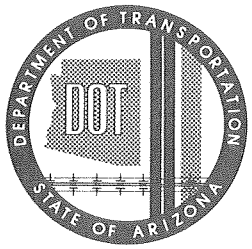

ARIZONA DEPARTMENT OF TRANSPORTATION

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SOCIOECONOMIC AND LAND VALUE IMPACT OF URBAN FREEWAYS IN ARIZONA

Final Report

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16. ABSTRACT

This study analyzes the impact of freeway construction on residential property values and the attitude of residents about the development of freeways in close proximity to their property.

Changes in land use along two corridors in the Phoenix Metropolitan area where freeways were developed are also analyzed. This was done using time series aerial photographs and county records of zoning changes.

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1.0 Introduction

This section provides an overview of the study, a summary of major findings, and describes the report organization.

1.1 Overview

This report includes two lines of research on the impact of urban freeways. The first objective of this study is to identify patterns of socioeconomic change that might accompany the development of new urban freeways in Arizona. As identified by the Arizona Department of Transportation, these socioeconomic patterns include:

1. Property values of land immediately adjacent to and contained within the corridors paralleling freeway development.
2. Land use patterns at major intersections and along freeway routes.
3. Industrial, office, and commercial development patterns generated by freeway construction.
4. Altered urban growth patterns created by freeway construction and attendant improvement in access to employment centers.
5. Attitudes of the population concerning their living environment and the relationship between improved transportation facilities and their own well-being.

The focus for most of the study is on the historical assessment of the actual changes and impacts that have occurred within Arizona as a result of urban freeways. This was based on a careful review of previous research and on other case studies.

The second line of research is to evaluate the effect upon land prices of an announcement of freeway construction. Based on land sales transactions between 1983 to 1987 recorded by the Maricopa County Assessor's Office, the effect of freeway announcement on land within a mile of the freeway alignment was distinguished from land outside the proposed freeway corridor.

Methodology

The socioeconomic case studies were performed on the Black Canyon Corridor from McDowell Avenue on the south to Bell Road on the north, and on the Superstition Corridor from I-10 on the west to Gilbert Road on the east. These corridors are in

three cities--Phoenix, Tempe, and Mesa. Within each of those corridors, two smaller (nine square mile) areas were selected for detailed analysis--the Black Canyon Study Area from McDowell to Camelback, and the Superstition Study Area from Mill Avenue to Price Road. In the Study Areas, control areas that were similar to freeway corridor development were also studied in depth, in order to better isolate freeway impacts.

Several information sources were used to reconstruct the historical impact of the freeways.

-- Aerial photographs and zoning maps
-- Census data
-- Property valuation and sales transactions records of the Maricopa County Assessor's Office
-- Planning documents
-- Telephone survey
-- Key informant interviews

The land value analyses were conducted on the Estrella Freeway, Sun Valley Parkway, South Mountain Freeway, Agua Fria Freeway, San Tan Freeway, Superstition Freeway, and Papago Freeway corridors.

Analytic Perspective

Figure 2-1 in Chapter 2.0 presents a model of the interaction between freeways and market forces. The market responds to urban freeway changes as well as other events affecting market demand. Each segment of the market weighs the economic advantages and disadvantages of the new freeway. If the change in the conditions is significant enough to cause a change in behavior, then changes in the market should occur. The most obvious change should be in land prices along the freeway corridor. Classic land use theory tells us that different land uses are in competition with one another for locations that meet their particular criteria. The land use that is both capable and willing to pay the most for a specific location should be able to locate in the area of choice. Since the new urban freeway has upset the market equilibrium that existed due to changes in accessibility, relative land prices will change, which should result in different land uses and development intensities than would have occurred if the freeway had not been built.

Local government response to a new urban freeway, either proactive or reactive, can affect the market response dramatically. This response is conveyed both through

local zoning and land use planning, and through the timing of public infrastructure development along the freeway route.

Generally, urban functions that make the most intensive use of the land are able to generate the greatest income. Therefore, given both locational requirements and ability to generate income, it is possible to predict idealized land use patterns along freeway corridors. These are illustrated in Figure 2-2 in Chapter 2.0. The case studies were performed using the construct of this analytic model.

The next section summarizes the conclusions and major findings of the case studies.

1.2 Major Findings

The strongest and most obvious conclusion about the historic socioeconomic impact of freeways in metro Phoenix is that freeways are a necessary but not sufficient cause for development to occur.

- Other factors are equally as important, including municipal planning and zoning, land availability, existing utilities and infrastructure, and other transportation modes--railroads and arterials in the case studies and, presumably, airports, and general development trends.
- Freeways merely create a condition that improves the market opportunity for change.
- More importantly, development around freeways can be controlled by strong urban land use planning.
- However, it is clear that income-generating properties--non-residential uses and apartments--have strong locational preferences for freeway corridors.
- In the absence of strong planning, private development will guide the freeway's development.

A secondary conclusion is that income-generating properties locate in freeway corridors, like classic land use theory predicts.

- Moreover, freeway intersections are most likely to be developed into non-residential activities.

- However, residential developments are the predominant corridor activity--60 percent of the Black Canyon's and 75 percent of the Superstition Corridor's inventory.

A third conclusion is that the intensity of freeway corridor development depends on a combination of macroeconomic demand conditions and the supply of developable land.

- The case of the Superstition Corridor and the urban form analysis demonstrates that one of the most important effects of freeways is the development of the urban fringe that is caused by freeway accessibility.
- Compared to that effect, there is a surprising amount of undeveloped land which exists in the corridors themselves, especially those on the fringes.
- The expansion of the urban freeway system from approximately 80 miles to over 200 miles will certainly accelerate accessibility to more remote fringes, while it will create an oversupply of corridor land.

Beyond these broad statements, the specific kinds of land uses and their locations are very much dependent on the peculiarities of place--existing land uses, existing zoning, etc. Combined with the finding that strong urban planning can control growth leads us to an optimistic conclusion: local residents can actively control land development in their neighborhoods, if city government cooperates with them.

If market pressures are accounted for, however, the Black Canyon and Superstition Area socioeconomic case studies have demonstrated that the life of quality residential neighborhoods extends far beyond freeway completion. What seems to be necessary is that quality residential neighborhoods need to be supported by complementary land uses and strong freeway design features. In particular, these include:

- Parks and schools, which are very important supporting land uses;
- Supporting freeway features that include the depressed freeway design, supplemented by ample right-of-way, walls that are high enough to contain noise, and features like pedestrian walkways to keep residential neighborhoods from becoming isolated from supporting land uses; and
- Classic land planning that buffers single family development from arterials and freeways by multifamily and non-residential uses.

In the Superstition Study Area, where this combination cf design and land planning was implemented, the rate of appreciation for single family property values for houses closer than one-half mile to the freeway actually was greater than similar homes in a control area beyond one-half mile of the freeway. Although there were too few sales transactions for smaller zones to be entirely confident of the information, the appreciation rate of houses closer than 600 feet to the freeway was also greater than for similar houses in the control area.

Regarding the land value/freeway announcement analysis, the conclusion is that land values in proposed freeway corridors have increased due to freeway alignment announcements.

- In all freeway corridors, the rate of land appreciation was substantially higher after freeway announcement, compared to its rate prior to announcement.
- The average monthly rate of sales value appreciation before the freeway announcement was virtually identical for impact zones and control areas--1.9 percent and 1.92 percent, respectively. After the freeway announcement, the average monthly appreciation was 3.77 percent in control areas and 6.67 percent in impact zones.
- Thus, within the freeway corridor, land prices trebled because of the freeway announcement.

Beyond these conclusions are the findings which support them.

Residential Property Values

- Residential property values from 1972 to 1987 were tracked in the Superstition Study Area.
- Values increased for all properties that were surveyed, both in the Control Area and the Impact Area.
- Within the Impact Area, there does not appear to be a correlation by distance.
- The rate of appreciation immediately after the freeway's construction was faster for the Study Area than for the metro average for a five-year period. It is possible this was due to increased freeway accessibility.

- After the freeway had been in place for five years, the rate of appreciation was about the same for the Study Area as for the larger North Tempe area in which it is included.

- In that later period, the rate of appreciation was faster for properties in the freeway impact zone than in the Control Area. In fact, Impact Area properties appreciated faster than the North Tempe average.

- The Superstition Study Area is a residential development that is supported by complementary land uses and by beneficial freeway design and other features.

Residential Attitudes

- Homeowners who moved to the Study Area before the Superstition was built did so because of the house and the neighborhood. Homeowners who moved after the freeway was built did so because of the neighborhood, because of freeway accessibility, and because of price.

- Accessibility is perceived to be the most positive freeway impact.

- Overall, 76 percent of homeowners considered the overall impact of the freeway on their lives as very good. By distance, the lowest positive response is 64 percent.

- Ninety percent of homeowners who moved to the area after the freeway was built thought its impact was positive.

- The majority of homeowners who lived more than 200 feet from the freeway would again buy a home as close to a freeway. Only 21 percent who lived within 200 feet would do so.

- People who live within 600 feet of the freeway are most uncertain about its property value effect. The further away people live, the more they believe the freeway has no effect.

- Moreover, people who live close to the freeway are preoccupied with its effect in their property's value. After 600 feet, homeowners are more realistic about other factors that affect property value.

Role of Municipal Planning

Between their alignment in urbanized and undeveloped areas and their alignment across several jurisdictions, each of which approached land use planning differently, the Black Canyon and Superstition Study Corridors provide very different case studies.

- The Black Canyon Study Area (from McDowell to Camelback) and, to a lesser extent, the South Black Canyon Corridor from McDowell to Northern Avenue are case studies in already urbanized areas, without a general plan accounting for freeways.

- The North Black Canyon Corridor is a case study of an undeveloped area, but one guided by a stronger general plan that contains sensible uses for freeway corridors.

- The Superstition Study Area and the Tempe Superstition Corridor are case studies in developing, but not completely urbanized, areas guided by a strong general plan, but one which, essentially, ignores the freeway.

- The Mesa Study Corridor is a case study in an undeveloped area guided more by the private market than by public planning.

Tempe's implementation of a plan which successfully developed the Superstition Corridor into proportionately more residential land uses than might be expected illustrates the very strong role that local governments can take in controlling freeway development. In contrast, it appears that Mesa did not have an integrated concept of the Superstition Corridor in relation to the rest of the city. Without a strong general plan context, incremental rezoning requests were prevalent. Thus, the corridor developed according to market forces which followed classic locational requirements. The Phoenix case is less clear, but it appears that the 1969 plan was implemented in the undeveloped North Black Canyon Corridor, probably because the plan followed classic locational requirements, thus anticipating the market.

As a detailed analysis of the Phoenix area corridors' development between 1959 and 1987 shows (Chapter 8.0), at a macroscopic scale classic locational requirements prevail rather strongly. However, the case study of general plans demonstrates that a clear vision of development as articulated in a general plan and in policy can result in development that is different than what pure market forces would have determined.

Land Use Impacts In Study Areas

- Both the Black Canyon and Superstition areas developed quickly after completion of the freeways.

- The influence of Encanto Park and Cielito Park in the Black Canyon area has influenced the stability of residential neighborhoods that surround it.

- The rapid industrial development of the western Black Canyon area is due more to the compilation of zoning, rail proximity, and available land with

utilities in place with the Black Canyon Freeway than to the freeway alone.

- Over a long period, from 1959 to 1987, residential density has increased with the encroachment of multifamily, especially along freeway and arterial corridors.

- Tempe's will to implement the 1967 General Plan, combined with a beneficial freeway design, has resulted in stable residential development along the Superstition Corridor.

- The placement of land uses in the Superstition area supports residential development. Like the Black Canyon, single family residential areas are supported by parks and schools. Non-residential activities are mainly clustered at arterial intersections, and industrial development is separated from any residential area by an arterial.

- Still, over time, the Superstition area has evolved into higher density uses. In part, this is from later development of non-residential activities. However, in the Impact Area and the older North Control Area, multifamily development has occurred, even displacing some single family residential.

Non-Residential Impacts in Study Areas

- The Black Canyon area is predominantly industrial, while the Superstition area is predominantly residential.

- The rate of non-residential development in the Black Canyon area grew at an annual 7 percent compound growth rate for almost a twenty-year period after the freeway's completion.

- In the Black Canyon, those areas which grew the most intensely combined favorable zoning, land and utility availability, and a mix of transportation nodes to develop into a large industrial center.

- Retail and office development in the Black Canyon are secondary developments.

- The Superstition area's non-residential development is primarily retail, both neighborhood and community center scale. This is not surprising for a primarily residential area.

- The Superstition's rapid non-residential development period lasted only twelve years, but over that time its growth rate was from 16 to 23 percent.

- Office development, mainly inside the freeway corridor, was strongest six years after the freeway was completed.

- Combining the two Study Areas, it is clear that freeways have stimulated non-residential growth in both cases.

- However, the freeway's presence is only a contributing factor to the precise location of non-residential development. Equally important are municipal planning and zoning, available land, utilities, and infrastructure, and other transportation nodes.

Corridor Development

The corridor analysis has produced some important findings, which follow according to the major questions that the analysis was designed to answer.

1. **To what extent has actual corridor development followed market-based land use theory?**

   - Freeway study corridors contain a larger share of income-generating properties, and the two "undeveloped" corridors, where the market was freer to develop, contain an even larger share.

   - Two corridors were already urbanized before freeway development, and both contain more extreme land use distributions, but for different reasons. Tempe's is because of municipal planning and the South Black Canyon's is because of previously existing locational attributes and site characteristics.

   - The two "undeveloped corridors" are the most similar pair among study corridors, including their share of income-generating uses.

   - Non-residential development within freeway corridors grew much faster than other kinds of development, and grew faster than metrowide non-residential development.

   - Inside freeway corridors, the growth rate for property that does not generate income was half the rate of other land uses.

2. **How strongly does municipal planning affect corridor development?**

   - Only 29 percent of corridor uses in the Tempe Superstition Corridor, which Tempe planned for residential, are income-generating properties.

   - Although each of the corridors are dissimilar in land use details, the Tempe corridor stands out in uniqueness in all areas--along its length, at intersections, within inner corridors, and within outer corridors.

3. **Do subareas of the corridor develop differently?**

   - Income-generating properties are 66 percent of all uses at intersections, 51 percent of all uses at inner corridors, and only 45 percent of all uses in outer corridors.

- Within study corridors, outer corridors developed more quickly at first, followed by inner corridors and then intersections. This is especially true of residential development.

- Non-residential inventory develop earliest at intersections, then inner corridors and then outer corridors.

4. **In previously undeveloped areas, have freeway corridors developed at different rates, magnitudes, and uses?**

   - Comparatively, the two previously undeveloped corridors--the North Black Canyon and the Mesa Superstition--look more alike than any other pair of study corridors.

   - The large amount of undeveloped land within corridors is surprising, given the short supply of freeway corridor land in metro Phoenix.

     -- In 1975, twelve years after freeway completion, about 30 percent of the South Black Canyon Corridor north of Bethany Home Road was undeveloped.

     -- In 1987, 22 years after freeway completion, 25 percent of the North Black Canyon's land area is still undeveloped.

     -- Six years after freeway completion, 30 percent of the Mesa Superstition Corridor is undeveloped.

     -- The Tempe Superstition is an exception. In 1975, when the freeway was completed, about 40 percent of the corridor was undeveloped. In 1987, only small infill pockets and industrial land were vacant.

   - Regional malls have been early activities which led development in the North Black Canyon and Mesa Superstition Corridors.

   - A large amount of residential development has also been an early activity in the two "undeveloped" corridors.

   - "Undeveloped" corridors have grown more rapidly than "developed" corridors, but no more rapidly than the entire metro area since 1975.

   - Non-residential development in "undeveloped" corridors is much more rapid than in any other area.

5. How strongly do freeway corridors attract the several kinds of land uses?

   - The rate of development for office, hotel, and apartment uses is much faster within corridors than in other areas.

   - Freeway attraction for industrial development is not as clear. Its rate is slower than other areas for "developed" corridors but faster for "undeveloped" corridors. Its growth rate was not as fast in corridors than in other non-residential uses.

- The growth rate for retail and single family/townhouse inventory inside corridors was half the rate of other land uses.

- Single family development is a large part of freeway corridor development. Almost 70 percent of the inventory in the study corridor is single family development. Even discounting the Tempe Superstition area, single family inventory is still almost 50 percent of the inventory in each of the remaining three corridors.

Urban Form Impacts

- From the research conducted in other areas and based on urban growth theories, the importance of major transportation systems in general, and urban freeways in particular, is known. Everything else equal, a commercial site with freeway access and visibility will be preferable over a site that lacks the freeway frontage.

- In addressing the urban form question, the difficulty is in quantifying the potential impact of urban freeways. Although the impacts can be described in concept, it is difficult to predict what the form of the metro area would be if the urban freeway system would have been developed differently.

- The shape of the metro area urban form in 1953 before any urban freeways had been built shows some correspondence between the major highway system and development patterns.

- The development pattern in 1983 appears to be strongly correlated to the major transportation routes within the metro area. In particular, substantial development has occurred along the North Black Canyon and along the Superstition Corridor. Little change is evident along the Papago Corridor.

- The development of the Papago in the late 1950s would have likely resulted in extensive industrial and residential development on the west side.

Land Sales/Freeway Announcement Effects

- The analysis used Maricopa County Assessor's records to track land sales before and after freeway announcements in five freeway corridors. "Impact Zones" within a mile of the corridor were distinguished from control areas.

- Of these corridors, there were a sufficient number of records in from freeway corridors to complete the statistical analysis.

- The following table shows the monthly sales appreciation rate for each corridor and for the average.

Monthly Land Sales Appreciation

	Before Announcement		After Announcement	
	Control	Impact	Control	Impact
Estrella	3.33%	3.07%	2.60%	4.65%
Sun Valley	1.44%	1.88%	6.85%	6.57%
Agua Fria	0.60%	0.10%	1.24%	1.52%
San Tan	2.30%	2.91%	4.37%	13.92%
AVERAGE	1.92%	1.99%	3.77%	6.67%

Source: Mountain West Research.

1.3 Report Organization

This report contains eleven major sections.

- Chapter 2.0 provides a theoretical context supported by other case studies in the literature.
- Chapter 3.0 orients the reader to Study Area definitions and descriptions.
- Chapter 4.0 provides the institutional context--the county's rapid growth, the timing of the freeways' construction, and municipal planning reactions to the freeways that directed the development of corridors.
- Chapters 5.0, 6.0, and 7.0 provide detailed case studies on the two nine-square mile Study Areas, distinguishing between an Impact Area contained in the freeway corridor, and Control Areas that are similar but further away.
  - -- Chapter 5.0 presents demographic and land use impacts.
  - -- Chapter 6.0 presents residential impacts, particularly the property value analysis and the attitudinal survey.
  - -- Chapter 7.0 presents non-residential impacts.
- Chapter 8.0 presents impacts on the longer freeway corridors.
- Chapter 9 discusses urban form impacts.
- Chapter 10 presents the land value/freeway announcement analysis.
- Chapter 11 presents conclusions and recommendations for further research.

2.0 Introduction to the Socioeconomic Impacts of Urban Freeways

2.1 Overview

The social and economic impacts resulting from freeway construction have been a routine part of project planning and development for many years. These studies usually concentrate on the direct social and economic effects of a project as expressed in terms of population or employment change or some other measure of direct impact. A typical impact associated with highway construction, for example, is the potential business loss due to a new highway project that takes traffic around a rural community rather than through the business district.

Although such studies have been routinely completed as part of urban freeway planning, the indirect impacts are often not fully considered. This may be largely due to the fact that many of these indirect impacts are difficult to measure. Unlike the measurement of business loss due to the construction of a highway bypass, many of the indirect impacts of urban freeways, such as land use change, are much more elusive. Although we know what the land use is after the urban freeway is in place, we can only speculate as to what the land use would have been if the freeway had not been built.

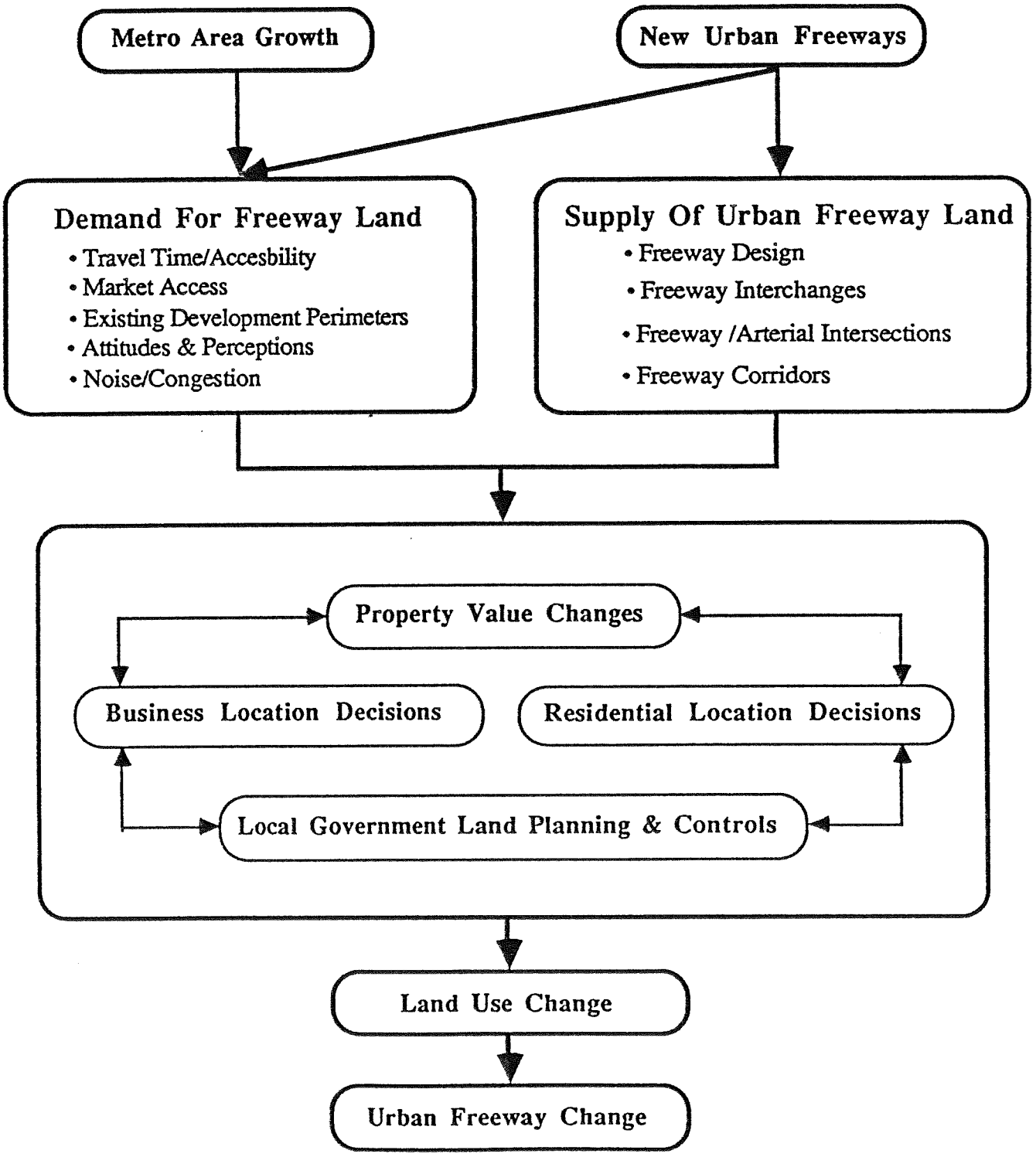
The major analysis question that arises in examining the indirect impacts is the question of attribution. In the case of the highway bypass around the rural community, a direct correlation can be drawn from the event (the construction of the bypass) to the impact (the loss of business in the community). The connection between the event and the impact in the case of urban freeways is not as clear.

The introduction of a freeway system within an urban area changes the economic equilibrium in both the business and residential segments of the community. The transportation cost structure is changed dramatically, either in terms of actual dollars or travel times, and the definition of market areas and labor sheds are modified.

Figure 2-1 presents a model of the interaction between freeways and market forces. The market responds to urban freeway changes as well as other events affecting market demand. Each segment of the market weighs the economic advantages and disadvantages of the new freeway. If the change in the conditions is significant

FIGURE 2-1

THEORETICAL MODEL OF FREEWAYS, MARKET FORCES, LOCAL GOVERNMENT CONTROL AND LAND DEVELOPMENT



enough to cause a change in behavior, then changes in the market should occur. The most obvious change should be in land prices along the freeway corridor. If the freeway has improved the accessibility of a given location to a greater number of customers for a certain retailer, for example, then that retailer should be able and willing to pay more for land. Classic land use theory tells us that different land uses are in competition with one another for locations that meet their particular criteria. The land use that is both capable and willing to pay the most for a specific location should be able to locate in the area of choice. Since the new urban freeway has upset the market equilibrium that existed due to changes in accessibility, relative land prices will change, which should result in different land uses and development intensities than would have occurred if the freeway had not been built.

Local government response to a new urban freeway, either proactive or reactive, can affect the market response dramatically. This response is conveyed both through local zoning and land use planning, and through the timing of public infrastructure development along the freeway route.

Generally, urban functions that make the most intensive use of the land are able to generate the greatest income. Therefore, given both locational requirements and ability to generate income, it is possible to predict idealized land use patterns along freeway corridors (see Figure 2-2).

- Freeway interchange areas are typically the most economically desirable pieces of real estate along freeways due to their "focusing effect," i.e., limited areas for freeway entry and exit produce maximum visual exposure and potential vehicular accessibility, therefore making them the most attractive area for development by activities that capitalize on those benefits.

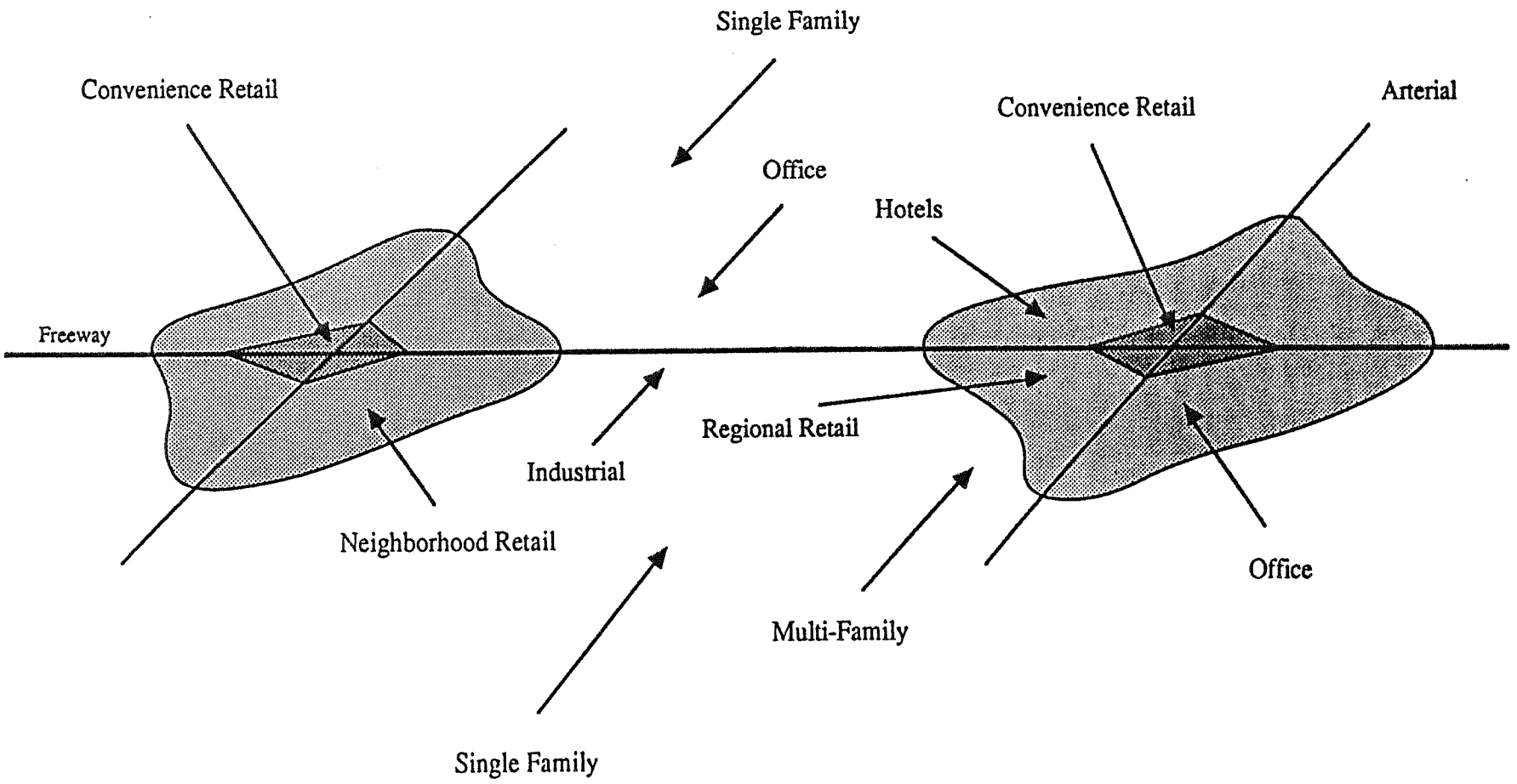
  -- Regional and community shopping centers, for example, will tend to locate in the areas just beyond the interchanges because of their accessibility and visibility requirements, as well as their ability to generate income.

  -- Neighborhood shopping facilities and convenience commercial developments also tend to locate adjacent to the freeway interchanges for similar reasons, albeit on a smaller scale and to a lesser degree.

- Hotels and motels, on the other hand, generally gravitate toward airports, at interchanges along major interstate routes, and in areas where two freeways intersect, particularly in areas close to major employment centers.

FIGURE 2-2

IDEAL LAND USE PATTERNS ALONG A FREEWAY



Source: Economic Research Division, Mountain West Research, July 1987.

- Office complexes are typically found throughout the freeway corridor. They often fill in the gaps of land between interchanges that are not highly desired by commercial developments.

- Condominium, townhouse, and apartment complexes are usually developed along arterials off of freeway interchanges, just beyond retail and office uses. These developments are compatible with retail and office functions.

- Single family residential areas are repelled from direct contact with freeway interchange uses. If freeways are located too closely to them, problems like noise, will often create problems, both real and perceived. The actual magnitude problems are greatly influenced by the physical design of the freeway. Single family residential uses are not ideal freeway corridor developments unless nuisance mitigation measures are implemented.

- Industrial uses are usually located on land along the freeway routes that are not desired by higher commercial uses, i.e., stretches between interchanges.

These are generalized land use patterns. There are a number of local factors that will distort this idealized land use pattern.

- The development of land along freeways is dependent upon local supply and demand conditions. One of the factors that influence this situation is the metro area's economic base. For example, if the economic base is predominantly business service oriented, then demand for office uses will be higher than, say, industrial uses.

- Another factor influencing land development patterns along freeway corridors is the supply of corridor land relative to demand for corridor land.

  -- If there is a limited amount of developable land adjacent to freeways and the local economy is highly successful in business development, it is likely that the freeway corridor will be put into the highest and best use. This has been metro Phoenix's condition to date.

  -- However, if the supply of developable freeway-adjacent land is high and the demand is low, large areas of the freeway corridor, except perhaps on the interchange, will probably remain vacant until the demand for land "catches up" with the supply.

- The specific impacts freeway development have on surrounding land uses obviously depend on whether the area is already developed or not.

  -- If the area is already developed (i.e., urbanized), then the freeway will not have as dramatic an impact on land use in comparison to an undeveloped area. While there may be both clearance and displacement in the freeway right-of-way and some redevelopment opportunities, the existing developments adjacent to the alignment will, for the most part, remain in place.

-- In areas where there are vacant parcels in an otherwise developed area, there may be infill development like multifamily housing or neighborhood retail uses.

- The final major factor influencing actual development patterns is the local government responsible for land use planning. The selection of a new freeway route often prompts the review and possible revision of a city's General Plan. Local governments may want to slow down freeway corridor development because they want to encourage development in other areas they deem of more strategic importance to their overall objective, or because corridor development will require tremendous investments in public infrastructure that they are not willing to commit.

2.2 Approach of Previous Research Studies

Previous case studies on the socioeconomic impacts of urban freeways generally can be categorized either as macro-oriented or micro-oriented. The macro-oriented studies were concerned with the effect of the urban freeway system on overall metropolitan growth as it relates to other metro areas, and on the distribution of activity within the metro area. The micro-oriented studies dealt more with traffic patterns, land use and property value issues in the vicinity of the freeway. National studies indicate that in relation to property value issues, business, industry and apartments typically benefit from freeway proximity, especially if the activity can benefit from freeway accessibility and visibility and can tolerate noise, air, or pedestrian safety problems that make freeway sites unsuitable for some activities such as detached housing.

The research studies generally used one of two primary methods to analyze the impacts of urban freeways. The first method is comparative statistics. Data are gathered for a test area along the urban freeways and summary statistics are prepared. For example, if a residential neighborhood was being analyzed, housing prices would be normalized, controlling for square footage and features such as swimming pools. Similar information is gathered for a control neighborhood that is similar in character to that in the subject area. Differences between the two sets of statistics are then analyzed with an attempt made to attribute a portion of the difference to the freeway. Historical studies are used, comparing changes over time in historical growth rates, land value, and land use before and after freeway construction. In reviewing previous empirical studies, some issues that are worth mentioning include the scarcity of relevant data, and the limited effort in the longitudinal studies which assess the impacts from the three time dimensions: before, during, and after the construction of the freeway.

In many of the macro-oriented studies, differences in rates of growth between areas with an urban freeway system and areas without a freeway system were analyzed, and a portion of the difference was attributed to the existence of the freeway system. Attribution is by far the most difficult issue. In many cases, changes are considered net additions or net benefits to the metropolitan area as a whole, when in fact the change may represent a redistribution of activity within the metropolitan area. These rates of growth are differentiated among areas due to the proximity and accessibility effects of freeway. Since the two variables are more likely to be indicative of the socioeconomic impacts of freeway development, the research questions that need to be addressed would be centered around them. In this framework, they will cover the analyses of property value, land use, commercial/industrial, and urban development impacts.

The second major approach that is utilized is primary survey. This approach involves a systematic survey of factors influenced by the urban freeway and involves a survey of residents and businesses within the area to determine likely behavioral responses to freeway construction. This approach is particularly helpful to assess the impact of the freeway on travel decisions and worker location decisions. In these types of studies, the origin and destinations of particular travellers are required to properly assess the impact on behavior. A survey is also required to assess the impact of freeways on attitudes and social well-being issues.

2.3 Findings of Previous Research

Conceptually, the social and economic impacts of freeway development separate obvious effects directly caused by right-of-way acquisition and displacement (direct impact) from indirect impacts triggered by freeway construction. Substantial documentation has been published on the direct impacts of highway-related activities and the compensation issue. The indirect impacts change the relative attractiveness of a neighborhood adjacent to the freeway (positively or negatively) to present and potential users of the neighborhood. The effect is commonly measured by "attractiveness" indicators. In this regard, the attractiveness measures are indicated by property value, land use pattern, business composition, and pattern of urban growth.

The analysis of actual development patterns and property values are more likely to be indicative of the socioeconomic impacts of the freeway construction program since

the factors that will be analyzed represent the results of actual market forces and behavior. The analysis of those four impact indicators will not only show the benefit of freeway development (positive attractiveness) but also the cost of freeway construction as well (negative attractiveness). The next sections review literature on the impact indicators as they relate to the development of freeway construction. The findings of research conducted in other areas provide a good foundation to develop the research plan to assess the impacts of urban freeways in Arizona.

2.3.1 Urban Form Impacts

There is a substantial amount of literature related to the interaction of transportation systems and employment and land use development. Although there is not one accepted theory about this interaction, the common thread is that both people and businesses will tend to locate in a way to minimize transportation cost, assuming all other factors equal.

In terms of residential location, people will trade off housing costs and commute costs. Commute costs include both out-of-pocket expenses and travel time. As commute costs increase, people want to pay less for housing. Thus, we see land costs and housing prices lower on the periphery of an urban area where commute costs are higher than for closer-in locations.

The business location decision is affected in much the same way. A business will tend to choose a location that strikes a balance between total transportation costs and land prices. This trade-off will be much different for different types of businesses for two primary reasons. First, the composition of transportation costs will vary depending on the type of business. A manufacturing company will weigh the costs of transporting raw material to the plant and the costs of transporting the finished product to market against land values. An office user may weigh the commute costs of employees (since the availability of quality labor is required) against the value placed on being in a business hub such as a downtown area. A retailer will trade off the commute times of his customers with land prices to determine the best location.

The addition of an urban freeway system changes the travel time, which changes commute costs and the relative accessibility of each point in the urban area. For the resident, reduced commute times, which translate into lower journey-to-work costs, mean that he can consume more "housing" or some other good. Changes in residential

patterns have been easier to identify than employment locations in other urban areas and have been more pronounced. This may be due to the fact that the residential segment of the market is more mobile than the employment segment due to lower per unit capital costs, it can internalize and react to such changes more quickly, and this market segment may have fewer ties to a given area.

Changes in employment locations are more difficult to isolate because of the lack of good subcounty employment data coded by place of work. Businesses usually represent higher capital investment in both land and structures. In addition, a business will tend to have significant value built-up in a given location in terms of market presence which will make it more reluctant to move to a new area. New businesses will also tend to locate in areas that have demonstrated success, or that have a concentration of similar types of businesses, or that project an image that is necessary for the new firm. For example, it would be unusual for a bank headquarters to be located outside of a financial district.

In the literature, the patterns of geographic distribution of population and employment indicate that in contrast to patterns of population distribution which are generally continuous, employment tends to concentrate in a relatively limited number of well-defined business areas. In the last few decades, diversified land use concentrations comparable with downtown in their range of functions developed in the form of clusters and corridors. In the Washington, D.C. area, the suburban regional employment centers employed almost half as many people as worked downtown in 1974. This area has few major differences with most other urban areas: the dominance of government employment and the concentration of regional employment in the central area. Because of the much higher relative importance of the central employment core in Washington, D.C., it is likely that other regions will contain more and larger suburban employment centers, and that the cumulative employment in such centers would exceed that of the downtown.

Many factors affect land use patterns in these concentrations, including land use regulation, historical factors and timing of development, local opportunities for annexation, and characteristics of transportation systems. Any examination of suburban clusters and corridors invariably emphasizes the importance of transportation system. Much of the literature indicates that freeway configuration has a significant impact on the spatial distribution of clusters and corridors. Because circumferential freeways offer

greater access to larger parts of the metropolis than do radial freeways, clusters and corridors usually are more intensively developed along beltways.

It is general knowledge that while central city jobs have been declining, suburban employment is rising. In 1975 in Denver, for example, the downtown's share of total regional employment was declining by 40 percent and is still expected to decline by 25 percent in the year 2000, despite major public efforts to curb this exodus. Suburbanization of employment in urban areas has reduced the significance of downtown not only for shopping but also for commuting. Recent statistical analyses for 25 large metropolitan areas suggest that the number of public transportation commuters is very closely related to the number of Central Business District (CBD) employees rather than to overall metropolitan size. In other words, the decline of transit commuting is largely due to the reduction of CBD employment.

Obviously, the desire for certain characteristics in housing units and neighborhood is not a function of freeway impact alone. However, for families with young children, the presence of a freeway significantly increases the desire to move. In low-density areas, primarily in suburbs, the physical impact of the freeway is mitigated by the dispersion of the residents. It is the accessibility of other parts of the metropolitan region, particularly the downtown area that marks the influence of a freeway in such tracts.

Communities are becoming more and more concerned about so-called "concomitant outputs," such as the tangible and intangible effects of the freeway system on society and the environment than about "performance outputs," such as changes in travel times, volume, costs, and other objectives of the transportation system. The concomitant outputs dictate the quality of life of neighborhoods affected by freeway construction. Major components of quality of life indicators include economic, education, social, and environmental factors, as well as mobility and accessibility. It means that the assessment of neighborhood quality of life is aimed at finding if the freeway system enhances economic vitality, greater mobility and better accessibility, higher educational attainment, and enriches socioenvironmental conditions.

Completion of the freeway system in metropolitan areas has opened a wide variety of locational options for urban land use. Employment centers in the form of new office sites have been prominent among these developments. A study analyzing the attraction

of freeway systems for new employment centers in seven metropolitan areas (Atlanta, Dallas, Denver, Louisville, Minneapolis-St. Paul, Omaha, and San Jose) showed that greater growth of new office sites occurred outside the downtown core than in it. Growth of office space averaged 24 percent in the core and averaged 207 percent in non-core areas. Growth of office space along freeways exceeded growth in all other non-core transportation corridors.

In summary, the review of previous research has revealed that urban freeways can increase development opportunities along the corridor and can reinforce prevailing development patterns. Freeways alone, however, are not a sufficient inducement to counteract an area's poor image or to create a market for land, housing, or commercial space where none has historically existed. Previous case studies found that the greatest amount of suburbanization occurred in metropolitan areas that did not have a beltway system even when compared to metro areas that had a beltway.

An urban freeway location has shown to be a positive influence on multifamily housing, however, single family residential patterns rarely are affected over the long run. The impact of freeways on residential development and on commercial and industrial land use is described below.

2.3.2 Land Use Impact

Freeway developments affect opportunities for social and economic activities by increasing the number of alternative sites where it is feasible to work, shop, or relax. This increases the options open to people using the freeway system. Accessibility advantages of freeways are often demonstrated in development patterns of land uses. A USDOT study has shown that areas affected by freeways have often experienced more industrial development than comparable areas without freeway developments. Business, industry, and apartments benefit from freeway proximity and are more tolerable to noise than single family houses. This conclusion implies that proximity is not the only determining factor of land use development.

As mentioned above, the presence of an urban freeway is not sufficient by itself to create a development market where none has existed. In a similar way, a freeway is viewed as an important factor in the location decision and land use change, but it is not the only factor. For example, freeway interchanges are favored as a location for a regional shopping development, but previous studies indicate that many would have been

built in a suburban area even without the freeway. Freeways do, however, appear to affect the timing, location, size, and initial success of regional centers, but are not critical in determining their overall feasibility.

Industrial and office developers are willing to pay a premium for corridor locations with accessibility and visibility from the freeway. However, previous studies indicate that the freeway is less important than the availability of land and a skilled labor force. In most communities, industrial sites with rail access were preferred over freeway sites.

The nature of a circulation system in an area close to freeway affects the area's form and development. A Minneapolis study indicates that where frontage roads are present and have easy access to and from the freeway, all sites fronting on the freeway are desirable, especially for commercial activities and lodging industry. If frontage roads are absent or have restricted access, development is concentrated around interchanges. This illustrates how local comprehensive plans might influence land use impact of freeways.

The timing of freeway construction relative to the development of adjacent land is also important in the land use impact analysis as shown by the Minneapolis study. The study shows that if adjacent land is developed before the freeway is built, little land is left for any freeway-oriented development, and only small clusters will form at major interchanges. If the freeway is built long before the adjacent land is improved, clustering at interchanges again will predominate, with development along the freeway between interchanges only as spillover from the clusters. Since the Minneapolis study was aimed at the analysis of land use patterns of businesses impacted by freeway systems, little has been said about the pattern of growth of residential areas.

Freeway development is largely a capital investment program. The financial consideration suggests that most freeways are commonly constructed in lateral or longitudinal stages. In the case of lateral stage construction, service roads are constructed and opened to traffic before the main lanes. In the case of longitudinal stage construction, the service roads or main lanes are constructed on a freeway section-by-section. The analysis of actual land use changes in Houston, Texas, reveals that residential land use is the most sensitive type of land use to staging freeway construction. Commercial and industrial development are also sensitive but with lower

magnitude. The impact of freeway construction scheduling on multifamily land use is much smaller.

2.3.3 Property Value Impact

One of the impacts that is of great concern to the public is the effect of an urban freeway on property values. A Seattle study indicates that where improvement in the accessibility of an area was substantial, property values appreciated significantly. The study showed that in Kingsgate, Interstate 405 resulted in a 12 percent appreciation. In the North King County, the appreciation that resulted from I-5 was 15 percent. In both areas, most residents used the freeways for commuting to work and realized significant time savings. On the other hand, in the control area there was little or no effect of freeway benefits on property values. For commercial and industrial property, values were found to have appreciated almost 17 percent more in the freeway impact area than in the control area.

Some of the properties closest to the highways also suffer some negative effects because of adverse environmental influences. Highway noise levels caused a partly offsetting decrease in property values for those houses closest to the highway. In the Seattle study, the magnitude of this adverse effect ranged from 0 to 7.2 percent, depending on the noise level and the character of the neighborhood involved. The study found that the impact was greatest in higher income neighborhoods.

The net effect on property values was positive for the areas where both effects could be quantified. This implies that all properties in the areas appreciated because of the freeway, but those closest to the freeway did not appreciate to the same extent. A study for North Springfield, Virginia estimates that the difference in sales price between properties in proximity to the highway with those equivalent properties located farther from the highway was $3,000 to $3,500.

A study in Canada indicated that levels of noise from highway traffic (up to 73 dBA) are not related to major differences in housing prices. Levels of 60 to 65 dBA have been shown to be associated with annoyance but appear not to affect housing prices. High sound levels (above 73 dBA) are necessary if housing prices are to be significantly affected. For high noise levels, the cost of noise appears to be roughly $650 to $700 per decibel, at 1977 prices.

A similar study in Virginia shows that housing prices appear to be influenced by noise level above 63 dBA (in Northern Virginia). For a house experiencing more than 63 dBA, the estimated reduction in price would be $94 per decibel, at 1978 prices. In Tidewater, Virginia, the influencing noise level was above 70 dBA, and the reduction in price was estimated to be $88 per decibel.

2.3.4 Impact on Businesses

The spatial pattern of businesses is a cumulative product of decisions made at particular sites. The impact of freeway construction on the location of business developments takes the corridor form of land use developments. Corridors are linear, activities string out along an axial freeway with most growth in the two directions along that artery. An analysis of factors theoretically associated with this land use concentration in seven metropolitan areas (Atlanta, Dallas, Denver, Louisville, Minneapolis-St. Paul, Omaha, San Jose) suggests that accessibility to the residences of white-collar workers, especially those who make decisions on business location, was most important.

The steady suburbanization of housing and retail activities in most metropolitan areas further reinforces the trend toward decentralized business location. An analysis of suburban office growth in several U.S. cities indicates that these businesses include many of the nation's most rapidly growing industries, such as service-oriented companies (data processing and research) and technologically-sophisticated firms (manufacturers of computers, precision instruments, and electronic components). There is also a clear trend towards mixed-use suburban congregations; the activities found at some multi-complex centers read like an inventory of traditional downtown facilities.

The types of locales preferred by different activities vary considerably. The findings from two case studies in Minneapolis-St. Paul show businesses are strongly attracted to corridor development. The strongest desire for easy access to freeways leads many industrial plants and warehouses to locate in corridors, as does the need for large tracts of less expensive land on which to construct efficient, one-story facilities with ample space for freight transfer and employee parking. Commercial establishments as a group have great geographical tolerance, and they are found in a wide range of locations. However, not all commercial activities want or can afford cluster locations (a cluster is an areal form, focussing on one or more nuclei). Automobile dealers like to be near one another, but their space requirements force them to highly visible sites on

cheaper land in corridors. The locational criteria of hotels and motels lead them to locate in both types of concentrations, clusters and corridors.

The Minneapolis-St. Paul study concludes that no absolutes govern the geographic behavior of business land uses, but their locational tendencies indicate that a corridor is formed by the coalescence of activities around its interchanges. Commercial activities group around interchanges with roads that serve residential areas; hotels and motels are attracted toward airports and interchanges with other freeways. Industrial and wholesale operations are the mainstay of the corridor and occupy large tracts not desired by other land uses. Office buildings are found throughout the corridor; these frequently fill in gaps between interchanges that are not commercially desirable.

2.4 Business and Residential Perceptions of Freeways

A freeway can be interpreted as a physical entity and/or a transportation facility. The former refers to the road as a physical intruder that necessitates demolition of housing and relocation of population, creates barriers to movement within neighborhoods, increases traffic around access and egress points, and generally pollutes the physical environment. The freeway as a facility is a carrier of goods and population that provides access between different zones of the metropolitan areas.

An analysis of the relationship between population density and freeway impact for 23 SMSAs in 9 states indicates substantial differences between affected and unaffected tracts in high-density tracts but not in the low-density stratum. The differences in the high-density tracts, however, were not necessarily attributed to the freeway. How does one account for the different patterns and magnitude of impacts between high- and low-density strata?

In the high-density tracts where the physical aspect of the freeway predominates, sensitivity to the road as a physical object would be greater. Local lower income and greater pedestrian dependency (more children walking to school), and more use of local neighborhood shopping facilities all contribute to the likelihood that a new freeway will disrupt normal transportation routes (force people to take detours). The more densely populated an area is, the greater the physical intrusiveness of any freeway construction project can be expected to be. It is not uncommon that families whose children are approaching school age have a tendency to seek suburban, single family housing and

open space. Once children begin to venture out alone, the quality of neighborhood becomes more important to the parents. There has been a body of research that points out the importance of quiet, traffic-free streets and general environmental qualities in conditioning feelings about a neighborhood.

2.5 Research Focus

Thus, previous research provides a strong theoretical foundation, supported by previous case studies, for the analysis of urban freeway impact in Arizona. The literature strongly emphasizes that each metropolitan area is unique, and that freeways in and of themselves only create opportunity, but change depends on a larger number of factors.

Phoenix is unique in the combination of its very rapid rate of growth, its low-density development that contributes to a rapid physical expansion of the urban periphery, and its extremely limited freeway system. Maricopa County's planned freeway system introduces a significantly new factor into the urban area's future development. Its implementation will create freeway corridors in both urbanized areas and in the undeveloped periphery. Moreover, the addition of 230 miles of freeway system to the urban network (compared to only 80 miles that are currently in place within the urban area) will substantially alter the supply/demand balance for freeway corridor property.

There are a number of areas that are explored in this document.

- What is the demographic impact of freeways?
- What are the land use impacts of freeways?
- What are the impacts on residential development?
- What are the impacts on residential property values?
- How do people living closely to a freeway perceive it?
- What are impacts on business?
- How do freeways affect urban form?

The chapters that follow present findings on the metro Phoenix case study areas, relating them back to the broader foundation provided by the literature.

3.0 Study Area Description

Based on consultation with the Arizona Transportation Research Center, portions of two freeways within metropolitan Phoenix were selected as case studies for this research project: the Superstition Freeway (Arizona 360) from its junction with Interstate 10 in the City of Tempe to Gilbert Road in the City of Mesa; and the Black Canyon Freeway from McDowell Road to Bell Road in the City of Phoenix. These two freeway corridors were selected because of their differences.

- They were built at different times, completed over a period from 1958 to 1981.
- They included a range of urban areas that, on one extreme, were almost completely urbanized older areas and, on the other extreme, were undeveloped agricultural land.
- They were built in different cities.

