_{\text{END}} = \left(\frac{\text{PRICE}_{\text{END}}}{\text{PRICE}_{\text{START}}}\right) \times \text{INDEX}_{\text{START}}$$

All index values were assigned on the basis of change from the original sales price, regardless of the number of sales for a given parcel. Index values could then be aggregated to create an unweighted price appreciation index for each zone in the Superstition Freeway corridor.

Price index values for each zone are shown in Figure 2. Average appreciation in sales prices tended to be lowest for homes abutting the freeway. Average year-over-year price appreciation for homes in the entire metropolitan statistical area was 3.73% from 1980 to 2000. Over the same period, year-over-year price appreciation for homes in Zones A and B was significantly lower, averaging 2.81% and 2.89%, respectively. In contrast, sales prices for homes in Zone C increased by an average of 4.32% year over year from 1980 to 2000. Properties in Zone B increased in value most rapidly in the early years (1980 to 1985) but slowed considerably after the freeway was completed to the eastern edge of the study area. The slower appreciation in the areas most proximate to the freeway suggests that, in the aggregate, property owners in Zone C experienced comparable benefits of proximity to the freeway without having to experience deleterious effects of traffic noise and pollution levels. The price differential among traffic-affected and traffic-insulated Zone C properties in the major streets analysis (Table 2) provides support for this hypothesis.

Because the results of the street-based regression indicated that traffic levels in general, regardless of type of thoroughfare, may have a significant effect on residential property sales, a third regression analysis was done to examine the effects of changes in traffic on US-60 on detached residential sales prices by zone. Average daily traffic (ADT) on US-60 from 1980 to 2000 was allocated to Zone A and Zone B properties in lieu of the yes/no responses for each zone. Hence, the possible values were zero (a "no" response) or the section length ADT for that year. The study area ADT values were estimated by using the total daily vehicle miles of travel for each US-60 segment divided by the total length of the Superstition Freeway study area. This was done to avoid double-counting vehicles that remained on the freeway for multiple segment lengths.

The results of this traffic-based analysis are given in Table 3. The *r*-square statistic for this analysis was 0.794, indicating that the regression model explained 79% of the variability in housing price. All variable coefficients were found to be statistically significant at the 95% level of confidence. Proximity to the freeway was found to have a more deleterious effect on property values when freeway traffic levels were higher across the study area boundaries. For the abutting properties in Zone A, ADT across the length of the study area freeway sections corresponded with a \$0.052 drop in detached single-family property values per vehicle. Property values in Zone B fell by \$0.027 per vehicle. All dollar amounts were standardized to year 2000 levels.

The reduction in housing prices as freeway traffic increased suggested that the drawbacks of proximity to the freeway were attributable to vehicle traffic. This would indicate that noise and air pollution did have a negative effect on property values that was not explained by differences in other housing characteristics. However, as indicated in the street-based analysis, these impacts were not the product solely of the freeway. Traffic on any street might be expected to have a negative impact on housing prices nearby. The incremental influence of each vehicle may or may not exhibit a linear relationship. Traffic data were not collected for the street-based analysis, so the possibility of a differential in traffic impacts between the freeway and surface streets could not be tested. However, given the depressed grade and noise mitigation improvements of the Superstition Freeway, it is