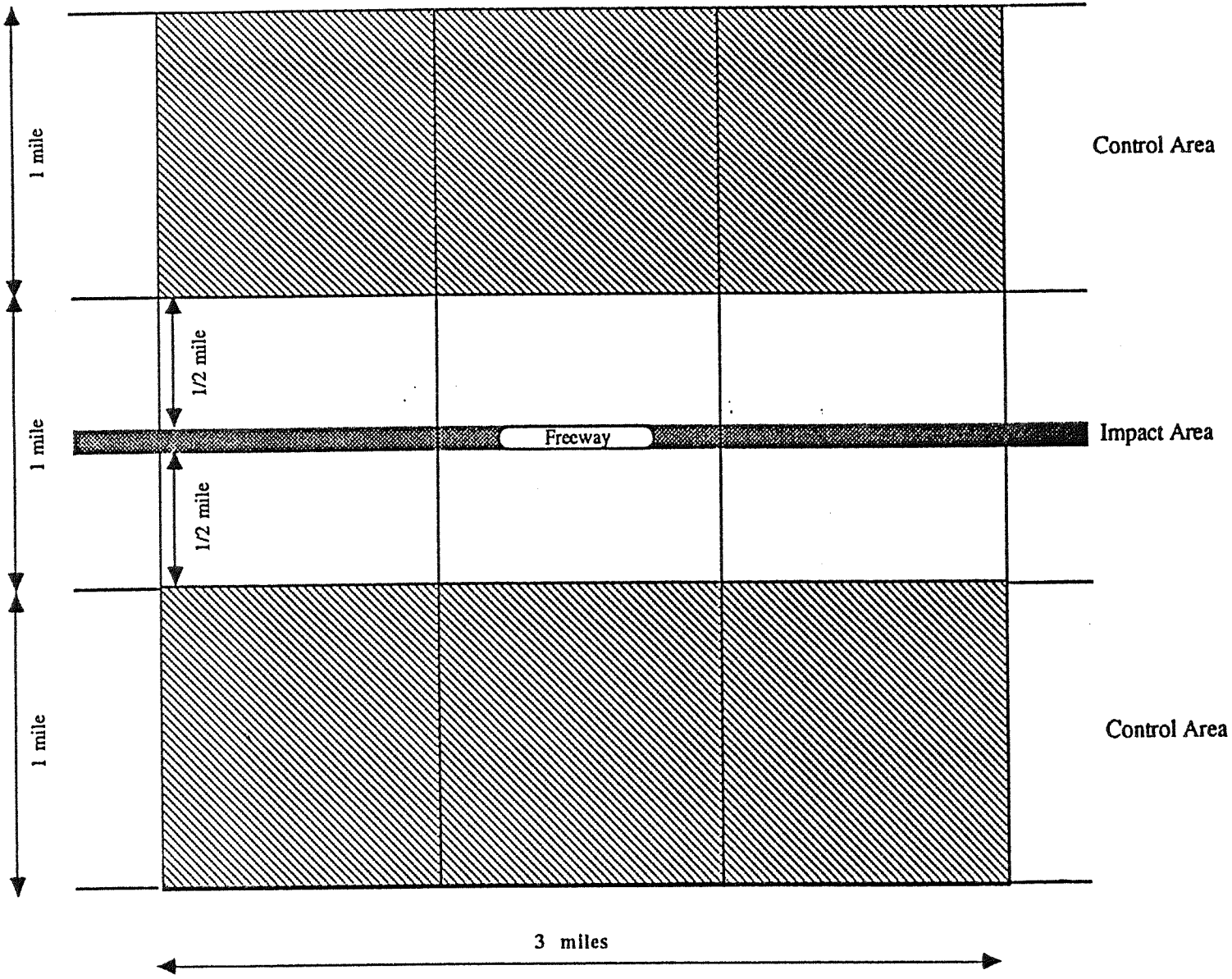
Based on a review of the literature on freeway impacts, two types of Study Areas were defined for each of the freeway corridors:

1. A study area was defined to include a segment three miles long, extending 1-1/2 miles on either side of the freeway. As Figure 3-1 shows, a study area was divided into three smaller areas:
   - a sample area, defined to be one-half mile on either side of the freeway, and
   - two control areas that extended beyond the sample area for one mile.

   The purpose of the control areas is to serve as areas against which the activity within the sample can be compared to determine the impact of the freeway.
2. The second type of area defined was a freeway study corridor (see Figure 3-2). A freeway corridor is defined to extend one-half mile on either side of the freeway and runs from 10 to 12 miles along the freeway. The corridors are used for more intensive land use analysis than the smaller study areas.

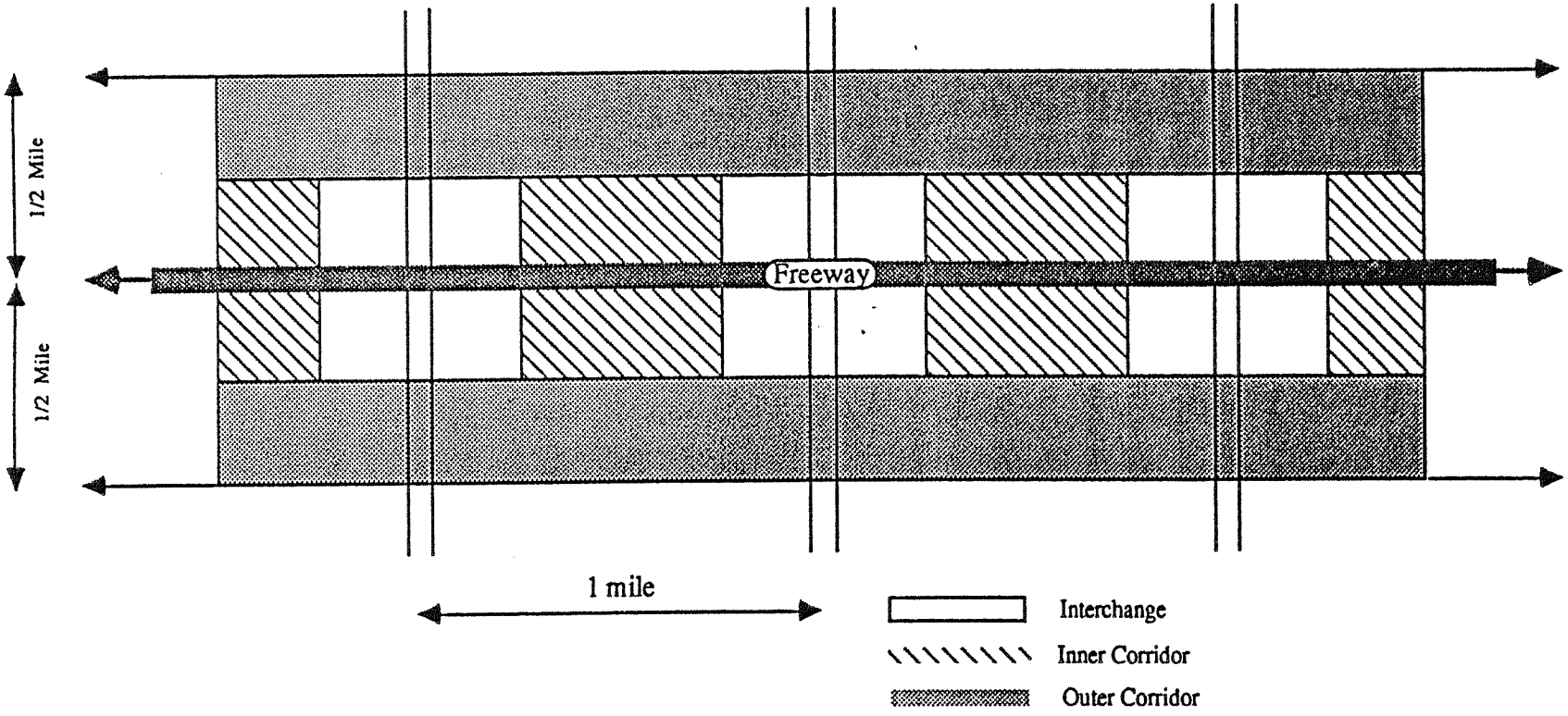
A study corridor is further categorized into three areas which provide different locational opportunities.

FIGURE 3-1
FREEWAY STUDY AREA STRUCTURE



Source: Economic Research Division, Mountain West Research, July 1987.

FIGURE 3-2
FREEWAY STUDY CORRIDOR STRUCTURE



Source: Economic Research Division, Mountain West Research, July 1987.

- The interchange consists of a one-half mile square area centered around each freeway-arterial interchange, extending one-fourth mile from the interchange in all directions.

- The inner corridor consists of a one-half mile parallel strip, extending one-fourth mile on either side of the freeway, that connects interchanges.

- The outer corridors are two one-mile by one-fourth mile strips, running parallel to the freeway adjacent to the interchange and inner corridor areas.

The literature indicates that the majority of freeway-related impacts will be found in a zone contained within one-half mile of the roadway, which precisely defines the study corridors. Each of the wider Study Areas, however, is further distinguished into "Impact" areas within one-half mile of the roadway and "Control" areas that extend from one-half to one-and-one-half miles from the roadway. This distinction is drawn in order to better isolate freeway-related impacts. The choice of study areas was largely based on this attribution issue--the timing and general character of land uses in their control areas was similar to those of their sample areas at the time the freeway was constructed. Thus, within metropolitan Phoenix, four distinct areas were identified. As Figure 3-3 shows, these include:

1. The Superstition Study Area
2. The Black Canyon Study Area
3. The Superstition Study Corridor
4. The Black Canyon Study Corridor

The Superstition Freeway Study Area is bounded by the Southern Pacific Railroad on the west, Price Road on the east, Broadway Road on the north, and Guadalupe Road on the south. The area is completely contained within the City of Tempe. The one-mile strip along the freeway from Southern and Baseline is defined as "impact area" and the remaining sections are defined as "control areas" (see Figure 3-4). Control Area North is contained between Broadway Road and Southern Avenue, while the Control Area South is contained between Guadalupe Road and Broadway Road. Where more detailed assessment is necessary, both Impact and Control Areas were further distinguished into smaller "neighborhoods".

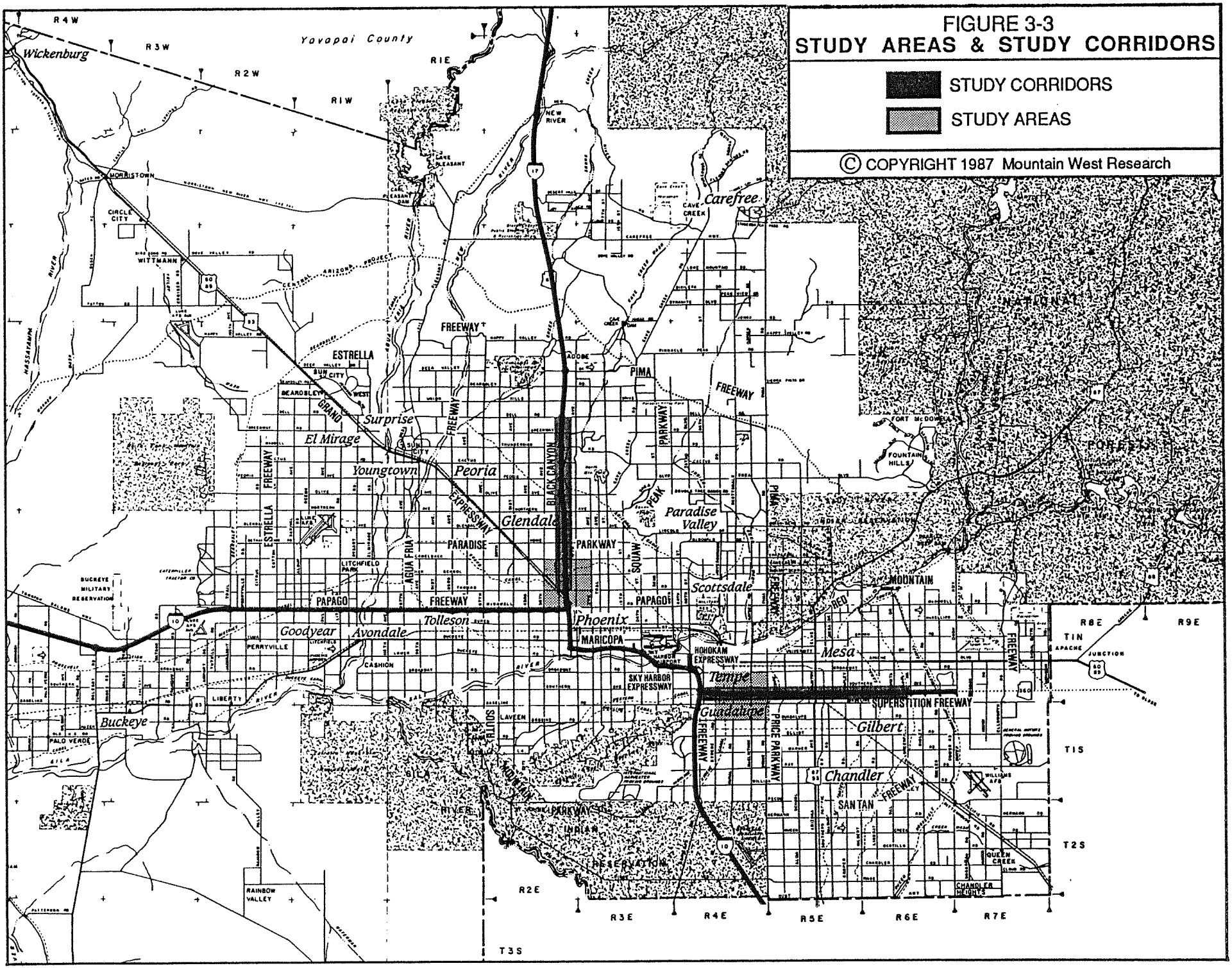


FIGURE 3-3
STUDY AREAS & STUDY CORRIDORS
STUDY CORRIDORS
STUDY AREAS
© COPYRIGHT 1987 Mountain West Research
Yavapai County
Wickenburg
Morristown
Circle City
Wittmann
Carefree
Cave Creek
Fountain Hills
Estrella
Sun City
Sun City West
Surprise
El Mirage
Youngtown
Peoria
Glendale
Paradise Valley
Scottsdale
Phoenix
Tolleson
Goodyear
Avondale
Litchfield Park
Buckeye
Palo Verde
Perryville
Cashion
Liberty
Rainbow Valley
Maricopa
Mesa
Tempe
Gilbert
Chandler
San Tan
Queen Creek
Chandler Heights
Williams AFB
Fort McDowell
Indian Reservation
Salt River
New River
Agua Fria River
Gila River
Hassayampa River
Central Arizona Project
Grand Avenue
Estrella Freeway
Black Canyon Freeway
Papago Freeway
Agua Fria Freeway
Superstition Freeway
Price Parkway
Pima Freeway
Hohokam Expressway
Sky Harbor Expressway
Squaw Peak Parkway
Red Mountain Freeway
Buckeye Military Reservation
Tonto National Forest
R4W
R3W
R2W
R1W
R1E
R2E
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R7E
R8E
R9E
T1N
T1S
T2S
T3S

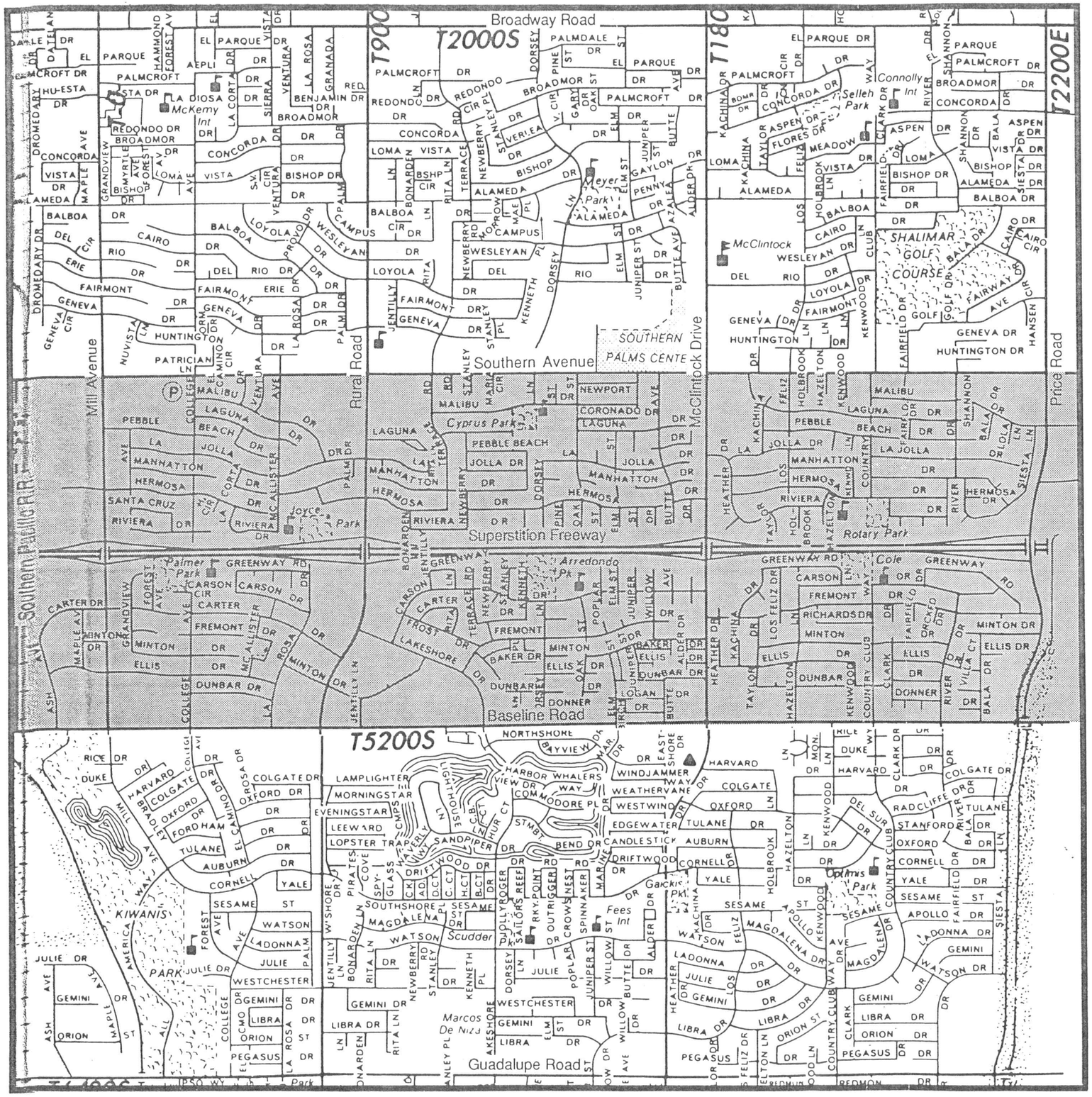


FIGURE 3-4

SUPERSTITION FREEWAY STUDY AREA

SAMPLE AREA

CONTROL AREA

The Black Canyon Study Area is a corridor of I-17 bounded by 35th Avenue on the west, 7th Avenue on the east, Camelback Road on the north, and McDowell Road on the south. The area is under the jurisdiction of the City of Phoenix. This study area was chosen because its freeway was built in an already urbanized area. The Black Canyon area was built in the late 1950s and completed in the early 1960s. It is a depressed freeway. The Black Canyon "Impact Area" is defined as a one-mile strip along I-17 from 27th Avenue on the west to 19th Avenue on the east, and from Camelback Road on the north to McDowell Road on the south (see Figure 3-5). The Control Area West is bounded by 27th Avenue and 35th Avenue. The Control Area East is bounded by 19th Avenue to 7th Avenue.

The Superstition Freeway Corridor runs from milepost 0.0 (at 56th Street, Tempe) to milepost 10.0 (at Gilbert Road, Mesa) along the S-360. The corridor covers a 1-mile wide area, so that the size of Superstition corridor study area is 10 square miles. A total of 40 smaller segments were defined in the Superstition Corridor. Most of the sections were developed after the freeway was constructed, except for a very few sections at the western edge of the corridor. Forty percent of the corridor is in Tempe, and the remaining segment is located in Mesa.

The Black Canyon Corridor starts at McDowell Road and ends at Bell Road. The one-mile corridor runs for 12 miles. A total of 48 smaller sections were defined in the Black Canyon Corridor, all located in the City of Phoenix.

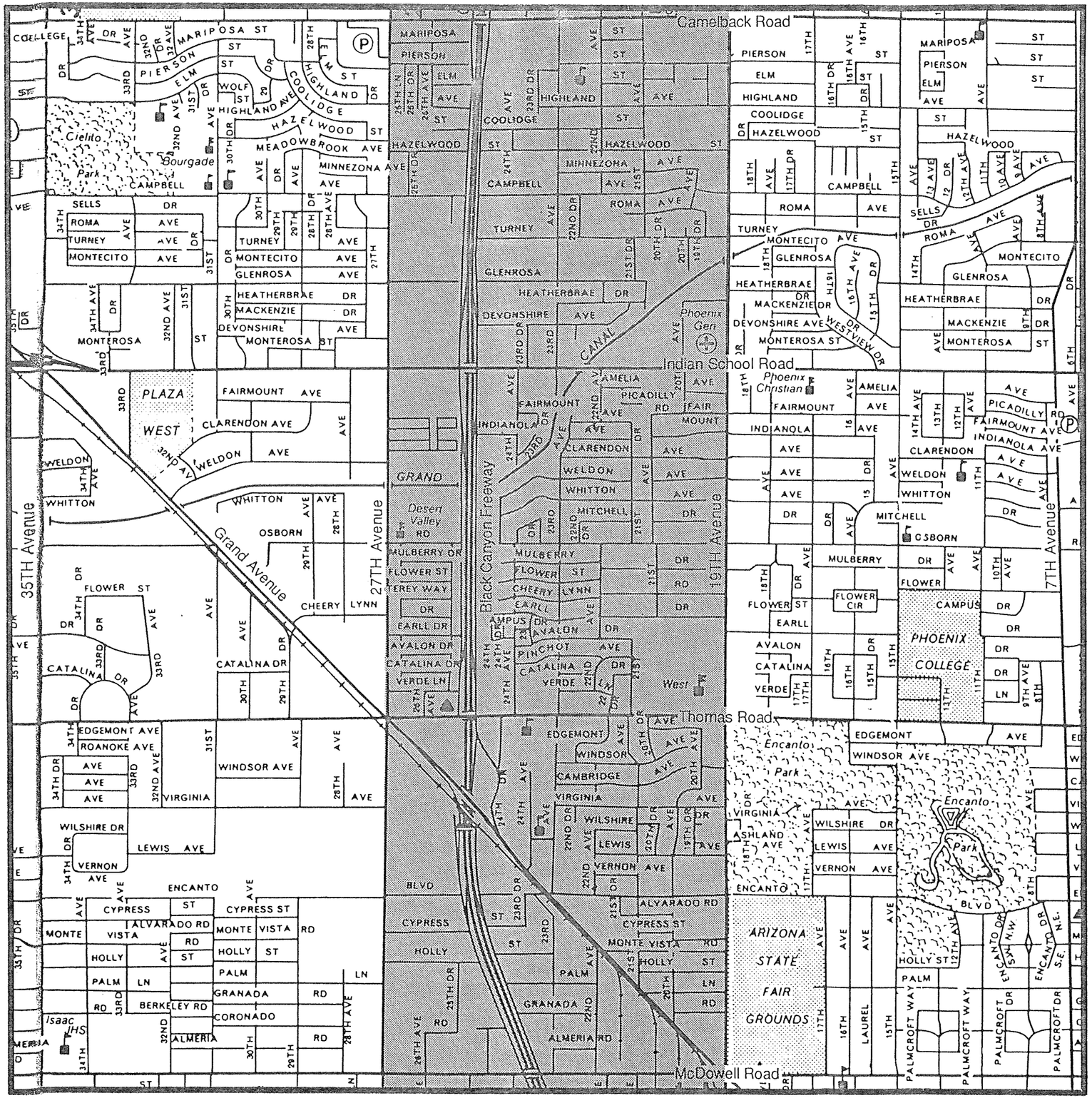


FIGURE 3-5

BLACK CANYON STUDY AREA

SAMPLE AREA

CONTROL AREA

4.0 Freeway Development and Municipal Planning

As later chapters substantiate, freeways are a necessary, but not sufficient cause for high density land use change in either their freeway corridors or in larger influence areas. The precise location of high density development is the result of a number of factors, but it is clear that good municipal planning--which anticipates and accommodates market results, combined with careful land planning and design requirements--will guide and control land use change around freeways, if the plan is acted upon.

This chapter lays out the broad context in which to evaluate the more microscopic case studies presented in later sections. Here, the magnitude of metro Phoenix's growth between 1955 and 1985, the timing of the case study freeways, and the municipal planning reactions to freeways are presented.

4.1 Growth in Metro Phoenix

In 1955, when the Black Canyon Freeway was being planned, Maricopa County's population was 477,000 (see Table 4-1). In 1960, when the first metropolitan freeway system was proposed, population had increased to 663,000. By 1980, when the Superstition Corridor was almost completely built, the county's population was 1.5 million. By 1985, the county's population was 1.8 million, and the average yearly population change, which was 30,000 in the early 1950s, had jumped to 65,000. Metro Phoenix's traffic problems had precipitated countywide approval of a sales tax increase to finance a metropolitan freeway system very similar to the one first proposed 25 years earlier.

Phoenix, Tempe, and Mesa have absorbed a good share of the county's population increase, and rapid growth has been a reality with which each of their general plans has dealt.

- As Table 4-2 shows, when the Black Canyon was built, the City of Phoenix was growing at an average rate of 44,000 persons yearly. Although growing at half that rate since, its yearly average increases of 13,000 to 24,000 persons is still large.
- Before the Superstition, Tempe was growing at 3,500 to 4,200 persons annually; after the Superstition was built, that annual rate jumped to 6,000, and has since dropped to 2,600 to 5,200 persons annually.

TABLE 4-1
TOTAL POPULATION
MARICOPA COUNTY
1950 TO 1985

	Level	Change		Annual Percent Change
		Absolute	Average Annual	
1950	331,770	N/A	N/A	N/A
1955	477,000	145,230	29,046	6.14
1960	663,510	216,510	43,302	8.22
1965	852,000	188,490	37,698	5.12
1970	971,228	119,228	23,846	2.65
1975	1,253,900	282,262	56,534	5.24
1980	1,509,262	255,362	51,072	3.78
1985	1,837,956	328,694	65,739	4.02

Source: U.S. Bureau of Census and Arizona Department of Economic Security.

TABLE 4-2

TOTAL POPULATION
STUDY AREA CITIES
1950 TO 1985

	Level	Absolute Change	Average Annual Change	Annual Growth Rate
		Phoenix		
1950	106,818	N/A	N/A	
1953	128,841	22,023	7,341	6.45
1960	439,170	310,329	44,333	19.15
1965	505,666	66,496	13,299	2.85
1970	584,303	78,637	15,727	2.93
1975	669,005	84,702	16,980	2.74
1980	789,704	120,699	24,140	3.37
1985	881,640	91,936	18,387	2.23
		Tempe		
1950	7,684	N/A	N/A	
1960	24,897	17,213	1,721	12.47
1965	45,919	21,022	4,204	13.02
1970	63,550	17,631	3,526	6.71
1975	93,822	30,272	6,054	8.10
1980	106,920	13,098	2,619	2.65
1985	132,942	26,022	5,204	4.45
		Mesa		
1950	16,790	N/A	N/A	
1960	33,772	16,982	1,698	7.24
1965	50,529	16,757	3,351	8.39
1970	63,049	12,520	2,504	4.53
1975	100,763	37,714	7,528	9.83
1980	152,453	51,690	10,338	8.63
1985	239,587	87,134	17,427	9.46

Source: U.S. Bureau of the Census.

- Before the Superstition was built, Mesa's annual population increase had doubled to 7,500, from 1,700 in the 1950s and 3,000 in 1960s. After the Superstition, its rate of growth jumped to 10,000 annually in the late 1970s, and again to 17,000 annually in the early 1980s.

4.2 Freeway Development

The Black Canyon and Superstition Freeways were built at two distinctly different periods in metro Phoenix's development. The Black Canyon Study Corridor was built in the late 1950s and early 1960s as part of the Federal Interstate system, and was conceived to be part of a national system that linked cities. In 1955, metro Phoenix's population was 477,000, and in 1965 it was 852,000. By the time the Superstition Study Corridor was built in the 1970s, it was conceived to be part of a larger, intra-urban freeway system. In 1970, Maricopa County's population was 971,000, and in 1985 it was 1.8 million.

4.2.1 The Black Canyon Study Corridor

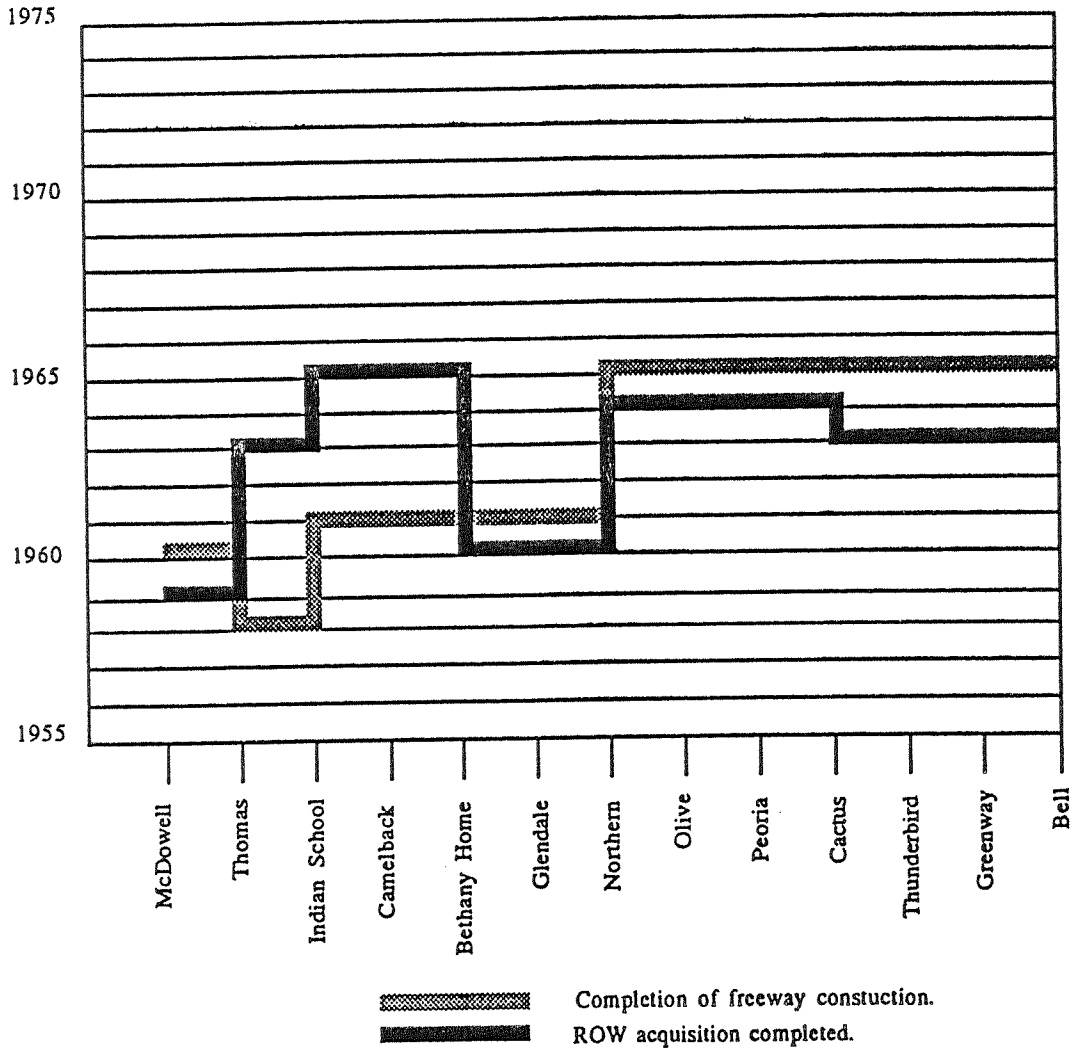
The Black Canyon Freeway was conceived, designed, and built as part of the Interstate Highway System, and was completely federally funded. In Arizona, six interstates were built, including Interstate 17 from Flagstaff to Phoenix Sky Harbor Airport. In Phoenix, I-17 was built largely along the Black Canyon Highway (27th Avenue). Its actual alignment weaved through different parts of the urbanized area, depending on design constraints and urban development. Along the Study Corridor, the Black Canyon's alignment was 25th Avenue from McDowell Road to Northern Avenue, and 27th Avenue above Northern Avenue.

As Figure 4-1 shows, the southern portion of the freeway (below Northern) was built from 1958 to 1961, and its entire northern portion (from Northern Avenue to Bell Road) was built by 1965.

- The southern alignment--25th Avenue-- was largely built through portions of a residential area, on a street that had a 50 to 60 foot right-of-way. A small number of properties along the freeway's right-of-way were condemned and, because of the length of the condemnation process, were not acquired for right-of-way until after construction was completed. The southern Black Canyon Corridor was built between 1958 and 1961, and all right-of-way was acquired by 1965.

FIGURE 4-1

SEQUENCE OF DEVELOPMENT
BLACK CANYON STUDY CORRIDOR



Source: Arizona Department of Transportation, July 1978.

- In contrast, the northern Black Canyon Corridor was built on undeveloped, largely agricultural land. Right-of-way was acquired in 1963 and 1964, and the freeway segment was built in 1965. That this freeway corridor was originally undeveloped means that its present land use condition is caused more by market forces existing in present-day Phoenix than was the southern Black Canyon.

4.2.2 The Superstition Study Corridor

In contrast to the Black Canyon Freeway, the Superstition Freeway was originally conceived as part of a larger intra-urban system, very similar to the one presently planned and being built. In 1960, Wilbur Smith and Associates completed a freeway system master plan for metro Phoenix, shown in Figure 4-2. Clearly, the Superstition was designed to be the southeast leg of a larger system, principally conceived to improve accessibility from Tempe and Mesa into the larger urban area. However, it was over ten years between that master plan and the Superstition's construction. By the time it was designed and built, it was widely believed that the Superstition would merely move through traffic from points east into the central urban core. The dramatic growth it would stimulate north and south of it in the East Valley in then-agricultural land, due to better accessibility, was unanticipated, certainly by the City of Mesa.

The Superstition Study Corridor was completed in several phases from 1972 to 1981, as Figure 4-3 shows. By that time, permitting requirements were stricter, and, unlike the Black Canyon, FHA approval for and public hearings on the Superstition's alignment and design were held between 1967 and 1975, prior to right-of-way acquisitions. Right-of-way was acquired in several stages between 1970 and 1980, and the freeway was completed between 1972 and 1981. Originally designed and built as a four-lane freeway, the system was widened to six lanes in 1983 and 1984.

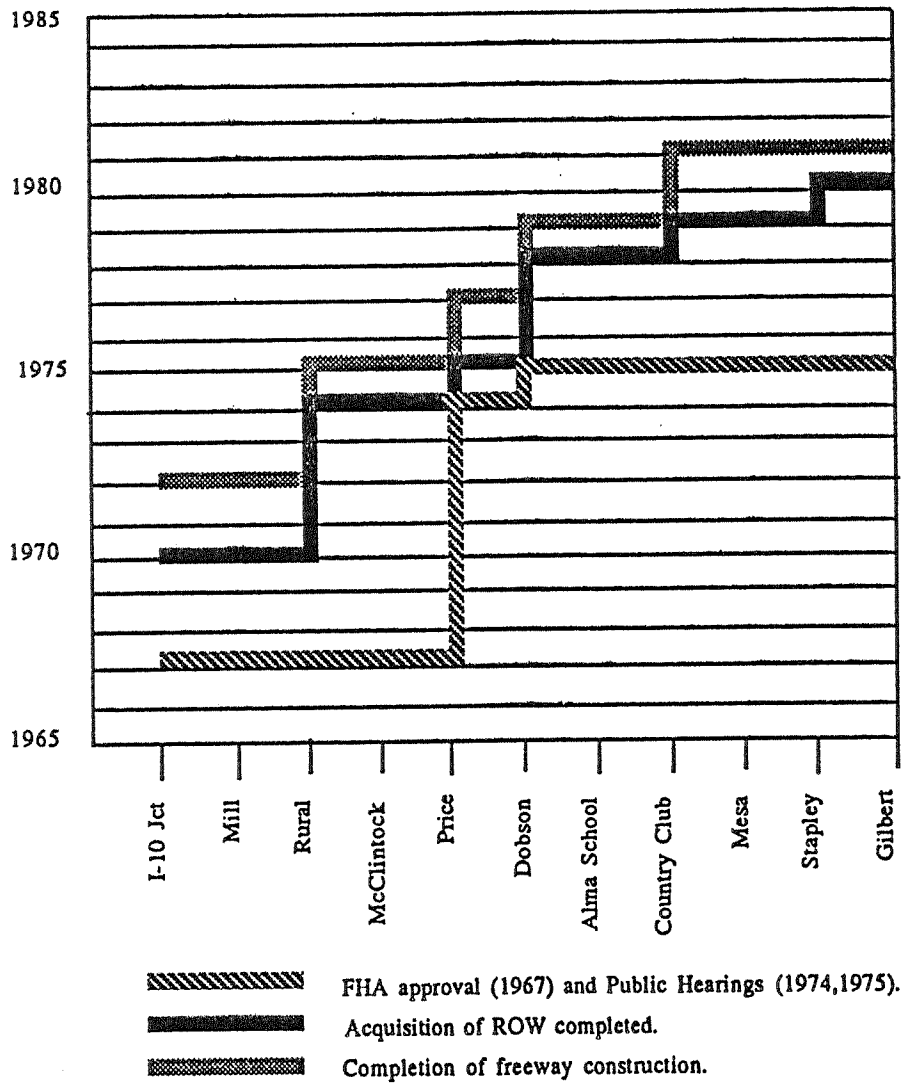
The Superstition Study Corridor is contained in two cities. The segment from I-10 to Price Road is in the City of Tempe and was completed in two phases--1972 and 1975. The segment east of Price to Gilbert Road is in the City of Mesa and was completed in three phases--1977, 1979, and 1981.

4.3 Municipal Urban Planning

There is a complexity of iterations among freeway development, urban planning by public jurisdictions, land development by private developers, and location decisions by

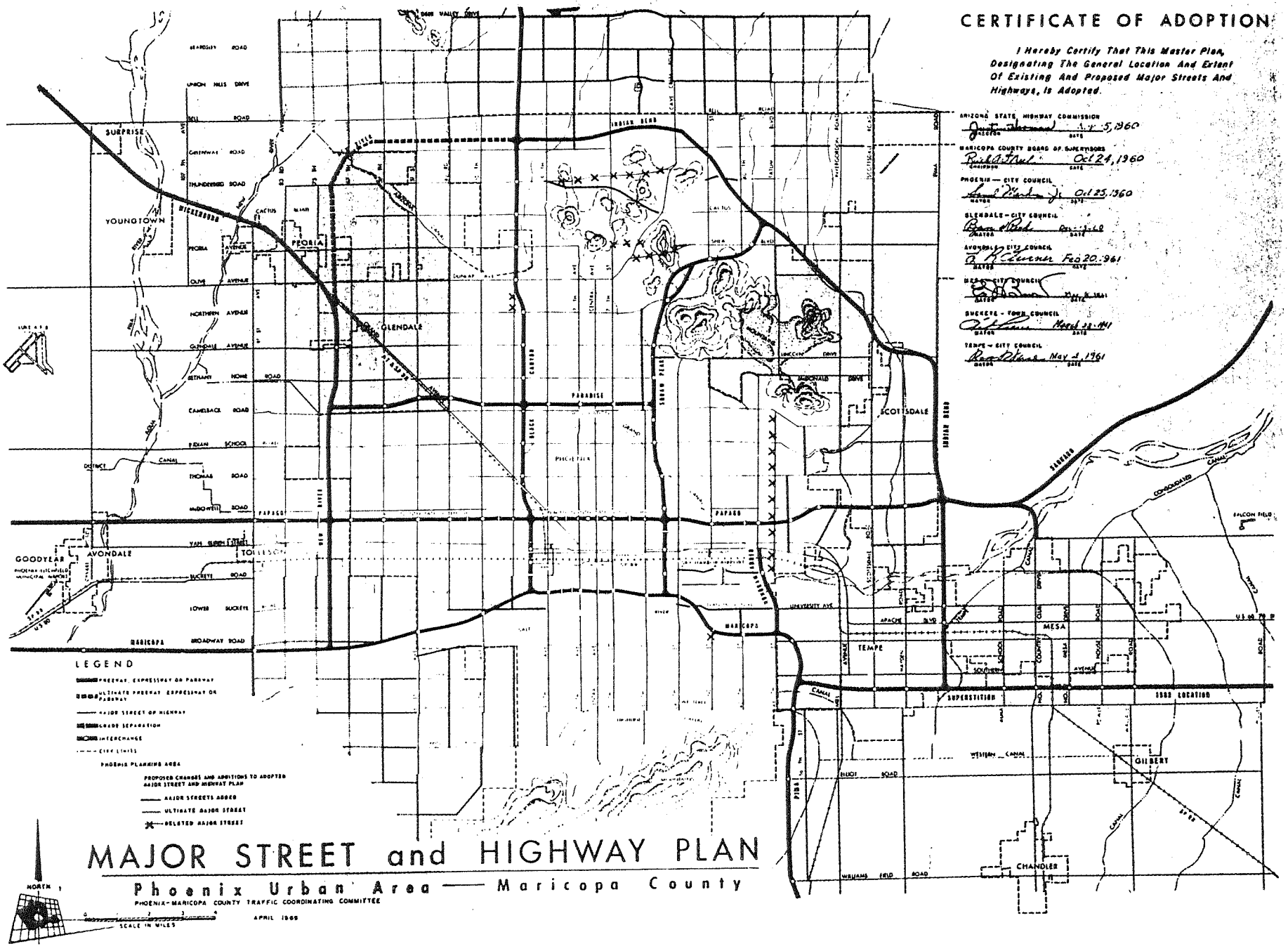
FIGURE 4-3

SEQUENCE OF DEVELOPMENT
SUPERSTITION FREEWAY STUDY CORRIDOR



Source: Arizona Department of Transportation, July 1978.

FIGURE 4-2


CERTIFICATE OF ADOPTION
I Hereby Certify That This Master Plan, Designating The General Location And Extent Of Existing And Proposed Major Streets And Highways, Is Adopted.
ARIZONA STATE HIGHWAY COMMISSION
MARICOPA COUNTY BOARD OF SUPERVISORS
Oct 24, 1960
PHOENIX — CITY COUNCIL
Oct 25, 1960
GLENDALE — CITY COUNCIL
AVONDALE — CITY COUNCIL
Feb 20, 1961
MESA — CITY COUNCIL
SUCKEYE — TOWN COUNCIL
March 28, 1961
TEMPE — CITY COUNCIL
May 4, 1961
LEGEND
PHOENIX PLANNING AREA
PROPOSED CHANGES AND ADDITIONS TO ADOPTED MAJOR STREET AND HIGHWAY PLAN
MAJOR STREETS ADDED
ULTIMATE MAJOR STREET
DELETED MAJOR STREET
SCALE IN MILES
APRIL 1960
MAJOR STREET and HIGHWAY PLAN
Phoenix Urban Area — Maricopa County
PHOENIX-MARICOPA COUNTY TRAFFIC COORDINATING COMMITTEE
SURPRISE
YOUNGTOWN
PEORIA
GLENDALE
SCOTTSDALE
PARADISE VALLEY
PHOENIX
TEMPE
MESA
GILBERT
CHANDLER
AVONDALE
GOODYEAR
TOLLESON
SUPERSTITION FREEWAY
1960 LOCATION

residential and non-residential users which results in the land use mix for areas influenced by freeways. This section describes how Phoenix, Tempe, and Mesa reacted to freeway corridors, as interpreted from their general plans.

A city's general plan results from an inventory of the range of factors that influence urban form, from expectations about future growth and development, and from public policy goals which are generally accepted by its citizens. In the thirty-year period between the Black Canyon Freeway's design and the Superstition Corridor's completion, there are obviously many factors which have influenced general policy by Phoenix, Tempe, and Mesa. However, the overriding macroeconomic condition of rapid growth in the metro area (discussed in Section 4.1) has certainly influenced changes in their general plans. Associated with this dramatic growth was a spatial expansion of the Phoenix urban area, as individual municipalities grew towards each other's borders. As an important factor that influences spatial development, major transportation corridors are an important element that influence land use plans. A major difference between the Black Canyon and the Superstition is that both Tempe and Mesa knew well in advance that the Superstition was planned, that it was meant to be part of a larger freeway system, and that spatial expansion is a baseline condition in metro Phoenix. The differences among the three cities' general plan responses to freeway systems is instructive, especially compared to actual land use development which has since occurred.

4.3.1 City of Phoenix

The city's first comprehensive plan was developed in 1923, was followed by a zoning ordinance in the late 1920s, and was promptly forgotten. Thus, the southern Black Canyon Corridor was developed in isolation of a guiding plan by the city. Although another general plan was not developed until 1969, a joint City/County Task Force was formed in 1957 to undertake a study which resulted in a 1959 land use plan. This conceptual plan, reproduced here as Figure 4-4, was never formally adopted. However, it was frequently referred to in Council hearings, and zoning cases were based on it. In effect, the plan guided the city's land planning until 1969.

The 1959 land use plan is interesting for four reasons.

FIGURE 4-4

DIAGRAMMATIC LAND USE PLAN · 1980

1. As a joint City/County effort, it is a plan for the larger urban area, with the notable exceptions of second-tier municipalities--Tempe, Mesa, Scottsdale, and Glendale. In that context, it is notable that the land use plan was developed without a circulation plan, although a pilot traffic study had just been started.

2. According to a principal contributor to its development, the 1959 plan was guided by an extrapolation of trends rather than a focus on urban form. Its goal was to accommodate growth, rather than to direct it. In the plan, trends were driven by population growth, which underestimated the county's 1980 population by 500,000 people.

3. Where it addressed the southern Black Canyon Freeway from Northern to McDowell, the plan maintained then-existing uses. In fact, density in the southern Black Canyon Corridor has increased dramatically since 1959.

4. Although the plan did not address the northern Black Canyon Freeway, it showed retail nodes at arterial intersections and an industrial zone from Thunderbird to Dunlap, with the balance of the corridor in low-density residential uses. The corridor has, in fact, developed more densely than indicated in the plan, and the locations of actual development bear no resemblance to the plan.

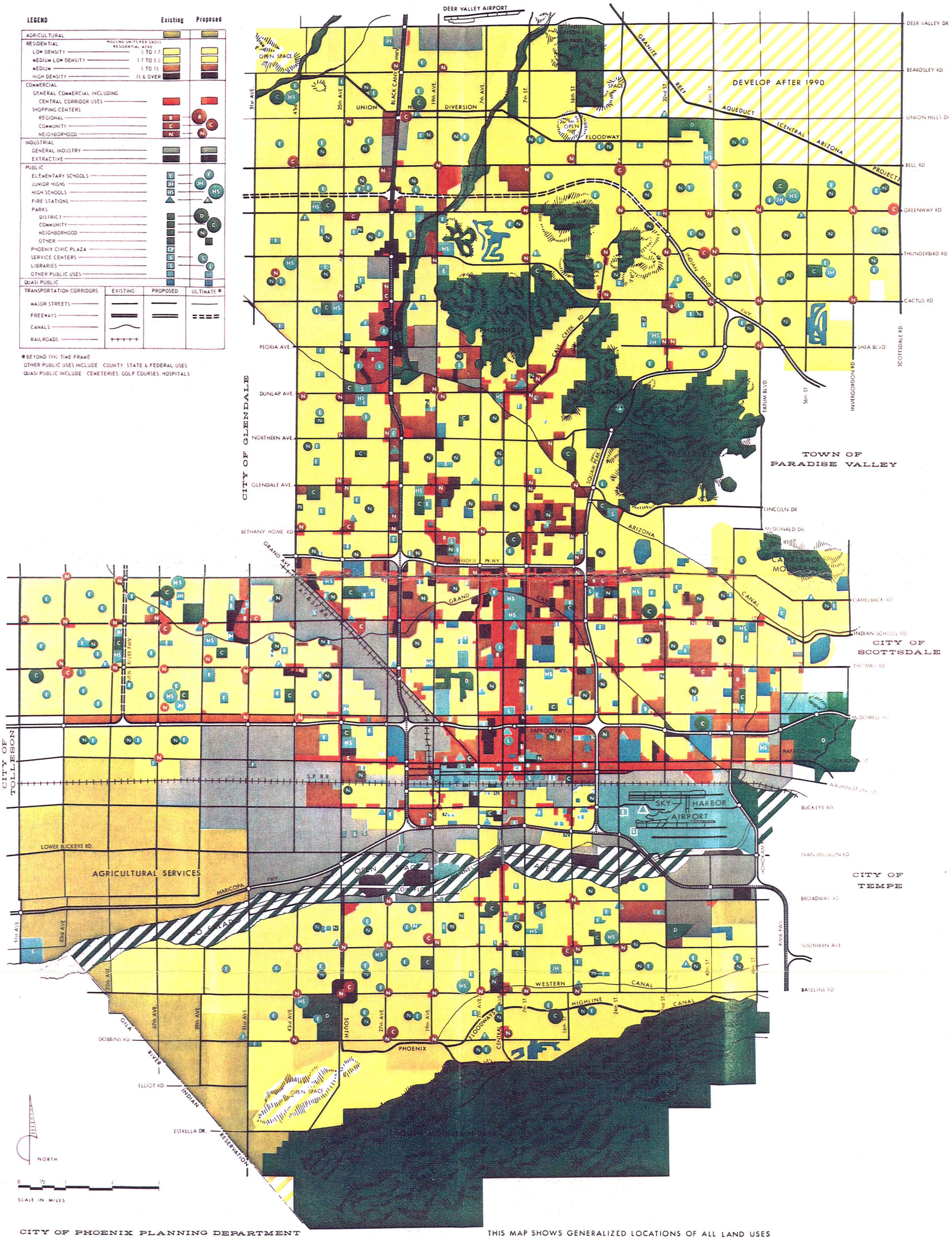
In 1969, Phoenix adopted its first General Plan in 46 years (see Figure 4-5). Unlike the 1959 Land Use Plan, the General Plan was made in the context of the Wilbur Smith Freeway Master Plan, made in 1960. By this time, Phoenix planning staff were concerned about the directions of growth and wanted to evaluate alternative ways to shape urban form. However, because the time required for that evaluation could not be achieved in the schedule required to complete the plan, the 1969 General Plan was, again, based on trends. A twenty-year plan, it was based on 1990 population projections that are close to those presently made for that year.

Because the plan assumed the development of the freeway system shown in Figure 4-2, it anticipated that more new growth would take place in peripheral areas made accessible for development by new freeways. In particular, growth was anticipated in the Laveen area (because of the now-abandoned western portion of the Maricopa Freeway), the Maryvale area (because of the much-delayed western Papago Freeway), and the northeast area (because of the completed Black Canyon and the western Outer Loop).

LAND USE PLAN 1990

FIGURE 4-5

Phoenix , Arizona



CITY OF PHOENIX PLANNING DEPARTMENT

THIS MAP SHOWS GENERALIZED LOCATIONS OF ALL LAND USES

The 1969 General Plan shows land uses that closely correspond to development which has actually occurred in the North Black Canyon Corridor. Between 1969 and 1987, almost 80 percent of the north Black Canyon was built, so the 1969 General Plan ruled its development. During the 1960s, rezoning in Phoenix was more the exception than the rule, a status that existed until the mid-1970s. Thus, north Black Canyon development was largely guided by the 1969 General Plan.

4.3.2 City of Tempe

The City of Tempe did not adopt a general plan until 1967, well after the 1960 Freeway Master Plan. Since, Tempe updated its general plan in 1972 and 1978, amended it in 1983, and is currently preparing another update. The frequency of these revisions has allowed Tempe to incrementally adjust to change, without dramatically changing its master plan. Each new general plan grows logically and sequentially from the previous. As a result, the interaction between new development, changing structural conditions, and land use planning is easy to follow. Moreover, Tempe's actual development has been faithful to the conceptual design, if not the detail, of the 1967 plan.