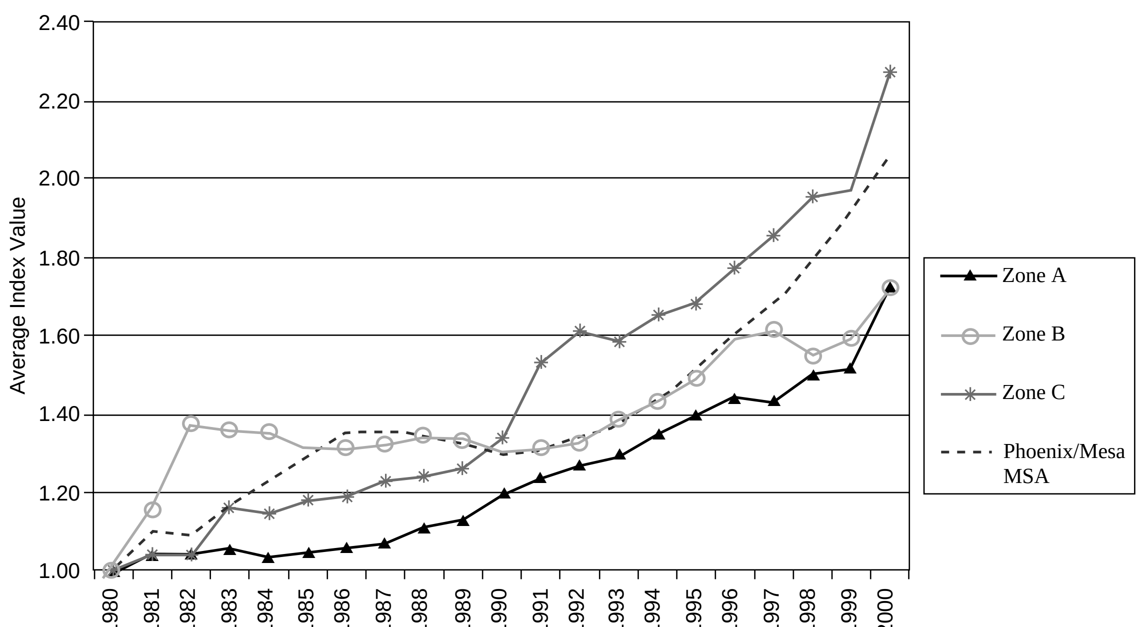


FIGURE 2 Residential price appreciation indexes, Superstition Freeway corridor.

TABLE 3 Traffic-Based Regression Coefficients by Zone for Single-Family Housing

Variable	Coefficient	Standard Error	*t*-Stat	*P*-Value	Confidence Interval	
					Lower 95%	Upper 95%
Intercept	0	N/A	N/A	N/A	N/A	N/A
Bldg. Sq. Ft.	$40.92	$0.96	42.4676	0.000000000	$39.03	$42.81
Lot Sq. Ft.	$2.20	$0.11	19.8614	0.000000000	$1.98	$2.41
Pool Sq. Ft.	$13.66	$1.49	9.1857	0.000000000	$10.74	$16.57
Bath Fxtrs.	$2,651.06	$226.03	11.7288	0.000000000	$2,207.90	$3,094.22
Age	$510.34	$36.95	-13.8124	0.000000000	-$582.78	-$437.90
Porch/Patio	$2,296.20	$556.87	4.1234	0.000038159	$1,204.40	$3,388.00
Air Cond.	$22,459.49	$1,771.91	12.6753	0.000000000	$18,985.46	$25,933.52
Evap. Cool	$21,089.60	$3,259.53	6.4701	0.000000000	$14,698.91	$27,480.30
Quality Good	$10,127.94	$838.28	12.0818	0.000000000	$8,484.40	$11,771.49
Carport	$2,666.66	$632.74	4.2145	0.000025641	$1,426.11	$3,907.21
Garage	$5,941.95	$613.83	9.6801	0.000000000	$4,738.46	$7,145.44
Zone A (ADT)[1]	-$0.05177	$0.01	-6.5168	0.000000000	-$0.06734	-$0.03619
Zone B (ADT)[1]	-$0.02731	$0.01	-5.3995	0.000000071	-$0.03722	-$0.01739

[1] Coefficients represent change in property value by zone (current dollars) given annualized US-60 ADT over entire length of study area.

plausible that the impact per unit of traffic on local surface streets might be greater than the impact per unit of freeway traffic.