Tempe's 1967 General Plan (Figure 4-6) identifies Apache Boulevard and Mill Avenue as the city's basic transportation structural elements. It recognizes that Interstate 10 and the Superstition Freeway will significantly change that structure. The Superstition is identified as "already becoming something of a physical barrier influencing the extension of urban growth beyond it to the south as well as affecting land uses in adjacent areas."[1] Interstate 10 is identified as both facilitating regional commuting to Tempe industries and as a focus for industrial development. Another freeway aligned on Price Road is barely mentioned and is treated as a thoroughfare.

The plan's focus is a central node in its downtown/university area, industrial development oriented in its historic area south of the Salt River and in new areas along I-10, generally west of the Southern Pacific Railroad. Commercial activities are located at arterial intersections throughout the city, with a regional mall designated for Rural and Baseline, south of the Superstition. Most of its undeveloped area, generally south of Broadway, is planned for low-density residential, with high density along Apache Boulevard.

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[1]Tempe Planning Department and Van Cleve Associates, The Comprehensive Planning Program, Tempe, Arizona, "Report Four: Land Use," April 1966.

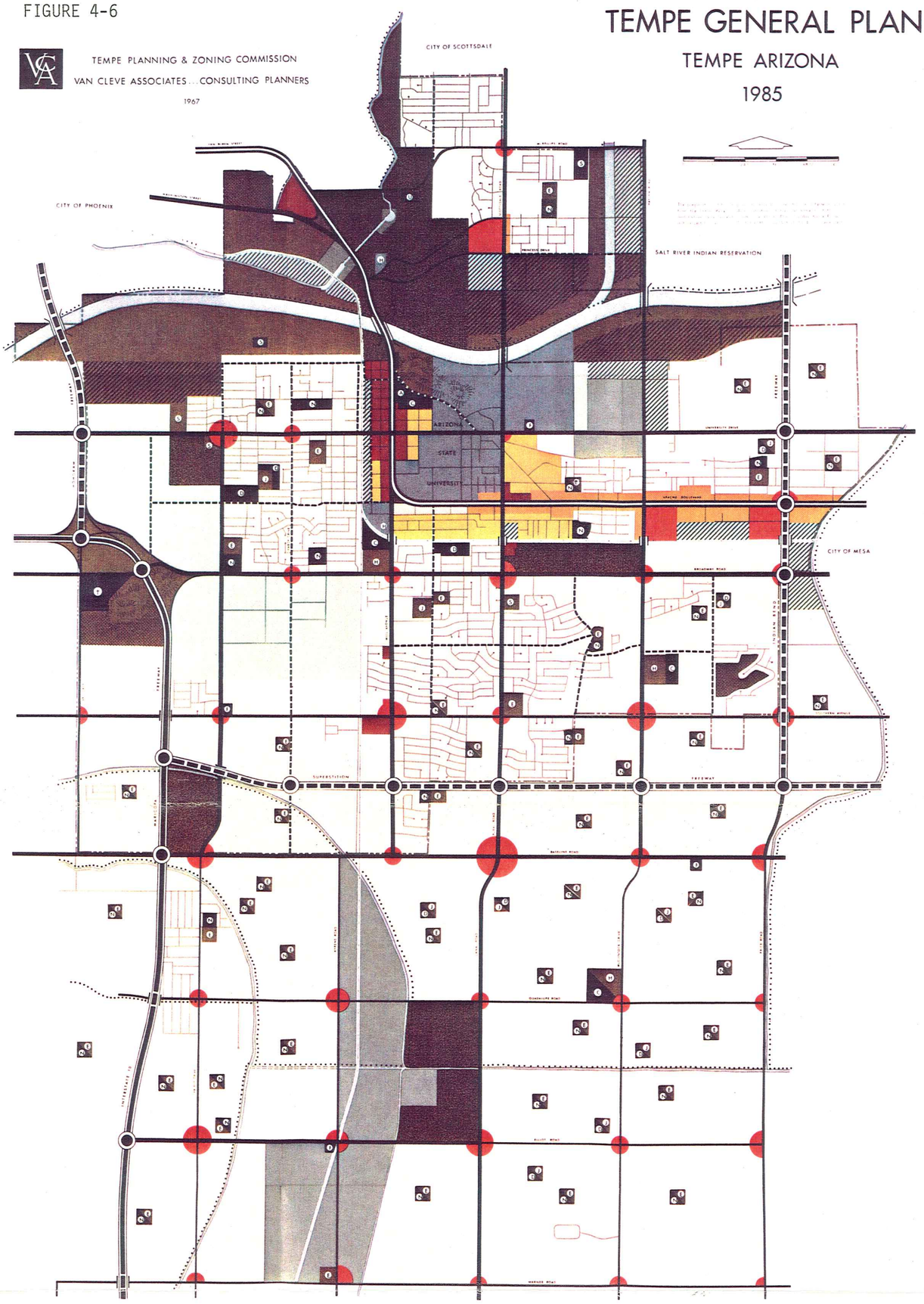
FIGURE 4-6

TEMPE GENERAL PLAN

TEMPE ARIZONA

1985

TEMPE PLANNING & ZONING COMMISSION
VAN CLEVE ASSOCIATES ... CONSULTING PLANNERS
1967



L E G E N D

RESIDENTIAL
LOW & MEDIUM DENSITY
HIGH DENSITY

COMMERCIAL
PLANNED
GENERAL
ARTERIAL
NEIGHBORHOOD
COMMUNITY
REGIONAL

INDUSTRIAL
PLANNED
LIGHT
HEAVY

SCHOOLS
ELEMENTARY
INTERMEDIATE
HIGH
SPECIAL
PARK - SCHOOL

RECREATION
NEIGHBORHOOD
DISTRICT
COMMUNITY
CITY
NON-PUBLIC

GOVERNMENTAL & INSTITUTIONAL
ADMINISTRATIVE
CULTURAL
UTILITIES
SERVICE
FIRE STATION
CEMETERY
UNIVERSITY
HOSPITAL

TRANSPORTATION
INTERSTATE HIGHWAY WITH INTERCHANGE
REGIONAL FREEWAY WITH GRADE SEPARATION
HIGHWAY ARTERIAL
MAJOR ARTERIAL
MINOR ARTERIAL
COLLECTOR STREET
HIKING & RIDING TRAILS

SPECIAL USES
OPEN SPACE
RECLAMATION LANDS
CANALS & FLOOD CHANNELS

The Superstition Corridor and Study Area were both planned to be residential areas, with commercial uses at arterial nodes. This plan ruled Tempe's development for the first phase of the completed Superstition, in 1972, from I-10 to Rural Road.

Tempe's 1972 General Plan (Figure 4-7) is almost identical to the 1967 plan in concept. It is more complete in that details are planned more carefully. The largest conceptual differences are an expansion of industrial land along I-10, integration of Rio Salado, differentiation among finer classes of residential densities, greater attention to parks and recreation, and the expansion of the urban area another mile south.

The Superstition Corridor and Study Area continued to be identified as residential areas in 1972, but at higher densities than in 1967. Moreover, the amount of commercial land has been expanded and specified. In particular, the large commercial core at Rural and Baseline is more clearly delineated. However, the area is clearly planned to be a well-integrated residential area, with generous planning for schools, parks, and community centers along the freeway and in its corridor. This plan ruled development through the balance of the completion of the Tempe portion of the Superstition, from Rural to Price in 1975.

The city's 1978 plan, which ruled until 1983, deviated even less from the 1972 plan than the 1972 plan deviated from the 1967 plan. The only changes between 1978 and 1972 in the Superstition Study Area and Corridor are minor changes at commercial corners, an increase in the highest density residential from 9 d.u. per acre to 10 d.u. per acre, and the addition of industrial land near I-10. The General Plan for 1978 is almost identical to the Study Area's existing land use in 1987. The guidance the 1967 plan provided for Superstition Corridor development has been a resounding success.

4.3.3 City of Mesa

The Superstition Freeway was built in Mesa between 1977 and 1981. Before that, Mesa was the Phoenix area's easternmost community, with its historic core centered two miles north of the planned Superstition. Most of its existing urban area in 1971 was further than a mile from the proposed Superstition, and that urbanized area was surrounded almost entirely by farm land. Prior to 1971, the city did not have a general plan.

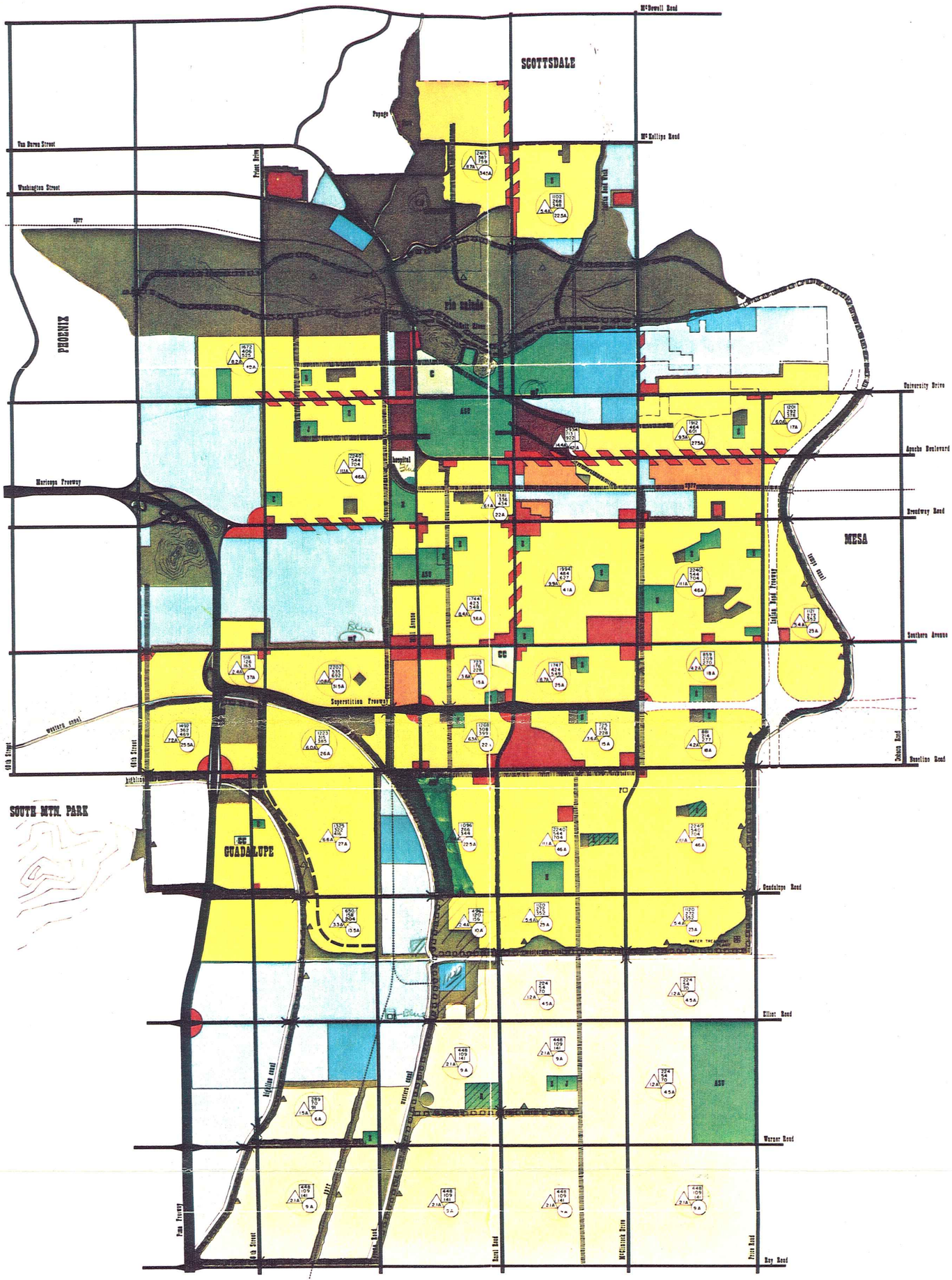


FIGURE 4-7

GENERAL PLAN

CITY OF TEMPE, ARIZONA & ENVIRONS

LEGEND

RESIDENTIAL	EXISTING	PROPOSED	PUBLIC USES	INDUSTRIAL
1 du/ACRE	E,J,H		SCHOOLS	GARDEN & LIGHT
5 du/ACRE		●	COMMUNITY PARK	HEAVY
9 du/ACRE		△	OPEN SPACE recreation	SCHOOL·PARK·COMMERCIAL
15 du/ACRE	C		CIVIC CENTER	
30 du/ACRE	CC		CULTURAL CENTER	
COMMERCIAL	mf	mf	FIRE STATION	
NEIGH./GENERAL			BICYCLE PATHS	
TOURIST·HIGHWAY			HORSE·BICYCLE PATH	
COMMERCIAL·RESIDENT			TREATMENT PLANT	LANDSCAPE BUFFER

SCHOOLS E= elementary J= junior high H= high (NUMBERS - anticipated number of students)

SUPPORTABLE COMMERCIAL - IN ACRES (general, local, freestanding (Additional potential generated by inter and intra city traffic)

RECOMMENDED PARKS IN ACRES

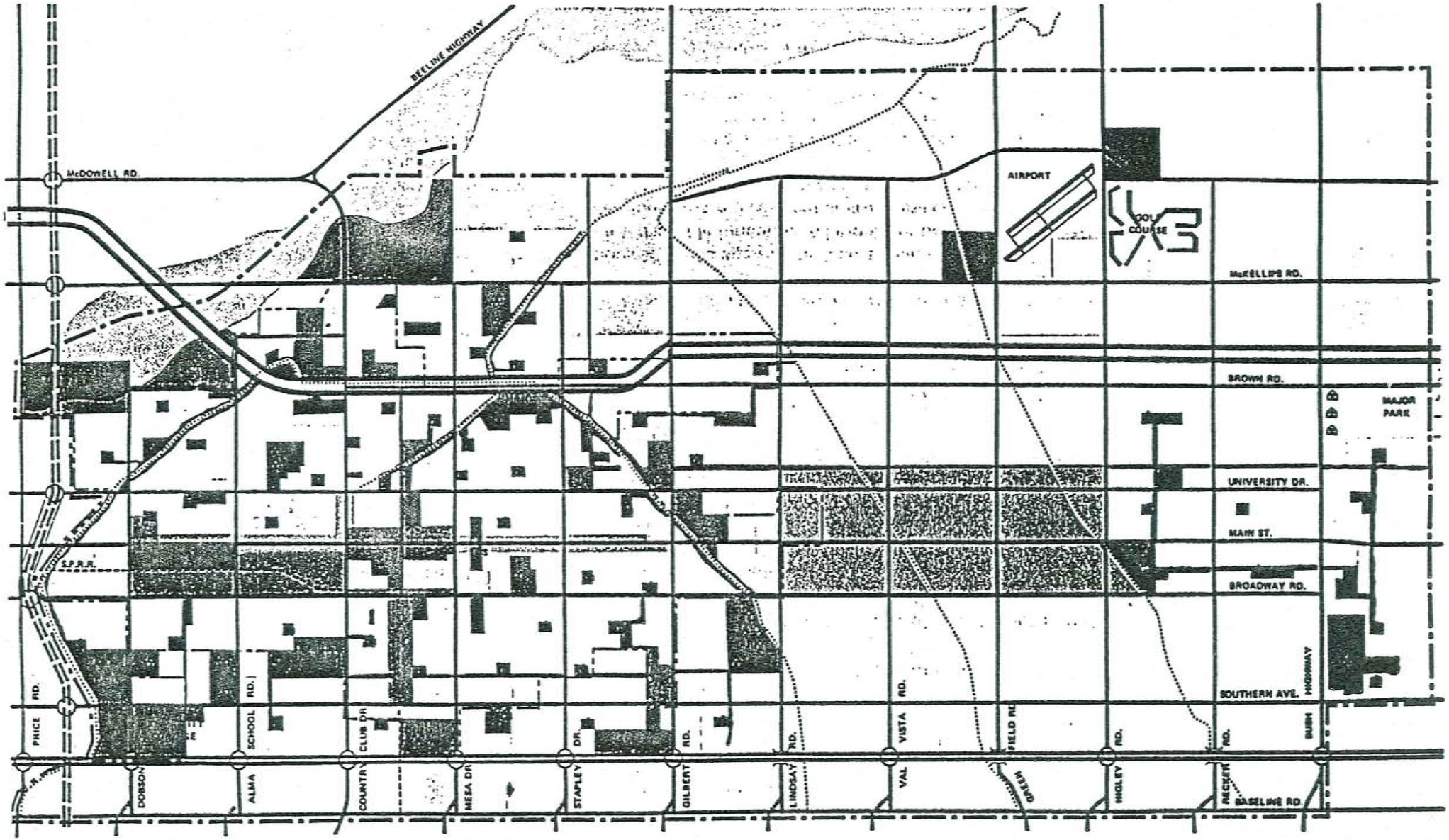
* dwelling unit

north

0 2000 4000 6000 scale in feet

JULY, 1972

SIMON EISNER & ASSOCIATES PLANNING CONSULTANTS



RESIDENTIAL
- LOW DENSITY (UP TO 8 DWELLINGS/ACRE)
- MEDIUM DENSITY (9 TO 15 DWELLINGS/ACRE)
- HIGH DENSITY (15 OR MORE DWELLINGS/ACRE)

COMMERCIAL
- CITY CENTER
- REGIONAL CENTER
- HIGHWAY COMMERCIAL SERVICES
- NEIGHBORHOOD COMMERCIAL

INDUSTRIAL
- LIGHT INDUSTRY
- INDUSTRIAL PARK

OPEN SPACE
- PUBLIC RECREATION
- AGRICULTURE AND VACANT

- CITY OF MESA BOUNDARY
- PLANNING AREA BOUNDARY

SCHOOLS
- ELEMENTARY
- JUNIOR HIGH
- SENIOR HIGH

PUBLIC - SEMI PUBLIC
- CIVIC AND GOVERNMENT CENTER
- H HOSPITAL
- SALT RIVER

CIRCULATION
- SUPERSTITION FREEWAY
- PROPOSED FREEWAY
- FREEWAY CORRIDOR
- INTERCHANGE
- ARTERIAL STREET
- CANAL
- RAILROAD
- GROWTH CORRIDOR

FIGURE 4-8

LAND USE PLAN - 1990

THE MESA COMPREHENSIVE PLAN

GRUEN ASSOCIATES

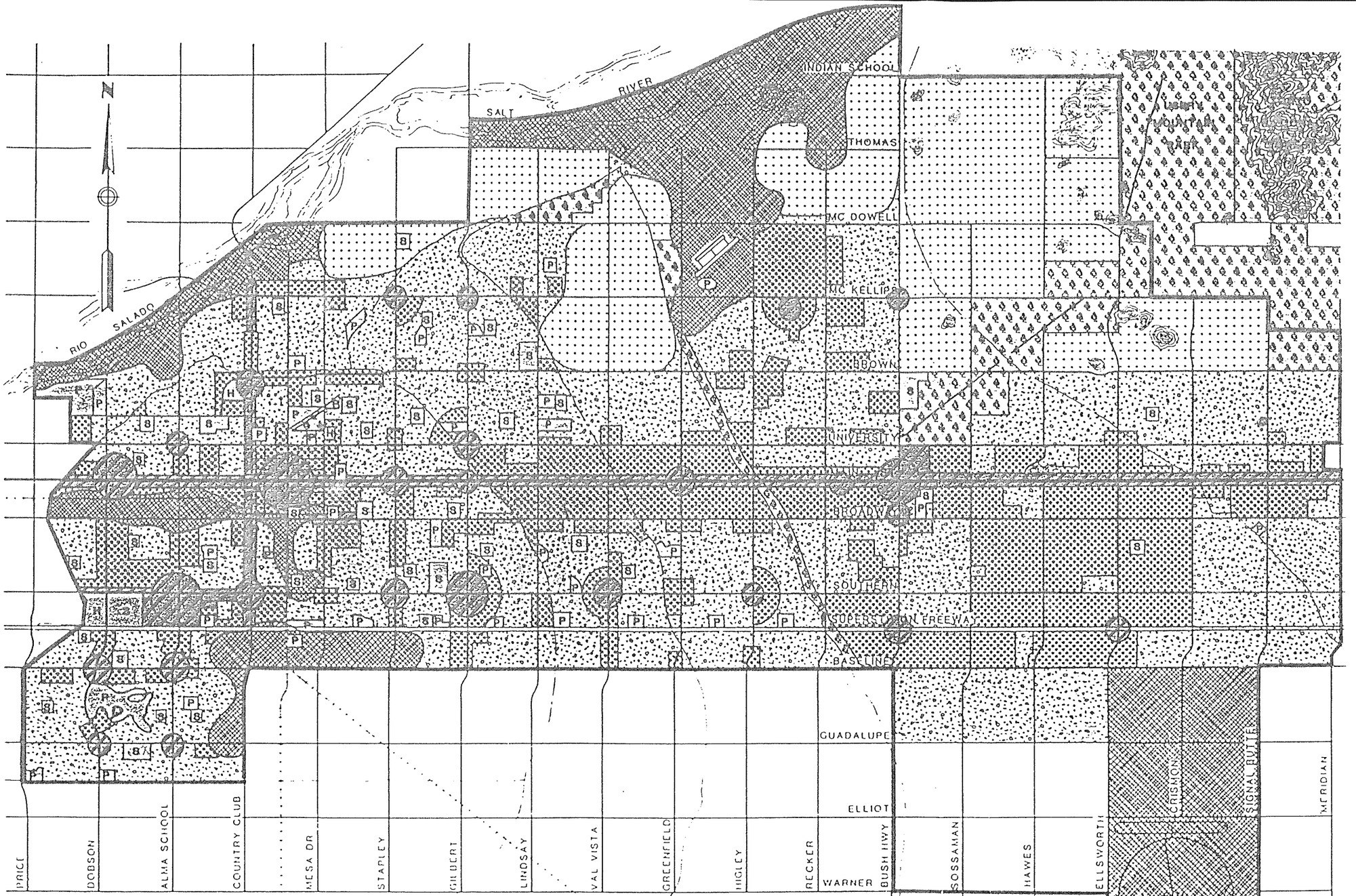


FIGURE 4-9

- Lowest Density (1 or less D.U.'s/AC)
- Lower Density (5 or less D.U.'s/AC)
- Higher Density (5 or more D.U.'s/AC)
- Major Commercial / Office Centers
- Commercial
- Industrial
- Public & Open Space
- P/H Park / Hospital
- S School
- Agriculture / Vacant

MESA GENERAL PLAN

YEAR 2000
LAND USE PLAN
(GENERALIZED)

scale in miles
0 2.5 5 10 20

Although traversing the entire length of Mesa, the Superstition was aligned only one-half mile from the city's southern border, and the 1971 General Plan (Figure 4-8) treated the freeway as a peripheral structure. At that time, another freeway aligned near Price Road and a third generally north of Brown Road were also proposed. The 1971 plan recognized that:

- The Superstition would not solve the city's circulation problem, while the northern corridor freeway would.
- The Superstition would provide accessibility to areas in east Mesa and south of the Superstition.
- However, the 1971 plan did not encourage growth in those areas, rather identifying two nodes in the already-urbanized areas around the city's central district and in east Mesa, with a "major activity corridor" between University and Broadway to connect the two nodes.
- Activities planned along the Superstition included parks, medium density residential and industrial land west of Stapley Drive, and low density residential east of it. These appear almost as an afterthought.

By the time Mesa's General Plan was updated in 1982, it was obvious that the 1971 plan had not controlled development along the Superstition. Instead, the market had controlled development. The Superstition provided access to East Valley agricultural land, which stimulated a land boom. Both landowners and speculators, who bought agricultural land in anticipation of the freeway, developed conceptual master plans, were granted zoning on the basis of these plans, and, as the freeway was built, sold the rezoned land to developers and builders. Between 1970 and 1980, population in the Mesa Planning Area went from 82,900 to 190,000 people. The rampant speculation induced by the freeway caused the city to develop a "freeway corridor policy," which imposed some guidelines for development, including density limitations. By 1982, Mesa's new general plan recognized that "the location of the Superstition Freeway has been instrumental in a variety of land use decisions." In particular, as Figure 4-9 shows,

- Dobson Ranch, a 2,000 acre master planned community (Mesa's first and only the sixth in the metro area) had developed south of the Superstition from Price to Alma School, and had annexed into Mesa.
- In conjunction with Dobson Ranch, several major non-residential activities developed north of the Superstition--just north of Dobson Ranch--including Desert Samaritan Hospital, a major commercial node at Dobson and Southern, and the Fiesta Mall at Alma School and Southern.

- Commercial activity from Mesa's central core developed south along Country Club, from the city's center to the junction of the freeway.
- Residential developments had been built east of Stapley more rapidly than anticipated.
- Mesa annexed 24 square miles of land south of the Superstition, east of Bush Highway.

Mesa's 1971 General Plan, in treating the Superstition as an afterthought, failed to control market development driven by accessibility along the freeway. In contrast, the 1982 plan identified the entire Superstition Corridor, from Dobson Ranch to Bush Highway, as a "major growth area", and identified the annexed area east of Bush Highway as a "growth potential area." The 1982 plan treats the entire area within Mesa as a complete planning unit and dispenses nodes throughout it.

By the time Mesa's 1982 General Plan was improved, important developments in the freeway corridor had already been completed or started. The General Plan extended these trends.

- Industrial land in the corridor, compared to the 1971 plan, is reduced substantially.
- Commercial nodes are located at arterial intersections along Southern Avenue (one-half mile north of the Superstition), with major nodes at the Fiesta Mall location and at Gilbert Road.
- High density residential is used as a buffer along arterials that intersect the freeway.
- Like Tempe, Mesa's plan calls for lower density residential along the freeway, but mainly contained within the inner corridor. These are supported internally by parks located at the midpoint of the inner freeway corridor.

Based on the freeway corridor analysis presented in Chapter 8.0, Mesa's 1982 General Plan has been more successful in guiding freeway corridor growth than its 1971 plan.

4.4 Conclusions

Between their alignment in urbanized and undeveloped areas and their alignment across several jurisdictions, each of which approached land use planning differently, the Black Canyon and Superstition Study Corridors provide very different case studies.

- The Black Canyon Study Area (from McDowell to Camelback) and, to a lesser extent, the South Black Canyon Corridor from McDowell to Northern Avenue are case studies in already urbanized areas, without a general plan accounting for freeways.
- The North Black Canyon Corridor is a case study of an undeveloped area, but one guided by a stronger general plan that contains sensible uses for freeway corridors.
- The Superstition Study Area and the Tempe Superstition Corridor are case studies in developing, but not completely urbanized, areas guided by a strong general plan, but one which, essentially, ignores the freeway.
- The Mesa Study Corridor is a case study in an undeveloped area guided more by the private market than by public planning.

Tempe's implementation of a plan which successfully developed the Superstition Corridor into proportionately more residential land uses than either market theory would predict or land planning principles would recommend, rather forcefully illustrates the very strong role that local governments can take in controlling freeway development. In contrast, Mesa had no clear concept of the Superstition Corridor in relation to the rest of the city and, for all practical purposes, abandoned it for incremental rezoning requests by private industry, which developed the corridor according to the market which, in turn, followed classic locational requirements. The Phoenix case is less clear, but it appears that the 1969 plan was implemented in the undeveloped North Black Canyon Corridor, probably because the plan followed classic locational requirements, thus anticipating the market.

As a detailed analysis of the Phoenix area corridors' development between 1959 and 1987 shows (Chapter 8.0), at a macroscopic scale classic locational requirements prevail rather strongly. What the case study of general plans demonstrates is that a clear vision of development that is contrary to the market can also prevail.

5.0 Demographic and Land Use Impacts in the Study Areas

As discussed in Chapter 2.0, there are several geographic scales at which freeways affect development. At the micro scale, freeways affect development in their immediate proximity--freeway corridors. This and the following chapters are detailed case studies that compare impacts in corridor "control" areas to "impact" areas. This chapter focuses on identifying urban growth and land use impacts due to the freeway, while Chapter 6.0 describes residential impacts, especially property value impacts and residential attitudes, and Chapter 7.0 describes business/industrial impacts. The Study Areas described in these chapters each contain three linear miles of freeway corridor; in contrast, Chapter 8.0 extends the analysis to much larger corridors--10 to 12 miles--and provides a broader, more macroscopic perspective than the detailed case studies.

This chapter, then, focuses on two potential freeway impacts--demographic and land use. These are distinguished between impact areas and control areas for two very different Study Areas--the Black Canyon, between McDowell and Camelback, and the Superstition, between the Southern Pacific Railroad and Price Road.

5.1 Demographic Impacts

Urban development impacts are defined in the literature as the rate, amount, and nature of change in the characteristics of population, housing, and employment that are attributable to the freeway system. The basic premise is that, although the urban transportation system is but one component in the urbanization process, it is the most important element.

5.1.1 Black Canyon Study Area

The Black Canyon Study Area, located in central Phoenix, is the oldest of these case studies. Its present housing stock dates from single family units built as early as the 1920s, although the bulk of its stock dates to the 1950s. Current major transportation nodes in the area include a regional highway (Grand Avenue), a railroad along Grand Avenue, and the freeways (I-17 and proposed I-10). Freeway construction was started in 1958 and the system was opened in 1961. Figure 5-1, which shows the physical growth of the Study Area, shows that the construction of I-17 occurred after the area had already been developed, and some residential properties along the freeway

FIGURE 5-1

BUILT - UP AREA, BLACK CANYON STUDY AREA

BUILT - UP AREA IN 1959

AREA DEVELOPED BETWEEN 1959 - 1969

AREA DEVELOPED SINCE 1969

SOURCE:
MOUNTAIN WEST RESEARCH, Economic Research Division
 Based on A.D.O.T. Aerial Photography 1959, and Landis Aerial Photography, 1969

alignment were condemned. Between 1959 and 1969, most undeveloped land in the Study Area had urbanized, and, in 1987, the entire area was developed. The Black Canyon Study Area is largely characterized by infill development. Although its land control is based on zoning that was not necessarily developed in relation to the freeway, that zoning was developed in relation to other major transportation corridors--Grand Avenue, the old Black Canyon Highway, and the railroad.

Population Impacts

Because census tract definitions changed, population change can be tracked only since 1965, four years after the freeway was completed. As Figure 5-2 shows, population growth in the Impact Area--within one-half mile of the freeway--is considerably lower than for the Control Areas--from one-half to one-and-one-half miles from the freeway. Between 1965 and 1970, population increased slightly, but there has been a general downward trend since. The Study Area's population has a lower median income than the Phoenix average, but contains a mix of neighborhoods. Across census tracts, 1980 median household income ranged from $8,667 to $22,418. There is also a wide range in median age by census tract.

Housing Impacts

Although the Black Canyon Study Area contains pockets of very old single family neighborhoods, and although residential neighborhoods around Encanto Park west of 19th Avenue are surprisingly stable, given their proximity to the freeway, the Study Area is converting to multifamily development. The Study Area experienced its largest increase in residential inventory (29 percent) between 1962 and 1975, immediately after freeway completion (Table 5-1). In all periods, the Impact Area experienced the greatest amount of inventory change, peaking at an 82 percent increase from 1962 to 1975. New additions are almost all in multi-unit inventory--apartments and townhouse/condos--which comprise 5.8 million of the 6.1 million square feet addition to residential inventory since 1962. In the Impact Area, multi-unit inventory change was 4.2 million of a total 4.3 million square feet change since 1962. There was barely any addition to the residential stock in the West Control Area, which is heavily industrial. In the East Control Area, where more stabilized residential neighborhoods are located, there were 1.3 million square feet of additions to multi-unit inventory, comprising 92 percent of the total increase.

FIGURE 5-2

POPULATION GROWTH
BLACK CANYON STUDY AREA
1965-1985

Source: Bureau of the Census, 1965-1985.

TABLE 5-1

RESIDENTIAL INVENTORY BY UNIT TYPE
BLACK CANYON STUDY AREA
1956 TO 1987
(000 square feet)

	Single Family	Townhouse/ Condo	Apartment	Mobile Home	Total
1956 Total	11,184	97	1,353	6	12,640
Impact Area	2,795	0	196	6	2,997
Control Area	8,389	97	1,157	0	9,643
Control West	3,133	0	87	0	3,220
Control East	5,256	97	1,070	0	6,423
1962 Total	11,531	97	1,934	12	13,574
Impact Area	2,987	0	392	6	3,385
Control Area	8,544	97	1,542	6	10,189
Control West	3,178	0	107	6	3,291
Control East	5,366	97	1,435	0	6,898
1975 Total	11,714	1,451	4,285	14	17,464
Impact Area	3,075	918	2,168	8	6,169
Control Area	8,639	533	2,117	6	11,295
Control West	3,199	0	227	6	3,432
Control East	5,440	533	1,890	0	7,863
1987 Total	11,781	1,731	6,114	14	19,640
Impact Area	3,101	1,144	3,399	8	7,652
Control Area	8,680	587	2,715	6	11,988
Control West	3,217	0	428	6	3,651
Control East	5,463	587	2,287	0	8,337

Source: Maricopa County Assessor's Office, Property Valuation Records.

Employment Impacts

Using the Maricopa County Assessor's Office count of building inventory, and making assumptions about employment density[2], employment in the Study Area from 1951 to 1987 was estimated. As Figure 5-3 shows, employment in the Impact Area grew substantially after freeway construction--from just over 10,000 workers in 1963 to 11,000 in 1969, 20,000 in 1975, and 30,000 in 1987. The Impact Area and the West Control Area, which contain industrial uses, contain most of the employment increase.

5.1.2 Superstition Study Area

The Superstition Study Area is located in Tempe. As Figure 5-4 shows, its northern section was largely built up before the freeway was constructed in 1972 and 1975. Most of the Study Area had developed by the freeway's completion in 1975, and only small pockets of vacant land exist there today. As previously discussed, by 1967 Tempe had identified the Superstition Study Area as primarily a residential area, and its development has largely followed that plan.

Population Impacts

The most rapid increase of population occurred in the 1970 to 1975 period, when the freeway was completed (Figure 5-5). After 1975, the population of the Impact Area and North Control Area are stable. The South Control Area was still adding population during the 1975 to 1980 period, while during the 1980s, its population stabilized. In relating this population trend to the timing of freeway construction, it is clear that 1980 was the beginning of the stable phase in the freeway development. At this development stage, the number of people per square mile in the study area ranged from 4,900 to 5,700.

In 1970, the median income of the Impact Area was $13,700, very similar to the Control Areas, where income by tract ranged from $12,937 to $13,902. By 1980, however, a wider range of income by census tract was experienced in both the Impact and Control Areas. The median income in the Impact Area ranged from $18,998 to $29,951, and, in the Control Areas, from $22,992 to $31,249.

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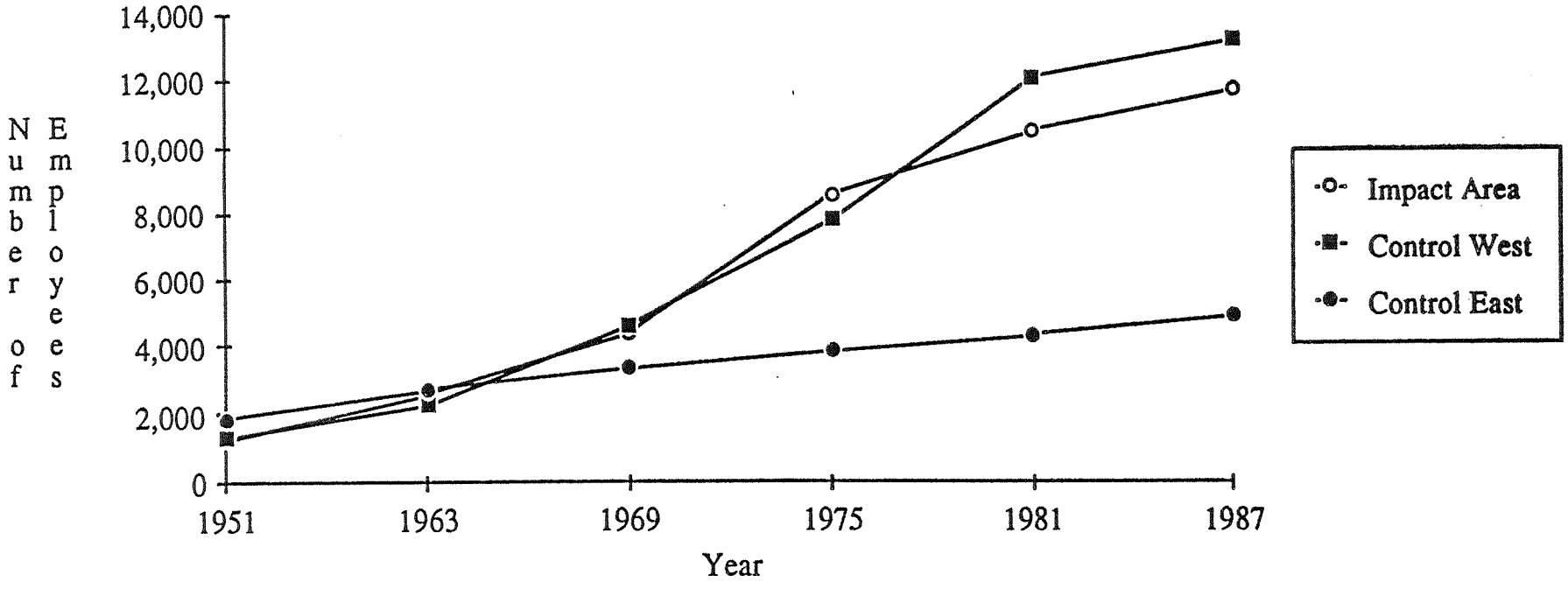
[2]Taken from Maricopa Association of Governments, Update of the Population and Socioeconomic Database for Maricopa County, Arizona, May 1987.

FIGURE 5-3

EMPLOYMENT GROWTH
BLACK CANYON STUDY AREA
1951-1987



Source: Economic Research Division, Mountain West Research, July 1987.

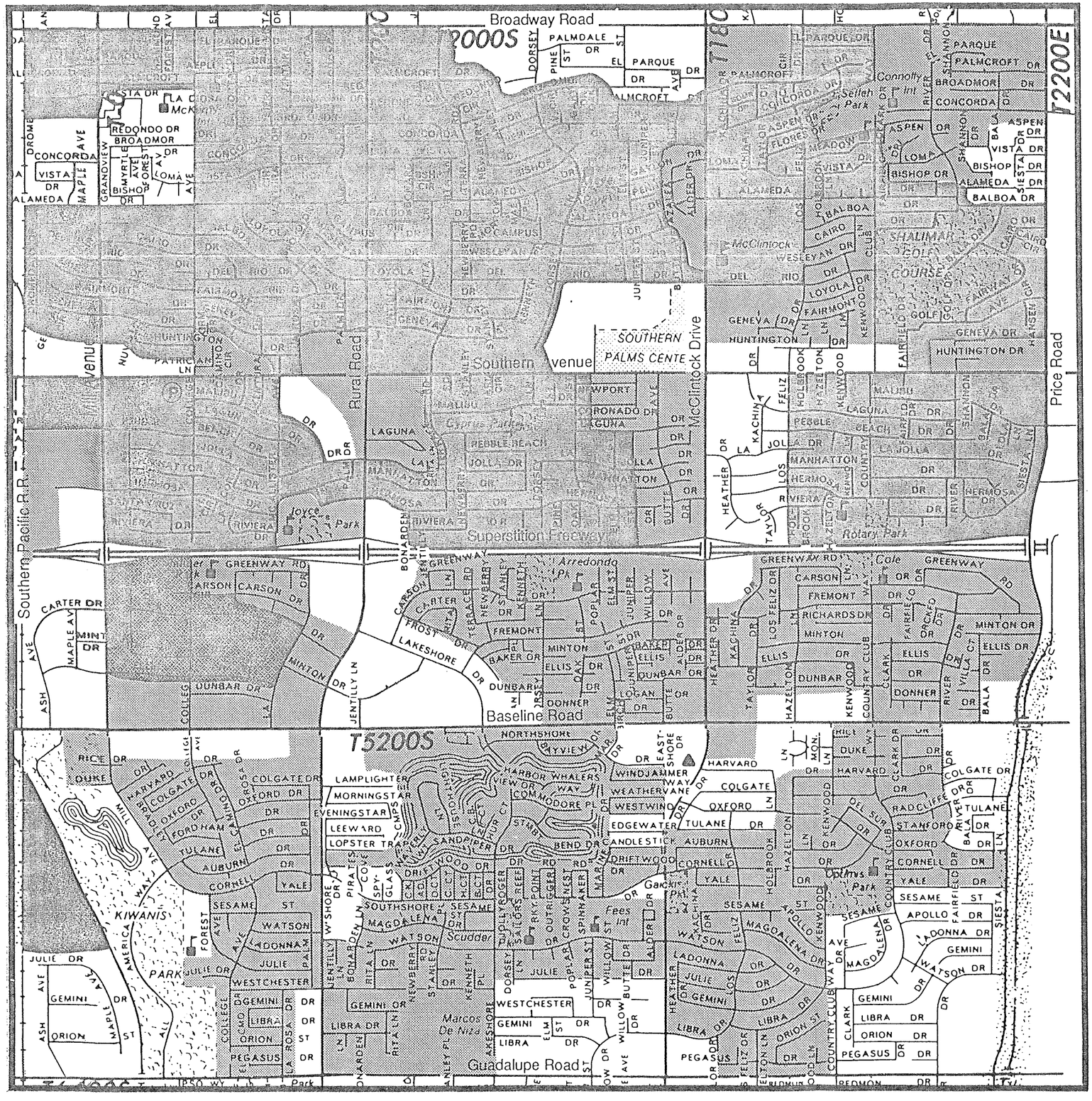


FIGURE 5-4

BUILT - UP AREA, SUPERSTITION FREEWAY STUDY AREA

BUILT - UP AREA IN 1969

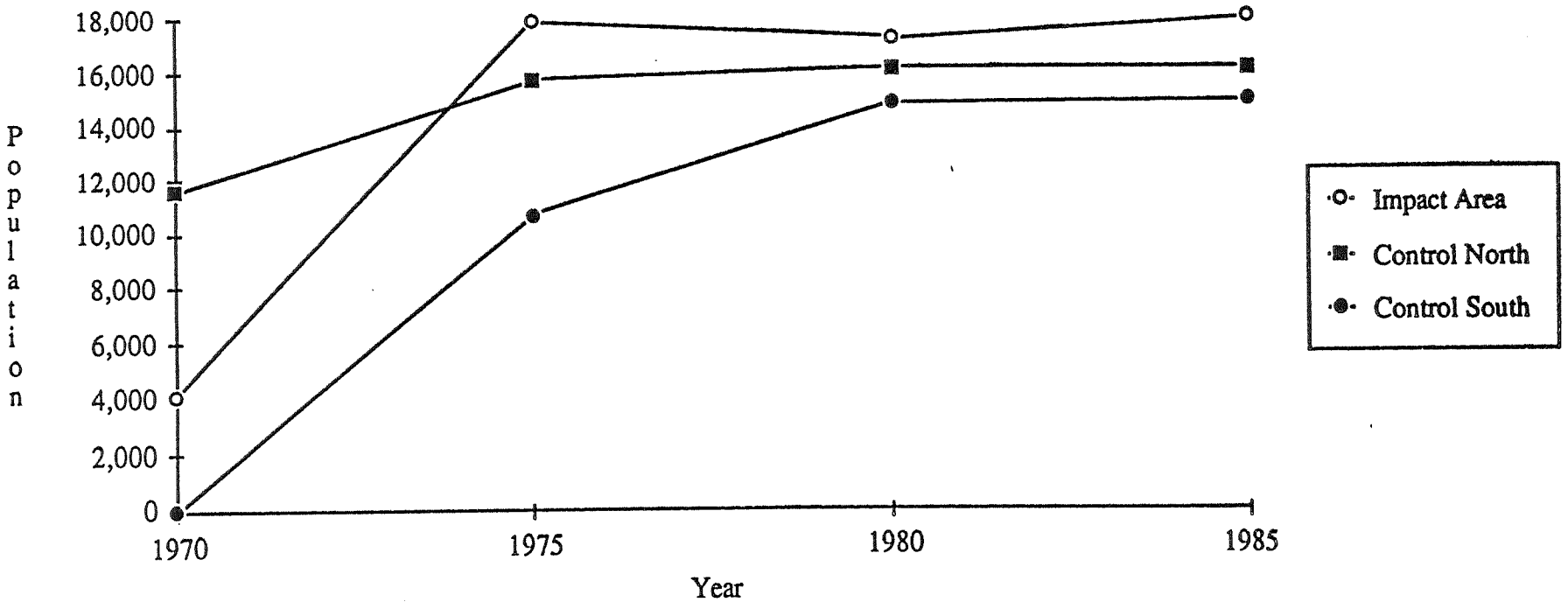
AREA DEVELOPED BETWEEN 1969 - 1975

AREA DEVELOPED SINCE 1975

SOURCE:
MOUNTAIN WEST RESEARCH, Economic Research Division

FIGURE 5-5

POPULATION GROWTH
SUPERSTITION STUDY AREA
1965-1985



Source: U.S. Bureau of the Census, 1965-1985.

Housing Impacts

Between 1970 and 1975, the Study Area's housing inventory grew from 5,664 units to 13,788 units (Table 5-2). The most rapid growth was in the Impact Area, which added 4,500 units, and the South Control Area, which added 3,245 units. A 300 acre master planned community, The Lakes, was started in 1971 in the South Control Area, between Rural and McClintock. In the 1970 to 1975 period, most of the inventory increase was in single family units. In contrast, between 1975 and 1980, there were 2,263 multifamily units added, more than additions to inventory. Both the Impact Area and the North Control Area lost single family inventory, replaced by multifamily.

TABLE 5-2

HOUSING INVENTORY
SUPERSTITION FREEWAY STUDY AREA
1970, 1975, AND 1980

	Total Area	Impact Area	Control Area		
			Total	North	South
			Total		
1970	5,664	1,024	3,090	3,090	---
1975	13,788	5,502	8,124	4,879	3,245
1980	15,820	5,799	10,021	5,382	4,639
			Single Family		
1970	3,330	909	2,421	2,421	---
1975	11,209	4,154	7,055	4,182	2,873
1980	11,140	3,687	7,453	3,746	3,707
			Multifamily		
1970	784	115	669	669	---
1975	2,417	1,348	1,069	697	372
1980	4,680	2,112	2,568	1,636	932

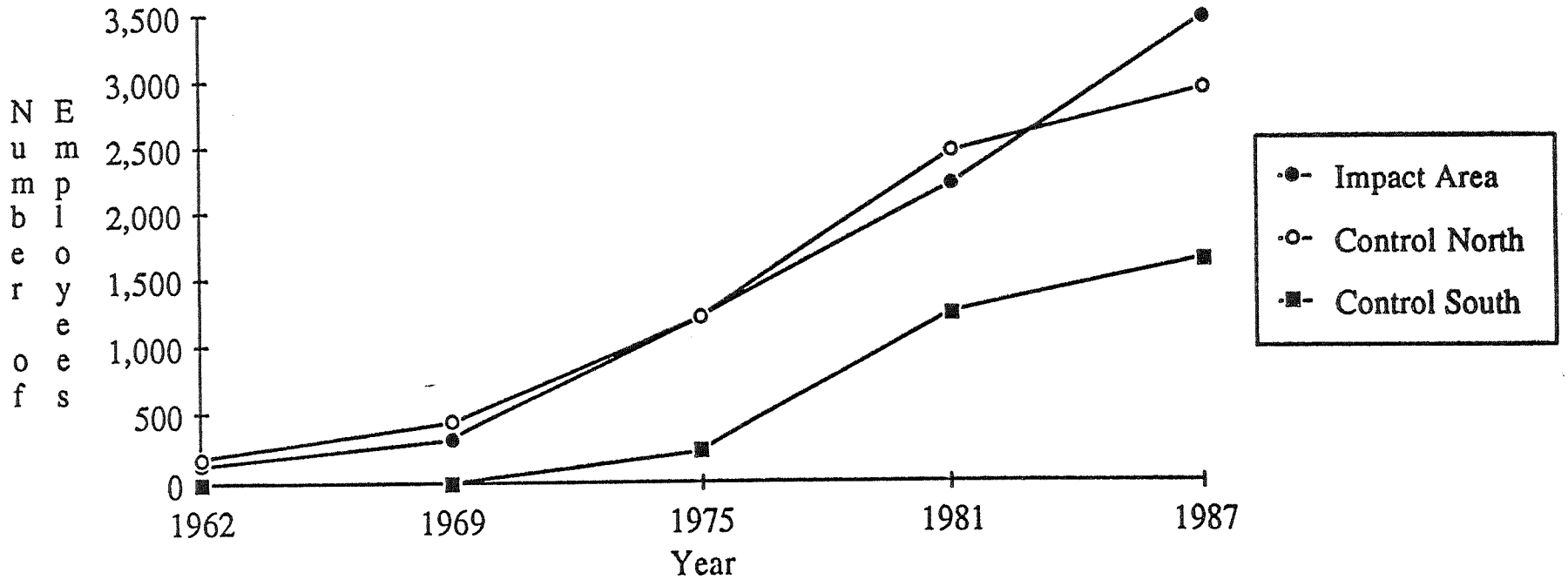
Source: U.S. Bureau of the Census.

Employment Impacts

Using Maricopa County Assessor's Office data, employment was estimated for the Study Area. As Figure 5-6 shows, the increase has been greatest for the Impact Area and the North Control Area. For all areas, the magnitude of increase has been greatest since the freeway was completed in 1975.

FIGURE 5-6

EMPLOYMENT GROWTH
SUPERSTITION STUDY AREA
1962-1987



Source: Economic Research Division, Mountain West Research, July 1987.

5.1.3 Findings Regarding Demographic Impacts

There are three major findings regarding demographic impacts.

- The freeway's completion stimulated population growth in the developing Superstition Study Area.
- Multi-unit residential inventory increased dramatically in the Black Canyon area after the freeway's completion, and has recently been replacing single family in older parts of the Superstition area.
- Employment growth in both areas has been substantial since freeway completion.

5.2 Land Use Impacts

Freeways enhance the market opportunity for land development because of the increase in accessibility of their influence area to the larger urban area. The land use impact of freeways is determined by various factors, including the proximity of their influence areas to other activity nodes, local comprehensive plans, freeway design, the timing of freeway construction, and market demand for end-users. While there are no absolutes that determine urban land use patterns or the locational behavior of businesses along freeways, there are certain principles that can help to predict their aggregate urban pattern, as discussed in Chapter 2.0. In a free market, income-generating land uses, generally, will be attracted by freeway access, while residential activities will be repelled. However, as Chapter 4.0 shows, land development is not purely a free market. In the Phoenix area, local municipalities have directed growth where a coherent plan was implemented.

In this context, the Black Canyon and Superstition Study Areas present two contrasting case studies. In Phoenix, the Black Canyon Study Area is redevelopment and infill, guided by zoning that was developed in the late 1920s. In Tempe, the Superstition Study Area is new development, directed by a coherent city plan. The following sections examine how various types of land uses come into being, particularly in relation to the timing of freeway construction.

5.2.1 Black Canyon Study Area

Land use in the Black Canyon Study Area has been affected by three major variables, one in each subarea.

- The East Control Area has been affected by the presence of Encanto Park, which occupies almost 20 percent of its area. It is a stronger, more stable residential neighborhood because of Encanto Park.
- The Impact Area has been affected by the Black Canyon Freeway.
- The West Control Area has been affected by historic industrial development and zoning, by the Southern Pacific Railroad, and by Grand Avenue.