Sample Results for Condominiums and Townhomes

Multiple-unit residential properties were evaluated by using the same *t*-test and regression procedures as for detached single-family homes. However, a smaller sample of recorded sales was collected for condominiums in the study area, which led to greater variance in the test results. Several variables were also omitted from the multiple-unit residential analysis, as these were either not relevant or not recorded. For example, the minimal lot size (if any) and planned amenities of these developments generally preclude swimming pools for individual units—none was recorded in the property sample. Similarly, properties had either air conditioning in the vast majority of cases, or no cooling system in a few cases, so evaporative cooling was not considered for the analysis.

Comparisons of the most influential variables are shown in the following section. As in the case of detached single-family residences, a *t*-test was used, when applicable, to determine whether observed differences in general characteristics were statistically significant. These general comparisons are then followed by zone-based and street-based regression analyses to determine the effects of location on multiple-unit housing prices. However, the smaller number of recorded sales made the regression analyses less reliable than those done for detached residential property.

Condominiums and Townhomes: Descriptive Statistic by Zone

Statistically significant differences in structure and lot size were observed between multiple-unit residential properties in all zones. Structures in Zone A tended to be smallest, with an average size of 917 ft^2. Zone B condominiums were largest, averaging 1,148 ft^2. Zone C condos averaged 1,060 ft^2 in size. Median structure size was virtually identical to average size for all zones, indicating that condos were normally distributed by structure size.

Differences in structure age at the time of sale were not found to be statistically significant between zones. Average structure age ranged from 5.15 years in Zone B to 6.03 years in Zone C. Median age was 4 years in Zone A, 3 years in Zone B, and 5 years in Zone C. Condos in Zone B had the largest adjusted sales price on average. Average and median adjusted sales prices were lowest in the control zone at $62,384 and $61,790, respectively. Properties in Zone A sold for an average of $65,759 in current dollars, and Zone B properties averaged $74,073. Observed differences in size and sales price were statistically significant at the 95% confidence level.

Condominiums: Regression Analysis

The regression model results for condominiums were not generally as reliable as the results recorded for detached single-family residences. This is likely a result of the smaller sample size for condos. A total of 609 sales transactions were recorded for condos. The data were more evenly distributed among the three zones, with 20.3% of sales in the abutting zone (A), 35.1% in the impact zone (B), and the remaining 44.6% in the control zone (C). The explanatory value (i.e., r^2) of this model was 64.6% for the zone-based analysis and 54.6% for the street-location analysis.

Regression results for condos shown in Table 4 had fewer variables than for detached single-family residences. Insufficient housing quality data were available to distinguish between condominium structures, and none of the units tested had swimming pools or cooling systems other than air conditioning, so these variables were removed from the analysis. As in the case of detached single-family residences, the coefficients for condominiums generally reflected the expected contribution of each housing component. However, the relative magnitude of each component tended to be quite different from that found in the detached single-family analysis. Note that results for condos were not directly comparable with results for detached residences because of the differences in the number of variables considered in the analysis.

In contrast to detached single-family residential property results, several variables were determined not to be statistically significant in the zone-based condo regression. *P*-values for number of bath fixtures, carport size, and the zone locations were all > 0.05, indicating