As Figure 5-7 shows, the extreme southeastern corner of the Study Area is dominated by Encanto Park, which enhances the quality and stability of single family subdivisions that surround it, largely in the East Control Area, but also in the Impact Area, from north of Encanto Boulevard roughly east of 23rd Avenue, north to Thomas Road. These subdivisions were clearly of higher quality when they were originally constructed, from the 1940s to the 1950s. The entire Study Area east of the freeway contains older single family subdivisions that are buffered from the freeway by multifamily development, which has encroached from the north and along arterials. Retail uses in the entire Study Area east of the freeway are neighborhood commercial, located on arterial and half-street corners.

West of the freeway, the entire Study Area is dominated by industrial development, which is an appropriate use along Grand Avenue and the rail line. This area was designated industrial in Phoenix's 1959 land use plan. North of Indian School, the western Study Area is residential, completely buffered from the freeway and partially buffered from the arterial by multifamily. Again, a large park and a school campus support single family development. Residential areas south of Indian School are lower quality, especially a mobile home park that abuts the freeway on the west side of the Impact Area.

Table 5-3 presents the land use change that has occurred in the Study Area since 1959, two years before the freeway was completed, but during its construction after right-of-way had been acquired and some residential properties were taken. Land use in 1959 is taken from an ADOT aerial photograph.

TABLE 5-3

LAND USE BY TYPE
BLACK CANYON STUDY AREA
1959 AND 1987
(Percent of Total)

	Industrial	Commercial & Office	Multifamily	Single Family/ School	Park	Not Developed
			Study Area			
1959	6.7	3.6	12.0	44.9	6.7	26.1
1987	20.1	9.5	20.3	36.2	8.3	--
			Impact Area			
1959	9.6	3.3	14.8	39.1	--	33.2
1987	20.8	13.5	35.9	29.8	--	--
			Control West			
1959	10.3	2.8	--	41.0	--	45.9
1987	50.0	10.9	4.2	27.1	7.8	--
			Control East			
1959	--	4.7	22.4	48.1	20.0	4.8
1987	--	4.2	20.8	57.8	17.2	--

Source: Mountain West, July 1987.

In 1959, of the nine square mile area, 26 percent was undeveloped; in 1987, the entire area is developed. In 1959, a third of the Impact Area was undeveloped (also see Figure 5-1), especially along freeway frontage. Almost 46 percent of the West Control Area was also undeveloped. Of the developed area in 1959, it is most significant that all the single family residential areas were already built. The most stable residential neighborhoods that remain are buffered from freeway and arterials, and have strong spatial support from Encanto and Cielito Parks and from local schools. This is especially true of the eastern half of the Study Area.

The bulk of new development since 1959 has been multifamily, industrial, and commercial/office. In the Impact Area, new development consists of multifamily and industrial uses, largely in the immediate freeway corridor. In the West Control Area, new development is almost solely industrial. Some redevelopment has taken place, mainly for commercial and office uses in the Impact Area.

The development that has taken place in the Black Canyon Corridor, especially of income-producing properties along the freeway corridor, is consistent with location theory. The specific land uses that have arisen are not surprising, given the spatial structure of freeway, arterials, and rail transportation. What is most significant is the longevity of stable residential neighborhoods, buffered from the freeway by multifamily uses, and given vitality by supporting land uses--parks and schools.

5.2.2 Superstition Study Area

Unlike the Black Canyon, the Superstition Study Area was mainly undeveloped when its freeway was built. Also, unlike the Black Canyon, the Superstition Freeway was not built on an arterial alignment, but on a half-mile alignment, below residential subdivisions already platted and partially built. As discussed in Chapter 4.0, Tempe's 1967 General Plan called for the Study Area to develop largely as residential. The configuration of its land use shows that the Study Area is a preplanned neighborhood. Grade school and neighborhood commercial areas are found in every tract.

The Superstition Study Area inverts the usual relationship between residential and non-residential land uses in between freeway and adjacent arterials, as Figure 5-8 shows. The Tempe General Plan called for commercial arterial development on Southern Avenue (in the North Control Area) and Baseline Road (in the South Control Area), with residential development in the area between. The Superstition's alignment on the half-mile street between Southern and Baseline was handled in three ways:

FIGURE 5-7

1987 LAND USE BLACK CANYON AREA

- SINGLE - FAMILY HOUSING
- MULTI - FAMILY HOUSING
- PARK
- GOVERNMENT BUILDING
- SCHOOL
- OFFICE
- GENERAL COMMERCIAL
- NEIGHBORHOOD / INTERMEDIATE COMMERCIAL
- LIGHT INDUSTRIAL
- HEAVY INDUSTRIAL

SOURCE: Mountain West Research, Economic Research Division
July 1987. Based on Landis Aerial Photography - 1987

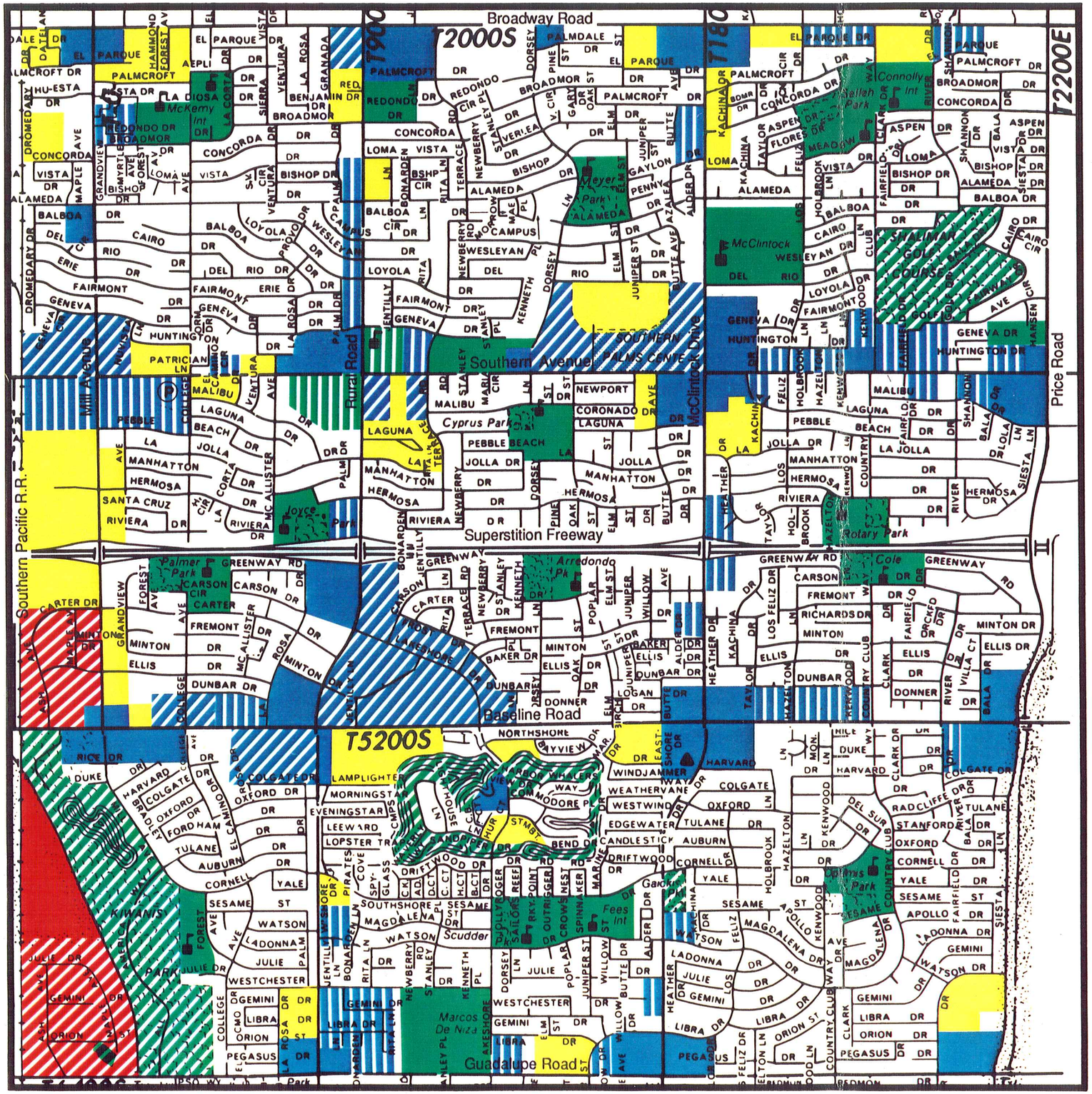


FIGURE 5-8

1987 LAND USE SUPERSTITION AREA

- SINGLE - FAMILY HOUSING
- MULTI - FAMILY HOUSING
- SCHOOL
- PUBLIC BUILDING
- PARK / LAKE
- NEIGHBORHOOD COMMERCIAL
- GENERAL COMMERCIAL
- OFFICE
- HEAVY INDUSTRIAL
- LIGHT / GENERAL INDUSTRY

SOURCE: Mountain West Research, Economic Research Division
July 1987. Based on Landis Aerial Photography - 1987

- The freeway's design, which was depressed, combined with adequate rights-of-way that created an undeveloped vegetated barrier and an eight- to ten-foot wall that mitigated noise as effectively as possible.

- Land uses that support residential development, including parks and schools next to the freeway. This is taken so far that a pedestrian walkway was constructed across the freeway, connecting residential subdivisions on its north side with Palmer Park on its south side.

- Commercial, office, and multifamily uses are located at arterial intersections, other than at Rural Road.

This is classic master planning for residential development and, in fact, is precisely the conceptual plan for The Lakes, a master planned community in the South Control Area.

The analysis of 1987 land uses indicate that two-thirds of the built-up area is dedicated to single family housing (Table 5-4). Multifamily housing makes up 5 to 7 percent of the Control Areas and 9 percent in the Impact Area. The percentages of commercial land use are 12 percent in the Impact Area, and 7 to 10 percent in the Control Areas. While 4 percent of the built-up area in the north Control Area is office, the amount in the Impact Area and control south are only 2 and 0.6 percent, respectively. Schools, parks, and public buildings occupy 11 to 17 percent of land in the Control Areas, but only 6 percent in the Impact Area.

TABLE 5-4

1987 LAND USE COMPOSITION
SUPERSTITION FREEWAY STUDY AREA
(As Percent of Developed Areas)

Land Use Category	North Control Area	Impact Area	South Control Area
Single Family	67.4	67.0	64.8
Multifamily	7.1	9.3	5.0
Office	4.1	2.4	0.6
Commercial	10.5	12.3	6.9
Industrial	---	3.0	5.1
School, Park, Public Bldg.	11.0	5.9	17.5
Total Developed Area	100.1	99.9	99.9

Source: Economic Research Division, Mountain West, July 1987, based on Landis Aerial Photograph, 1987.

There is very little industrial development. As Figure 5-8 shows, one such industrial area is located in the Study Area's southwest corner, a relatively older section, and is proximate to the railroad. Another industrial area is located farther north. The older industrial area is kept away from the residential area, buffered by the Western Canal and a north-south stretch of the Kiwanis regional park. The newer industrial concentration is limited to a location at the southwest corner of the railroad-freeway junction, isolated from the residential area by the industrial buffer district.

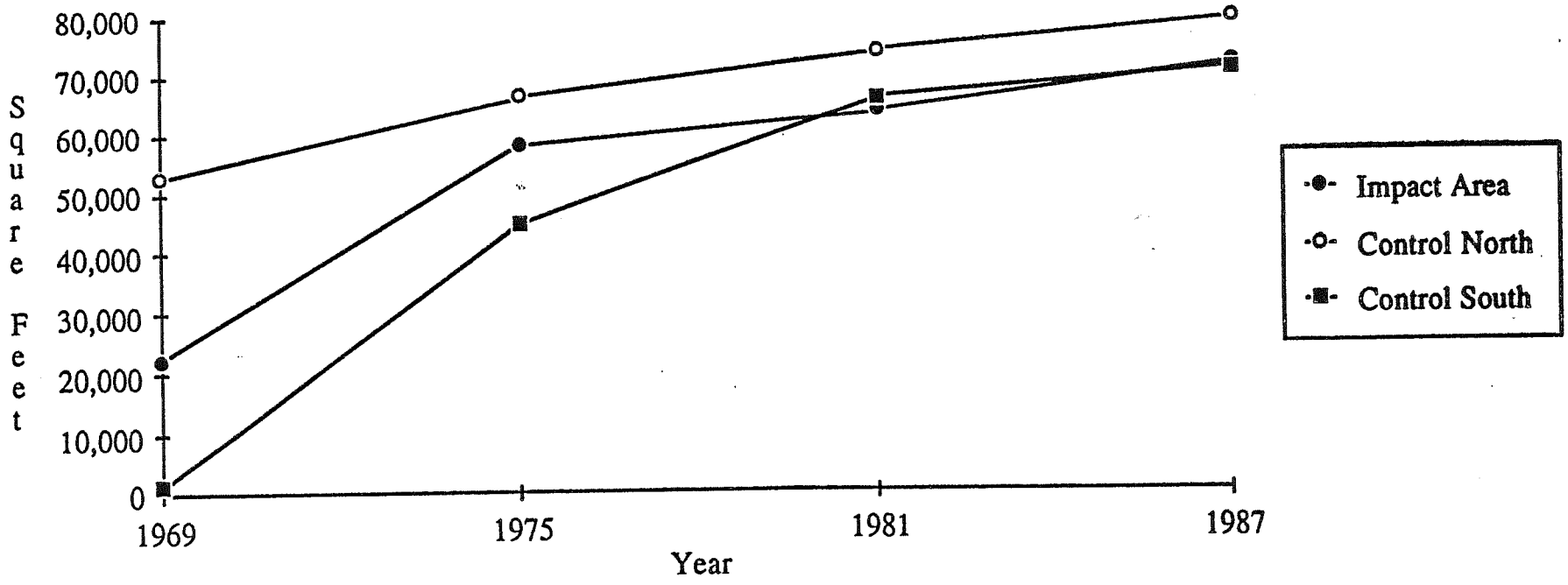
The spatial distribution of land uses in the Study Area illustrates the arrangement of preplanned activities which need certain space requirements, but it does not really tell much about the magnitude of the freeway impacts on those activities. Historically, the area north of freeway was primarily developed before the freeway, while the south area was developed during and after the freeway construction. The growth of the built-up area (in square feet) in the sample and control areas is displayed in Figure 5-9. The figure shows a rapid growth during the period of 1969-1975 (the construction period), followed by a slower rate after 1975. The trend of growth suggests that 1975-1981 was a post-construction period, and 1981-1987 to be a stable phase in the staging period of freeway development impact.

The Impact Area has gradually evolved to higher density uses, as Table 5-5 shows, but the location of higher density has been in the major arterials, not on the freeway (Figures 5-4 and 5-8).

- From 84 percent of its developed area in single family in 1969, in 1987 the Impact Zone contained 67 percent single family, which is similar to the Control Areas.
- The Impact Area's multifamily share has doubled, but only to 9.3 percent (and that, as Figure 5-8 shows, is at arterial intersections and between Mill Avenue and the Southern Pacific rail line).
- Its share of schools, parks, and public buildings more than doubled between 1969 and 1987. Although this is lower than the Control Areas, schools and parks are equally distributed and centered in the Impact Area.
- Its share of commercial is the highest of all areas. This is the sole exception to the Impact Area's residential character--a large commercial node at the freeway and Rural Road.
- Finally, while the Impact Area's share of office development has tripled, it is insignificant and less than that in the North Control Area.

FIGURE 5-9

GROWTH OF THE BUILT-UP AREA
SUPERSTITION STUDY AREA
1969-1987



Source: Economic Research Division, Mountain West Research, July 1987.

TABLE 5-5

LAND USE BY TYPE
SUPERSTITION FREEWAY STUDY AREA
1969 TO 1987
(Percent of Total Developed Area)

	Single Family Residential			Multifamily Residential			School, Park, Public Building			Commercial			Office		
		Control			Control			Control			Control			Control	
	Impact	North	South	Impact	North	South	Impact	North	South	Impact	North	South	Impact	North	South
1969	84.0	79.0	0.0	4.8	4.3	0.0	2.4	11.6	0.0	8.2	2.7	0.0	0.6	2.3	0.0
1975	76.1	75.1	75.7	8.8	5.0	2.1	7.3	11.3	14.6	6.9	4.9	3.9	0.9	3.7	0.4
1981	72.8	71.8	69.7	8.8	6.1	3.1	6.7	11.7	18.9	10.7	6.0	5.5	1.0	4.4	0.7
1987	67.0	67.4	64.8	9.3	7.1	5.0	5.9	11.0	17.5	12.3	10.5	6.9	2.4	6.4	0.6

Source: Economic Research Division, Mountain West, July 1987.

5.2.3 Findings Regarding Land Use Impacts

There are several major findings regarding land use impacts in the Study Areas.

- Both the Black Canyon and Superstition areas developed quickly after completion of the freeways.
- The influence of Encanto Park and Cielito Park in the Black Canyon area has influenced the stability of residential neighborhoods that surround it.
- The rapid industrial development of the western Black Canyon area is due more to the compilation of zoning, rail proximity, available land with utilities in place, and the Black Canyon Freeway than to the freeway alone.
- Over a long period, from 1959 to 1987, residential density has increased with the encroachment of multifamily, especially along freeway and arterial corridors.
- Tempe's will to implement the 1967 General Plan, combined with a beneficial freeway design, has resulted in stable residential development along the Superstition Corridor.
- The placement of land uses in the Superstition area supports residential development. Like the Black Canyon, single family residential areas are supported by parks and schools. Non-residential activities are mainly clustered at arterial intersections, and industrial development is separated from any residential area by an arterial.
- Over time, the Superstition area has evolved into higher density uses. In part, this is from later development of non-residential activities. However, in the Impact Area and the older North Control Area, multifamily development has occurred, even displacing some single family residential.

6.0 Impacts on Residential Neighborhoods in Study Areas

One of the most important findings of the land use analysis is that, in both Study Areas, residential development, particularly single family development, has been well-maintained over reasonably lengthy periods in areas close to freeways. In both the Black Canyon and Superstition Study Areas, these residential uses benefited by strong spatial support from complementary land uses (e.g., parks), by buffering from freeways and arterials (e.g., multifamily buffering and beneficial freeway design), and by strong urban planning (e.g., the Tempe case).

This chapter focuses on three issues. First, the locational rationale for residential land use patterns are reviewed. Second, the property value impact of close freeway proximity is evaluated for the Superstition Study Area. Third, the perception of the freeway by homeowners in the Superstition Study Area is presented.

6.1 Overview of Theory and Literature

6.1.1 Locational Requirements and Preferences

As discussed in Section 2.1, the various kinds of urban land uses differ substantially in their locational requirements and in their ability to pay for their locations. In general, urban freeways greatly improve accessibility to other parts of the metro area, increase traffic volume and site visibility, but also create noise, air pollution, unwanted light, and pedestrian safety problems.

The several kinds of residential land uses, according to classic location analysis, differ in their attraction to a freeway location. Attraction depends on their requirements for greater urban accessibility and site visibility, balanced against their tolerance for the negative impacts generated by freeways. In general:

- Single family residential developments are, for the most part, repelled by freeway corridor activities and uses. A quality residential environment is where traffic flows are minimized, street noise reduced, and visibility lowered. While individuals desire convenient access to freeway and highway corridor activities, they do not want to live in a freeway corridor.

- Condominium and townhouse developments are common uses along freeway corridors, often built near regional retail centers. Clusters of multifamily developments are built along the freeway corridor because of the proximity

to major activity centers. These multifamily developments often function as an effective land use buffer between the single family developments and nonresidential uses in the corridor.

- Apartment complexes are often constructed along freeways because they benefit from increased accessibility to other parts of the metropolitan area and from increased freeway visibility.

On balance, transportation accessibility does not rank among the most important reasons for residential locations (Table 6-1).

TABLE 6-1

RESIDENTIAL LOCATION REQUIREMENTS

Delphi Panels
Ranked in Order of Importance

Factors	All Panels	Panel A	Panel B	Panel C
Water, sewer, utilities	1	1	2	1
Available land	2	3	1	3
Schools and government services	3	2	3	2
Zoning	4	7	7	4
Recreational facilities	5	9	4	6
Urban area nearby	6	4	5	9
Commercial district nearby	7	5	6	8
Interstate highway	8	10	10	5
Population cluster	9	8	9	7
Transportation facilities/access	10	6	12	10
Intersection of highways	11	12	8	12
Industrial area nearby	12	11	11	11
Labor and skills available	13	13	13	13
Airport facilities	14	14	14	14
Railroad facilities	15	15	15	15

Source: Joseph M. Davis, "A Delphi Approach to Land Use Forecasting," 1976.

- The most important locational requirements for residential development refer to primary requirements in its immediate proximity--site improvements, land availability, schools and other public services, and zoning.

- The second important set of location requirements refers to amenities provided by other land uses--recreation, nearby urban areas, and nearby commercial district.

- A third cluster, ranked in the bottom half, generally refers to surface transportation accessibility--interstate highway, transportation access, and intersection of highways.

- Lastly is a cluster of urban activities which repel residential development --industrial areas, airports, and railroads.

The importance of transportation accessibility to residential development is ambiguous. According to earlier case studies, the importance of accessibility varies by income and residential density.

- A freeway can be interpreted as a physical entity and/or a transportation facility. The former refers to the road as a physical intruder that necessitates demolition of housing and relocation of population, creates barriers to movement within neighborhoods, increases traffic around access and egress points, and generally pollutes the physical environment. In contrast, as a facility, the freeway is a carrier of goods and population that provides access between different zones of the metropolitan areas.

- In low income neighborhoods, the physical aspect of the freeway predominates, and sensitivity to the road as a physical object is greater. Local lower income and greater pedestrian dependency (more children walking to school), and more use of local neighborhood shopping facilities all contribute to the likelihood that a new freeway will force people to take detours and disrupt normal transportation routes.

- The more densely populated an area is, the greater the physical intrusiveness of any freeway construction project can be expected to be.

- It is not uncommon that families whose children are approaching school age have a tendency to seek suburban, single family housing and open space. Once children begin to venture out alone, the quality of neighborhood becomes more important to the parents. There is a large body of research that points out the importance of quiet, traffic-free streets and general environmental qualities in conditioning feelings about a neighborhood.

- In such suburban, low-density areas, the physical impact of the freeway is mitigated because the higher income residents make greater use of the larger urban area. Therefore, the accessibility to other parts of the metropolitan region, particularly the downtown area and other job centers, marks the influence of a freeway in suburban areas.

Thus, based on their locational requirements and their ability to pay for higher-priced freeway corridor property, residential land uses should develop in the following relationship to urban freeways, according to the literature.

- Condominium, townhouse, and apartment complexes are usually developed along arterials off of freeway interchanges, just beyond retail and office uses. These developments are compatible with retail and office functions.

- Single family residential areas are repelled from direct contact with freeway interchange uses, but are attracted to convenient accessibility. If freeways are located too closely, problems like noise, often create problems, both real and perceived. The actual magnitude of problems are greatly influenced by the physical design of the freeway. Single family residential uses are not ideal developments for freeway corridor developments unless nuisance mitigation measures are implemented.

These are, however, generalized land use patterns, and there are a number of local factors that will distort the idealized pattern. Regarding residential develpoment in Phoenix, two consistent observations in the literature are particularly important.

- The specific impacts freeway development has on surrounding land uses obviously depends on whether the area is already developed or not. If the area is already urbanized, then the freeway will not have as a dramatic an impact on land use in comparison to an undeveloped area. While there may be both clearance and displacement in the freeway right-of-way and some redevelopment opportunities, the existing developments adjacent to the alignment will for the most part, remain in place. In areas where there are vacant parcels in an otherwise developed area, there may be infill development like multifamily housing or neighborhood retail uses.

- The final major factor influencing actual development patterns is the local government responsible for land use planning. The selection of a new freeway route often prompt the review and possible revision of the a city's General Plan. Local governments may want to slow down freeway corridor development because they want to encourage development in other areas they deem of more strategic importance to their overall objective, or because corridor development will require tremendous investments in public infrastructure that they are not willing to commit.

6.1.2 Property Values

The impact freeways have on land use decisions is important because land use is the key determinant of property values. Regarding residential development, the literature identifies four important factors that affect property values: freeway design, proximity to right-of-way, municipal planning and zoning, and noise impact.

Freeway Design

There are three basic types of freeway designs: (1) elevated; (2) at grade; and (3) depressed. Each design has a different effect on the adjacent and surrounding areas. The most preferred type of freeway by residents of single family residential

developments is depressed, because it minimized both perceived and actual visual and sound exposure. Commercial, multifamily residential development (particularly apartment complexes), and, to a lesser degree, industrial developments prefer the at-grade freeway design because it does not restrict visual exposure or accessibility. Elevated freeways are the most unpopular with nearly all types of urban uses.

Proximity to Right-of-Way

The literature indicates a general lack of empirical evidence on which to specify the relationship between distance from the right-of-way and changes in property values. This is not to say that such a distance-decay relationship does not exist, but it is more a reflection of the complexity of the problem. Many different factors need to be controlled, including the physical design of the freeway, human-related value systems, the economic conditions that exist in the overall metropolitan area as well as the local area, etc.

The evidence that does exist suggests strongly that the property value impact zone is relatively limited to areas in close proximity to the freeway. In these studies, certain impact zones were a-priori assumed prior to data collection. For example, one study defined the "abutting zone" as the area within 200 feet of the center of the freeway right-of-way; the "impact zone" as the area 250 feet to 500 feet away; and the "control zone" as the area greater than 500 feet from the center of the freeway right-of-way. Another study in Chicago used the following areas to measure the property value impact--within one block and one to eight blocks as the two impact areas; and beyond eight blocks from the freeway as the control area, i.e., they assumed no-impact area. Generally, property value impact areas are believed to lie within one-half mile of the freeway right-of-way.

An important finding is that property values of blighted and deteriorated residential and commercial areas within the freeway impact zone experienced growth rates less than those for control areas. This suggests that increased transportation access does not by itself revitalize property values in deteriorating parts of the city for reasons discussed above in Section 5.1.1. The opposite result was obtained for suburban residential property values. Especially where improvement in the accessibility of an area was substantial, property values appreciated significantly more rapidly. A Seattle study has shown that in Kingsgate, Interstate 405 resulted in a 12 percent appreciation. In the North King County, the appreciation that resulted from Interstate 5 was 15

percent. In both areas, most residents used the freeways for commuting to work and realized significant time savings. On the other hand, in the control area there was little or no effect of freeway benefits on property values. The same study indicates that, unfortunately, some of the properties closest to the highways also suffer some negative effects because of adverse environmental influences, particularly due to noise levels.

Noise

While the development of freeways generally has a positive effect on surrounding property values because of increased accessibility, property values of residential areas directly adjacent to the freeways have been offset, compared to control areas. The primary reason for this effect has been largely attributable to the increased noise levels (real and perceived) that accompany freeway development.

The property value impact of freeways on directly adjacent property does not necessarily cause a decrease in values, although property value decreases have sometimes been observed in the range of zero to 7 percent less than in control areas.

Highway noise levels have caused a partly offsetting decrease in property values for those houses closest to the highway. On balance, the net effect of adverse and beneficial influences of freeways is positive where both effects could be quantified. This finding implies that all properties in freeway-influence areas appreciate, but those closest to the freeway do not appreciate to the same degree. One study estimates that the difference in sales price between properties in proximity to the freeway with those equivalent properties located farther from the highway is $3,000-$3,500.

A consistent and important finding in the literature is that property value impacts due to freeway noise are caused only when noise exceeds a certain threshold. This suggests that the problem can be mitigated.

- A Canadian study indicates that levels of noise from highway traffic, up to 73 dBA, are not related to major differences in housing prices. Levels of 60 to 65 dBA were shown to be associated with annoyance, but appear not to affect housing prices. Property values were affected only when the 73 dBA threshold was exceeded, with the cost of noise appearing to be roughly $650 to $700 per decibel, at 1977 prices.

- A similar study in Northern Virginia shows that property values appear to be influenced by a noise level above 63 dBA. Above this threshold, the estimated reduction in value is $94 per decibel, at 1978 prices.

- In Tidewater, Virginia, the influencing noise level was above 70 dBA, and the reduction in price was estimated to be $88 per decibel.

- One of the most comprehensive studies conducted on the relationship between freeway noise and property values examined empirical data from 14 residential sites in the United States and Canada. The survey suggests a noise discount in the range 0.16 to 0.63 percent per decibel, with a mean of 0.40 percent.

The significance of these studies lies not in the specific numbers (the studies were conducted in different locations and in different time periods, etc.), but in the fact that noise damage is a possible consequence of freeway development in areas close to existing single-family structures, especially in areas of more expensive housing. Noise is mitigatable. Freeway design (e.g., depressed freeways) and other mitigation measures can control property value impacts due to noise.

Municipal Planning and Zoning

Local government is a key payer in determining the type and intensity of land use around freeways. While the selection of a new freeway route in the city will often prompt a review of the General Plan, there is no assurance that revisions will be made. Land use decisions along freeways have to be consistent with the overall land use patterns and goals of the city. Generally, however, cities welcome the development of new freeways because it strongly enhances their economic development potential, and thus are often willing to revise their General Plan to allow relatively intense urban development along the corridor, particularly at interchanges. Conversely, public determination to preserve existing land uses and zoning, to control adjacent land uses and zoning, and to implement nuisance mitigation measures, successfully prevents land use change.

6.2 Impact on Property Values in the Phoenix Area

As discussed earlier, both the Black Canyon and Superstition Study Areas were largely urbanized before freeways were built in them. In both cases, municipalities continued to implement land use controls based on policies that were developed prior to freeway development. The result is that both Study Areas presently contain a higher

proportion of residential land than would have occurred if the freeway had been built before land was developed.

The Superstition Study Area, in particular, is largely residential, with over 67 percent of its land area in single family residential use. The Superstition Freeway was constructed on a half-mile street right-of-way, south of and adjacent to existing single family residential subdivisions between Mill Avenue and McClintock Drive, and north of and adjacent to another single family development between Mill Avenue and College Avenue (see Figure 4-1 in Section 4.0). The freeway's Mill-to-Rural segment was originally completed in 1972 and widened in 1984, and the Rural-to-McClintock segment was completed in 1975 and widened in 1984. Since the completion of these segments, new single family developments were built adjacent to the freeway (both north and south) from College Avenue to Price Road along the entire length, with the exception of arterial intersections at Mill, Rural, and McClintock.

The Superstition Study Area contains very effective design measures to protect residential land use.

- For this entire length, the freeway is a depressed design.
- The freeway right-of-way creates an undeveloped, vegetated barrier, at least 21 feet wide between the roadway and residential property lines.
- The freeway is also separated by an 8 to 10 foot high wall.
- These design measures have effectively mitigated noise problems while creating a more private location for residences immediately next to the freeway right-of-way.
- Additionally, a pedestrian walkway connects residential subdivisions north of the freeway with Palmer Park, south of the freeway. Five school sites with small neighborhood parks have been built (adjacent to the freeway) in five of the six residential neighborhoods next to the freeway.

These design measures, combined with land use control resulting from the City's General Plan, have effectively controlled development in the Superstition Study Area to be compatible with single family residential use. The balance of this chapter examines the property value effect and effect on residential attitudes of a freeway segment that is very well-integrated with adjacent residential development.

6.2.1 Methodology

Study Area Definition

The study area for property value analysis is located in the northern part of the Study Area, delineated by the freeway on the south, Mill Avenue on the west, Alameda Drive on the north, and McClintock Drive on the east (see Figure 6-1). The area contains 2 square miles and is bisected into an impact zone and a control zone.

- The area was mainly developed by seven major builders--Nu Vista, Cavalier, Brentwood, Hallcraft, Hughes, Cyprus, and Knoell Homes--that built subdivisions in both the impact and control zones. Thus, the Study Area largely controls for factors other than the freeway.
- Southern Avenue (one-half mile away from the freeway) divides the area into two parts. Its northern half is a control zone.
- The impact zones are located between Southern Avenue and the freeway. They are further bisected into four smaller zones. A row of houses closest to the freeway (up to 200 feet from the freeway) is designated as Zone A. The next row of houses (parallel to the freeway, 200-400 feet from the freeway) is Zone B, and those houses 400-600 feet away belong to Zone C. Zone D is located over 600 feet and up to one-half mile from the freeway.

Data Source and Observations

The analysis was performed on property sales transactions from the Maricopa County Assessor's Office. The parcel number, address of the property, the names of seller and buyer, year built, year sold, sales price, property size, and features of the property was recorded for all transactions from 1972 to 1987. The total number of sales is 4,096 transactions; of that, 2,885 sales, or 70.4 percent, were complete, reliable, and used in the analysis. The distribution of sales by zone is displayed in Table 6-2.

6.2.2 Property Value Trends

Study Area Housing Stock

The average sales price of properties in the Study Area was $83,110 in 1987. By comparison, the median sales price of resale single family units was $72,000 in North Tempe and $79,300 in metro Phoenix during the same period. Within the Study Area, the impact area units had an average sales price of $86,557, while the control area units were $78,126. The impact area units averaged 1,788 square feet, about 110 square feet larger than the control area units, and also sold for about $1.60 per square foot higher.

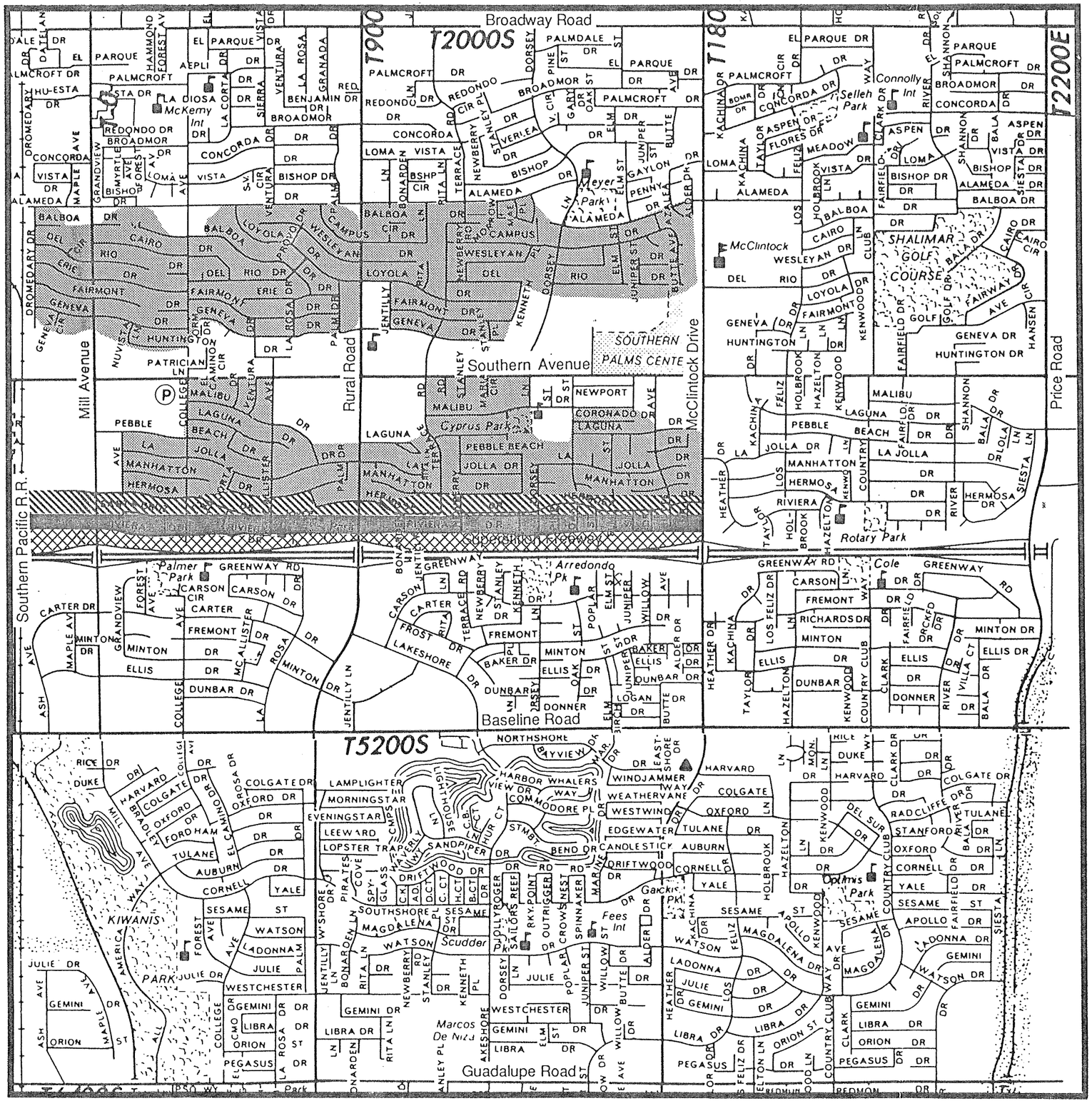


FIGURE 6-1

STUDY ZONES FOR PROPERTY VALUE ANALYSIS, SUPERSTITION FREEWAY STUDY AREA

- IMPACT ZONE UNDER 200 FT.
- IMPACT ZONE - 200 - 400 FT.
- IMPACT ZONE - 400 - 600 FT.
- IMPACT ZONE - 600 FT. - 1/2 MILE
- CONTROL ZONE - 1/2 MILE - 1 MILE

SOURCE:
MOUNTAIN WEST RESEARCH, Economic Research Division,

TABLE 6-2

SALES TRANSACTIONS BY ZONE
SUPERSTITION STUDY AREA
1987

Zone	Total Entries	Complete Data	% Complete Data to Total Entries	Average House Size (Sq.Ft.)	Average 1987 Sales Per Sq.Ft. ($)	Average 1987 House Price ($)
A	131	100	76.3	1,867	$46.94	$87,637
B	219	153	69.9	1,818	51.47	93,572
C	251	180	71.7	1,815	48.12	87,338
D	1,284	905	70.5	1,769	47.11	83,338
Impact Zones	**1,885**	**1,338**	**71.0**	**1,788**	**48.41**	**86,557**
E	533	340	63.8	1,586	45.73	72,528
F	586	400	68.3	1,842	47.63	87,734
G	524	353	67.4	1,764	46.55	82,114
H	568	454	79.9	1,507	47.26	71,221
Control Zones	**2,221**	**1,547**	**69.7**	**1,669**	**46.81**	**78,126**
Total Area	4,096	2,885	70.4	1,746	$47.60	$83,110

Source: Economic Research Division, Mountain West, July 1987.

Unadjusted Property Value Trends

The average sales price per square foot increased between 1972 and 1987 for all neighborhoods in the Study Area (Table 6-3). The Study Area average rose from $18.10 per square foot in 1972 to $47.60 per square foot in 1987. The Impact Zone average increased from $17.70 per square foot in 1972 to $48.40 per square foot in 1987, while the Control Zone went from $18.50 to $46.80. Values increased for all properties in the Impact Zone, irrespective of their distance from the freeway.

Appreciation curves for the Study Area show a flat period from 1972 to 1976, a period of rapid increase from 1976 to 1980, and a period of more gradual increase since then (see Figure 6-2). Over the entire period, the average value has consistently been higher for the Control Zone than for the Impact Zone, with differentials of less than a dollar per square foot in the 1970s to $4.00 per square foot in the 1980s.

There is not a strong correlation between unadjusted value and distance from the freeway for properties in the Impact Zone (see Figure 6-3). Although differences exist, they are not related to distance. A simple regression analysis was performed on the value of properties located within 200 feet of the freeway, compared to the value of properties located over 200 feet. The value of the R2 ranged from 0.87 to 0.98 for each neighborhood, which demonstrates that the variation in property values is not distributed differently by distance.

Rate of Appreciation. The rate of appreciation during the 1976 to 1979 period was faster for the Study Area than the metro Phoenix average (see Figure 6-4). This is all the more impressive since the metro average (the Maricopa County consumer price index for purchase of a house) includes more expensive new housing as well as resale housing. It is possible that the more rapid Study Area increase was due to freeway accessibility.

Figure 6-4 also shows, however, that the rate of appreciation has been slower in the Study Area than in metro Phoenix since 1981. This is caused by the presence of new, more expensive housing in the metro measure. To correct for this, the Study Area was measured against the rate of appreciation in resale housing, as measured by Arizona State University using Maricopa County Assessor's Office sales transactions (see Figure 6-5). Because there are to few observations for individual zones on an annual basis, appreciation is defined as the percentage increase from the average 1982 to 1984 sales price, compared to the average 1985 to 1987 sales price.

TABLE 6 - 3

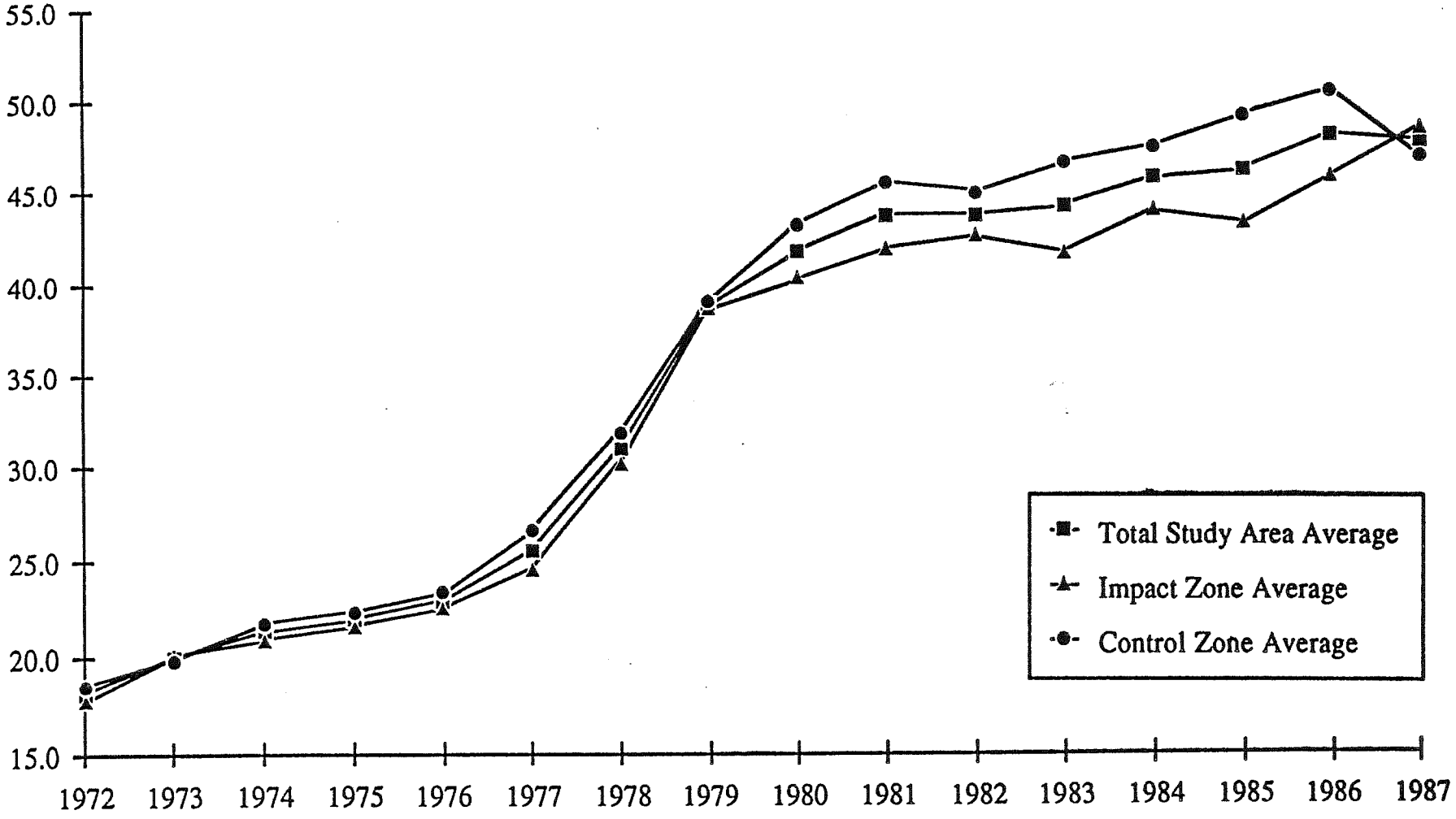
AVERAGE SALES PRICE
SUPERSTITION STUDY AREA BY ZONE
1972 - 1987
($/Sq. Ft.)

Year	Study Area Average	Impact Zone					Controll Zone				
		Under 200 ft.	200 - 400 ft.	400 - 600 ft.	600 ft - 1/2 Mile	Average	Area E	Area F	Area G	Area H	Average
1972	18.1	18.5	16.6	18.0	17.8	17.7	16.4	20.1	19.0	18.5	18.5
1973	19.9	19.6	20.3	20.4	20.0	20.1	17.3	21.8	20.2	20.1	19.8
1974	21.3	21.1	21.6	20.5	20.5	20.9	19.8	23.5	21.9	21.6	21.7
1975	22.0	20.9	19.9	23.4	22.2	21.6	19.6	24.4	23.0	22.4	22.3
1976	22.9	21.9	22.6	22.7	22.8	22.5	20.6	26.5	23.4	22.9	23.3
1977	25.6	24.5	24.5	24.1	25.1	24.6	25.2	28.0	27.9	25.2	26.6
1978	31.0	30.4	28.4	31.7	30.2	30.2	29.7	32.0	33.3	32.2	31.8
1979	38.9	36.6	39.5	40.2	38.5	38.7	35.5	42.0	40.4	38.6	39.1
1980	41.8	38.7	40.8	40.2	41.7	40.3	38.8	47.8	43.7	42.9	43.3
1981	43.8	37.2	45.4	42.6	42.7	42.0	41.4	49.3	48.2	43.2	45.5
1982	43.8	42.8	41.3	43.0	43.3	42.6	41.1	45.6	48.0	45.2	44.9
1983	44.2	40.6	38.4	45.6	42.4	41.8	42.3	48.2	47.7	48.3	46.6
1984	45.7	43.7	39.1	45.9	47.1	43.9	43.8	51.1	48.2	46.9	47.5
1985	46.1	47.0	38.0	43.1	44.9	43.2	44.6	51.2	51.1	49.3	49.1
1986	48.1	42.7	47.2	46.1	46.9	45.7	47.3	51.6	52.9	49.8	50.4
1987	47.6	46.9	51.5	48.1	47.1	48.4	45.7	47.6	46.6	47.3	46.8

Source: Economic Research Division, Mountain West Research, July 1987.

FIGURE 6-2

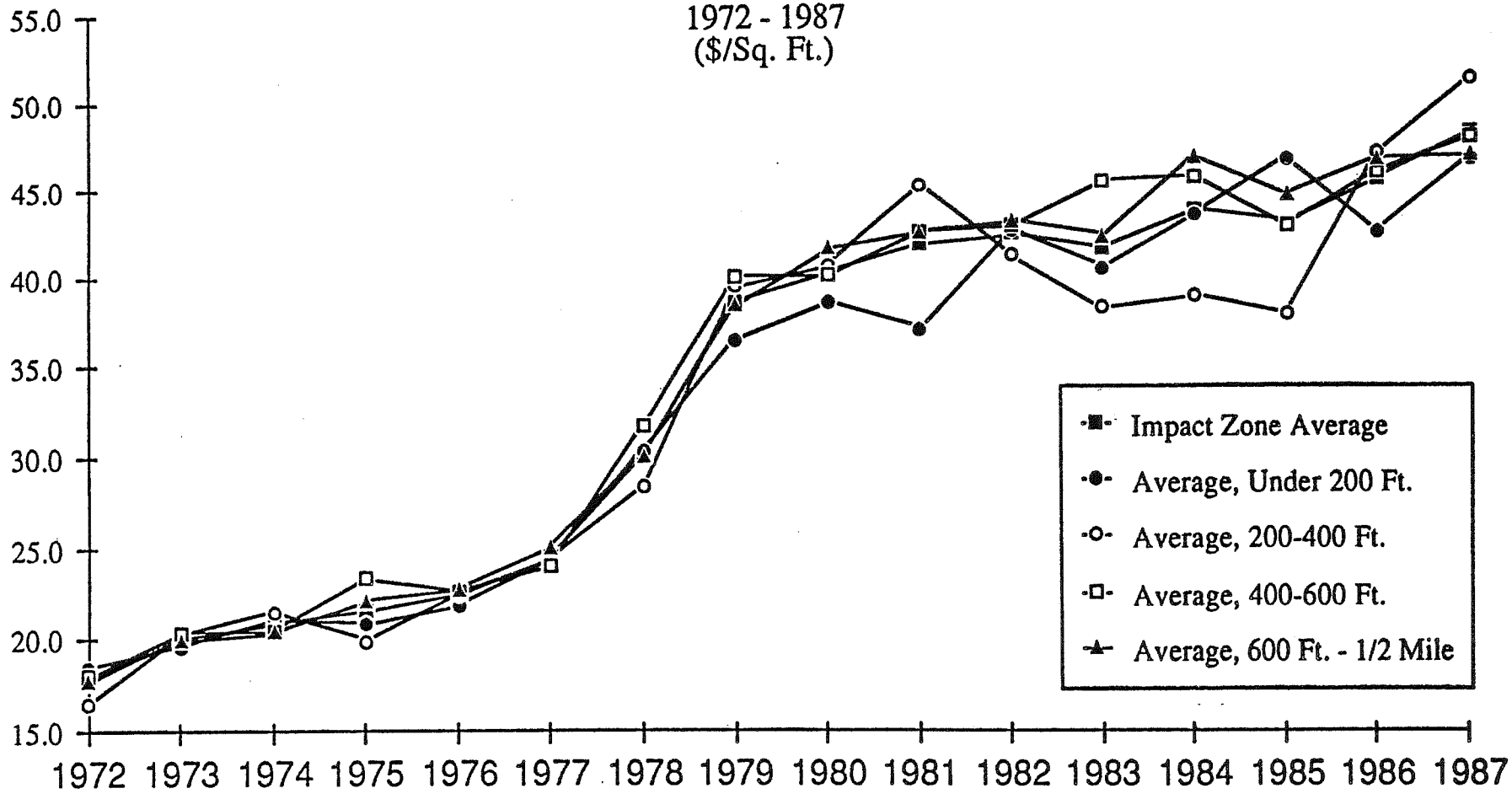
AVERAGE SALES PRICE
STUDY AREA, IMPACT ZONE AND CONTROL ZONE
1972 TO 1987
($/Sq. Ft.)



Source: Economic Research Division, Mountain West Research, July 1987.

FIGURE 6 - 3

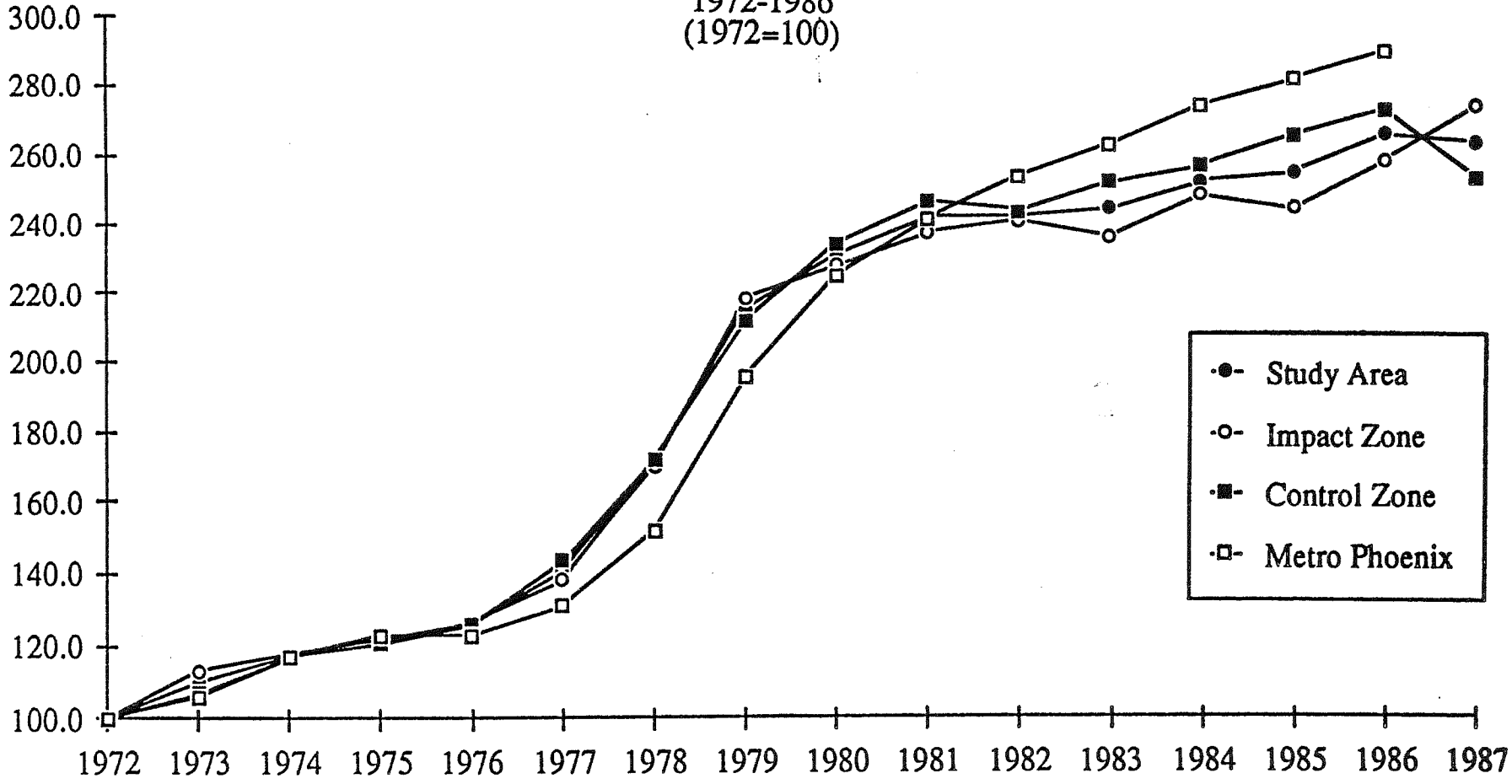
AVERAGE SALES PRICE
IMPACT ZONE BY DISTANCE
1972 - 1987
($/Sq. Ft.)



Source: Economic Research Division, Mountain West Research, July 1987.

FIGURE 6-4

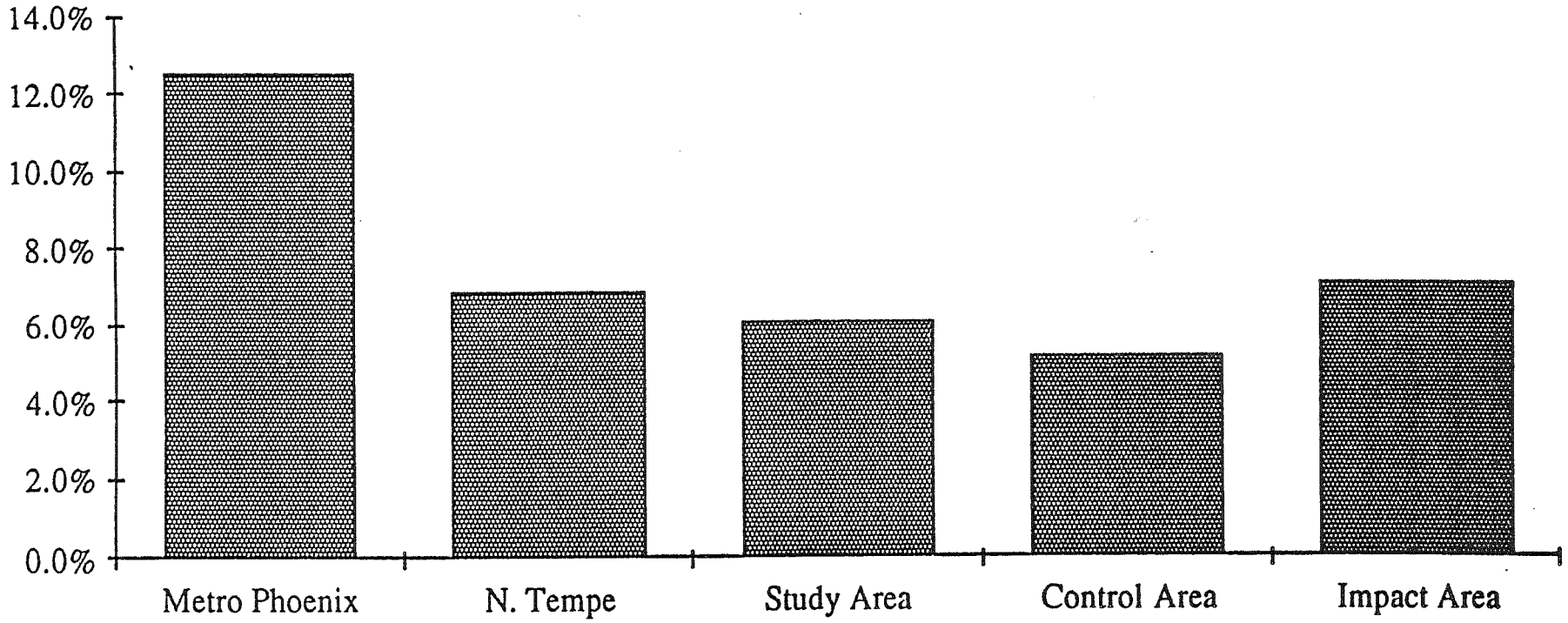
APPRECIATION INDEX
STUDY AREA AND METRO PHOENIX
1972-1986
(1972=100)



Source: Economic Research Division, Mountain West Research, July 1987.

FIGURE 6-5

APPRECIATION OF RESALE HOUSING
1982-1984 AVERAGE COMPARED TO 1985-1987 AVERAGE
STUDY AREA BY DISTRICT, NORTH TEMPE AND METRO PHOENIX



Source: Economic Research Division, Mountain West Research, July 1987.

Figure 6-5 shows some significant results. North Tempe resale housing appreciated at about half the rate of the metro Phoenix average. The Study Area compares very favorably with North Tempe. Significantly, the Impact Area's appreciation was greater than the Control Area's--seven percent, compared to five percent. There were too few observations inside the Impact Area to perform an analysis with a reasonable confidence level that would distinguish properties by smaller zones.

6.2.3 Conclusions Regarding Property Value Analysis

In conclusion, then, there are no discernable negative property value impacts from the Superstition Freeway in the Study Area. To put these results in perspective, however, the Study Area is very well-integrated with the freeway. The freeway has a beneficial design, rights-of-way are adequate, and the City of Tempe has consistently followed through with its General Plan guidelines to make the Study Area a single family residential neighborhood with strong residential attributes--schools, parks, and shopping facilities. Freeway accessibility, in this context, is a positive attribute.

6.3 Homeowners' Attitudes in the Superstition Study Area

Subjectively, a freeway can be interpreted as a physical entity and/or a transportation facility. Previous studies have found that lower income residential neighborhoods, with greater pedestrian dependency, perceive freeways as physical barriers. In contrast, higher income suburban neighborhoods, with greater automobile dependency, perceive freeways as facilities providing intra-urban accessibility.

Since a freeway can have two quite different connotations, the assessment of community attitudes toward freeway development is vital in highway planning. In suburban areas of metro Phoenix, which have a high degree of automobile dependency, it is more likely that freeways will be perceived to be facilities that increase accessibility. Certainly, that Maricopa County voters approved the freeway expansion program contingent on a sales tax increase would indicate this is so. Still, many miles of new freeway will, by necessity, be built through residential neighborhoods. The pertinent question becomes one focused on trade-off. Does close proximity to an urban freeway create a negative perception that outweighs the positive perception of increased accessibility? The Superstition Study Area provides an opportunity to test the question on a residential neighborhood that is well-integrated with the freeway. The perception,

opinion, and attitudes of Superstition area residents were examined through primary survey research using a structured questionnaire.

6.3.1 Methodology

The principal objective of the survey is to assess how residents in the Superstition corridor perceive freeways in their neighborhood. Neighborhoods were grouped by distance, as displayed in Figure 6-1 above. The similarity of homebuilders in the several neighborhoods helps prevent bias in respondents for choosing their dwelling unit.

The universe of all residents in the study area was provided by the sales transaction records. Telephone interviews with these homeowners were conducted in the late afternoon and early evening of the period June 30 through July 10, 1987 with 109 completed interviews.

The survey instrument covered five basic areas of inquiry:

- Reasons for locating in the dwelling unit and in the neighborhood. In particular these questions indicated the importance of freeway accessibility in the selection of place of residence.
- Plans to move within the next year. This question partly reflects the level of satisfaction of residents in the neighborhood. In other words, the question is aimed at finding if the freeway is a factor that stimulates relocation of residents.
- Overall impact analysis. These questions assess residents' opinion about the benefits and costs of having freeway in their neighborhood, and how these two components balance each other. One question assesses the annoyance level of each freeway disturbance element, such as noise, vibration, lights, air pollution, and visual effects.
- Impact on property value. The objective of these questions is to examine how residents perceive the impact of freeway on property value, their opinion on other factors that affect housing value, and their attitude toward living in the proximity of the freeway.
- Mitigation measures. In case the respondent thinks that there are negative impacts of freeway construction, this open-ended question elicits suggestions for mitigation measures.

The balance of this section summarizes the major survey findings.

6.3.2 Survey Results

Mountain West conducted a survey of 109 residents living in the Superstition Freeway Study Area in 1987. Almost 40 percent of those surveyed lived in their houses before 1975 (see Table 6-4). Another 34 percent moved in between 1975 and 1980, and the remaining established residency after 1980. Respondents' distribution by distance from the freeway was homogeneous. Nineteen of the 109, or 17 percent, live within 200 feet of the freeway. Another 22, or 20 percent of those surveyed, lived between 200 and 400 feet of the freeway. About 20 percent of the respondents each came from the other groups: those living 400 to 600 feet, those living 600 to one-half mile, and those living more than one-half mile from the freeway.

TABLE 6-4

GROUPING OF RESPONDENTS
BASED ON LOCATION AND LENGTH OF RESIDENCY

	Length of Residency			
Distance from Freeway	Before 1975	1975-1980	After 1980	Total
Under 200 feet	8	7	4	19
200-400 feet	9	7	6	22
400-600 feet	9	7	6	22
600 feet - 1/2 mile	9	8	7	24
Over 1/2 mile	8	8	6	22
Total	43	37	29	109

Source: Economic Research Division, Mountain West, July 1987.

Characteristics of Respondents

Of the 109 respondents in this survey, 53 are male and 56 are female. Of the population in families of these respondents, the working force population (20 - 60 years) is 54 percent, and a substantial share (35 percent) are children under 21. This proportion of children helps explain why the importance of quiet, traffic-free streets and general environmental qualities are stressed by most of the respondents.

In terms of the occupation of respondents, the highest percentage is held by professionals (29 percent), followed by sales workers (21 percent), clerical workers (13 percent), and service workers (11 percent). The occupational composition indicates that the area is characterized by medium income residents.

Most of the adults in the area work in central Phoenix (28 percent), Tempe (25 percent), Scottsdale (12 percent), Mesa (10 percent), and Chandler (6 percent). The work place structure shows that approximately half of the working adults do not really need the freeway for work place accessibility.

Reasons to Locate in the Neighborhood

Freeways are an important attractive factor in the residential location decision. Respondents' reasons for choosing to live in the neighborhood varied by how long they had lived there (Table 6-5). The top three responses for "older" residents, who made their location decision before the freeway was built, were decisions based on the house (price and age/style), and neighborhood characteristics. The top three reasons for the newer residents, who made their decision five years after the freeway was built, were neighborhood characteristics, accessibility to the greater urban area, and price of the house.

TABLE 6-5

RANKING OF SIX MOST IMPORTANT REASONS
TO LOCATE IN THE NEIGHBORHOOD
FOR "OLDER" AND "NEWER" RESIDENTS
(Percent)

Rank	Reasons to Locate in the Neighborhood	"Older" Resident n=43	Rank	Reasons to Locate in the Neighborhood	"Newer" Resident n=29
1	Price	84	1	Neighborhood	95
2	Age/Style	84	2	Accessibility	78
3	Neighborhood	70	3	Price	74
4	Close to Work	46	4	Facilities	52
5	Facilities	45	5	Close to Work	50
6	Accessibility	30	6	Age/Style	40

Notes: "Older" resident = respondent who has been living in the area before 1975
"Newer" resident = respondent who has been living in the area after 1980

Source: Economic Research Division, Mountain West, July 1987.

The differences among the responses of the two groups are interesting. The first and third choices for older residents are reversed for newer residents. Accessibility,

however, jumped from number six for older residents to number two among newer residents. Since the location decision of the older residents predates the opening of the freeway segment, this finding is not surprising. The ranking of accessibility as number two among the newer residents indicates its importance in the residential location decision.

In contrast to the significant difference by length of residence, there is little difference in location reasons by residents' distance from the freeway.

Plans to Relocate

None of respondents indicated plans to move for freeway-related reasons. Only three of the respondents indicated that they intended to move within the near future. The reasons stated for the move were related to work transfers or a desire to upgrade their housing. None was because of the freeway.

A related question was whether respondents would ever again buy or rent a home this close to a freeway. Fifty-five percent agreed they would, 27 percent would not, and 18 percent were uncertain. Responses were correlated to distance, as Table 6-6 shows.

TABLE 6-6

WOULD YOU EVER AGAIN BUY OR RENT A HOME THIS CLOSE TO A FREEWAY?
(percent)

	Distance					
	Under 200 feet	200-400 feet	400-600 feet	600 ft.-1/2 mile	Over 1/2 mile	Total
Yes	21	55	50	88	55	55
No	47	27	36	4	23	27
Uncertain	32	18	14	8	23	18

Source: Economic Research Division, Mountain West, July 1987.

Perception of Overall Freeway Impact

Of those surveyed, 76 percent considered the overall impact of the freeway on their lives as good or very good (see Figure 6-6). The percentage increases for those who live further from the freeway. Of those living within 200 feet of the freeway, 74 percent considered the freeway as good or very good while 10 percent considered it bad or very bad. Among those living within 200 to 400 feet of the freeway, 64 percent considered the freeway as a positive and 14 percent considered it in a negative light. The negative responses among these two groups were much higher than the negative responses given by the other three groups. An interesting result is the frequency of the neutral response among the five groups. The middle group had the highest incidence of a neutral response. In addition, the two groups farthest from the freeway had the lowest neutral response to the question.

Residents' perception of the freeway is strongly correlated to their length of residence. Of those who had made their residential decision before the freeway was built, only 65 percent thought the freeway's impact was good or very good. In contrast, 90 percent of those who had made their residential decision since 1980 thought its impact was beneficial (see Table 6-7).

TABLE 6-7

OVERALL PERCEPTION BY LENGTH OF RESIDENCE
(percent of total)

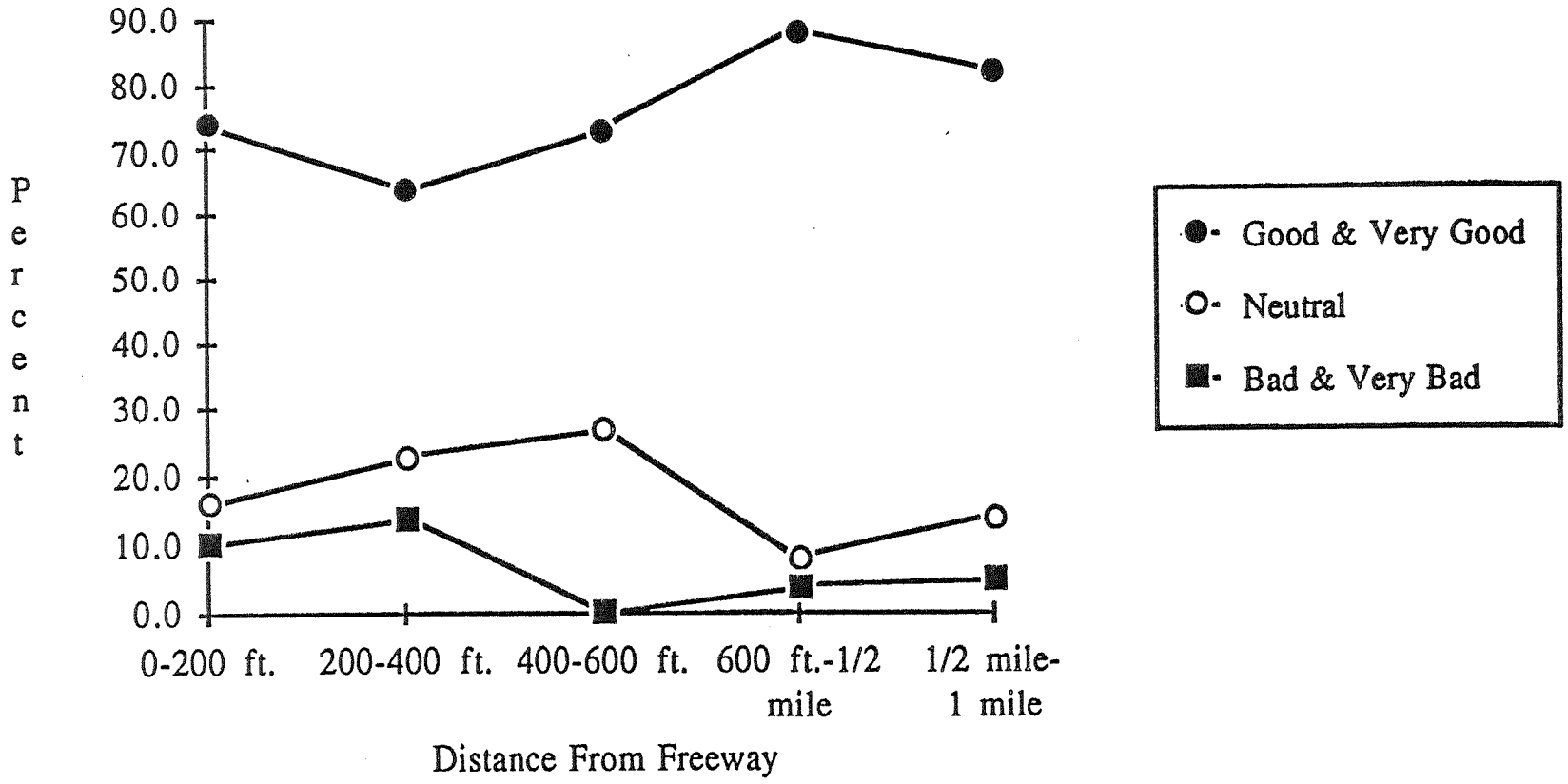
	Length of Residence		
Freeway Impact	Before 1975	1975-1980	After 1980
Good and Very Good	65	78	90
Neutral	23	19	7
Bad and Very Bad	12	3	3
Total	100	100	100

Source: Economic Research Division, Mountain West, July 1987.

Respondents ranked noise and air pollution as the most noticeable negative effects from the freeway. Noise was identified as the most noticeable problem by those living closest to the freeway--under 400 feet (see Table 6-8). With increasing distance, air pollution was ranked the most noticeable problem. Vibration, light, and the freeway's visual effect were identified as lesser problems.

FIGURE 6-6

RESIDENTS' OVERALL PERCEPTION



Source: Economic Research Division, Mountain West Research, July 1987.

TABLE 6-8

ADVERSE FREEWAY EFFECTS

	Primary Adverse Effect (percent of total)					
	Under 200 feet	200-400 feet	400-600 feet	600 ft.- 1/2 mile	Over 1/2 mile	Total
Noise	70.5	66.7	33.3	45.5	21.4	48.8
Air Pollution	23.5	28.0	66.7	54.5	78.6	48.8
Vibration	5.9	4.8	--	--	--	2.4
Total	100.0	100.0	100.0	100.0	100.0	100.0

	Rank Order				
	Under 200 feet	200-400 feet	400-600 feet	600 ft.- 1/2 mile	Over 1/2 mile
Noise	1	1	2	2	2
Air Pollution	2	2	1	1	1
Vibration	4	4	3	3	3
Light	3	5	4	4	5
Visual Effect	5	3	5	5	4

Source: Economic Research Division, Mountain West, July 1987.

Respondents were further asked to distinguish whether negative effects were annoying or merely noticeable, both inside and outside their homes. As Table 6-9 shows, noise was identified as both the most annoying problem, both inside and outside the home and also as the most noticeable problem, inside and outside the home. The freeway was blamed for air pollution as the second-ranked problem, especially outside the home. Noise is especially bothersome to those closest to the freeway, as is the freeway's light.

TABLE 6-9

ANNOYING AND NOTICEABLE PROBLEMS
(Number of Responses)

	Distance					
	Under 200 feet	200-400 feet	400-600 feet	600 ft.-1/2 mile	Over 1/2 mile	Total
Annoying Problems	4	5	1	1	2	13
Inside the Home	2	2	—	—	—	4
Noise	1	2	—	—	—	3
Vibration	1	—	—	—	—	1
Outside the Home	2	3	1	1	2	8
Noise	1	3	—	1	—	5
Air Pollution	1	—	1	—	2	4
Noticeable Problems	50	41	47	32	4	174
Inside the Home	16	11	10	6	1	44
Noise	8	7	5	3	—	23
Air Pollution	4	2	5	1	1	13
Vibration	3	2	—	1	—	6
Light	1	—	—	1	—	2
Outside the Home	34	30	37	26	3	130
Noise	14	13	16	12	2	57
Air Pollution	7	8	17	10	1	43
Light	9	8	4	2	—	23
Visual Effect	3	—	—	1	—	4
Vibration	1	1	—	1	—	3

Source: Economic Research Division, Mountain West, July 1987.

Asked to identify the benefits of the freeway, 67 percent identified accessibility, while another 23 percent identified reduced travel time, which is an attribute of accessibility. Although only 5 percent said the freeway had no benefit, 18 percent of

those living under 200 feet from the freeway thought there was no benefit, as did 7 percent of those living between 200 and 400 feet.

Impact on Property Values

There is a mixed perception about the impact of freeways on property values. The overriding perception is that freeways either increase values or have no effect. Almost two-thirds of the respondents were either uncertain or thought there was no impact on property values (Figure 6-7). Overall, 31 percent thought property values were enhanced by the freeway and 7 percent thought that freeways depressed values. The perception that property values were enhanced increased as respondents lived further from the freeway. Conversely, the perception that values declined, decreased for respondents who lived further from the freeway.

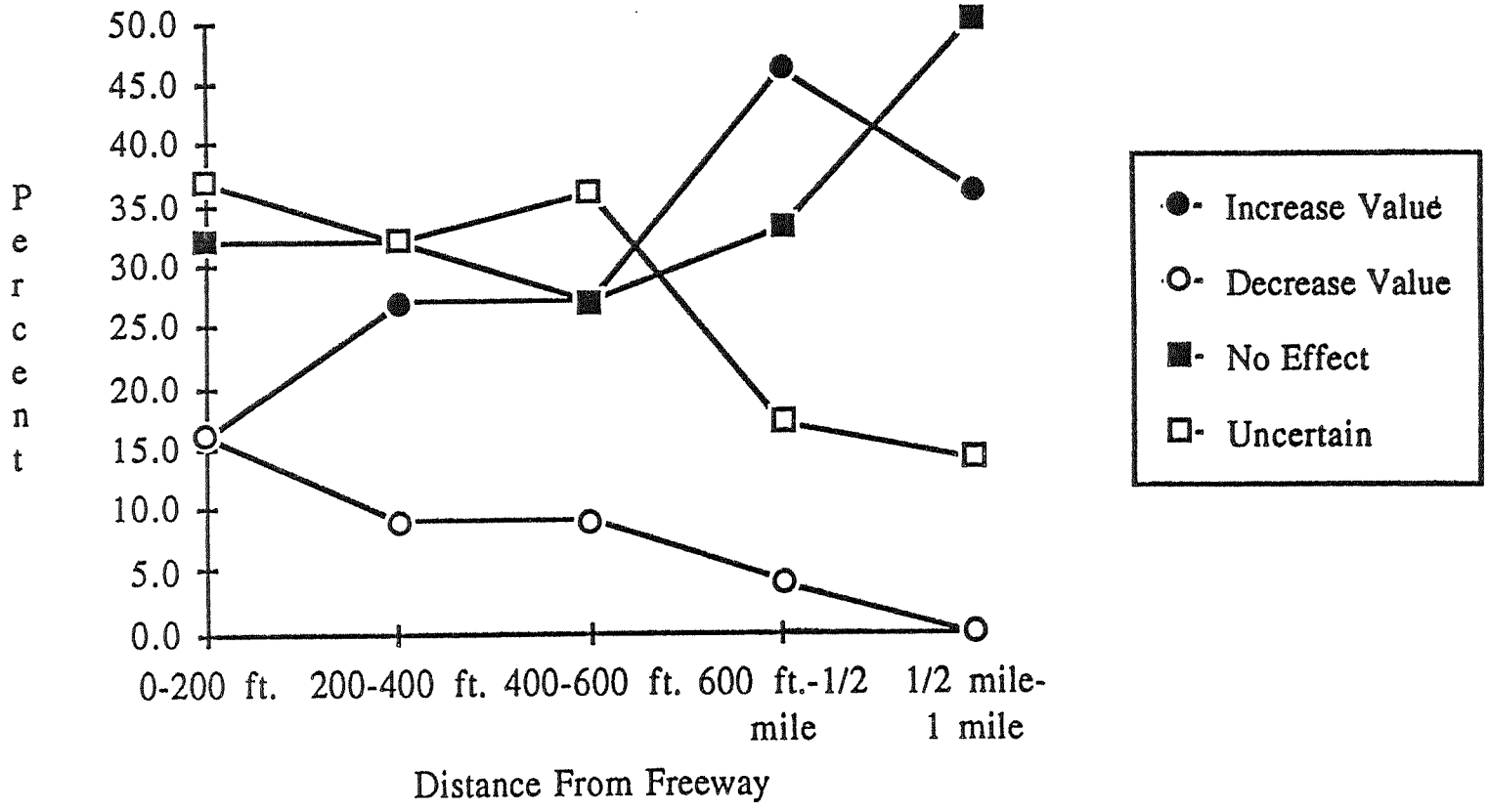
Distance has an effect on perceived property values. Of those living the closest to the freeway (under 200 feet), 16 thought that values increased, and another 16 percent thought that values declined. A major watershed occurred in the distance 200 feet to 600 feet. Of respondents living in that area, 27 percent thought values increased and only 9 percent thought they declined. A third watershed occurred over 600 feet, where a clear plurality perceived an increase in property values.

Length of residence also has an effect in perceived property values (see Table 6-10). Of "older" residents, 37 percent thought the freeway increased value, 12 percent thought it decreased value, 26 percent thought it had no effect, and 26 percent were uncertain. The share who thought it had no effect increased for residents who made the location decision after the freeway was built. Similarly, the share who thought the freeway caused a decline in property value decreased for "newer" residents.

Fifty-one percent of Study Area residents recognize that other factors besides the freeway affect their property values. There is a strong and direct correlation between that recognition and distance from the freeway (see Table 6-11). Only 21 percent of those whose properties abut the freeway recognize other factors, compared to 36 percent of those between 200 and 400 feet, 46 percent between 400 and 600 feet, 67 percent between 600 feet and one-half mile. The freeway apparently permeates the perception of those who live closest to it.

FIGURE 6-7

RESIDENTS' PERCEPTION OF PROPERTY VALUE



Source: Economic Research Division, Mountain West Research, July 1987.

TABLE 6-10

PERCEPTION OF FREEWAY IMPACT ON PROPERTY VALUE
BY LENGTH OF RESIDENCE
(Percent of Total)

Perception	Length of Residence		
	Before 1975	1975-1980	After 1980
Increase Value	37	22	34
Decrease Value	12	8	--
No Effect	26	35	48
Uncertain	26	35	17
Total	101	100	99

Source: Economic Research Division, Mountain West, July 1987.

TABLE 6-11

ARE THERE ANY FEATURES IN YOUR NEIGHBORHOOD
THAT AFFECT PROPERTY VALUE OTHER THAN THE FREEWAY?
(percent)

	Distance From Freeway					
	Under 200 feet	200-400 feet	400-600 feet	600 ft.-1/2 mile	Over 1/2 mile	Total
No	68.4	45.5	54.5	29.1	18.2	42.2
Uncertain	10.5	18.2	--	4.2	--	6.4
Yes	21.0	36.4	45.5	66.7	81.8	51.4

Source: Economic Research Division, Mountain West, July 1987.

Other factors that were identified in an open-ended response were facilities (ASU, library, post office, schools, church, shopping), house conditions, neighborhood conditions (quiet/noise), recreation (lakes, park), no through traffic, and negative impact from high-rise multifamily.

Mitigation Measures

People do have ideas to mitigate the impact of freeways. A open-ended question on how negative impacts of freeways can be mitigated was asked of respondents. By the nature of the question, the list represents exploratory findings.

Planning/design/programming

-- Should have built freeway through industrial area instead of residential area
-- Put more trees to deaden noise
-- Plan ahead so don't have to add lanes
-- Plan to have freeways connect
-- Exit/entrance streets have too much traffic

Implementation/Construction

-- Too dusty, need more water, keep construction sites clean
-- Don't do construction work during rush hour
-- Construction is slow compared to other states

Other

-- Need more freeways, should have built it sooner
-- Don't build anymore
-- Need rapid transit

Although many of the comments likely represent common frustrations with the status of the metro area freeway system and the problems associated with construction, the comment on exit and entrance streets having too much traffic is worthy of note.

An important finding in the research literature is that local planning and zoning controls and the planning and design of the areas immediately adjacent to freeways is critical, especially with regard to the circulation system.

6.3.3 Conclusions Regarding Homeowners' Attitudes

In conclusion, residents' attitudes towards the freeway are ambiguous. Overall, attitudes towards the freeway are positive. Residents who made their residential decision prior to freeway construction, however, are less positive towards the freeway than those who moved afterwards. "Newcomers" value the Study Area's accessibility much higher than older residents. Although no residents will move because of the freeway, only 20 percent of those who live within 200 feet would ever buy that close again, and only 50 percent of those who live from 200 to 600 feet would again do so. Although the majority of residents think that the freeway has either enhanced their property values or had no effect, almost 70 percent of those who live within 200 feet think that no other neighborhood features besides the freeway affect their property value, and about 50 percent of those who live from 200 to 600 feet agree. These responses indicate that the freeway permeates the perception of those who live most closely to it. This is all the more significant because of the high quality of this residential development.

6.4 Major Findings Regarding Property Values and Residential Attitudes

The two primary research efforts conducted in the Superstition Study Area resulted in several important findings. Regarding the property value analysis:

- Property values increased for all properties that were surveyed, both in the Control Area and the Impact Area.
- Within the Impact Area, there does not appear to be a correlation by distance.
- The rate of appreciation immediately after the freeway's construction was faster for the Study Area than for the metro average for a five-year period. It is possible this was due to increased freeway accessibility.
- After the freeway had been in place for five years, the rate of appreciation was about the same for the Study Area as for the larger North Tempe area in which it is included.
- In that later period, the rate of appreciation was faster for properties in the freeway impact zone than in the Control Area. In fact, Impact Area properties appreciated faster than the North Tempe average.

The important findings about residents' attitudes toward the freeway on balance are ambiguous.

- Homeowners who moved to the Study Area before the Superstition was built did so because of the house and the neighborhood. Homeowners who moved after the freeway was built did so because of the neighborhood, because of freeway accessibility, and because of price.

- Accessibility is perceived to be the most positive freeway impact.

- Overall, 76 percent of homeowners considered the overall impact of the freeway on their lives as very good. By distance, the lowest positive response is 64 percent.

- Ninety percent of homeowners who moved to the area after the freeway was built thought its impact was positive.

- The majority of homeowners who lived more than 200 feet from the freeway would again buy a home as close to a freeway. Only 21 percent who lived within 200 feet would do so.

- People who live within 600 feet of the freeway are most uncertain about its property value effect. The further away people live, the more they believe the freeway has no effect.

- Moreover, people who live close to the freeway are preoccupied with its effect in their property's value. After 600 feet, homeowners are more realistic about other factors that affect property value.

7.0 Non-Residential Impacts

7.1 Locational Requirements and Preferences

Commercial land value within an urban area is dependent upon its overall accessibility to other parts of the metropolitan area. The alignment and construction of a freeway will considerably improve vehicular access to areas adjacent and in close proximity to the freeway corridor. As a result, those corridor areas will generally become extremely attractive for more intensive urban development of business activities. While there are no absolutes that determine urban land use patterns or the locational behavior of businesses along freeways, there are certain locational requirements that can help to predict their aggregate urban pattern.

- Regional and community shopping centers rely heavily upon fast and convenient vehicular access within their trade area. Minimizing travel time is more important than reducing the distance between the shopping center and the potential customers. Developers usually want assurances from the local government that no competing shopping center will be allowed to locate nearby. Visual exposure is also an important location requirement.

- Neighborhood shopping facilities, generally between 5 to 12 acres in size, contain lower order consumer goods and services, e.g., grocery stores. Like larger shopping centers, neighborhood centers require convenient vehicular access. However, unlike the larger centers, the trade area for a neighborhood center is relatively small (about 2 to 3 miles).

- Convenience commercial developments (fast food restaurants, gas stations, convenience stores, diners, motels, etc.) locate along highway arterials and freeways and primarily cater to visitors and local commuters.

- Industrial plant and warehousing operations require truck and automobile access to major transportation systems--arterials, freeways, railroads and airports--for the efficient movement of supplies and workers to the plant, as well as manufactured products from the plant to their markets. Many industrial operations seek large, flat parcels of land for large buildings and areas for loading, unloading and employee parking.

- Office complexes require convenient access to other parts of the metropolitan area and some visibility from major transportation routes. Due to the wide range of businesses that occupy large office complexes, it is difficult to identify specific locational requirements.

- Hotels and motels differ slightly in their locational requirements. Hotels are usually located in or close to major employment, recreation centers, and airports, often along interstate freeway interchanges, and in many cases are developed in conjunction with other commercial uses. Motels

cater primarily to the automobile traveler and seek locations along major highways and freeways. Motels located along freeways are both located on arterials fed by interchanges and along freeway routes accessed by frontage roads.

In general, transportation rates is a highly important locational requirement for non-residential land uses. Tables 7-1 and 7-2 rank "attractiveness factors" that several panels of experts used in locating commercial and manufacturing facilities. For commercial uses, highway intersections and interstate highways were two of the five most important reasons, while "interstate highway" was the second most important reason for manufacturing uses.

As noted throughout this report, these are generalized land use requirements, and a number of local factors will distort the actual land use pattern, including:

- The development of land along freeways is dependent upon local supply and demand conditions, including the metro area's economic base. For example, if the economic base is predominantly business service oriented, then demand for office uses will be high.

- Another factor influencing land development patterns along freeway corridors is the supply of corridor lands relative to demand for corridor land. If there is a limited amount of developable land adjacent to freeways and the local economy is highly successful in business development, it is likely that the freeway corridor will be put into the highest and best use. This has been metro Phoenix's condition to date.

- In the case of Phoenix, there will be a tremendous supply of developable sites along the freeway system brought into the real estate market over the next 20 to 25 years. Even with a booming metropolitan economy, the supply of freeway corridor will be larger than its demand for many years.

- The specific impacts freeway development has on surrounding land uses depend on whether the area is already developed. If it is, then the freeway will not have as a dramatic an impact than in an undeveloped area.

- The final major factor influencing actual development patterns is the local government responsible for land use planning.

The balance of this chapter describes timing and intensity of non-residential development in each of the Study Areas.

TABLE 7-1

COMMERCIAL LOCATION REQUIREMENTS

Delphi Panels
Ranked in Order of Importance

Factors	All Panels	Panel A	Panel B	Panel C
Water, sewer, utilities	1	4	1	2
Intersection of highways	2	1	3	3
Available land	3	3	2	7
Population Cluster	4	2	6	1
Interstate highway	5	7	4	4
Transportation facilities/access	6	5	7	5
Urban area nearby	7	6	5	8
Zoning	8	10	8	6
Commercial district nearby	9	8	9	9
Industrial area nearby	10	9	10	11
Labor and skills available	11	11	11	10
Schools and government services	12	12	12	12
Railroad facilities	13	13	14	13
Recreational facilities	14	14	13	15
Airport facilities	15	15	15	14

Source: Joseph M. Davis, "A Delphi Approach to Land Use Forecasting", 1976.

TABLE 7-2

MANUFACTURING LOCATION REQUIREMENTS

Delphi Panels
Ranked in Order of Importance

Factors	All Panels	Panel A	Panel B	Panel C
Available land	1	1	1	2
Interstate highway	2	2	4	3
Water, sewer, utilities	3	5	3	5
Labor and skills available	4	4	2	6
Transportation facilities/access	5	3	6	1
Railroad facilities	6	6	7	4
Zoning	7	13	5	7
Intersection of highways	8	7	8	9
Airport facilities	9	8	12	8
Population cluster	10	11	10	13
Industrial area nearby	11	12	9	10
Urban area nearby	12	9	11	11
Schools and government services	13	10	13	14
Commercial district nearby	14	14	14	12
Recreational facilities	15	15	15	15

Source: Joseph M. Davis, "A Delphi Approach to Land Use Forecasting", 1976.

7.2 Black Canyon Study Area

Non-residential development in the Black Canyon Study Area, from 1957 to 1987, was reconstructed using the Maricopa County Assessor's Office property valuation records. Over the thirty-year period, total non-residential intensity has increased from 1.9 million to 14.4 million square feet, and, as Figure 7-1 shows, the rate of increase did not change from the freeway's completion until 1981--almost a twenty-year period. Moreover, non-residential intensity has increased since 1981, but only at a slower rate.

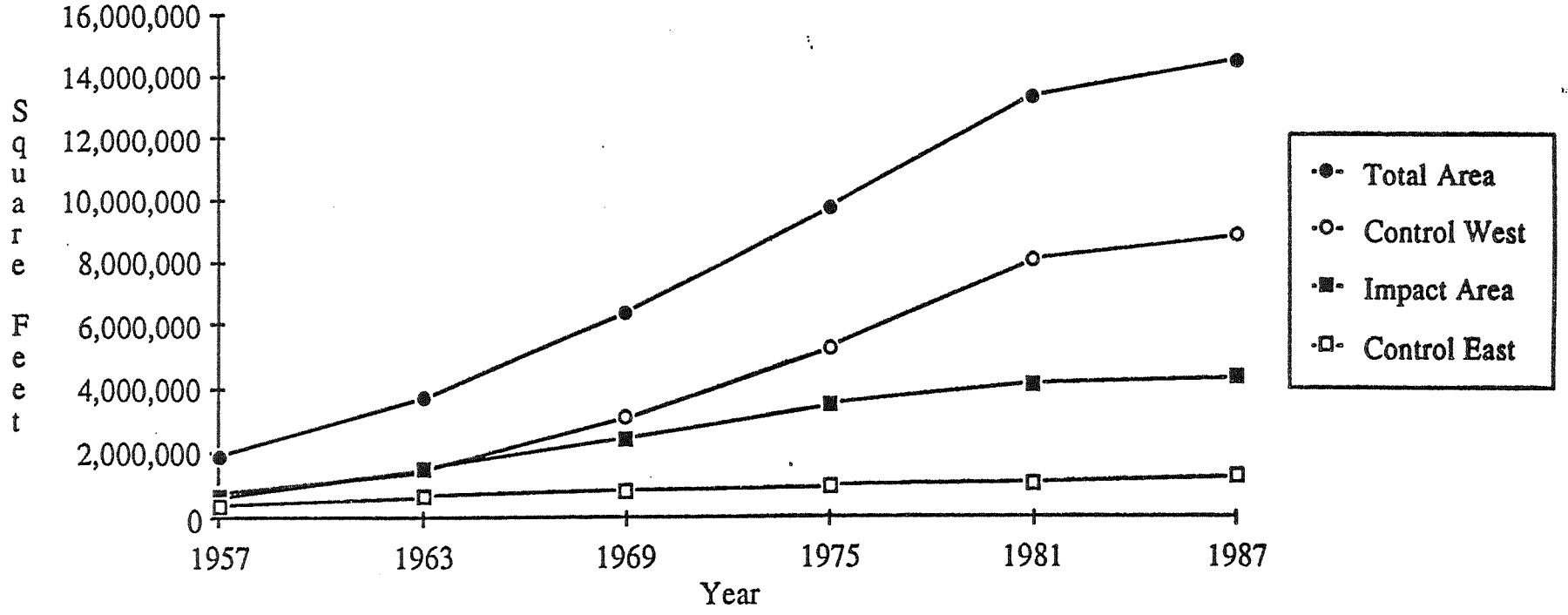
Over that thirty-year period, non-residential development has taken place in the West Control Area, where three major transportation nodes--the Southern Pacific rail line, the Grand Avenue arterial, and the freeway--along with industrial zoning and available vacant land that contained utility infrastructure have all combined to stimulate industrial development from 800,000 square feet in 1957 to 8.8 million square feet in 1987. As Figure 7-1 shows, the West Control Area grew the most rapidly and at the largest magnitude of subareas in the Study Area, and Figure 7-2 shows that the increase in space was much larger and more rapid than other non-residential uses.

After the West Control Area, the Impact Area, which contains large areas of industrial development (also at the intersection of the freeway, the Grand Avenue arterial, and the railroad), grew the most substantially. It went from 660,000 square feet in 1957 to 4.3 million in 1987. The East Central Area, which as previously discussed, has successfully maintained its original residential character due to the influence of Encanto Park and the original higher quality of its single family development, had the least growth in non-residential development. Still, it also grew from 430,000 to 1.3 million square feet.

Overall, the Study Area is dominated by industrial use (Figure 7-2). In 1957, industrial space was 850,000 square feet, increasing to 2.1 million in 1963 just after the freeway was completed, and growing very rapidly from 1963 to 1981. In 1981, there were 9 million square feet of industrial space in the Study Area, which has increased only to 9.8 million square feet since. Commercial space follows, going from 950,000 square feet in 1957 to 2 million by 1969, and 3.1 million in 1987. Office development has increased from a negligible 100,000 square feet in 1957 to 1.5 million square feet in 1987.

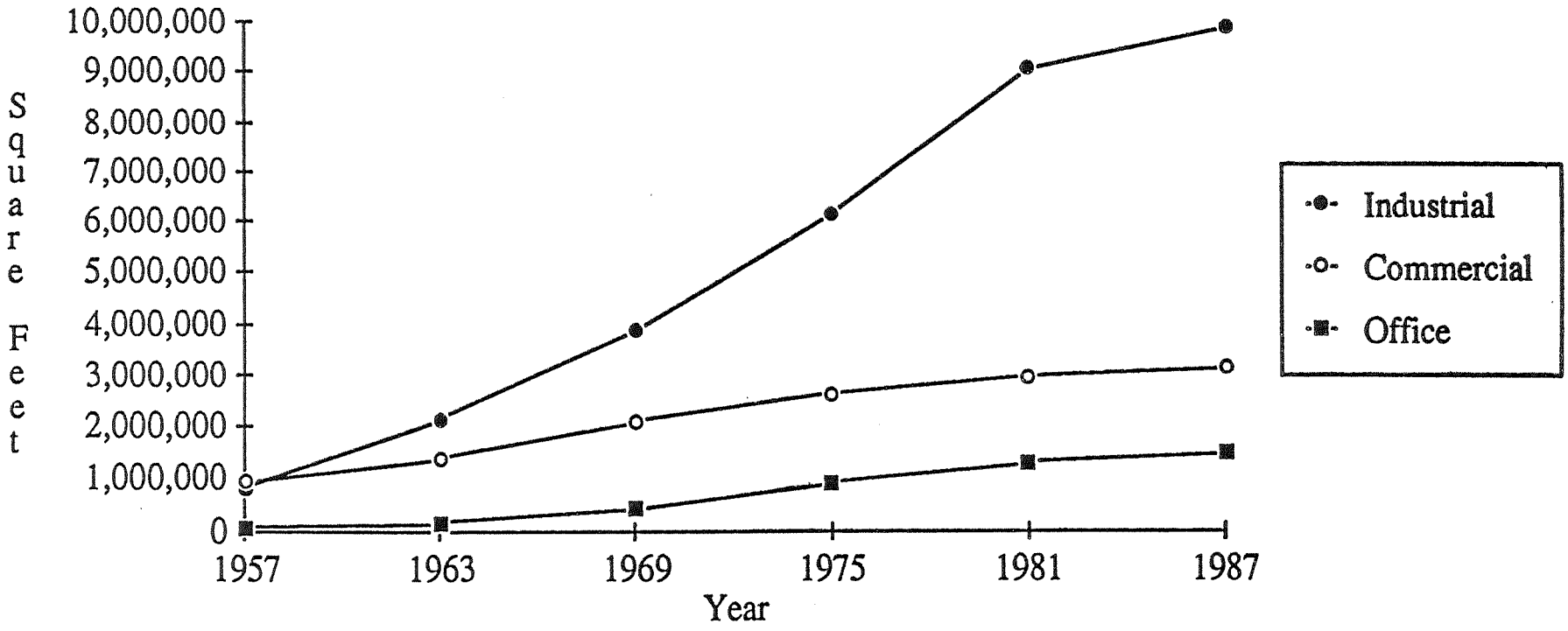
FIGURE 7-1

NONRESIDENTIAL DEVELOPMENT
BLACK CANYON STUDY AREA
1957-1987



Source: Economic Research Division, Mountain West Research, July 1987.

FIGURE 7-2
NONRESIDENTIAL DEVELOPMENT
TOTAL
BLACK CANYON STUDY AREA
1957-1987



Source: Economic Research Division, Mountain West Research, July 1987.

Figures 7-3 through 7-5 show the change in non-residential composition in each subarea. The West Control Area is clearly dominated by industrial uses (Figure 7-3). The Impact Area's non-residential development was driven by industrial growth from 1957 to 1981, but commercial development has been steady and office development since 1969 has also been significant (Figure 7-4). Over the last six years, growth has been slow. The East Control Area, which is more influenced by residential development than the other subareas, has experienced the least rapid and smallest non-residential growth. Figure 7-5 emphasizes that retail uses predominate there.

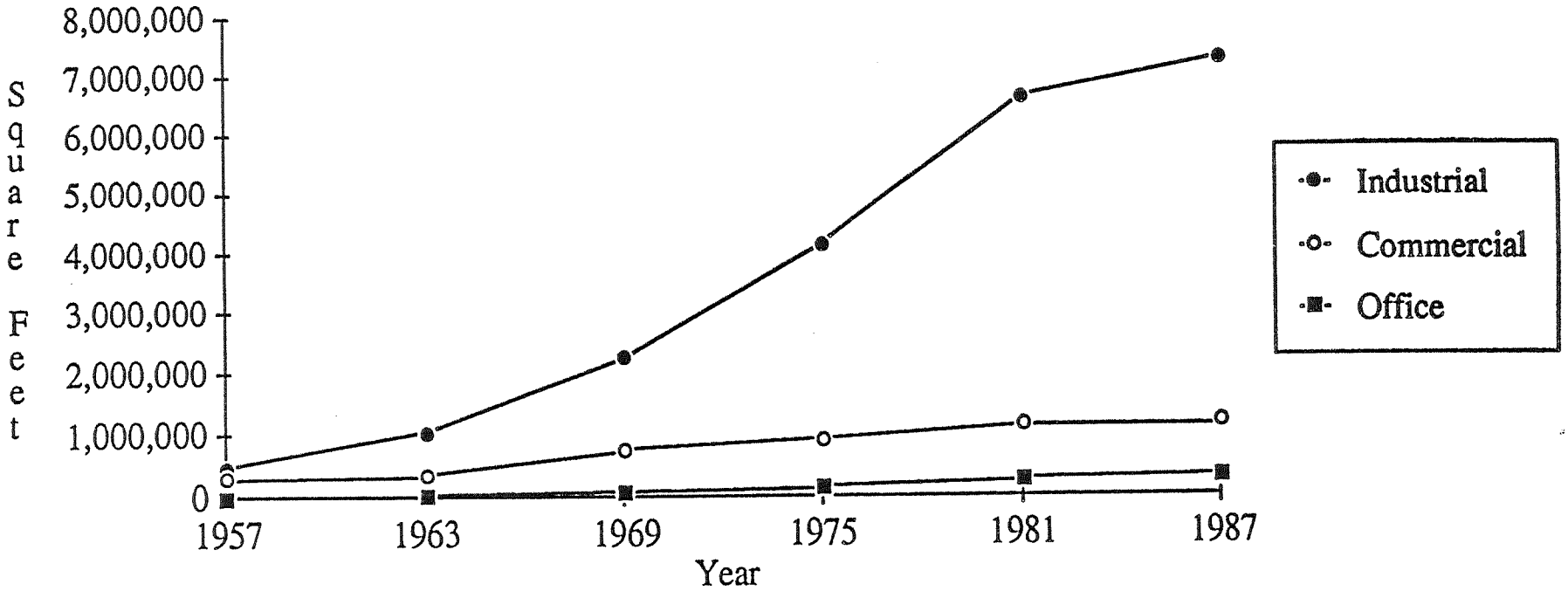
7.3 Superstition Study Area

The development of non-residential income-generating property in the Superstition area increased most substantially after the completion of the freeway in 1975, as Figure 7-6 shows. From 400,000 square feet in 1969, non-residential intensity increased to 1.4 million square feet in 1975. By 1981, non-residential space increased by another 2 million square feet; it grew again by another million square feet by 1987.

Before 1975, the Impact Area and the North Control Area grew the most rapidly; between 1975 and 1981, the South Control Area grew most rapidly. Most of this increase was along arterials. Since 1981, the Impact Area has increased the most due to the development of the Rural Road node between Baseline and the Superstition. In 1987, the Impact Area contained 43 percent of all non-residential uses in the Study Area, including 46 percent of its office uses. The North Control Area contained 35 percent and the South 23 percent.