TABLE 4 Zone-Based Regression Coefficients for Condominiums and Townhomes

Variable	Coefficient	Standard Error	*t*-Stat	*P*-Value	Confidence Interval Lower 95%	Confidence Interval Upper 95%
Zone-Based						
Intercept	0	N/A	N/A	N/A	N/A	N/A
Bldg. Sq. Ft.	$65.95	$3.63	18.1681	0.00000000	$58.82	$73.08
Lot Sq. Ft.	$1.41	$0.32	4.42767	0.00001132	$0.78	$2.04
Bath Fxtrs.	$581.19	$553.90	1.04928	0.29447366	-$506.62	$1,669.01
Age	-$836.53	$86.82	-9.6355	0.00000000	-$1,007.03	-$666.02
Porch/Patio	$8,217.61	$1,096.91	7.49161	0.00000000	$6,063.36	$10,371.87
Air Cond.	$7,899.88	$1,957.61	4.03548	0.00006155	$4,055.27	$11,744.48
Carport	$1,492.57	$1,482.60	1.00672	0.31447353	-$1,419.15	$4,404.29
Garage	$7,106.48	$1,254.13	5.66645	0.00000002	$4,643.45	$9,569.51
Zone A	$2,705.99	$1,735.05	1.5596	0.11938316	-$701.54	$6,113.51
Zone B	$2,780.06	$1,441.49	1.92861	0.05425182	-$50.92	$5,611.04
Street-Based						
Intercept	0	N/A	N/A	N/A	N/A	N/A
Bldg. Sq. Ft.	$63.37	$4.69	13.5085	0.00000000	$54.14	$72.59
Lot Sq. Ft.	$1.31	$0.40	3.2777	0.00114169	$0.52	$2.10
Bath Fxtrs.	$379.87	$738.82	0.51416	0.60743400	-$1,072.75	$1,832.49
Age	-$917.34	$110.40	-8.3095	0.00000000	-$1,134.39	-$700.28
Porch/Patio	$5,836.08	$1,799.57	3.24304	0.00128580	$2,297.87	$9,374.29
Air Cond.	$6,959.82	$2,757.72	2.52376	0.01201212	$1,537.75	$12,381.89
Carport	$4,649.24	$2,015.00	2.30732	0.02156671	$687.47	$8,611.02
Garage	$12,248.78	$2,045.57	5.98795	0.00000000	$8,226.89	$16,270.67
Zone A	$5,161.74	$2,443.36	2.11255	0.03528220	$357.73	$9,965.74
Major Street	$4,653.80	$1,513.15	3.07557	0.00225099	$1,678.73	$7,628.87

that there was >5% likelihood that the coefficients for these variables were the product of random variation. However, the *p*-value for Zone B locations was only slightly greater than 0.05, so a less-stringent confidence interval (e.g., 90%) would likely have produced statistically significant results.

Also notable in the zone-based analysis are the positive values associated with each zone. Although these numbers were not statistically significant, the coefficients suggested that buyers of attached residential property had different priorities for housing amenities. However, at the level of confidence chosen, no conclusion could be reached about the value of location in the zone-based analysis.

Regression results comparing the Zone A properties with control area (Zone C) locations on and off major surface streets indicated that higher condominium property values were associated with major thoroughfares. Although the street-based analysis had a lower explanatory value overall, statistically significant results were reached for a greater number of variables. In the street-location analysis, only bath fixtures had a *p*-value that was not significant at the 95% level of confidence.

Most variables that were statistically significant in both regressions (e.g., structure and lot size, age) fell within the confidence intervals predicted by the other model. However, the smaller sample size and slightly larger *p*-values for most variables in the street-location analysis made the confidence intervals for estimated values of each housing characteristic quite large. Nonetheless, the street-location analysis resulted in statistically significant coefficients at the 95% level of confidence for differences in location.

The street-based regression results indicated that access was a positive amenity for buyers of attached residential units. Condo sales both in Zone A and on primary streets in Zone C were valued at a premium compared with control zone properties located on smaller thoroughfares, all other characteristics being equal. A slightly higher premium was placed on locations adjacent to the freeway than on locations located on major (mile) streets, as indicted by the coefficients for these variables. In year 2000 housing-price dollars, the estimated premium was $5,162 for Zone A locations and $4,654 for primary-street locations, relative to the control properties. The 95% confidence interval for the Zone A location premium ranged from $358 to $9,966 (in 2000 dollars), while the primary-street locations had a premium ranging from $1,679 to $7,629 at the same level of confidence.