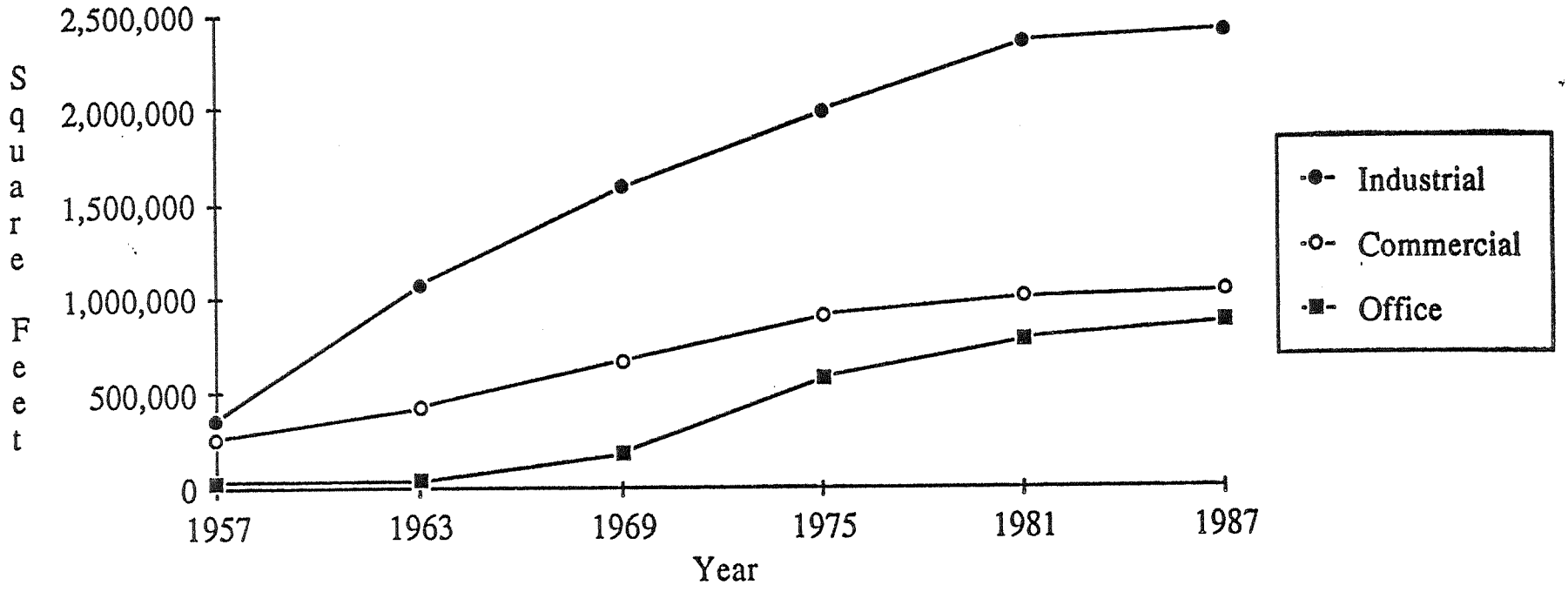
The composition of non-residential growth in the Study Area is dominated by retail uses, which comprise 57 percent of all non-residential space (Figure 7-7). Office uses are 26 percent, and industrial uses are 17 percent. During the first phase of the Study Area's development, from 1969 to 1981, commercial uses grew the most rapidly, which is consistent with the area's residential character. Since 1981, the most significant increase has been in office (the Baseline/Rural/Superstition node) and industrial (in the western edge of the Study Area).

FIGURE 7-3
NONRESIDENTIAL DEVELOPMENT
CONTROL WEST
BLACK CANYON STUDY AREA
1957-1987



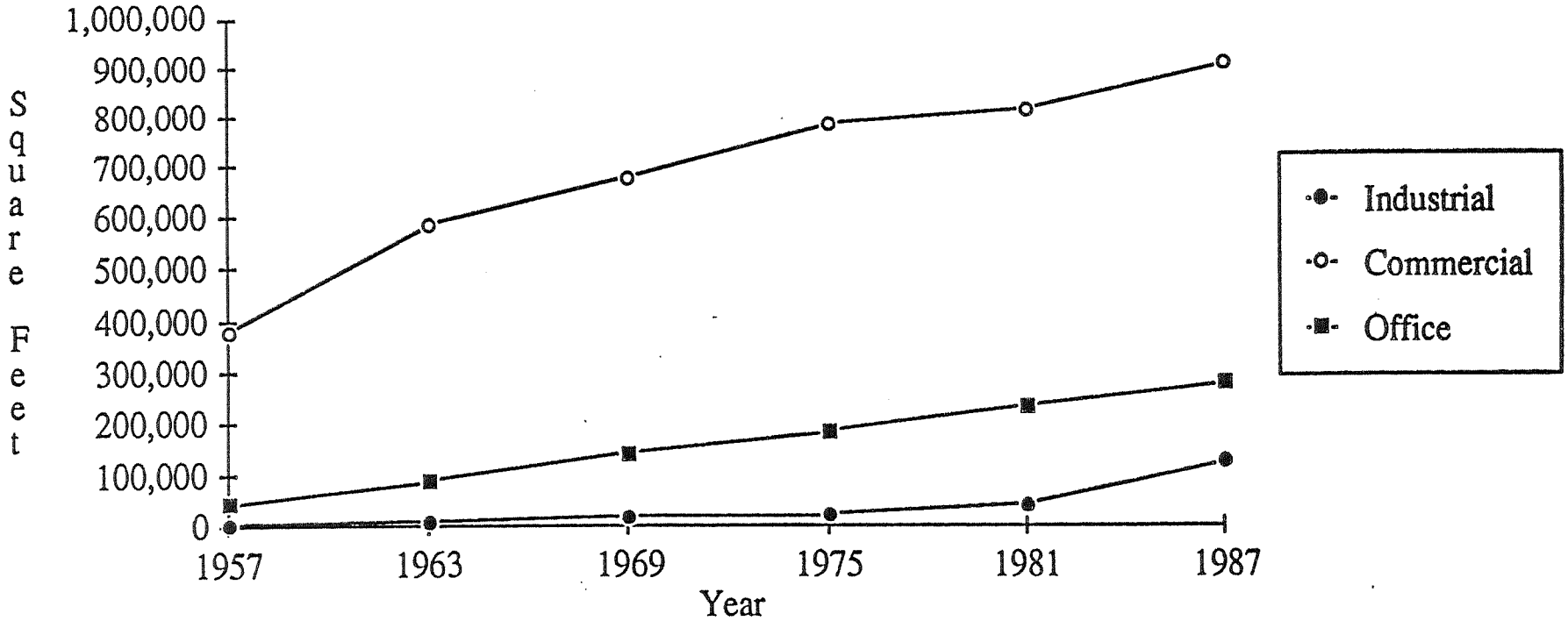
Source: Economic Research Division, Mountain West Research, July 1987.

FIGURE 7-4
NONRESIDENTIAL DEVELOPMENT
IMPACT AREA
BLACK CANYON STUDY AREA
1957-1987



Source: Economic Research Division, Mountain West Research, July 1987.

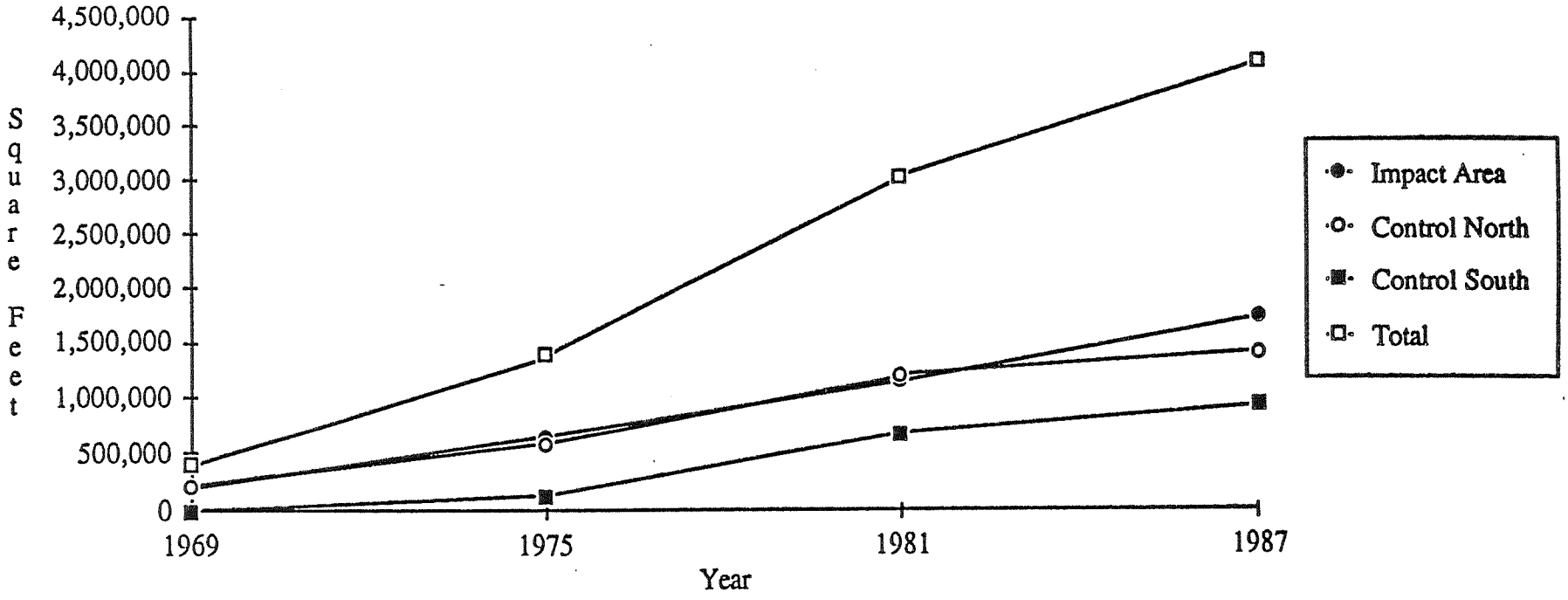
FIGURE 7-5
NONRESIDENTIAL DEVELOPMENT
CONTROL EAST
BLACK CANYON STUDY AREA
1957-1987



Source: Economic Research Division, Mountain West Research, July 1987.

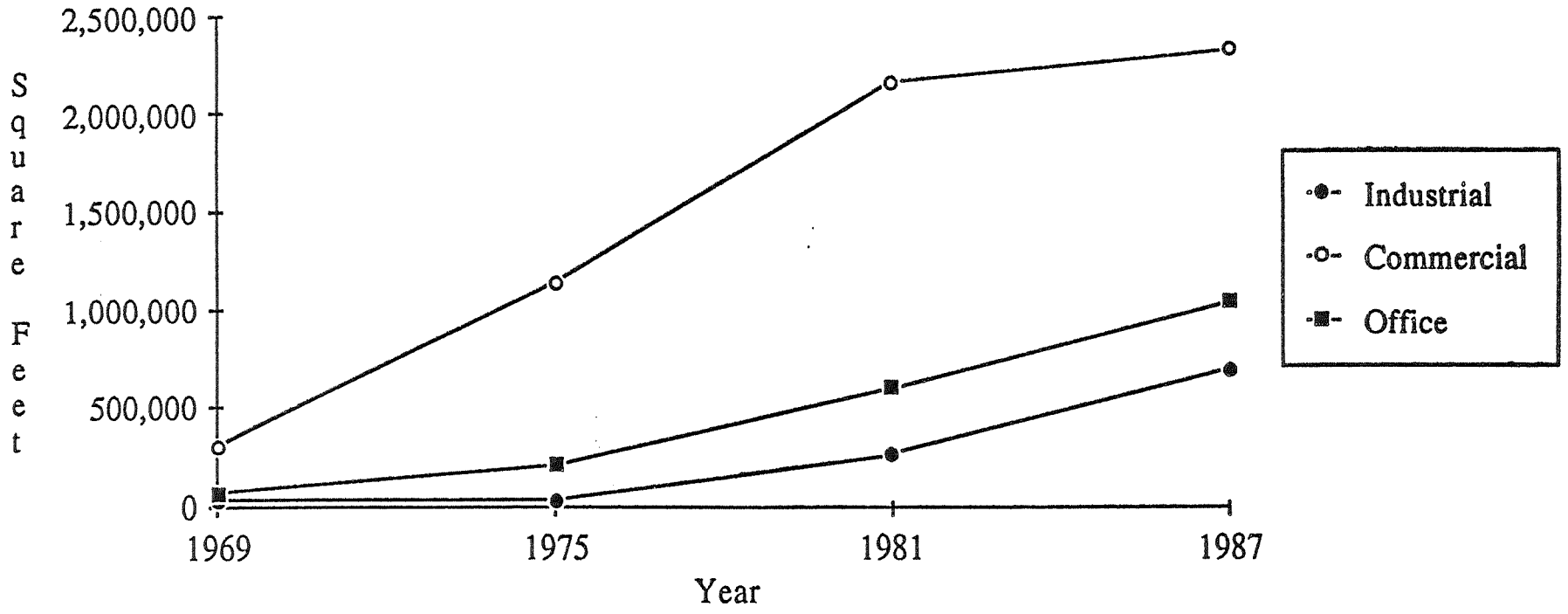
FIGURE 7-6

NONRESIDENTIAL DEVELOPMENT
SUPERSTITION STUDY AREA
1969-1987



Source: Economic Research Division, Mountain West Research, July 1987.

FIGURE 7-7
NONRESIDENTIAL DEVELOPMENT
TOTAL
SUPERSTITION STUDY AREA
1969-1987



Source: Economic Research Division, Mountain West Research, July 1987.

The composition of non-residential growth for the Impact Area and the Control Areas are presented in Figures 7-8 through 7-10. Along the corridor in the Impact Area, retail uses grew by 400,000 square feet before 1975, and again by 1981, at which point it peaked (Figure 7-8). Office development grew most substantially after 1981. In 1987, 56 percent of the Impact Area's non-residential development was commercial, 28 percent was office, and 16 percent was industrial.

Most of the North Control Area's non-residential development took place before 1981, oriented along Southern and Broadway (Figure 7-9). Non-residential activity was retail, with the balance in office uses. The South Control Area grew by 550,000 square feet between 1975 and 1981, and again by 250,000 square feet after 1981 (Figure 7-10). Almost all the post-1981 growth was in industrial development oriented to Kyrene Road, along the Southern Pacific rail line.

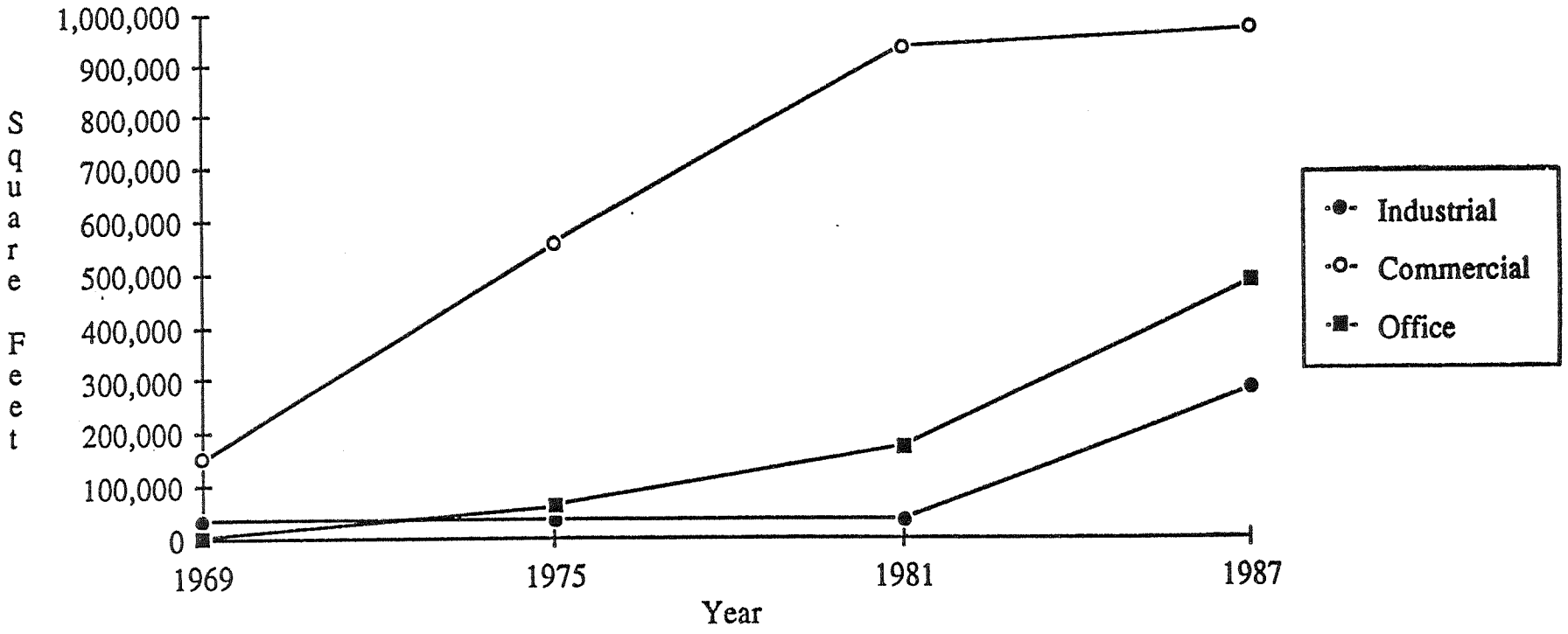
In sum, due to the strong residential character of the Superstition Study Area, most of its non-residential development was in retail uses. More office development, however, has developed within the freeway corridor, and this has taken place later than retail uses. The Impact Area also contains the plurality of non-residential uses in the Study Area, which is attributable to office development in the corridor. Finally, that industrial development which has taken place is oriented not to the freeway, but to rail transportation.

7.4 Major Findings Regarding Non-Residential Impacts

There are several major findings regarding the non-residential impact of freeways that this comparative case study supports.

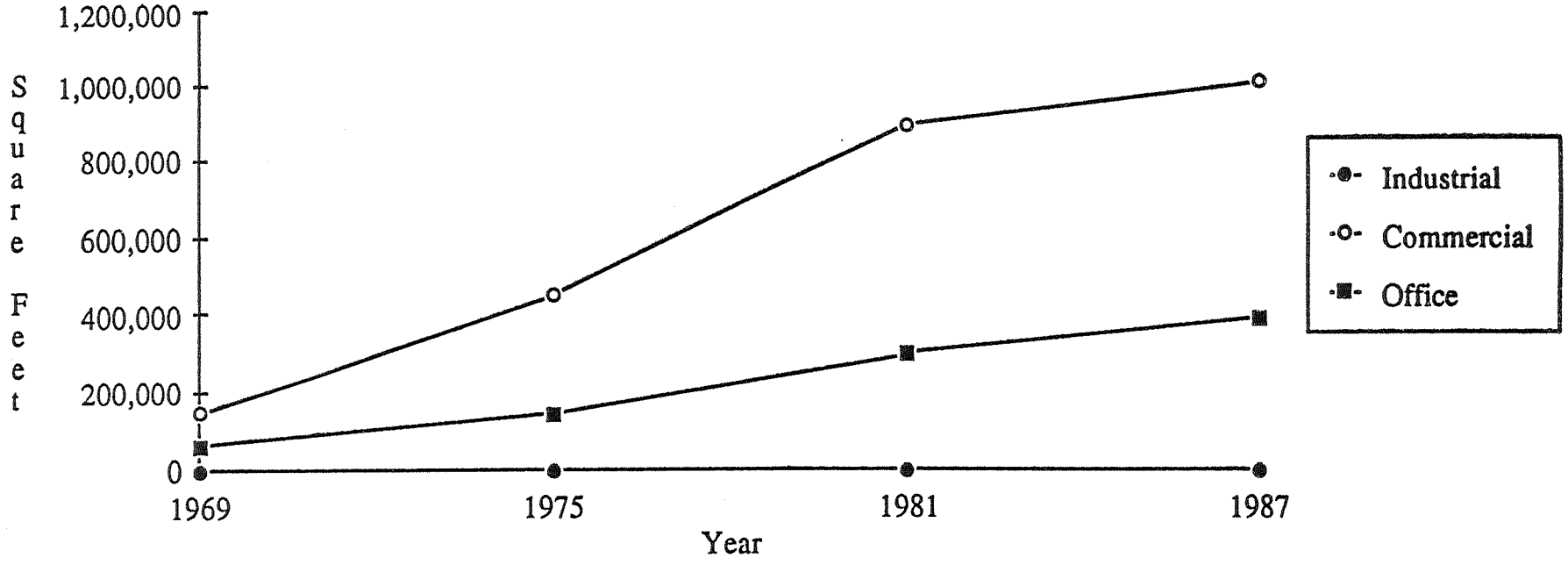
- The Black Canyon area is predominantly industrial, while the Superstition area is predominantly residential.
- The rate of non-residential development in the Black Canyon area grew at an annual 7 percent compound growth rate for almost a twenty-year period after the freeway's completion.
- In the Black Canyon, those areas which grew the most intensely combined favorable zoning, land and utility availability, and a mix of transportation nodes to develop into a large industrial center.
- Retail and office development in the Black Canyon are secondary developments.

FIGURE 7-8
NONRESIDENTIAL DEVELOPMENT
IMPACT AREA
SUPERSTITION STUDY AREA
1969-1987



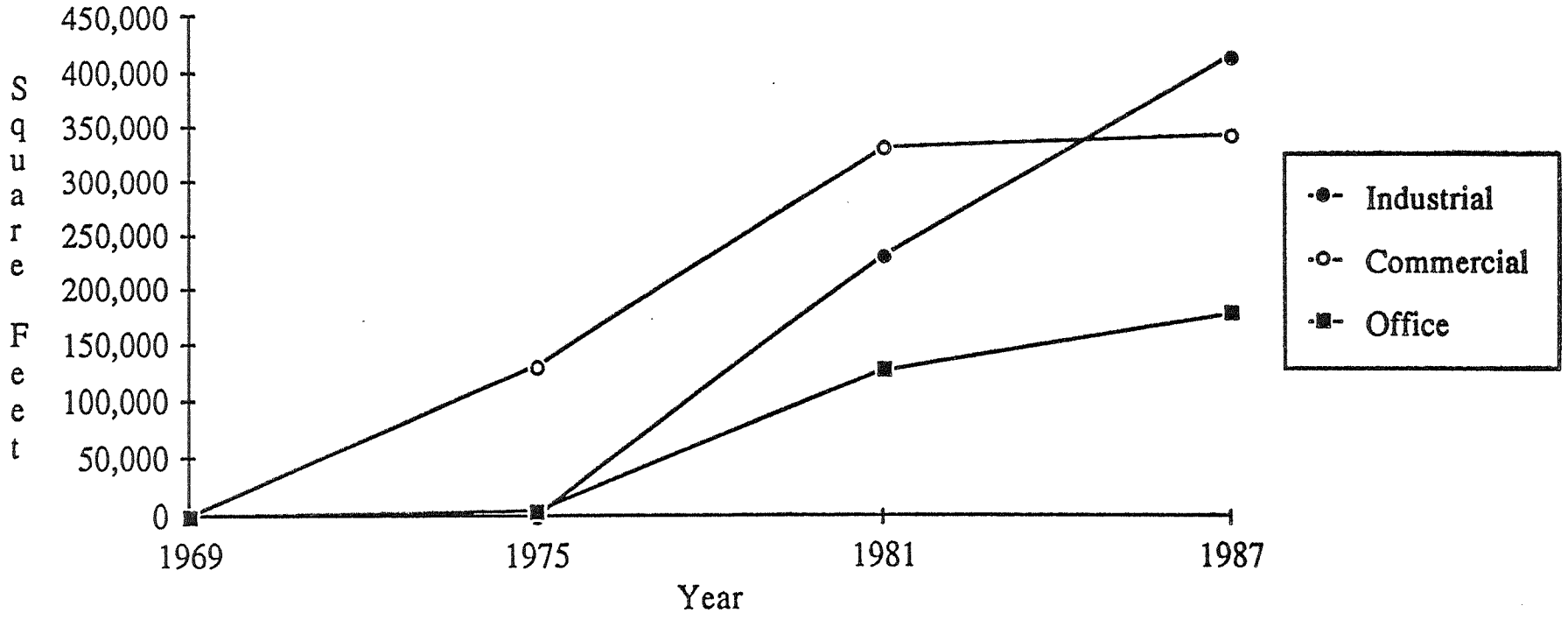
Source: Economic Research Division, Mounatin West Research, July, 1987.

FIGURE 7-9
NONRESIDENTIAL DEVELOPMENT
CONTROL NORTH
SUPERSTITION STUDY AREA
1969-1987



Source: Economic Research Division, Mountain West Research, July, 1987.

FIGURE 7-10
NONRESIDENTIAL DEVELOPMENT
CONTROL SOUTH
SUPERSTITION STUDY AREA
1969-1987



Source: Economic Research Division, Mountain West Research, July, 1987.

- The Superstition area's non-residential development is primarily retail, both neighborhood and community center scale. This is not surprising for a primarily residential area.

- The Superstition's rapid non-residential development period lasted only twelve years, but over that time its growth rate was from 16 to 23 percent.

- Office development, mainly inside the freeway corridor, was strongest six years after the freeway was completed.

- Combining the two Study Areas, it is clear that freeways have stimulated non-residential growth in both cases.

- However, the freeway's presence is only a contributing factor to the precise location of non-residential development. Equally important are municipal planning and zoning, available land, utilities, and infrastructure, and other transportation nodes.

8.0 Freeway Corridor Development in Metro Phoenix

Urban freeway corridors, according to location theory, should attract income-producing land uses and should repel lower density owner-occupied residential uses. As discussed in Chapters 6.0 and 7.0, the locational attributes of freeway corridors should enable non-residential and multifamily uses to generate the income that they would also be willing to pay for the prime corridor land.

Theoretically, in a free market, freeway/arterial intersections should attract the highest-density uses, especially retail, hotel, and office. Inner corridors should also attract high density uses, especially office, industrial, and multifamily residential. Outer corridors should develop into lower-density uses, including industrial, multifamily residential, and lower-density residential.

However, such market-driven development has certainly been controlled in the Study Areas by municipal planning. Additionally, on a microscopic scale, market-driven development has also been constrained by existing uses, land availability, and other transportation modes. It is reasonable, then, to expect more purely market-driven development from freeways to occur in undeveloped areas rather than in existing urbanized areas.

Using two major sources of data,[3] there are five major questions the corridor analysis addresses.

1. To what extent has actual corridor development followed market-based land use theory?
2. How strongly does municipal planning affect corridor development?
3. Do subareas of the corridor develop differently? In particular, have freeway/arterial intersections, inner freeway corridors, and outer freeway corridors developed differently?
4. In previously undeveloped areas, have freeway corridors developed at different rates, magnitudes, and uses?

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[3]First, the property valuation records of the Maricopa County Assessor's Office were used to inventory the square footage of buildings in the tax rolls. Second, aerial photos as early as 1959 were mapped to show land use change over time.

5. How strongly do freeway corridors attract the several kinds of land uses?

1.1 Overview

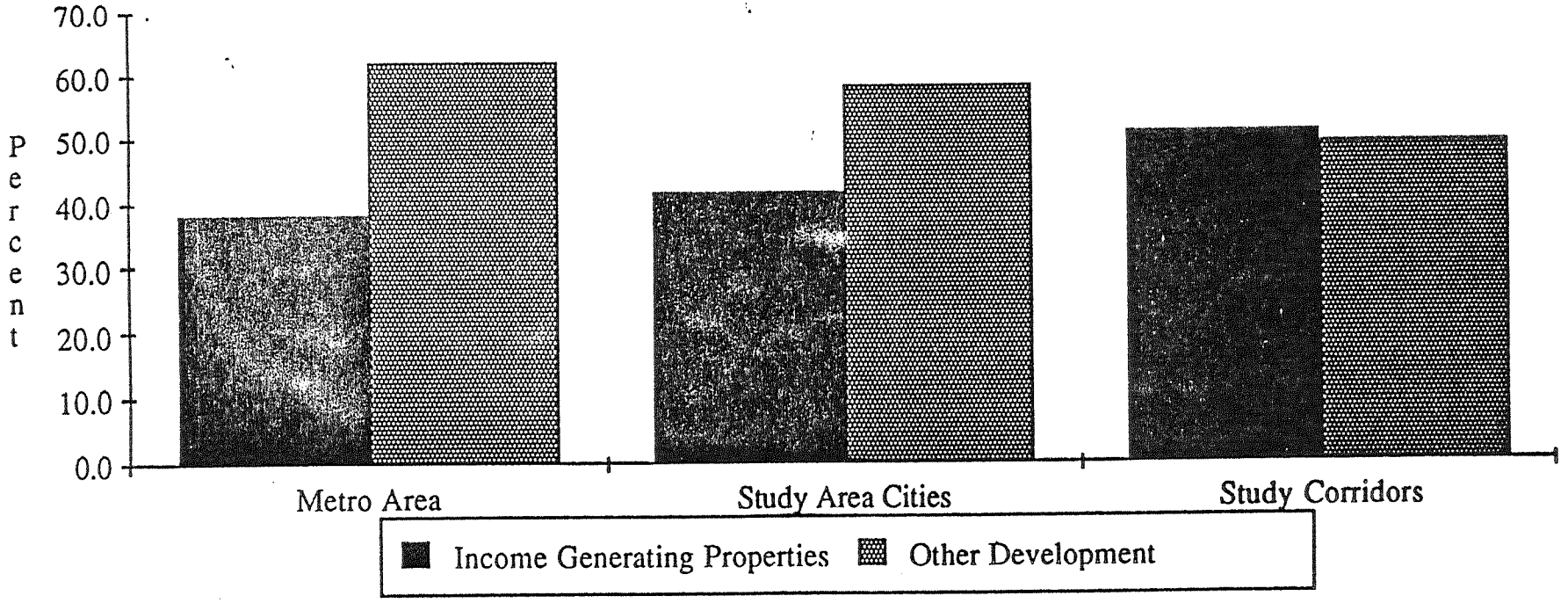
Freeways have had a dramatic impact on the land use mix and development density in the corridors which surround them in Phoenix. Like land use theory predicts, freeway study corridors have developed predominantly into income-generating properties, which include all non-residential and apartment development. At that very high level of aggregation, as Figure 8-1 shows, the freeway study corridors contained proportionally more income-generating properties (51 percent) in 1987 than either the metro Phoenix area (38 percent) or the Study Area cities (42 percent).

Within freeway corridors, the market should dictate the mix of development which can compete for "prime" real estate. Intersections are by far the most valuable zone inside the freeway corridor and therefore should develop into uses which have the need for, and the ability to pay for, these valuable locations. Intersections, therefore, should develop into regional malls, community shopping center, neighborhood shopping centers, offices, and hotels. The other zones in the freeway corridor should develop into office, industrial, and multifamily residential uses. Figure 8-2 shows a clear preference by income-generating uses for intersections (where 66 percent of all uses are income-generating) and inner corridors (51 percent), compared to outer corridors (45 percent).

Municipal planning in the inner and outer corridor zones directs more residential uses there, whereas intersections are more generally kept for high-density, non-residential uses. Figure 8-3 compares four distinct freeway study corridors. On the average, 51 percent of the corridors are occupied by income-generating properties. In the Tempe Superstition, which has been most strongly controlled by municipal planning, only 29 percent of corridor uses are income-generating properties. Clearly, municipal control affects market-driven development.

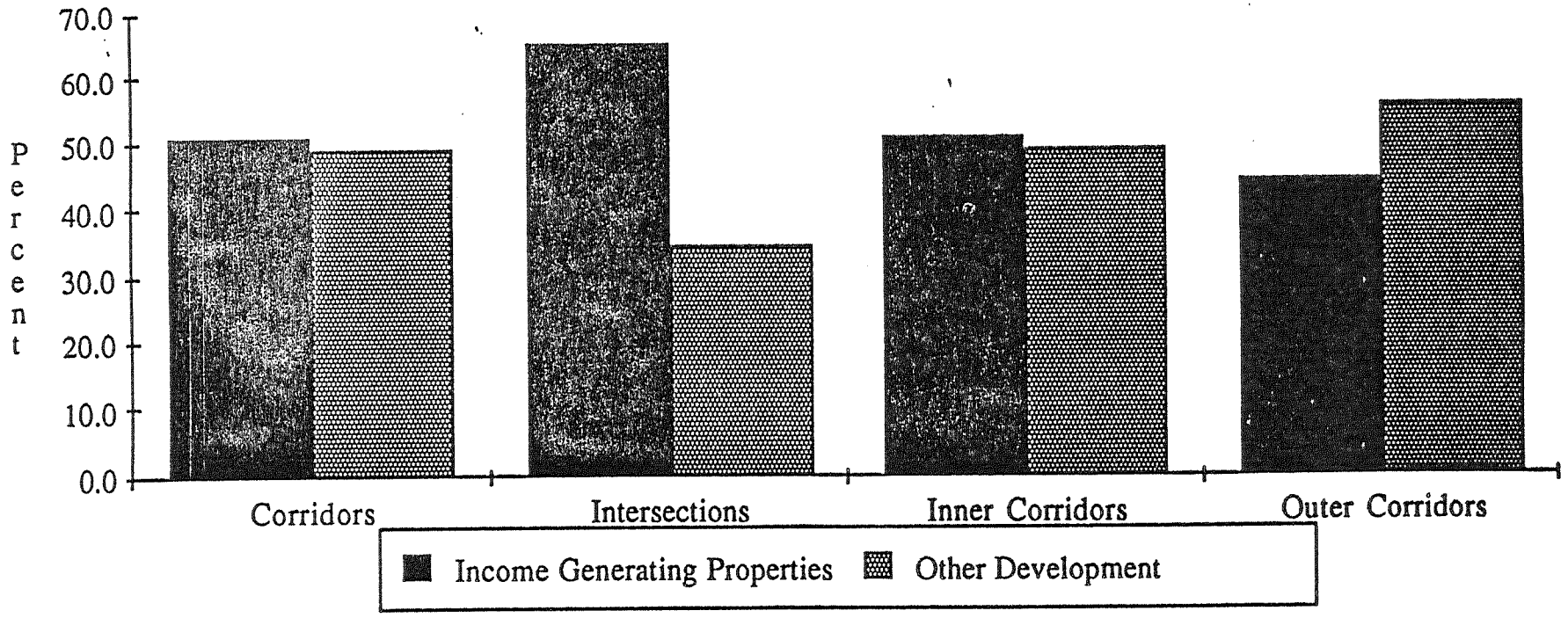
Intuitively, it is reasonable that market-driven development would be most likely to take place in previously undeveloped areas. However, this is not the case. As Figure 8-3 also shows, the South Black Canyon Corridor, which has contained a freeway for the longest time and was the most urbanized when its freeway was built, contains the greatest share of income-generating development.

FIGURE 8 - 1
INCOME-GENERATING AND OTHER DEVELOPMENT
METRO AREA, STUDY AREA CITIES, AND STUDY CORRIDORS
1987



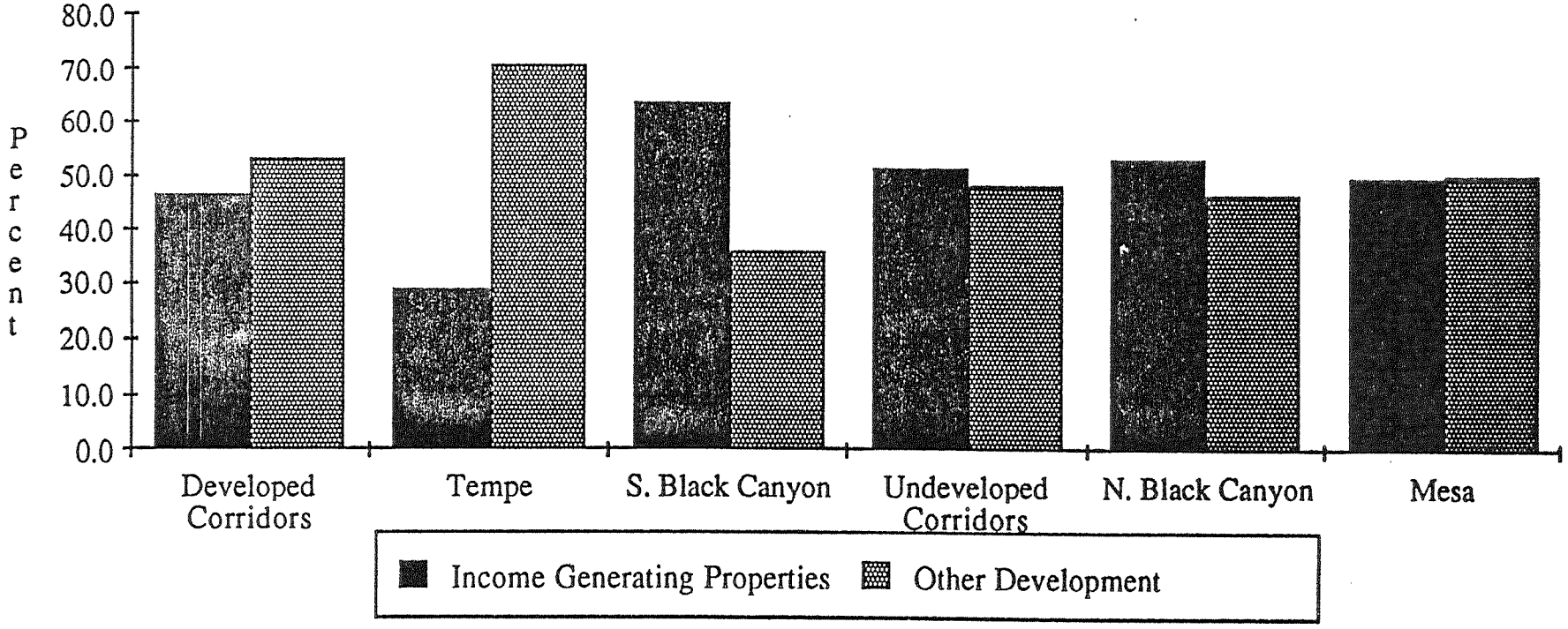
Source: Economic Research Division, Mountain West Research, July 1987.

FIGURE 8 - 2
INCOME-GENERATING AND OTHER DEVELOPMENT
STUDY CORRIDORS BY AREA
1987



Source: Economic Research Division, Mountain West Research, July 1987.

FIGURE 8 - 3
INCOME-GENERATING AND OTHER DEVELOPMENT
STUDY CORRIDORS BY TYPE
1987



Source: Economic Research Division, Mountain West Research, July 1987.

The Mesa Superstition and the North Black Canyon are both corridors that were undeveloped before freeways were built, and while both contain a high share of income-generating uses, both contain less than the South Black Canyon. It is possible that the South Black Canyon's more central location in the larger urban area, combined with the longer period in which it has contained a freeway, has encouraged higher-intensity uses over time.

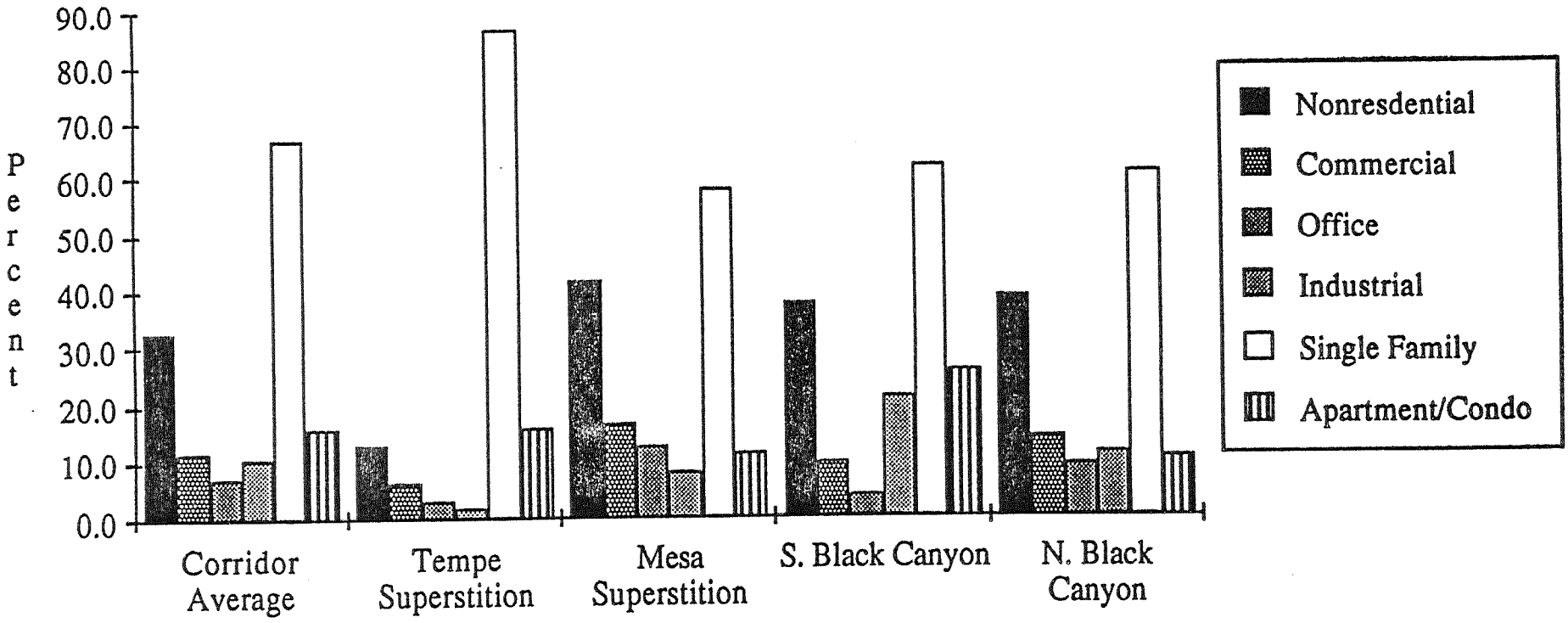
In general, the freeway study corridors contain higher intensity uses--especially within their intersections and along their inner corridors--than the balance of the metro area; however, the differences among study corridors are as striking as their similarities. Figures 8-4 through 8-7 present land use profiles for each of the Study Area corridors. There is a large dissimilarity in specific land uses, whether comparing entire corridors (Figure 8-4), intersections (Figure 8-5), inner corridors (Figure 8-6), or outer corridors (Figure 8-7). The next two sections describe the present composition of the corridors in more detail.

8.1.1 Black Canyon Study Corridor, 1987

Of all Study Corridors, the Black Canyon contains the highest concentration of high density development--nearly 42 million square feet of buildings (Table 8-1). About 39 percent of all development in the Black Canyon corridor is non-residential, and over 64 percent is non-residential and multifamily residential. In the corridor intersections, this rises to almost 90 percent of all development. While the inner and outer corridors have more single family residential than the intersections, the non-residential and multifamily residential share (over 50 percent) continues to be well above the Phoenix and metropolitan area averages.

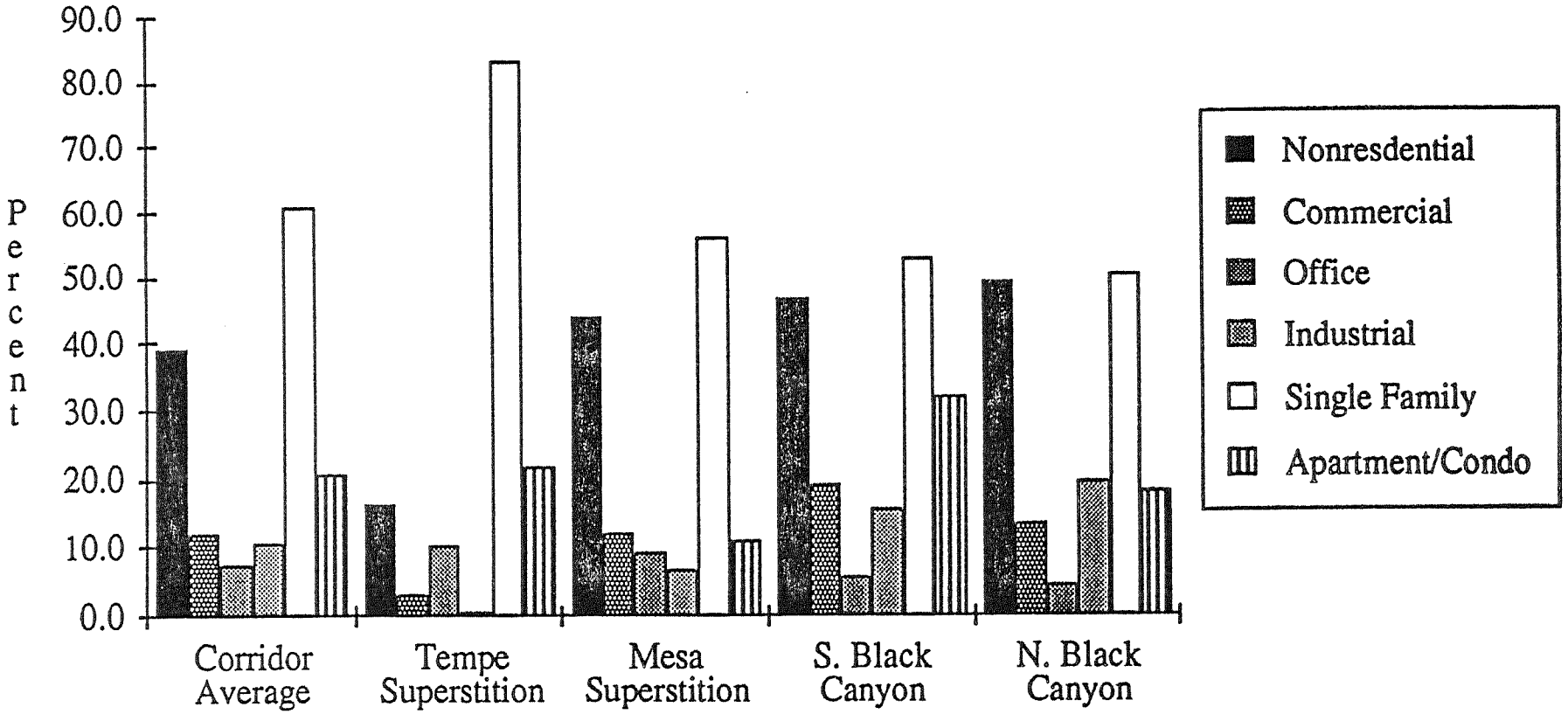
As Table 8-2 shows, the South Black Canyon Corridor has over 22 million square feet of developed space. Non-residential land uses accounted for 38 percent of all development and 47 percent of the intersection zones. Since this section of the corridor was already developed at the time of freeway construction, its non-residential development density is slightly less than the North Black Canyon Corridor. However, the density of multifamily residential is 250 percent that of the northern section of the corridor (Figure 8-4). Since nearly all of the land in this corridor segment is currently developed, any changes in density or land use mix that take place will be the result of redevelopment and conversion.

FIGURE 8-4
DISTRIBUTION OF LAND USES BY CORRIDOR
1987



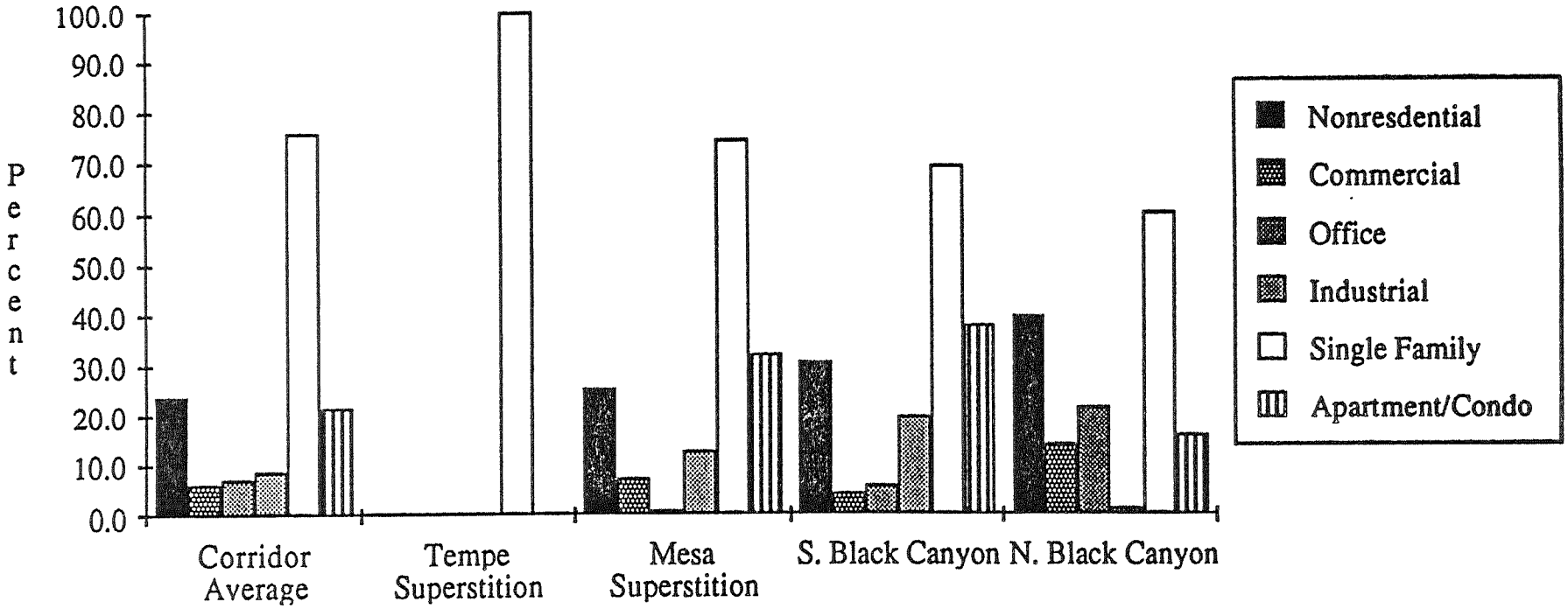
Source: Economic Research Division, Mountain West Research, July 1987.

FIGURE 8-5
DISTRIBUTION OF LAND USES IN CORRIDOR INTERSECTIONS
1987



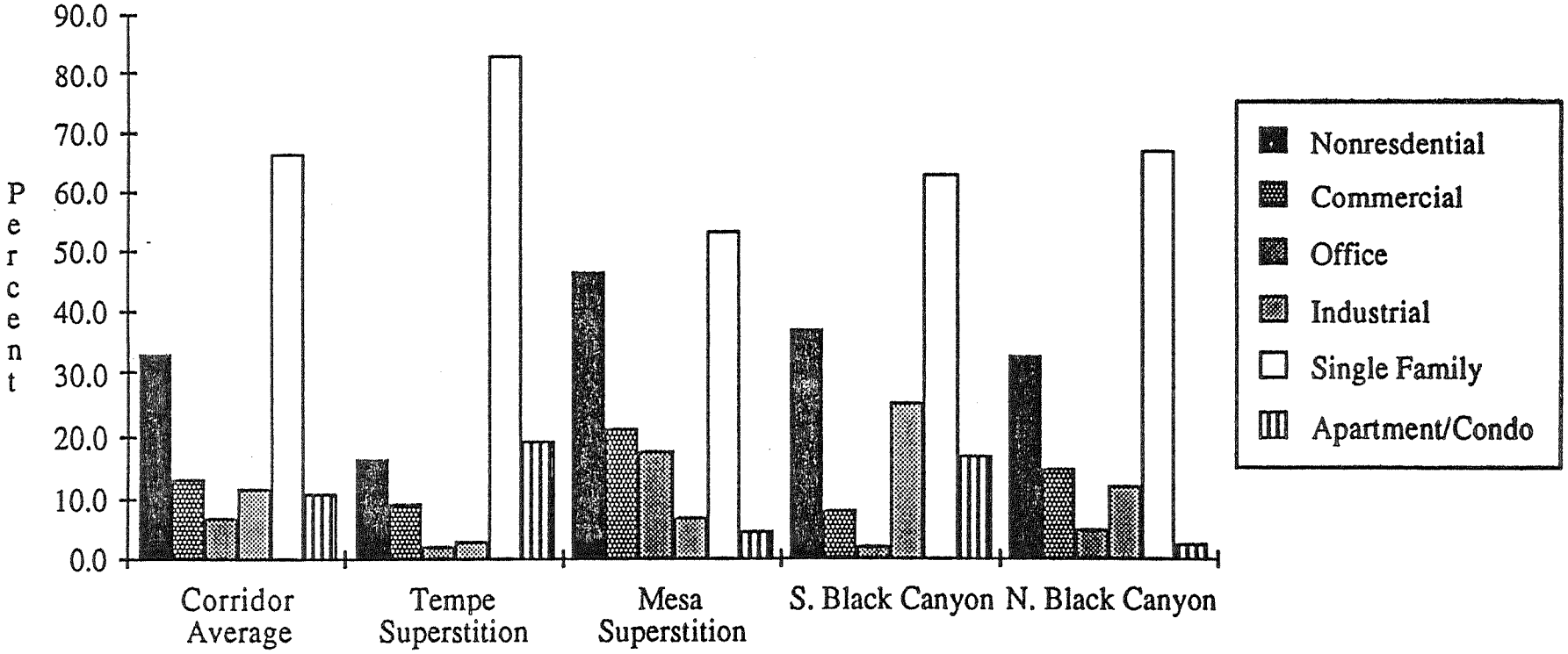
Source: Economic Research Division, Mountain West Research, July 1987.

FIGURE 8-6
DISTRIBUTION OF LAND USES IN INNER CORRIDORS
1987



Source: Economic Research Division, Mountain West Research, July 1987.

FIGURE 8-7
DISTRIBUTION OF LAND USES IN OUTER CORRIDORS
1987



Source: Economic Research Division, Mountain West Research, July 1987.

TABLE 8-1
DEVELOPMENT DENSITY
STUDY CORRIDORS, 1987

	Total Area (000's sq.ft.)	Nonresidential Uses (% of Total)						Residential Uses (% of Total)				
		All	Ind.	Office	Retail	Hotel	General	All	SF	Condo	Apt	MH
Metro Total	1,108,990	26.0	9.4	5.6	7.1	1.2	2.6	74.0	53.5	8.3	12.0	0.2
Study Cities Total (Phoenix, Mesa and Tempe)	861,005	28.7	11.1	6.2	7.4	1.2	2.8	71.3	51.5	6.6	12.9	0.2
All Corridors	66,654	34.0	12.3	7.0	11.7	2.0	0.9	66.0	39.4	9.5	17.0	0.1
Intersection	15,556	42.7	13.6	6.7	14.0	7.4	1.0	57.3	21.2	13.1	22.9	0.1
Inner Corridor	16,062	27.8	9.3	9.6	7.2	1.0	0.8	72.2	41.8	7.2	23.1	0.0
Outer Corridor	35,036	33.0	13.1	6.0	12.8	0.0	1.0	67.0	46.4	9.0	11.5	0.1
Black Canyon	41,992	38.6	16.7	6.7	12.0	2.3	1.0	61.4	34.3	8.3	18.7	0.1
Intersection	11,040	48.1	17.7	5.3	16.6	7.5	0.9	51.9	14.1	12.2	25.4	0.2
Inner Corridor	11,074	35.2	10.9	13.6	8.9	0.9	0.8	64.8	28.6	9.1	27.0	0.0
Outer Corridor	19,878	35.2	19.3	3.6	11.2	0.1	1.1	64.8	48.7	5.7	10.4	0.0
Superstition	24,662	26.2	4.9	7.7	11.2	1.5	0.9	73.8	48.2	11.6	13.9	0.1
Intersection	4,516	29.4	3.6	10.0	7.6	7.1	1.1	70.6	38.5	15.1	16.9	0.0
Inner Corridor	4,988	11.4	5.6	0.6	3.3	1.1	0.8	88.6	71.1	2.9	14.6	0.0
Outer Corridor	15,158	30.1	5.0	9.3	14.9	0.0	0.9	69.9	43.5	13.5	12.8	0.2

Source: Economic Research Division, Mountain West Research, July 1987.

TABLE 8-2
DEVELOPMENT DENSITY
BLACK CANYON CORRIDOR, 1987

	Total Area (000's Sq.Ft.)	Nonresidential Uses (% of Total)						Residential Uses (% of Total)				
		All	Ind.	Office	Retail	Hotel	General	All	SF	Condo	Apt	MH
Metro Total	1,108,990	26.0	9.4	5.6	7.1	1.2	2.6	74.0	53.5	8.3	12.0	0.2
Study Cities Total (Phoenix)	633,248	30.7	12.2	7.2	7.5	1.3	2.5	69.3	50.7	6.0	12.5	0.1
Black Canyon	41,992	38.6	16.7	6.7	12.0	2.3	1.0	61.4	34.3	8.3	18.7	0.1
Intersection	11,040	48.1	17.7	5.3	16.6	7.5	0.9	51.9	14.1	12.2	25.4	0.2
Inner Corridor	11,074	35.2	10.9	13.6	8.9	0.9	0.8	64.8	28.6	9.1	27.0	0.0
Outer Corridor	19,878	35.2	19.3	3.6	11.2	0.1	1.1	64.8	48.7	5.7	10.4	0.0
South Black Canyon	22,018	38.0	21.5	4.1	10.0	1.3	1.1	62.0	30.4	5.4	26.1	0.1
Intersection	5,552	46.9	15.7	5.9	19.5	4.8	1.0	53.1	17.3	3.3	32.2	0.3
Inner Corridor	5,644	30.8	19.9	5.8	4.3	0.0	0.8	69.2	26.0	5.5	37.7	0.1
Outer Corridor	10,822	37.1	25.3	2.3	8.1	0.1	1.4	62.9	39.5	6.5	16.9	0.0
North Black Canyon	19,974	39.3	11.4	9.5	14.3	3.3	0.8	60.7	38.6	11.5	10.7	0.0
Intersection	5,488	49.3	19.8	4.6	13.7	10.3	0.8	50.7	10.8	21.3	18.5	0.0
Inner Corridor	5,430	39.8	1.7	21.8	13.7	1.8	0.8	60.2	31.4	12.9	15.9	0.0
Outer Corridor	9,056	32.9	12.1	5.1	14.9	0.0	0.7	67.1	59.7	4.7	2.8	0.0

Source: Economic Research Division, Mountain West Research, July 1987.

The North Black Canyon Corridor, which is presently about 75 percent developed, contains a high intensity of non-residential uses. Of almost 20 million square feet, 39 percent is non-residential and 21 percent is multifamily residential. The intersections of the North Black Canyon have the highest density of non-residential use (49 percent) of any corridor segment in the study (Figure 8-5). Multifamily density in the Black Canyon Corridor (11 percent) is much lower than in the South Black Canyon Corridor. North Black Canyon condominium density, however, is double that of the southern segment.

8.1.2 Superstition Study Corridor Development, 1987

The Superstition Study Corridor contains almost 25 million square feet of developed space (Table 8-3). Overall, its non-residential density (26 percent) is the same as metropolitan area average, but varies substantially by jurisdiction, as shown in Figure 8-4. Strict planning by Tempe has made its freeway corridor nearly all residential, while non-residential development in Mesa is the highest of any corridor in the study. Retail and office land use density throughout the corridor is higher than the study city and metro averages. Industrial use represents only 5 percent of its development, compared to the metrowide average of 9 percent. The Superstition Corridor contains a significantly greater condominium and apartment density, about 25 percent, than the metro average of 20 percent.

Residential development density in Tempe's portion of the Superstition Corridor is the highest of any study segment. In total, 87 percent of its building inventory is residential, compared to a metro average of 74 percent and a corridor average of 66 percent (Table 8-3). Moreover, 100 percent of the inventory in Tempe's inner freeway corridor is residential. In complete contrast, non-residential development in the Mesa portion of the Superstition Corridor has the highest density of all study corridors. About 42 percent of the 11 million square feet of development in the corridor is non-residential. As with the Tempe portion of the corridor, retail and office comprise most non-residential development. Apartment and condominium development density (11.5 and 8.4 percent, respectively) are the same as the metro average, while single family represents only 38 percent of development compared to a metro average of 54 percent. Currently, only about half of the land in the Mesa portion of the Superstition Corridor is developed.

TABLE 8-3
DEVELOPMENT DENSITY
SUPERSTITION CORRIDOR, 1987

	Total Area (000's Sq. Ft.)	Nonresidential Uses (% of Total)						Residential Uses (% of Total)				
		All	Ind.	Office	Retail	Hotel	General	All	SF	Condo	Apt	MH
Metro Total	1,108,990	26.0	9.4	5.6	7.1	1.2	2.6	74.0	53.5	8.3	12.0	0.2
Study Cities Total (Mesa and Tempe)	227,757	23.2	7.9	3.4	7.2	0.9	3.7	76.8	54.0	8.5	14.0	0.4
Total Superstition	24,662	26.2	4.9	7.7	11.2	1.5	0.9	73.8	48.2	11.6	13.9	0.1
Intersection	4,516	29.4	3.6	10.0	7.6	7.1	1.1	70.6	38.5	15.1	16.9	0.0
Inner Corridor	4,988	11.4	5.6	0.6	3.3	1.1	0.8	88.6	71.1	2.9	14.6	0.0
Outer Corridor	15,158	30.1	5.0	9.3	14.9	0.0	0.9	69.9	43.5	13.5	12.8	0.2
Mesa Superstition	11,150	41.9	8.2	12.8	16.9	3.4	0.5	58.1	38.2	8.4	11.5	0.0
Intersection	2,123	43.9	7.0	9.5	12.4	15.1	0.0	56.1	22.1	22.8	11.2	0.0
Inner Corridor	2,237	25.5	12.5	1.3	7.5	2.5	1.8	74.5	36.3	6.0	32.2	0.0
Outer Corridor	6,790	46.6	7.2	17.7	21.4	0.0	0.3	53.4	43.9	4.7	4.8	0.0
Tempe Superstition	13,512	13.2	2.1	3.4	6.5	0.0	1.2	86.8	56.4	14.3	15.9	0.2
Intersection	2,393	16.6	0.7	10.5	3.3	0.0	2.0	83.4	53.0	8.4	22.0	0.0
Inner Corridor	2,751	0.0	0.0	0.0	0.0	0.0	0.0	100.0	99.4	0.4	0.2	0.0
Outer Corridor	8,368	16.6	3.2	2.5	9.6	0.0	1.4	83.4	43.2	20.6	19.3	0.3

Source: Economic Research Division, Mountain West Research, July 1987.

8.2 Historical Development of Study Corridors

This section describes the development of Study Corridors from before freeway construction to their present condition.

8.2.1 South Black Canyon Corridor

The Black Canyon Freeway was completed in the study corridor between 1958 and 1962. As Figure 8-8 shows, the entire corridor was substantially urbanized in 1959, and mainly contained residential development, largely north of Indian School Road. In 1962, as Table 8-4 shows, there was almost 10 million square feet of inventory in the corridor, of which 71 percent was residential, mainly in single family development.

By 1969, seven years after the freeway's completion, the corridor's inventory had grown 31 percent to 13.1 million square feet. Intersections grew 59 percent, inner corridors 40 percent, and outer corridors 20 percent. Non-residential inventory had grown 54 percent, led by industrial development south of Indian School around the rail line and Grand Avenue. Multifamily inventory increased 144 percent, especially between Indian School and Bethany Home Roads. In 1969, about 25 percent of corridor land was still vacant. Even in 1975, twelve years after freeway completion, about 30 percent of the corridor north of Bethany Home was undeveloped.

By 1987, the entire corridor has developed to include 22 million square feet. Over 1969, total inventory expanded 68 percent, including 84 percent at intersections, 103 percent at inner corridors, and 48 percent at outer corridors. Non-residential inventory grew 88 percent and residential grew 58 percent, including a 185 percent increase for multifamily. Presently, the South Black Canyon Corridor contains no vacant land, which infilled 12 to 25 years after the freeway's completion.

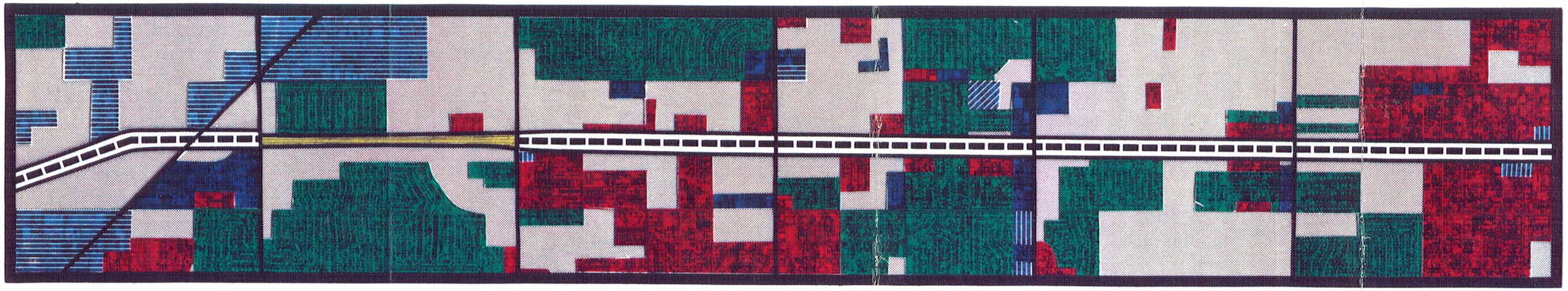
8.2.2 North Black Canyon Corridor

Prior to the freeway, the North Black Canyon was almost completely undeveloped, as Figure 8-9 shows, containing only 3 million square feet of inventory, of which most was single family residential (Table 8-5). Even in 1969, four years after the freeway was completed, the corridor contained only 4.2 million square feet of inventory, led by about one million square feet of residential development, mostly around Cactus Road. About 370,000 square feet of industrial space had developed at Thunderbird Road.

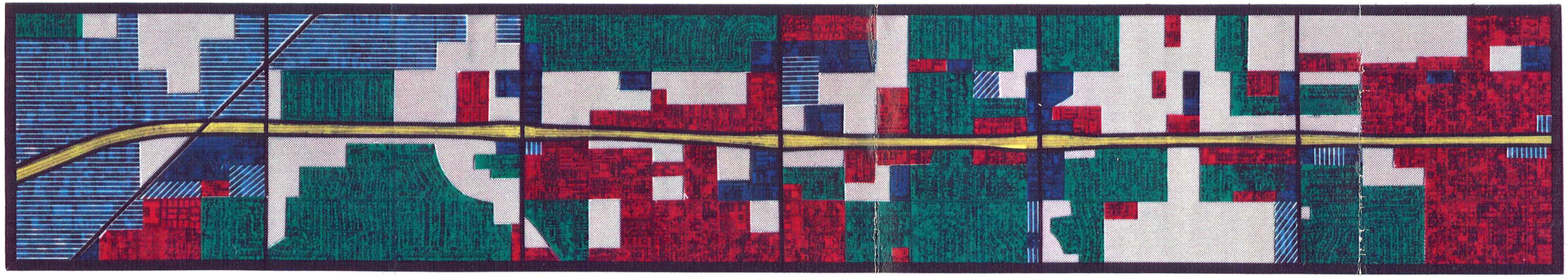
FIGURE 8-8

FREEWAY & LAND DEVELOPMENT IN THE SOUTH BLACK CANYON CORRIDOR

1959



1969



Single Family
Multi Family
Commercial
Office
Industrial
Institutional
Vacant Land
Existing Freeway
Planned Freeway

SOURCE:
MOUNTAIN WEST RESEARCH, Economic Research Division

FIGURE 8-8 (continued)

FREEWAY & LAND DEVELOPMENT IN THE SOUTH BLACK CANYON CORRIDOR

1975

I - 17

1987

I - 17

McDOWELL ROAD
THOMAS ROAD
INDIAN SCHOOL ROAD
CAMELBACK ROAD
BETHANY HOME ROAD
GLENDALE AVENUE
NORTHERN AVENUE

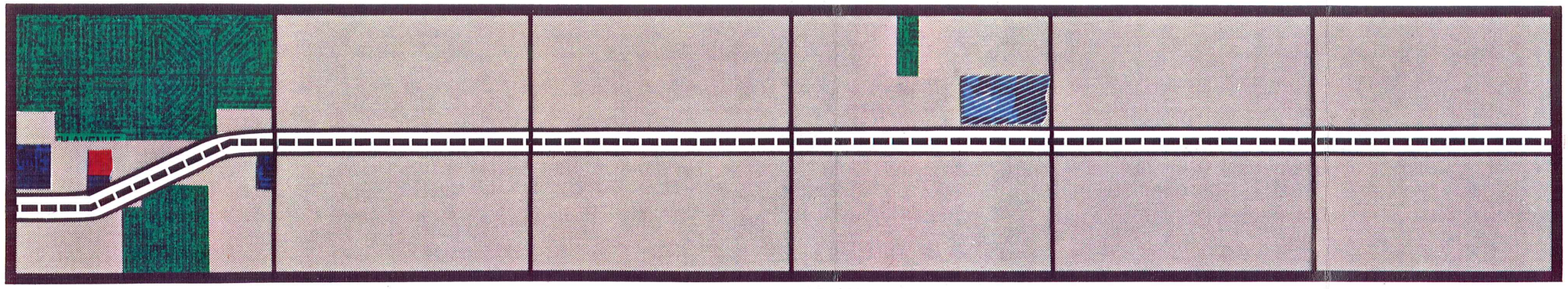
Single Family
Multi Family
Commercial
Office
Industrial
Institutional
Vacant Land
Existing Freeway
Planned Freeway

SOURCE:
MOUNTAIN WEST RESEARCH, Economic Research Division

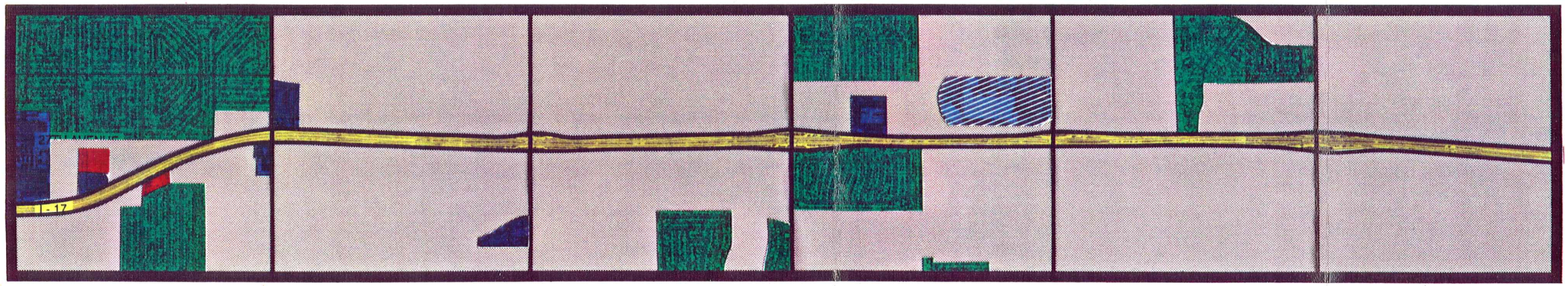
FIGURE 8-9

FREEWAY & LAND DEVELOPMENT IN THE NORTH BLACK CANYON CORRIDOR

1959



1969



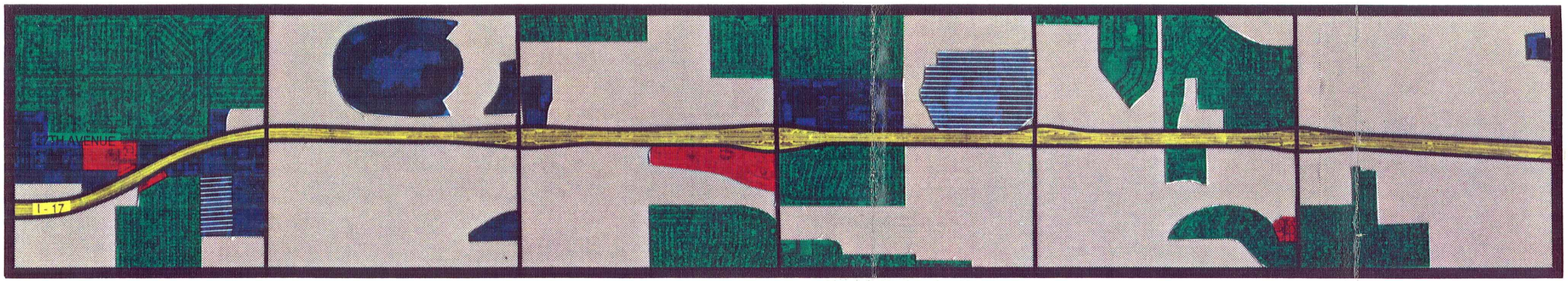
Single Family
Multi Family
Commercial
Office
Industrial
Institutional
Vacant Land
Existing Freeway
Planned Freeway

SOURCE:
MOUNTAIN WEST RESEARCH, Economic Research Division

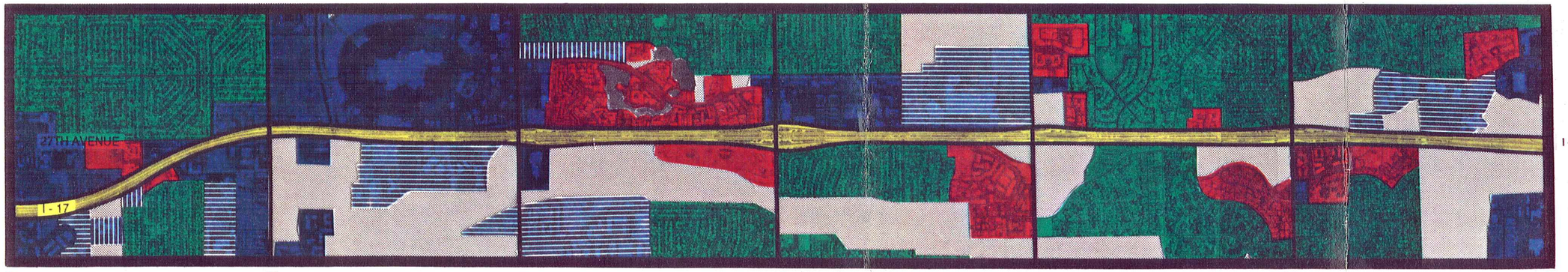
FIGURE 8-9 (continued)

FREEWAY & LAND DEVELOPMENT IN THE NORTH BLACK CANYON CORRIDOR

1975



1987



Single Family
Multi Family
Commercial
Office
Industrial
Institutional
Vacant Land
Existing Freeway

SOURCE:
MOUNTAIN WEST RESEARCH, Economic Research Division

TABLE 8-4
SOUTH BLACK CANYON DEVELOPMENT
1962, 1969 AND 1987
(000's Sq. Ft.)

	Phoenix City			Total Corridor			Intersections			Inner Corridor			Outer Corridor		
	1962	1969	1987	1962	1969	1987	1962	1969	1987	1962	1969	1987	1962	1969	1987
Total	199,108	263,343	633,248	9,985	13,105	22,018	1,902	3,022	5,552	1,980	2,769	5,644	6,103	7,314	10,822
Nonresidential	44,436	66,828	194,543	2,883	4,450	8,359	821	1,388	2,606	487	782	1,737	1,575	2,280	4,016
Industrial	16,275	24,586	77,281	1,827	2,762	4,730	386	569	872	390	605	1,122	1,051	1,588	2,736
Office	5,163	10,426	45,827	96	263	903	37	78	329	11	82	327	48	103	247
Retail	16,744	24,042	47,593	910	1,371	2,200	391	730	1,084	68	77	243	451	564	873
Hotel	1,982	2,669	8,140	17	18	279	4	5	266	0	0	0	13	13	13
General Use	4,272	5,105	15,702	33	36	247	3	6	55	18	18	45	12	12	147
Residential	154,672	196,515	438,705	7,102	8,655	13,659	1,081	1,634	2,946	1,493	1,987	3,907	4,528	5,034	6,806
Single Family	132,775	159,764	320,878	6,262	6,413	6,700	920	929	960	1,362	1,415	1,466	3,980	4,069	4,274
Townhouse	829	6,166	37,729	1	202	1,191	0	0	181	0	56	309	1	146	701
Multifamily	20,333	29,820	79,301	824	2,013	5,740	154	686	1,786	127	512	2,128	543	815	1,826
Mobile Homes	735	534	797	15	27	28	7	19	19	4	4	4	4	4	5

Source: Economic Research Division, Mountain West Research, July 1987.

TABLE 8-5
NORTH BLACK CANYON DEVELOPMENT
1962, 1969 AND 1987
(000's Sq. Ft.)

	Phoenix City			Total Corridor			Intersections			Inner Corridor			Outer Corridor		
	1962	1969	1987	1962	1969	1987	1962	1969	1987	1962	1969	1987	1962	1969	1987
Total	199,108	263,343	633,248	3,133	4,158	19,974	650	1,051	5,488	624	670	5,430	1,859	2,437	9,056
Nonresidential	44,436	66,828	194,543	438	896	7,847	326	704	2,706	100	109	2,163	12	83	2,978
Industrial	16,275	24,586	77,281	326	699	2,275	326	699	1,087	0	0	90	0	0	1,098
Office	5,163	10,426	45,827	2	2	1,897	0	0	254	0	0	1,183	2	2	460
Retail	16,744	24,042	47,593	109	191	2,852	0	5	754	100	106	745	9	80	1,353
Hotel	1,982	2,669	8,140	0	0	667	0	0	567	0	0	100	0	0	0
General Use	4,272	5,105	15,702	1	4	156	0	0	44	0	3	45	1	1	67
Residential	154,672	196,515	438,705	2,695	3,262	12,127	324	347	2,782	524	561	3,267	1,847	2,354	6,078
Single Famil	132,775	159,764	320,878	2,695	3,262	7,702	324	347	595	524	561	1,705	1,847	2,354	5,402
Townhouse	829	6,166	37,729	0	0	2,297	0	0	1,170	0	0	701	0	0	426
Multifamily	20,333	29,820	79,301	0	0	2,128	0	0	1,017	0	0	861	0	0	250
Mobile Hom	735	765	797	0	0	0	0	0	0	0	0	0	0	0	0

Source: Economic Research Division, Mountain West Research, July 1987.

By 1975, ten years after freeway completion, the corridor was developing rapidly. The area south of Olive was infilling rapidly, the Metrocenter Mall and some adjacent retail was in place, multifamily was developing south of Cactus, and single family development north of Peoria and in the outer corridor had grown substantially.

Northwest Phoenix development is commonly believed to have been led by industrial users located along the North Black Canyon. However, the development sequence in Figure 8-9 shows that Metrocenter was in place in 1975, before most industrial development seen by 1987, occurred. In fact, the Study Corridors each contain a regional mall (and a significant amount of community center scale retail space). These two regional malls contain 24 percent of all regional mall space in metro Phoenix.

Between 1969 and 1987, the entire corridor has grown 538 percent, with intersections expanding 422 percent, inner corridors by 710 percent, and outer corridors by 271 percent. By 1987, 22 years after the freeway's completion, the corridor contained 20 million square feet of inventory, but about 25 percent of its land area is still undeveloped. Undeveloped land is on the east side of the freeway for most of its length from Olive to Bell. Eight out of 24 possible arterial intersections are still undeveloped.

8.2.3 Tempe Superstition Corridor

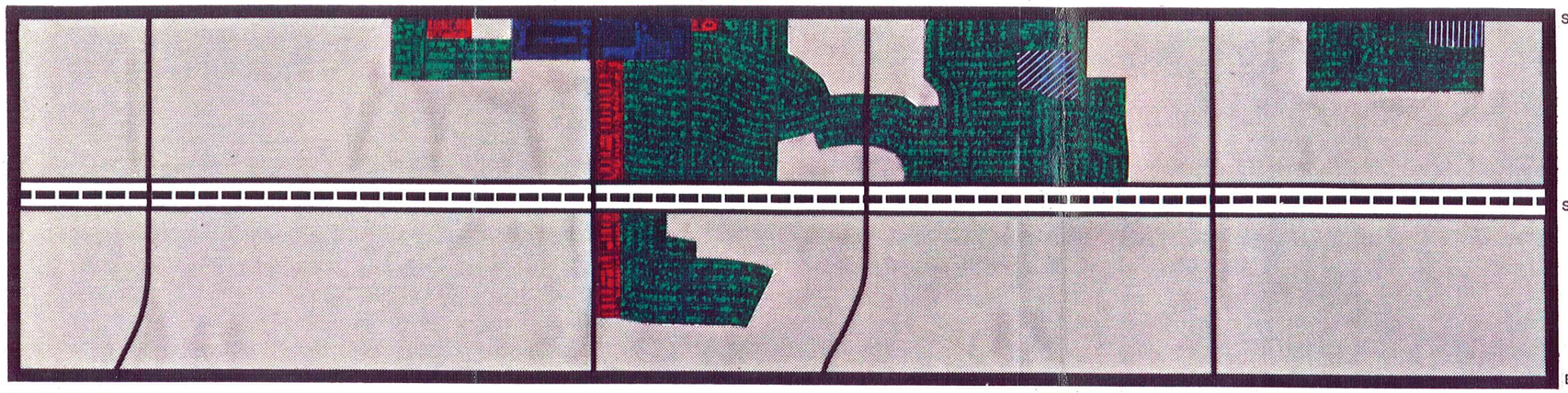
As previously discussed, the Tempe portion of the Superstition Corridor has been strongly influenced by municipal planning. The resulting domination of residential development in this corridor is shown in Figure 8-10. In 1969, the freeway was planned through the half-mile alignment, through several subdivisions. That year, the corridor's inventory was 3.8 million square feet, of which 3.2 million square feet was single family residential (Table 8-6). By 1972, when the freeway had only been completed to Mill Avenue, about 40 percent of the corridor's total area had developed, mainly into single family residential, including schools along the freeway and its alignment.

By 1975, when the freeway was completed, the corridor was about 60 percent developed and contained 8.8 million square feet of inventory, including 8.2 million square feet of residential and 6.2 million square feet of single family. Of the 670,000 square feet of non-residential inventory, 480,000 square feet was retail. Between 1969 and 1975, only 18 percent of new development was at intersections and 52 percent was in outer corridors.

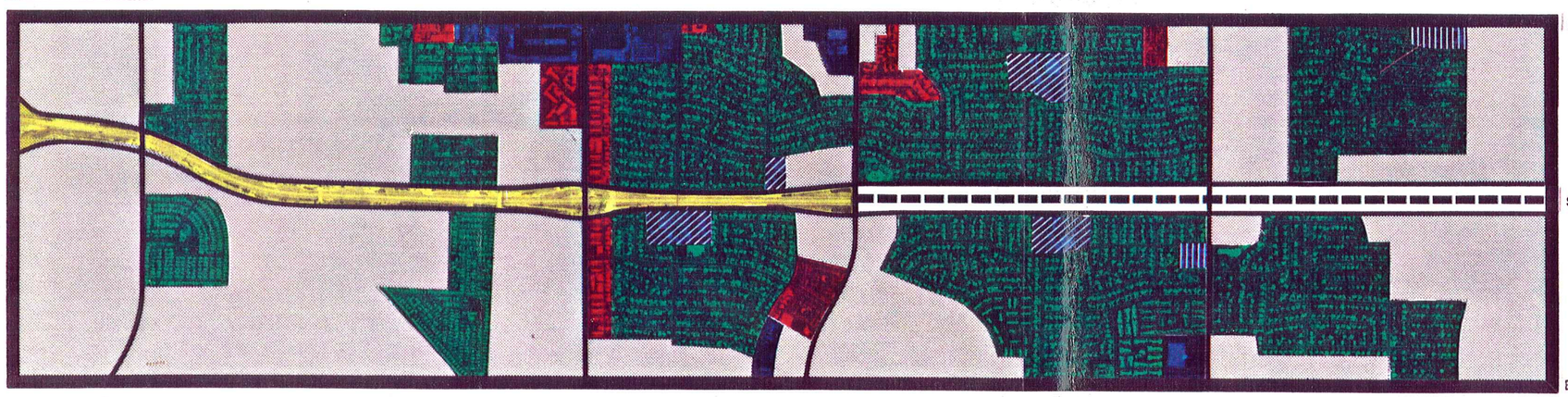
FIGURE 8-10

FREEWAY & LAND DEVELOPMENT IN THE TEMPE SUPERSTITION CORRIDOR

1969



1972



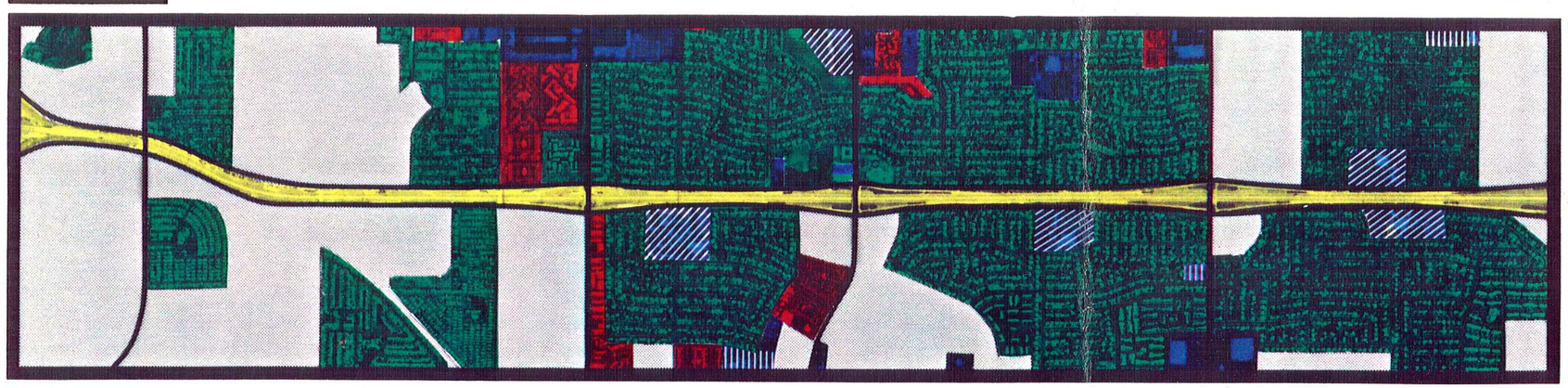
Single Family
Multi Family
Commercial
Office
Industrial
Institutional
Vacant Land
Existing Freeway
Planned Freeway

SOURCE:
MOUNTAIN WEST RESEARCH, Economic Research Division

FIGURE 8-10 (continued)

FREEWAY & LAND DEVELOPMENT IN THE TEMPE SUPERSTITION CORRIDOR

1975



1987

Single Family
Multi Family
Commercial
Office
Industrial
Institutional
Vacant Land
Existing Freeway
Planned Freeway

SOURCE:
MOUNTAIN WEST RESEARCH, Economic Research Division

TABLE 8-6
TEMPE SUPERSTITION DEVELOPMENT
1969, 1975 AND 1987
(000's Sq. Ft.)

	Tempe City			Total Corridor			Intersections			Inner Corridor			Outer Corridor		
	1969	1975	1987	1969	1975	1987	1969	1975	1987	1969	1975	1987	1969	1975	1987
Total	27,520	53,737	95,654	3,842	8,822	13,512	877	1,763	2,393	864	2,365	2,751	2,101	4,694	8,368
Nonresidential	6,308	12,742	26,279	206	671	1,786	0	40	397	0	0	0	206	631	1,389
Industrial	999	4,051	12,386	36	36	281	0	0	16	0	0	0	36	36	265
Office	326	867	2,674	5	43	458	0	0	252	0	0	0	5	43	206
Retail	2,047	3,739	6,285	147	479	883	0	17	80	0	0	0	147	462	803
Hotel	168	575	990	0	0	0	0	0	0	0	0	0	0	0	0
General Use	2,768	3,510	3,944	18	113	164	0	23	49	0	0	0	18	90	115
Residential	21,212	40,995	69,375	3,636	8,151	11,726	877	1,723	1,996	864	2,365	2,751	1,895	4,063	6,979
Single Family	16,820	29,845	47,506	3,231	6,222	7,620	795	1,134	1,269	864	2,349	2,735	1,572	2,739	3,616
Townhouse	523	3,706	8,888	384	1,534	1,931	82	200	200	0	10	10	302	1,324	1,721
Multifamily	3,757	7,253	12,755	21	395	2,152	0	389	527	0	6	6	21	0	1,619
Mobile Home	112	191	226	0	0	23	0	0	0	0	0	0	0	0	23

Source: Economic Research Division, Mountain West Research, July 1987.

In 1987, the corridor was entirely developed except for small infill pockets and industrial land west of 56th Street. Unlike earlier periods, the most recent development period includes substantial non-residential development. Non-residential inventory grew 167 percent and residential inventory grew 45 percent. Most of the non-residential growth, as Figure 8-10 shows, was along arterials at the outside of the outer corridor. By 1987, the freeway had been entirely completed for 12 years. The corridor's inventory was 13.5 million square feet, of which 87 percent is residential. Almost 18 percent of the corridor's inventory is in intersections, 20 percent is in inner corridors, and 62 percent is in outer corridors. Between 1975 and 1987, the corridor's inventory grew 53 percent, intersections grew 36 percent, inner corridors grew 16 percent, and outer corridors grew 78 percent. Despite this expansion, large parcels at the I-10 intersection are still vacant, over 15 years after the freeway's completion.

8.2.4 Mesa Superstition Corridor

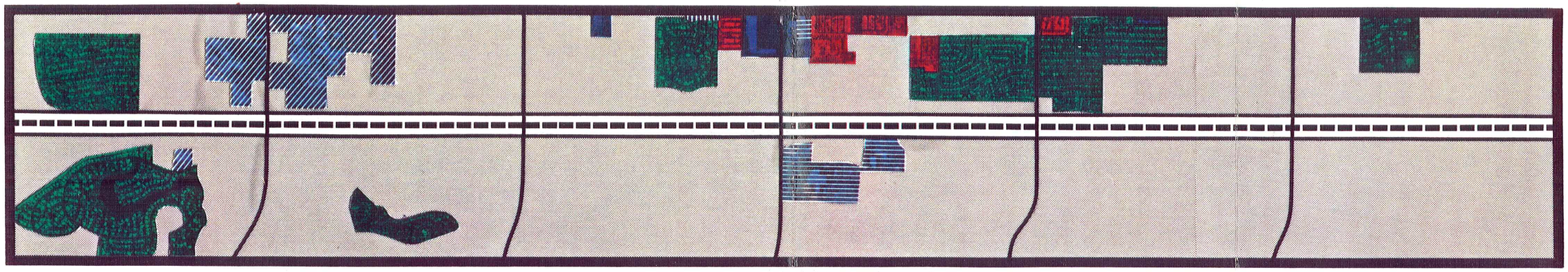
As a directly opposing case study to Tempe, the Mesa Superstition Corridor was almost entirely led by the market. In 1974, the freeway was planned but had already been known about for years. The sparse development that existed in the corridor included Dobson Ranch and other residential developments contained in an area designated only three years earlier. Other leaders were Mesa Community College and commercial and multifamily uses oriented toward Southern Avenue (Figure 8-11). In 1975, the corridor's inventory was 2.6 million square feet, including 2.1 million residential and 1.9 million single family (Table 8-7). Almost all development was in its outer corridor.

By 1977, the freeway had been built in the corridor's first mile, but few additions to development were made. In 1980, the freeway had been built along three miles, and market growth was substantial. The Fiesta Mall had been started at the Alma School/Superstition intersection and additional retail uses were built in the Dobson Ranch area. Again, like the North Black Canyon, corridor development was led by a large regional mall. Beyond retail, residential developments in the eastern half of the corridor were also largely developed in 1977. In 1981, the corridor's inventory was 8.7 million square feet--a 230 percent increase over 1975. Of the 6.1 million square feet increase, 47 percent was non-residential, about equally split between office and retail uses. Of residential development, 40 percent was high density residential.

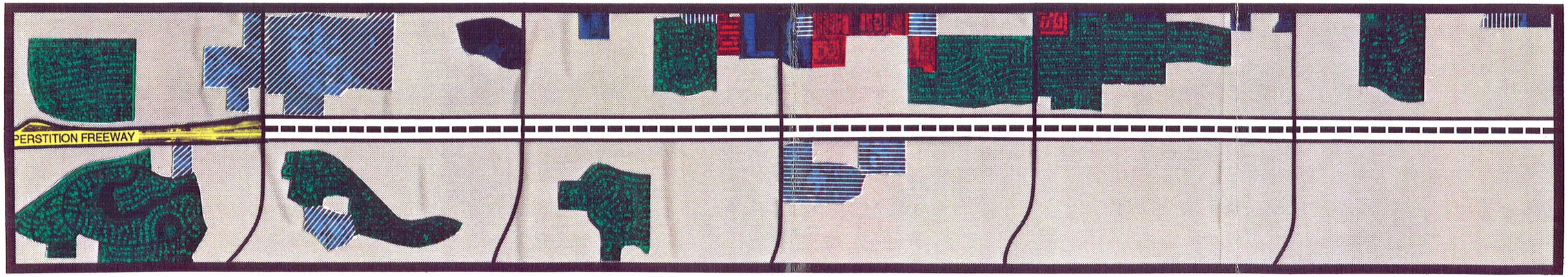
FIGURE 8-11

FREEWAY & LAND DEVELOPMENT IN THE MESA SUPERSTITION CORRIDOR

1974



1977



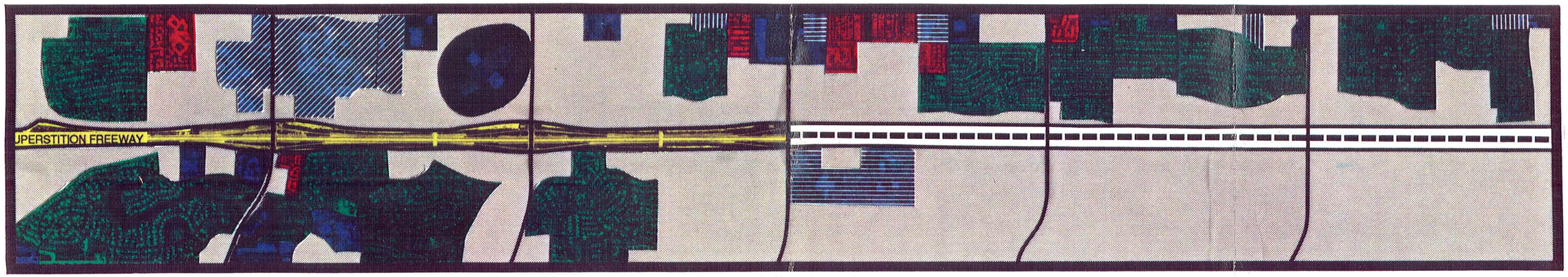
Single Family
Multi Family
Commercial
Office
Industrial
Institutional
Vacant Land
Existing Freeway
Planned Freeway

SOURCE:
MOUNTAIN WEST RESEARCH, Economic Research Division

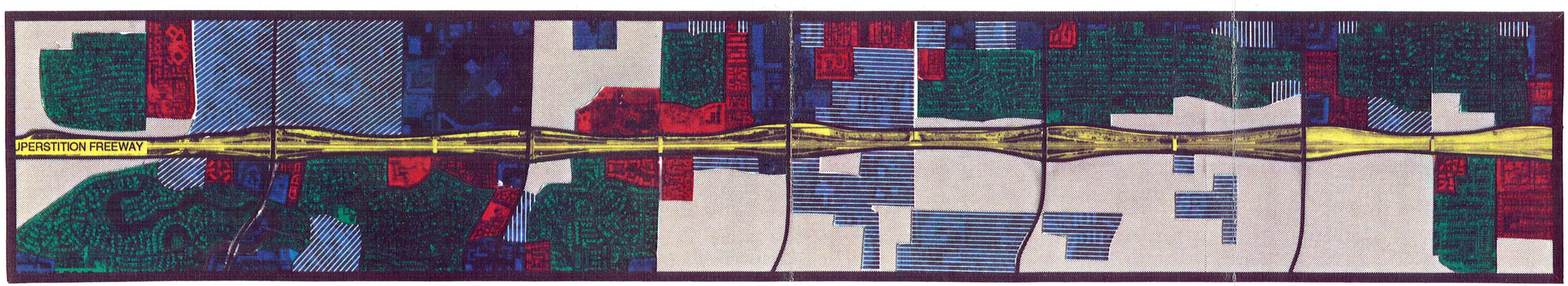
FIGURE 8-11 (continued)

FREEWAY & LAND DEVELOPMENT IN THE MESA SUPERSTITION CORRIDOR

1980



1987



Single Family
Multi Family
Commercial
Office
Industrial
Institutional
Vacant Land
Existing Freeway
Planned Freeway

SOURCE:
MOUNTAIN WEST RESEARCH, Economic Research Division

8.4 Major Findings Related to Freeway Corridor Development

The corridor analysis has produced some important findings, which follow according to the major questions that the analysis was designed to answer.

1. **To what extent has actual corridor development followed market-based land use theory?**

   - Freeway study corridors contain a larger share of income-generating properties, and the two "undeveloped" corridors, where the market was freer to develop, contain an even larger share.

   - Two corridors were already urbanized before freeway development, and both contain more extreme land use distributions, but for different reasons. Tempe's is due to municipal planning and the South Black Canyon's to previously existing locational attributes and site characteristics.

   - The two "undeveloped corridors" are the most similar pair among study corridors, including their share of income-generating uses.

   - Non-residential development within freeway corridors grew much faster than other kinds of development, and grew faster than metrowide non-residential development.

   - Inside freeway corridors, the growth rate for property that does not generate income was half the rate of other land uses.

2. **How strongly does municipal planning affect corridor development?**

   - Only 29 percent of corridor uses in the Tempe Superstition Corridor, which Tempe planned for residential, are income-generating properties.

   - Although each of the corridors are dissimilar in land use details, the Tempe corridor stands out in uniqueness in all areas--along its length, at intersections, within inner corridors, and within outer corridors.

3. **Do subareas of the corridor develop differently?**

   - Income-generating properties are 66 percent of all uses at intersections, 51 percent of all uses at inner corridors, and only 45 percent of all uses in outer corridors.

   - Within study corridors, outer corridors developed more quickly at first, followed by inner corridors and then intersections. This is especially true of residential development.

   - Non-residential inventory develop earliest at intersections, then inner corridors and then outer corridors.

4. **In previously undeveloped areas, have freeway corridors developed at different rates, magnitudes, and uses?**

- Comparatively, the two previously undeveloped corridors--the North Black Canyon and the Mesa Superstition--look more alike than any other pair of study corridors.

- The large amount of undeveloped land within corridors is surprising, given the short supply of freeway corridor land in metro Phoenix.

  -- In 1975, twelve years after freeway completion, about 30 percent of the South Black Canyon Corridor north of Bethany Home Road was undeveloped.

  -- In 1987, 22 years after freeway completion, 25 percent of the North Black Canyon's land area is still undeveloped.

  -- Six years after freeway completion, 30 percent of the Mesa Superstition Corridor is undeveloped.

  -- The Tempe Superstition is an exception. In 1975, when the freeway was completed, about 40 percent of the corridor was undeveloped. In 1987, only small infill pockets and industrial land were vacant.

- Regional malls have been early activities which led development in the North Black Canyon and Mesa Superstition Corridors.

- A large amount of residential development has also been an early activity in the two "undeveloped" corridors.

- "Undeveloped" corridors have grown more rapidly than "developed" corridors, but no more rapidly than the entire metro area since 1975.

- Non-residential development in "undeveloped" corridors is much more rapid than in any other area.

5. **How strongly do freeway corridors attract the several kinds of land uses?**

- The rate of development for office, hotel, and apartment uses is much faster within corridors than in other areas.

- Freeway attraction for industrial development is not as clear. Its rate is slower than other areas for "developed" corridors but faster for "undeveloped" corridors. Its growth rate was not as fast in corridors than in other non-residential uses.

- The growth rate for retail and single family/townhouse inventory inside corridors was half the rate of other land uses.

- Single family development is a large part of freeway corridor development. Almost 70 percent of the inventory in the study corridor is single family development. Even discounting the Tempe Superstition area, single family inventory is still almost 50 percent of the inventory in each of the remaining three corridors.

9.0 Urban Form Impacts

The importance of major transportation systems in general, and urban freeways in particular, is known. From the research conducted in other areas and based on urban growth theories, major surface transportation facilities do attract development within a market. Everything else equal, a commercial site with freeway access and visibility will be preferable over a site that lacks the freeway frontage. As pointed out before, this assumes that a viable market exists for the proposed use on either parcel.

In addressing the urban form question, the difficulty is in quantifying the potential impact of urban freeways. Although the impacts can be described in concept, it is difficult to predict what the form of the metro area would be if the urban freeway system would have developed differently than it did.

In the metro Phoenix area, for example, we can speculate what would have happened to the relative distribution of growth if the Papago Freeway, rather than the Black Canyon, had been built in the late 1950s. This example is appealing since it does not assume that any additional freeways are built; only that a different one is constructed. It seems reasonable to assume that the overall accessibility within the metro area would not change substantially but rather that the relative accessibility of certain areas would change. In particular, the North Black Canyon area would have lower accessibility and the west side of the metro area would have improved accessibility.

Figure 9-1 shows the shape of the metro area urban form in 1953 before any urban freeways had been built. There is some correspondence between the major highway system and development patterns. Growth in the Tempe and Mesa areas in the eastern portion follow US 60 and 89. Development is also following this highway on the west side along the Grand Avenue Corridor. This is the highway connecting Phoenix to Los Angeles. Finally, there is some development along US 80 (now AZ 85) in the southwest section. This highway connected Phoenix to San Diego.