While the price differences observed in the zone-based analysis may have been primarily the result of lot size and housing style discussed in the previous section, the primary-street location analysis for condominiums suggested that buyers of these properties place a greater emphasis on immediate access to a major thoroughfare. However, the nature of these types of developments is such that an individual unit may be sheltered from the impacts of traffic and still have an address location on the through street. More so than detached residential units, condominiums benefit from community landscaping, perimeter walls, and the close proximity of other units as a potential buffer from traffic-induced noise and other effects. Therefore, some degree of caution should be used in assessing these results.

Because the analysis did not distinguish between individual units in a complex by actual distance from the thoroughfare, it is possible that some units actually experienced some differential in pricing based on this distance. The relatively low explanatory value of this analysis suggests that better means of distinguishing between units would have yielded superior results. Nonetheless, the overall picture indicates that major streets, including freeways, present a more desirable location for the development of multiple-unit communities. This may reflect some difference in consumer preference for locational amenities between buyers of detached and attached residential properties.

Nonresidential Summary

The analysis of nonresidential property was limited by the availability of commercial sales data and transaction details. No statistically significant results were obtained for nonresidential properties, but a few tentative assessments were made from the information on hand. First, the Superstition Freeway appeared to exert a greater influence on the development of commercial property sites than industrial property sites in Mesa. This may be due to the greater reliance of many commercial establishments on a single transportation mode (i.e., automobiles). The observed values per square foot for vacant commercial land suggest that demand for commercial space was slightly greater in the impact zone (B) than in areas farther from the freeway (Zone C).

Results for office and retail properties also appear to support this observation. However, results for restaurant properties showed a bias toward higher values in Zone C, which would not be expected if the freeway afforded some locational advantage. Apartment buildings tended to have higher sale values in Zone B, which corroborated findings for condominiums. It appears that buyers of attached residential property place a greater emphasis on access to surrounding facilities than do buyers of detached residential property. This observation rests on the assumption that the value of apartment communities is based on the expected rental income from tenants, which would reflect tenants' willingness to pay for the amenities associated with the apartment community. It should be emphasized that, despite the observation of these weak trends, none of these cases can be considered conclusive given the limited scope of commercial property sales data.

CONCLUSIONS

Freeway development confers benefits to highway users in the form of reduced transportation costs. This reduction in transportation costs can have a variety of spillover effects on highway users and nonusers alike. Previous research has identified a number of population, economic, and land use effects that tend to accompany freeway development. Improving the access to locations along the freeway corridor makes these sites more attractive to development.

The effects of these changes in access are usually observed in an increase in population and commercial activity in the freeway corridor (*7*). As individuals and firms relocate to areas served by the new freeway, economic activity tends to rise in the corridor. This increased demand for homes and commercial land has generally been associated with an increase in property values in the transportation corridor, as savings from reduced transportation costs are capitalized into asset values (*1*). However, most researchers caution that gains in one area are frequently losses in another, and a broader impact assessment should evaluate the changes brought about by migration of firms and individuals from other areas.

Freeway development can also impose costs on users and nonusers. Highway users may suffer in the short term as construction diverts traffic onto smaller local streets. All drivers share the added costs of congestion in the form of lost time and higher vehicle operating costs (*8*). Property owners may also suffer, both in the short term as construction reduces access to local homes and businesses and in the longer term as added traffic noise and pollution adversely affect properties closest to the highway. Considered in conjunction with the benefits that accrue to property owners from freeway development, these negative impacts generally have been interpreted as evidence that freeways impose costs on certain property owners that may not be offset by gains.

A substantial body of research has been devoted to the examination of this distribution effect, in which the benefits and costs of freeway development are not distributed equally among property owners. Most research has focused on changes in single-family residential properties, probably for two reasons. First, data on residential property sales are easily gathered, and housing characteristics are more comparable than for many commercial properties. Second, residential property owners tend to be the most vocal opponents of freeway development, as commercial property owners generally welcome the benefits of proximity to a freeway (*2*).

Freeway construction has been shown to stimulate migration to freeway corridors (*8*) and to increase the amount of residential and commercial development in the corridor (*9*), but it may lead to a decline in marketability for existing residential units (*10*). Previous research has identified a persistent negative impact on homes located closest to freeways, though in many cases these effects are small (*6, 11*) or more than offset by net gains in the surrounding area from increased accessibility (*3*).

This research identified similar results for residential properties located in the Superstition Freeway corridor. However, additional analysis of different types of residential property and the general influence of all traffic yielded new insights. Among the findings were the following:

- Detached single-family homes were adversely affected by proximity to the freeway. The negative effects on sale prices were greatest for homes adjacent to the freeway, but a reduction in property values was also observed in the impact area (within $\frac{1}{2}$ mi of US-60).
- Price appreciation was also lower for single-family homes nearest the freeway, indicating that negative impacts were not transitory, but lasting.
- Overall price appreciation in the Superstition Freeway corridor suggested that the negative impacts to some property owners were more than offset by housing price appreciation in the surrounding areas. Average sales price appreciation for Mesa and Gilbert single-family homes within 5 mi of the freeway (including adversely affected properties) was higher than housing price appreciation in the metropolitan area.
- The negative impact on single-family housing values associated with proximity to the freeway was also found to exist for homes located on major surface streets. An inverse relationship (i.e., negative correlation) between freeway traffic levels and housing prices was observed as well.
- Multiple-unit residential developments appeared to benefit from proximity to the freeway and from locations on major surface streets, suggesting that owners of these types of properties had different preferences for locational amenities than owners of detached single-family homes. Condominium owners were found to experience a slight rise in property values when the property was located in the zone adjacent to the Superstition Freeway or on a major mile street.

The data available permitted only a cursory comparison of commercial and other nonresidential properties in the Superstition Freeway corridor. Vacant commercial land appeared to be valued more highly than expected. While comparable property values were observed for restaurants and office properties in the impact and control areas, retail properties appeared to command higher prices closer to the freeway. A pricing differential was also observed for large apartment buildings, which were priced at a premium to apartments in the control zone, reinforcing the results obtained for condominiums. However, none of the nonresidential property results was statistically significant, and these observations should be interpreted with caution.

Perhaps the most important finding of this research is the correlation between traffic and residential property values. Although researchers have traditionally focused on freeway corridors to evaluate property value effects, the implicit assumption is that proximity to traffic is at the root of any negative impact on residential properties. Viewed in this context, the freeway itself is nothing more than a conduit for traffic effects. The same negative effects were observed for single-family homes located on major mile streets more than $\frac{1}{2}$ mi from the Superstition Freeway.

Motor vehicle traffic on a particular route is a complex derivation from a number of related influences, including local population, automobile ownership, driver preferences, the number and characteristics of alternate routes or modes of transportation, and the amount of commercial activity in an area. If there is traffic generated by the freeway, the net impact of traffic in general will be greater (*12*). If sufficient alternate routes exist, property owners may experience smaller accessibility benefits from freeway construction (*3*). However, freeways tend to concentrate traffic in a more localized area. If a region experiences growth in traffic without the benefit of freeway development, traffic will be dispersed over a wider area. Although this may have less of an impact on a specific group of property owners, it is probable that more properties will be exposed to the negative effects of traffic.

Freeway development is a trade-off between accessibility and traffic growth. But the same can be said for construction of any roadway. The effects of traffic form the basis for changes in property values—whether positive, as might be hypothesized for commercial establishments serving a mobile population, or negative, as expected from residential proximity to traffic noise and air pollution. Whether a thoroughfare is classified as a highway or a local street may not be as important as the volume of traffic carried. Assessments of the net effects of freeways on nearby property values are limited, in that opposition to freeway development is typically the impetus for further research. However, in recognizing that the freeway is simply another means of carrying traffic, the analysis shifts to the benefits and costs of the road system in general; in other words, the impact of traffic. It is recommended that further research examine the changes in property values with respect to differences in traffic volumes to clarify the relationship between these variables.

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