Figure 9-2 shows the development pattern in 1983. By this time, the developed area is many times larger than it was in 1953. Although some of the patterns of development are somewhat difficult to discern in some places, there still appears to be a strong correlation to the major transportation routes within the metro area. In

FIGURE 9-1

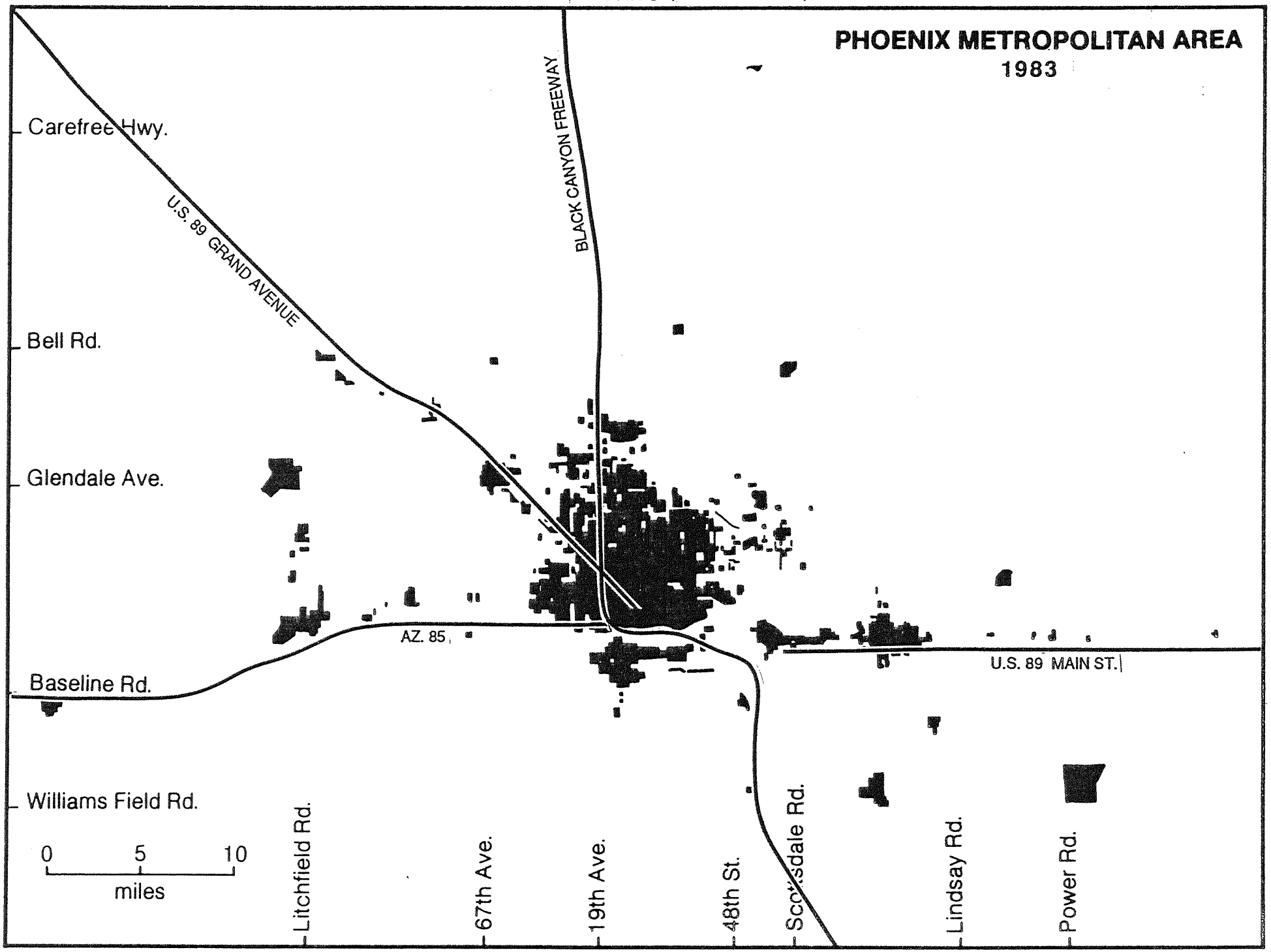
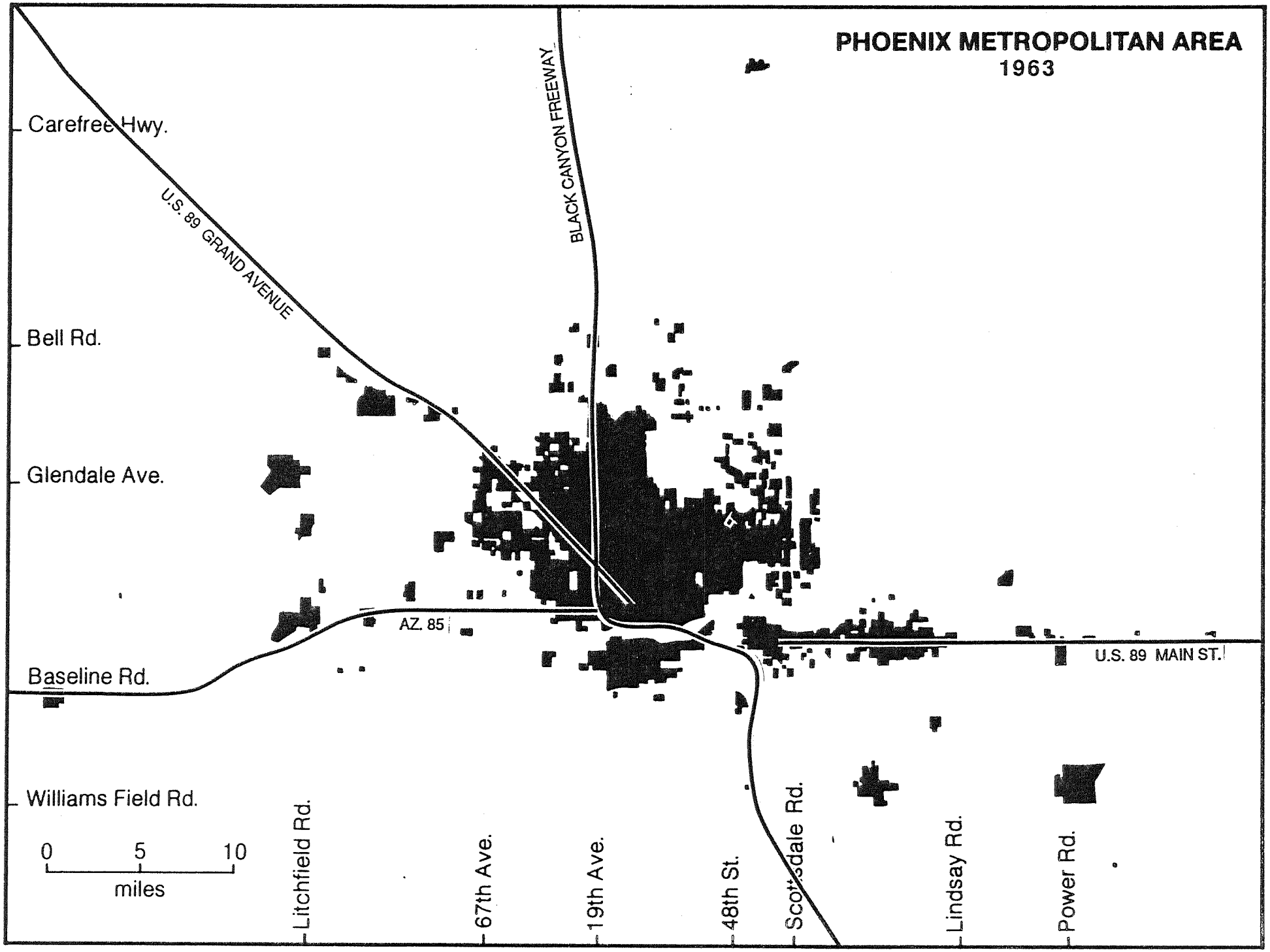

PHOENIX METROPOLITAN AREA
1983
Carefree Hwy.
U.S. 89 GRAND AVENUE
BLACK CANYON FREEWAY
Bell Rd.
Glendale Ave.
AZ. 85
U.S. 89 MAIN ST.
Baseline Rd.
Williams Field Rd.
0 5 10
miles
Litchfield Rd.
67th Ave.
19th Ave.
48th St.
Scottsdale Rd.
Lindsay Rd.
Power Rd.

FIGURE 9-2


PHOENIX METROPOLITAN AREA
1963
Carefree Hwy.
U.S. 89 GRAND AVENUE
BLACK CANYON FREEWAY
Bell Rd.
Glendale Ave.
AZ. 85
U.S. 89 MAIN ST.
Baseline Rd.
Williams Field Rd.
0 5 10
miles
Litchfield Rd.
67th Ave.
19th Ave.
48th St.
Scottsdale Rd.
Lindsay Rd.
Power Rd.

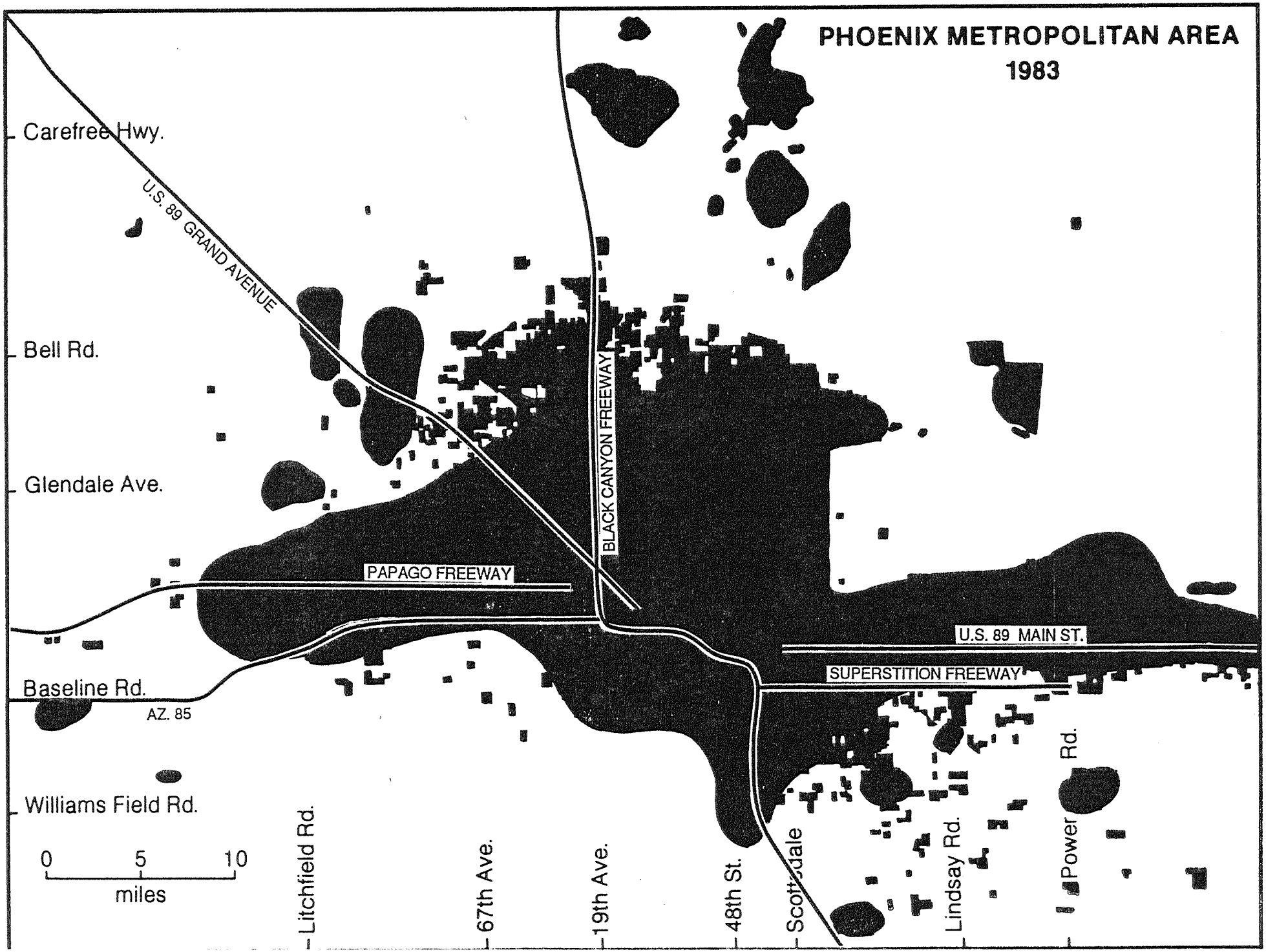
particular, substantial development has occurred along the North Black Canyon and along the Superstition Corridor. Little change is evident along the Papago Corridor.

The question is: what would the pattern of development look like if other freeways had been built instead of the Black Canyon and Superstition Freeways? Figure 9-3 presents a perspective on how the growth along the north Black Canyon might have been distributed along the Papago Freeway Corridor with the improved accessibility. Although it is impossible to predict how much of the growth in the metro area would have redistributed along the Papago, it is clear that the development pattern would look significantly different than it does today.

The development of the Papago in the late 1950s would have likely resulted in extensive industrial and residential development on the west side. The City of Phoenix has its Southwest Industrial Preserve in the area which would have benefited greatly from the early construction of the Papago. The market link to Los Angeles that the Papago Freeway provides, compared to the Black Canyon link to Flagstaff, might have resulted in more economic growth for metropolitan Phoenix as a whole during the 1960s and 1970s.

A similar example can be constructed for the Southeast Valley of metropolitan Phoenix. Growth in the Southeast Valley followed the Superstition Corridor and resulted in the rapid expansion of South Tempe and Mesa. If the Superstition had not been built but instead the freeway just to the north of Brown Road (actually referred to as the extension of the Papago Freeway) had been constructed, the distribution of growth would have been much different. Growth in the Mesa area likely would have followed the freeway corridor with the northern part of Tempe and Mesa developing faster than they did. Growth in the southern parts of Tempe may have been closer to I-10 than pushing eastward along the Superstition.

FIGURE 9-3


PHOENIX METROPOLITAN AREA
1983
Carefree Hwy.
U.S. 89 GRAND AVENUE
Bell Rd.
Glendale Ave.
BLACK CANYON FREEWAY
PAPAGO FREEWAY
U.S. 89 MAIN ST.
SUPERSTITION FREEWAY
Baseline Rd.
AZ. 85
Williams Field Rd.
0 5 10
miles
Litchfield Rd.
67th Ave.
19th Ave.
48th St.
Scottsdale
Lindsay Rd.
Power Rd.

10.0 The Effect of Freeway Announcements on Land Prices

10.1 Problem Statement and Organization of Study

The objective of this phase of the analysis is to evaluate the effect upon land prices of an announcement of freeway construction.

There are many social and economic factors affecting value of land along the freeway, as discussed in Chapters 2, 4, 5, 6 and 7 of the main body of this report. It is not the purpose nor the intent of this section of the report to assess the impact new freeways will have on land use patterns. Further, it is not the intent nor the scope of this report to discuss the individual factors which affect value, such as utilities, cost, and proximity to interchanges, etc. The intent of this section of the report is to analyze market data and determine whether the announcement of the freeway R.O.W. alignment alone has an effect in that corridor.

The remainder of this chapter is organized into two parts. The first part studies the values in selected control areas not affected by the corridor and the values in the corridor areas prior to the announcement and subsequent to the announcement. A statistical regression analysis is employed to analyze changes in value when the use remains constant. Further, an analysis is conducted to determine the overall change in prices, if any, between the control area and corridor subsequent to an announcement. However, no consideration is given to the size of the parcel, existing use or intended use, zoning, and financing, etc.

The second analysis considers all recorded transactions over a specified time which are located within the control area and corridor. Therefore, we are able to analyze the change in value for properties regardless of government, physical, and locational variances.

There are many factors which will affect or impact property values of existing uses along freeways. These factors generally impact the utility of a specific site. For example, the type of freeway design will have a different effect on various types and uses. There are three basic types of freeway designs: 1) elevated, 2) at grade, and 3) depressed. Each design has a different effect on the adjacent and surrounding areas. Adjacent land to the freeway interchanges are most desirable areas for corridor

development because of their focusing effect which maximizes visual exposure and accessibility. The type and magnitude of land use development along interchanges depend on a number of factors, such as city planning and zoning, market conditions, and design of interchange, etc.

Due to the extensive freeway system planned for the Phoenix metropolitan area, accurate property appraisals are needed for right-of-way acquisition, particularly for severance damages. In addition to freeway design and freeway interchanges, the proximity of the right-of-way to adjacent uses has an effect on value. Literature regarding the impact of freeways on nearby property values indicates a general lack of empirical evidence on which to specify the relationship between distance from the right-of-way and changes in property values. In our analysis the corridor tended to be approximately one mile in width and represents properties in our opinion which are influenced by the freeway. The control area, or properties located outside of the corridor and assumed not to be influenced by the freeway, is also approximately one mile in width and located one mile in distance from the chosen corridors.

Other key factors influencing value include municipal planning and zoning. While the selection of a new freeway road in the city will often prompt a review of the general plan and request for zoning changes, there is no assurance that revisions will be made. The size and shape of parcels will be affected by the construction of the freeway, particularly at interchanges. The exact property value impact depends on the land requirements of the intended land use given present zoning. Other factors which may increase or decrease value include frontage road access, noise impact, public infrastructure such as sewer, water, electricity, and drainage.

The results of the following analysis indicate the overall effect the freeway has on value resulting from a synergy of the above factors in addition to the locational accessibility provided by the freeway. Each section between 10.2 and 10.7 provides its own summary and conclusion of findings. Findings in this report indicate that land values and frequency of transactions were greater in the corridor versus the control areas subsequent to the announcement. An additional study would be required to determine the long term effects on prices of property adjacent to the corridor.

Section 10.8 addresses change in use and historical zoning changes which took place subsequent to freeway expansion. No analysis of zoning was called for in the

proposal of this report. Improved evidence as to the impact on zoning changes that the announcement of the intent to construct a freeway would require further study. Similarly, comparison of the change in value as it compares to Valley wide trends requires additional attention.

10.2 Study of Values/Sales in Selected Control Areas

The study areas used in the selected control analysis include the Estrella Freeway, Sun Valley Expressway, South Mountain Parkway, Agua Fria Freeway, and Santan Freeway. Sales transactions were tracked for these freeways during two periods--prior to freeway announcement and after freeway announcement. Further, sales transactions were distinguished between two corridor zones--an "impact zone" within a mile of the freeway alignment, and a "control zone" over a mile.

The two areas selected to provide a historical summary of changes in use in selected areas include the Papago Freeway and the Superstition Freeway. The latter locations include a study of two 160 acre parcels which were selected at random at locations within the corridor. The particular location within the corridor of the Papago and the Superstition Freeway was selected at an area where expansion of the freeway had recently taken place. Therefore, an analysis of property use before the freeway expansion and after the freeway expansion could be conducted. Land uses and values were tracked in each 160 acre quarter section for the 1977 to 1987 period.

10.3 Estrella Freeway

Originally named the Northwest Loop, this 37 mile road will be one of the last of the freeways to be constructed. The initial completion date is set for some time during 2005; however, recent events could expedite the construction.

The alignment begins below Interstate Highway 10 at State Route 85. Though planned to follow Cotton Lane, alignments approximately 1/4 mile east of Cotton Lane are currently under consideration. Either route would provide greater accessibility from the Northwest Valley to Luke Air Force Base, the prison facility at Perryville, the Trotting Park, and Estrella, a master development by Continental Homes.

The proposed alignments connecting Cotton Lane at Beardsley Road with Interstate Highway 17 between Dynamite Boulevard and Lone Mountain Road are even less certain due to numerous natural and man-made barriers.

Controversy has arisen concerning the funding of the construction. In December, 1985, Maricopa Association of Governments announced it had never intended for the sales tax money approved by voters to be used for construction of the road, only for acquisition of right of way.

The cost estimates for the Estrella now range from below the 1985 estimate for construction to almost double that projection. Trending up to 1987 dollars, the estimated cost was $364 million; the range is now between $312 million and $618 million.

10.3.1 Regression Analysis

Because of its location outside of current development, most of the Estrella Corridor and its control group areas are unimproved. Current uses tend to be agricultural or undeveloped raw desert; this remains unchanged from the announcement date. However, the size of each parcel in this location is larger than in many other areas under study, with the exception of the Santan Freeway in the Southeast Valley. Therefore, the number of transactions occurring during the four years straddling the announcement are limited.

Within the 24 months preceding the announcement, we found 18 sales within the corridor and 15 within control areas. Almost all control data for the Estrella were found within a wide band east of the corridor. Though we initially chose a two mile wide strip east of Reem Road, it was necessary to expand our focus another two miles in order to achieve a sample size of any significance.

Prior to April, 1985, we found a 3.07 percent per month average increase in value within the impact area and 3.33 percent per month within the control areas. This equates to 36.8 and 39.90 percent per year respectively. Some pent-up speculation appeared to occur within an eight month period prior to the announcement within the corridor. The graph, Estrella 1, shows the location of the data points clustering vertically during this time period. This was not evident from the location of data points on Estrella Control 1.

After the announcement, sales transactions did not occur with any fury, as the graphs Estrella 2 and Estrella Control 2 show. The larger agricultural parcels along the southern portion of the freeway corridor showed few significant jumps in value. Activity did seem to increase in lesser priced land. In this regard, a difference in appreciation is apparent. A 4.65 percent monthly increase was noted for the impact area, while the increase within the control groups was only 2.6 percent. Annual figures are 55.8 and 31.2 percent respectively.

10.3.2 Survey of Transactions

All recorded transactions were tracked within the study corridor and the control areas used. Using a somewhat "global" approach, we looked at records coded for vacant land and for all records. The results of this survey are summarized below.

	Before Announcement 2/83 to 4/85		After Announcement 4/85 to 9/86	
	Corridor	Control	Corridor	Control
Average All Values	1,899,637	475,565	1,613,426	4,089,751
No. of Transactions	480	290	187	207
Average Vacant Values	110,693	136,958	304,840	127,879
No. of Transactions	194	76	62	19

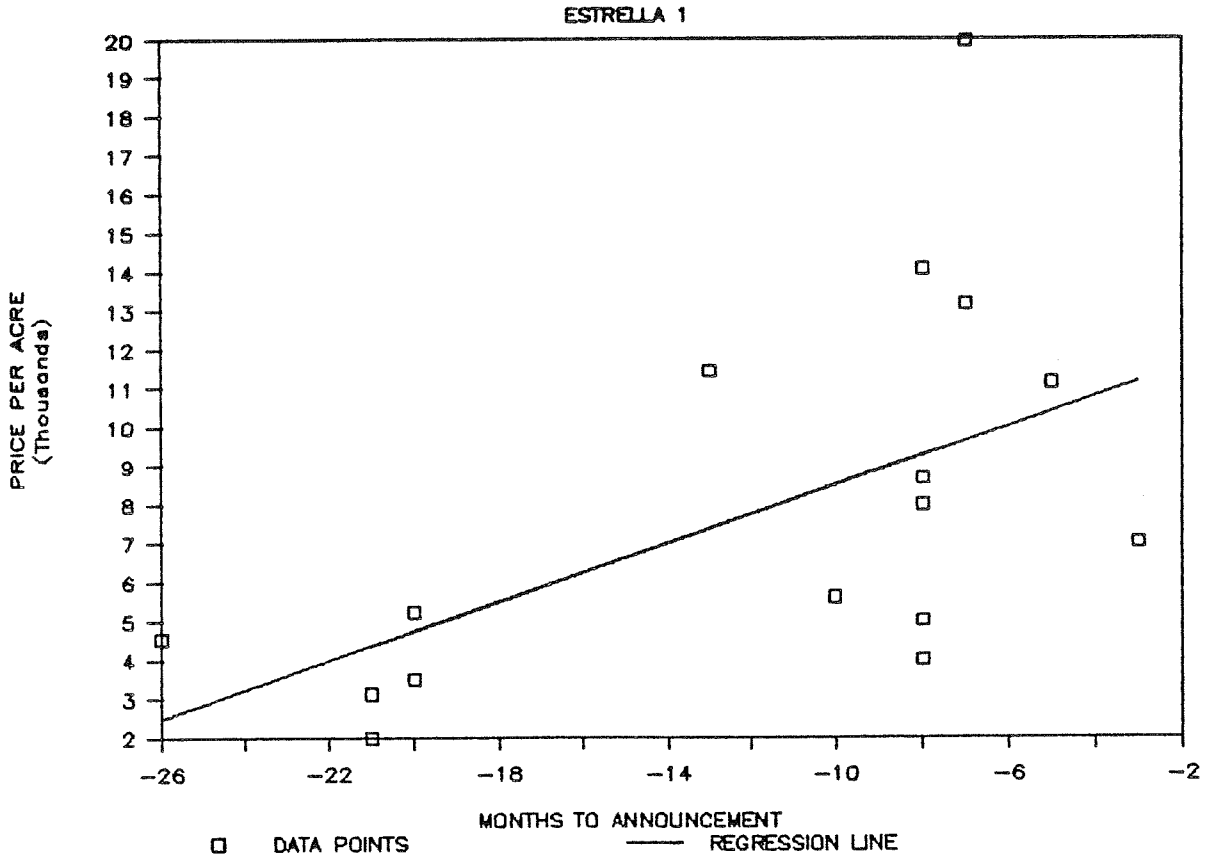
The average price per transaction before the announcement was $1,899,637 versus the average price after the announcement being $1,613,426. The decline is primarily due to the fact that there were numerous large multiple transactions which took place within the corridor. Subsequent to the announcement, a larger number of transactions took place having smaller size making the data less significant. This increase in total value within the control area is the opposite scenario.

Of some relevance is the fact that:

1. the average price of vacant land within the corridor increased at a greater rate after the announcement than land within the control area; and

2. the number of transactions within the corridor declined significantly after the announcement, while the number of transactions in the control area declined slightly suggesting a shift in location to the corridor.

REGRESSION LINE



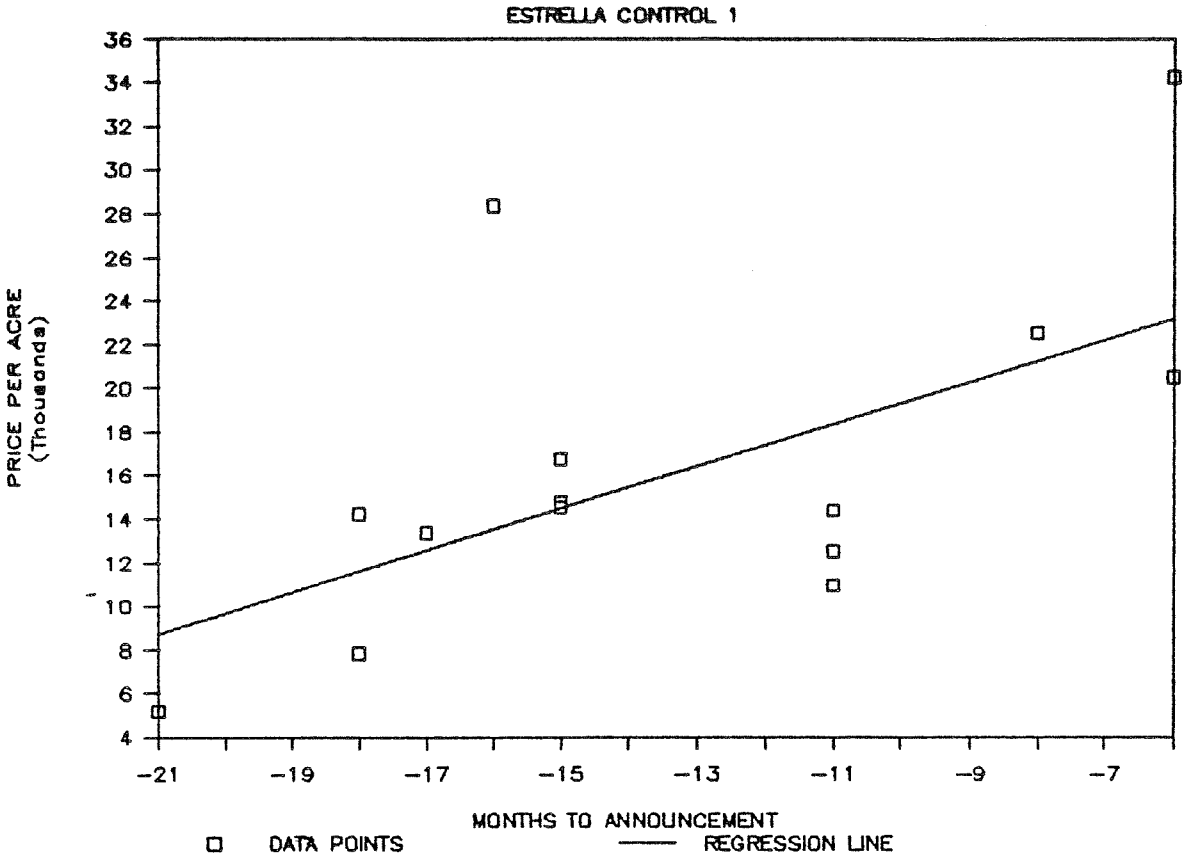
SALE NUMBER	ASSESSOR'S TAX PARCEL	APPROXIMATE LOCATION	DATE OF SALE	SALES PRICE	AREA (ACRE)	PRICE PER ACRE	MONTHS FROM 4/85	REGRESSION LINE
1	503-75-046C	AREA BELL/COTTON LN	9/83	$90,000	25.57	$3,520	-20	4747
2	503-58-019	GRAND /PINNACLE PEAK	9/83	$149,300	28.5	$5,239	-20	4747
3	503-75-058	AREA BELL/SARIVAL	12/84	$3,082,000	276.99	$11,127	-5	10404
4	503-53-026	DYSART/PINNACLE PEAK	8/83	$160,000	80	$2,000	-21	4370
5	503-50-026	DYSART/PINNACLE PEAK	8/83	$249,200	80	$3,115	-21	4370
6	503-53-039B	BULLARD/PINNACLE PEAK	4/84	$399,936	35	$11,427	-13	7387
7	503-53-041	BULLARD/PINNACLE PEAK	9/84	$320,000	40	$8,000	-8	9272
8	503-53-042	BULLARD/PINNACLE PEAK	9/84	$320,000	40	$8,000	-8	9272
9	502-27-002M	BETHANY HOME/COTTON LN	9/84	$149,700	17.285	$8,661	-8	9272
10	502-27-014B	BETHANY HONE/CITRUS	10/84	$2,080,000	158	$13,165	-7	9650
11	501-04-009A	GLENDALE/COTTON LN	2/85	$800,000	114.155	$7,008	-3	11158
12	500-05-002Q	COTTON LN/VAN BUREN	10/84	$194,313	9.75	$19,930	-7	9650
13	503-53-013	PINNACLE /LITCHFIELD	9/84	$1,993,500	141.8	$14,059	-8	9272
14	503-53-025C	EL MIRAGE/PINNACLE	6/84	$160,000	40	$4,000	-8	9272
15	503-53-025H	EL MIRAGE/PINNACLE	9/84	$100,000	20	$5,000	-8	9272
16	503-53-041	DEER VLY/BULLARD	9/84	$320,000	40	$8,000	-8	9272
17	503-23-009F	BLACK CANYON/CAREFREE	7/84	$160,000	28.49	$5,616	-10	8518
18	500-06-028	SARVIAL/L BUCKEYE	3/83	$697,500	154.09	$4,527	-26	2484

Regression Output:

Constant	12289.46
Std Err of Y Est	3935.594
R Squared	0.309297
No. of Observations	18
Degrees of Freedom	16

X Coefficient(s)	377.12729859
Std Err of Coef.	140.89181765

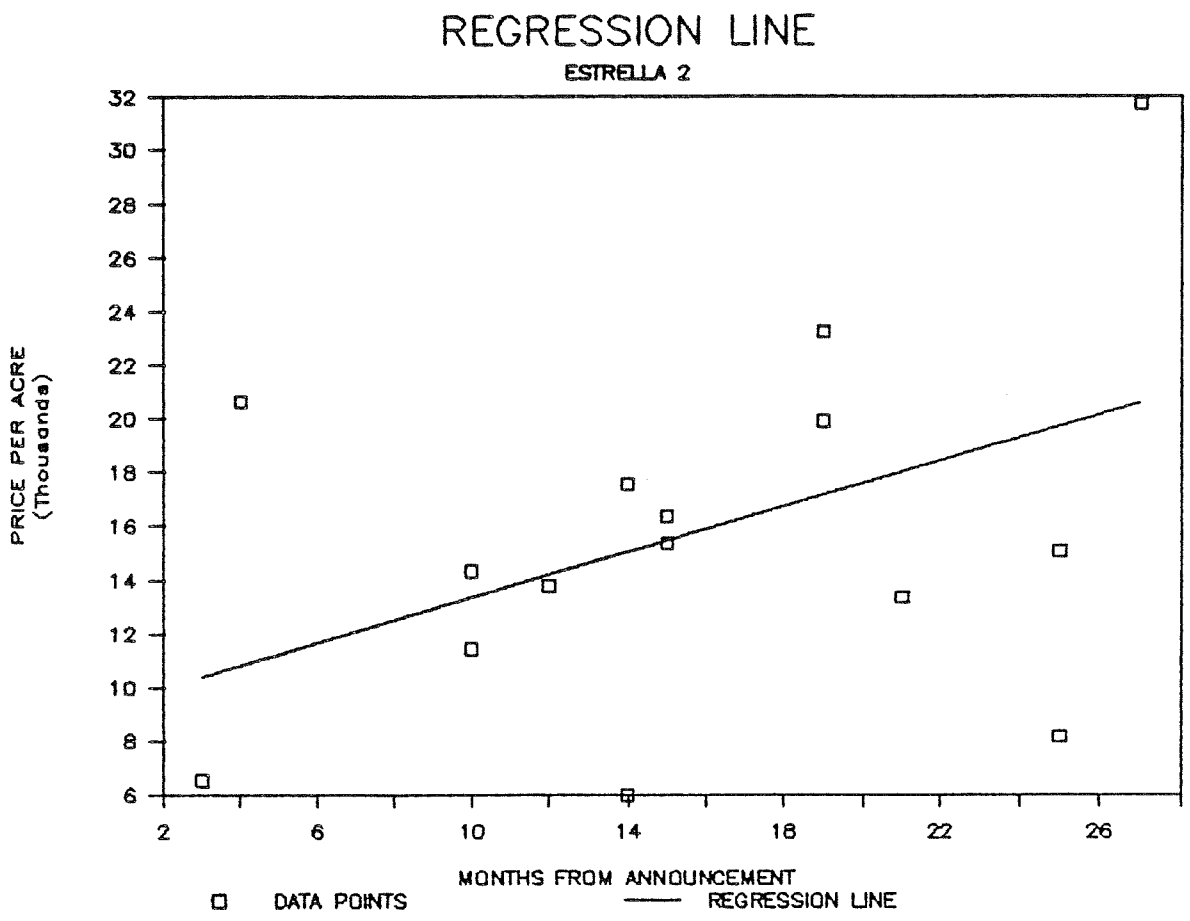
REGRESSION LINE



SALE NUMBER	ASSESSOR'S TAX PARCEL	APPROXIMATE LOCATION	DATE OF SALE	SALES PRICE	AREA (ACRES)	PRICE PER ACRE	MONTHS FROM 4/85	REGRESSION LINE
1	501-69-009	REEMS RD/INDIAN SCHL	8/83	$820,000	157.576	$5,204	-21	8724
2	500-07-018C	BULLARD/VAN BUREN	6/84	$582,000	40.5	$14,370	-11	18356
3	501-17-016	REEMS N OF WADELL	2/84	$670,080	40	$16,737	-15	14503
4	501-17-015	WADELL W OF REEMS	6/84	$4,000,000	320	$12,500	-11	18356
5	501-17-014	REEMS N OF WADELL	11/83	$285,000	36.44	$7,821	-18	11613
6	501-17-025C	AREA WADELL/REEMS	11/83	$285,000	20	$14,250	-18	11613
7	501-56-011B	DYSART S OF GLENDALE	11/84	$615,000	17.97	$34,224	-6	23172
8	501-56-016B	DYSART/GLENDALE	11/84	$820,000	40	$20,500	-6	23172
9	501-17-015	WADELL W OF LITCHFIELD	6/84	$4,000,000	320	$12,500	-11	18356
10	501-17-005D	BULLARD AVE/GREENWAY	2/84	$6,838,665	471.373	$14,508	-15	14503
11	501-17-009	BULLARD AVE/GREENWAY	2/84	$1,478,569	100	$14,786	-15	14503
12	501-63-024H	EL MIRAGE/CAMELBACK	6/84	$389,000	35.575	$10,935	-11	18356
13	501-72-001N	DYSART/THOMAS	9/84	$675,000	29.98	$22,515	-8	21245
14	501-62-003	LITCHFIELD/CAMELBACK	12/83	$500,000	37.375	$13,378	-17	12576
15	501-74-001	EL MIRAGE/THOMAS	1/84	$275,000	9.697	$28,359	-16	13540

Regression Output:

Constant		28951.03
Std Err of Y Est		6381.985
R Squared		0.336110
No. of Observations		15
Degrees of Freedom		13
X Coefficient(s)	963.21110416	
Std Err of Coef.	375.45419595	

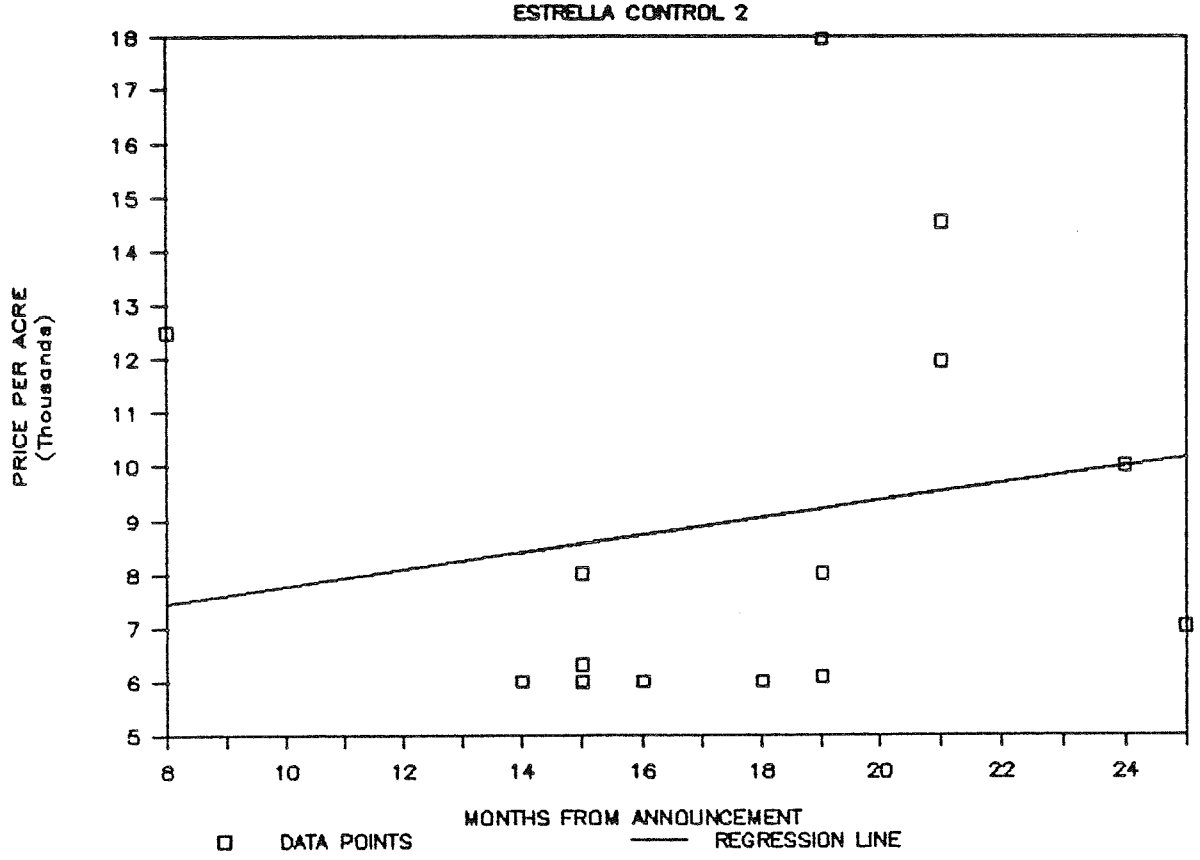

REGRESSION LINE
ESTRELLA 2
PRICE PER ACRE (Thousands)
32
30
28
26
24
22
20
18
16
14
12
10
8
6
2
6
10
14
18
22
26
MONTHS FROM ANNOUNCEMENT
DATA POINTS
REGRESSION LINE

SALE NUMBER	ASSESSOR'S TAX PARCEL	APPROXIMATE LOCATION	DATE OF SALE	SALES PRICE	AREA (ACRES)	PRICE PER ACRE	MONTHS FROM 4/85	REGRESSION LINE
1	503-53-029	DEER VLY/EL MIRAGE	6/85	$523,200	80	$6,540	3	10385
2	502-43-004C	AREA YUMA/COTTON LN	10/86	$4,500,000	193.97	$23,199	19	17169
3	501-02-010C	CAMELBACK E OF COTTON	10/86	$157,700	7.92	$19,912	19	17169
4	201-06-005	LAKE PLEASANT/CAREFREE	5/86	$4,229,925	241	$17,552	14	15049
5	502-43-006	NWC BROADWAY/COTTON	6/85	$5,800,000	378.04	$15,342	15	15473
6	502-27-004P	GLENDALE W OF COTTON	1/86	$557,700	39	$14,300	10	13353
7	502-43-003D	L BUCKEYE/COTTON LN	10/86	$4,500,000	193.485	$23,258	19	17169
8	502-43-025B	NWC BROADWAY/COTTON	4/87	$1,272,025	156	$8,154	25	19712
9	502-43-026	BROADWAY/COTTON	6/87	$7,791,820	245.826	$31,696	27	20560
10	502-09-004B	AREA OLIVE/178TH	4/87	$2,690,000	178.688	$15,054	25	19712
11	502-27-004Y	AREA DORSET/COTTON	1/86	$584,550	51.131	$11,432	10	13353
12	501-04-009B	AREA GLENDALE/COTTON	12/86	$1,600,000	120.01	$13,332	21	18017
13	501-05-003A	AREA NORTHERN/COTTON	3/86	$4,317,300	314	$13,749	12	14201
14	501-06-001	AREA NORTHERN/COTTON	7/85	$6,294,625	305.34	$20,615	4	10809
15	501-12-010E	AREA BELL/COTTON	6/86	$3,844,603	235	$16,360	15	15473
16	503-53-034A	HAPPY VLY/SARVIAL	5/86	$480,000	80	$6,000	14	15049
17	503-53-015	DEER VLY/LITCHFIELD	6/85	$676,800	103.5	$6,539	3	10385

Regression Output:

Constant	9113.041
Std Err of Y Est	6333.489
R Squared	0.211527
No. of Observations	17
Degrees of Freedom	15
X Coefficient(s)	423.97555276
Std Err of Coef.	211.35129458

REGRESSION LINE



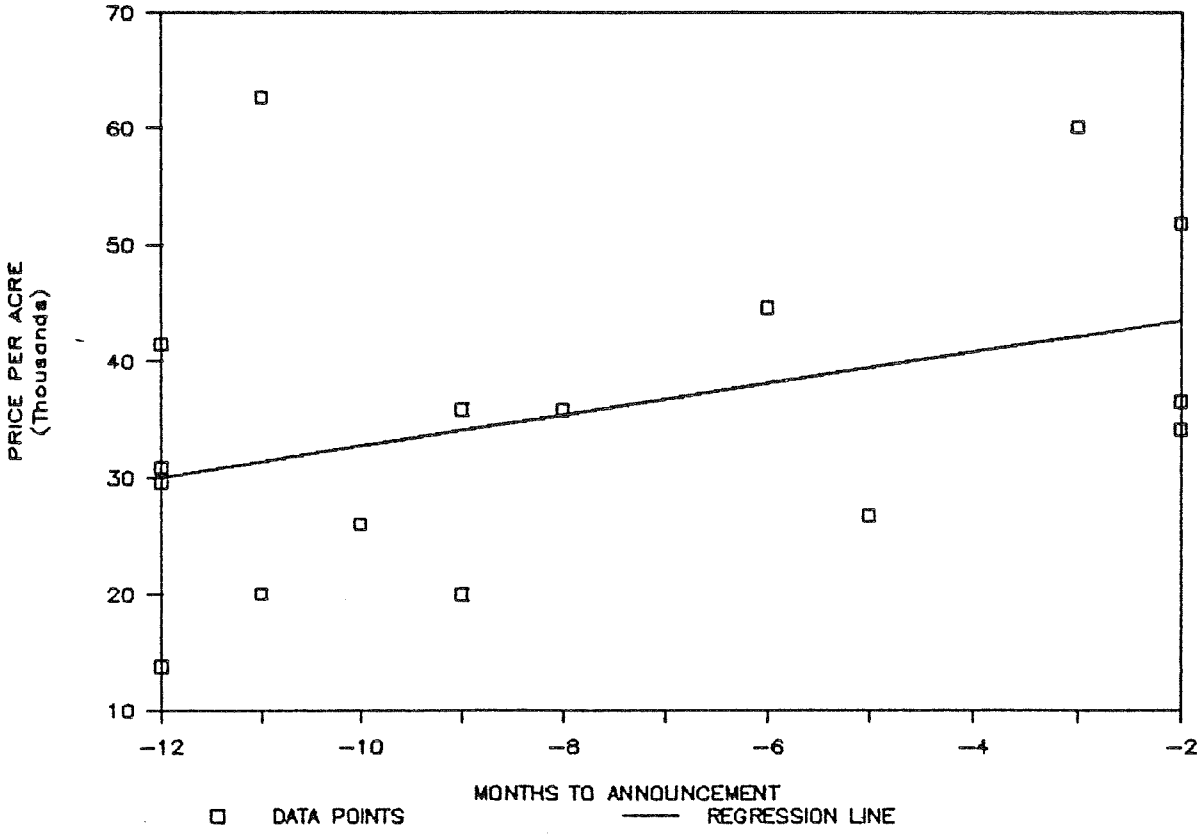
SALE NUMBER	ASSESSOR'S TAX PARCEL	APPROXIMATE LOCATION	DATE OF SALE	SALES PRICE	AREA (ACRES)	PRICE PER (ACRES)	MONTHS FROM 4/85	REGRESSION LINE
1	503-78-010T	AREA 199TH/UN HILLS	6/86	$120,000	19	$6,316	15	8565
2	503-79-04B	HAPPY VLY/ 199TH AVE	12/86	$238,976	20	$11,949	21	9530
3	503-79-006J	HAPPY VLY/191ST AVE	4/87	$140,000	20	$7,000	25	10172
4	503-78-007C	GROVERS/191ST AVE	6/86	$120,000	20	$6,000	15	8565
5	503-78-009A	GROVERS/191ST AVE	5/86	$234,000	39	$6,000	14	8405
6	503-78-009E	GROVERS/191ST AVE	3/87	$200,000	20	$10,000	24	10012
7	503-78-009F	GROVERS/191ST AVE	7/86	$114,000	19	$6,000	16	8726
8	503-78-010D	GROVERS/191ST AVE	6/86	$156,000	19.5	$8,000	15	8565
9	503-76-005B	UNION HLS/199TH AVE	12/86	$1,600,000	110	$14,545	21	9530
10	503-78-001	BEARDSLEY/203RD AVE	10/86	$960,000	157.9	$6,080	19	9208
11	503-78-006	BEARDSLEY/203RD AVE	9/86	$960,000	160	$6,000	18	9047
12	501-42-005	SWC PEORIA/REEMS	10/86	$329,400	18.36	$17,941	19	9208
13	501-42-016A	NEC NORTHERN/REEMS	11/85	$3,883,750	310.7	$12,500	8	7440
14	503-78-007A	GROVERS/191ST AVE	6/86	$228,000	38.02	$5,997	15	8565
15	503-79-004B	HAPPY VLY/199TH AVE	12/86	$238,976	20	$11,949	21	9530
16	503-79-006N	HAPPY VLY/199TH AVE	10/86	$640,000	80	$8,000	19	9208

Regression Output:

Constant	6154.506
Std Err of Y Est	3790.013
R Squared	0.033570
No. of Observations	16
Degrees of Freedom	14
X Coefficient(s)	160.71776945
Std Err of Coef.	230.46622656

REGRESSION LINE

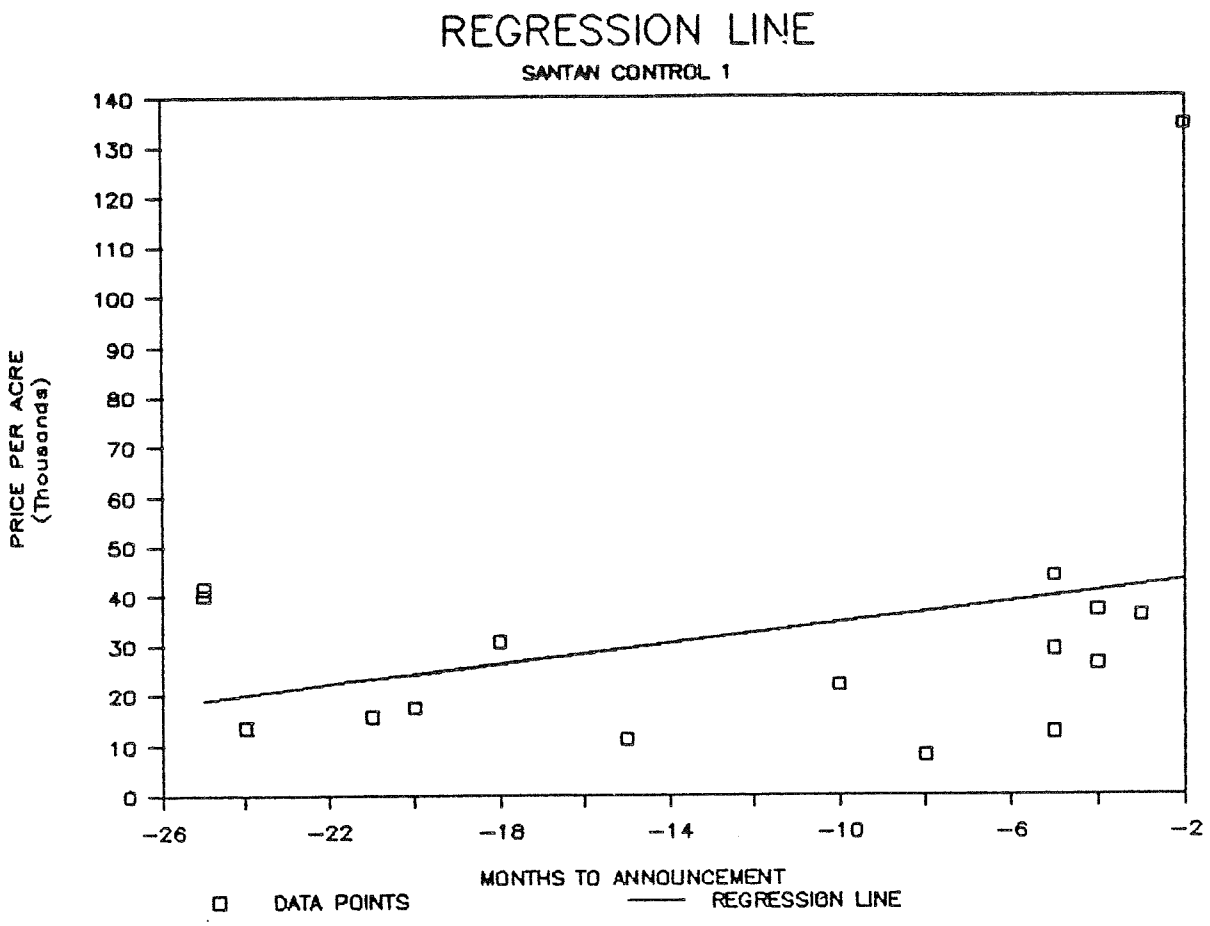
SANTAN 1



SALE NUMBER	ASSESSOR'S TAX PARCEL	APPROXIMATE LOCATION	DATE OF SALE	SALES PRICE	AREA (ACRES)	PRICE PER ACRE	MONTHS FROM 4/85	REGRESSION LINE
1	304-33-002M	GILBERT /WILLIAMS FLD	11/84	$455,160	10.199	$44,628	-6	38158
2	304-23-025C	ELLIOTT/LINDSAY	3/85	$1,672,526	48.99	$34,140	-2	43551
3	303-30-006E	PECOS E OF COOPER	7/84	$1,000,000	38.462	$26,000	-10	32764
4	304-04-001B	SWC HAWES/GUADALUPE	8/84	$1,450,000	72.71	$19,942	-9	34112
5	303-36-004A	SEC 88TH GERMANN	5/84	$1,575,544	38	$41,462	-12	30067
6	304-42-009G	SEC RAY/LINDSAY	5/84	$1,792,242	58	$30,901	-12	30067
7	304-46-003A	NEC PECOS/VAL VISTA	5/84	$2,200,000	160	$13,750	-12	30067
8	304-44-001A	WILLIAMS FLD/GILBERT	5/84	$4,308,600	145.643	$29,583	-12	30067
9	304-06-001F	SWC BASELINE/POWER	6/84	$6,510,000	103.85	$62,687	-11	31416
10	304-03-007A	BASELINE/HAWES	2/85	$1,151,718	19.167	$60,089	-3	42203
11	304-03-008J	BASELINE/HAWES	10/84	$2,100,000	58.56	$35,861	-8	35461
12	304-03-008D	BASELINE/HAWES	3/85	$700,000	19.167	$36,521	-2	43551
13	304-04-013A	SOSSAMAN/ELLIOT	6/84	$1,399,500	69.877	$20,028	-11	31416
14	304-27-001E	WARNER/GREENFIELD	8/84	$350,000	9.763	$35,850	-9	34112
15	303-27-010C	ALMASCHL/PECOS	3/85	$505,716	9.75	$51,868	-2	43551
16	303-43-010C	OCOTILLO/COOPER	12/84	$2,760,000	103.133	$26,762	-5	39506

Regression Output:

Constant	46247.88
Std Err of Y Est	13324.63
R Squared	0.146012
No. of Observations	16
Degrees of Freedom	14
X Coefficient(s)	1348.3813055
Std Err of Coef.	871.52434017

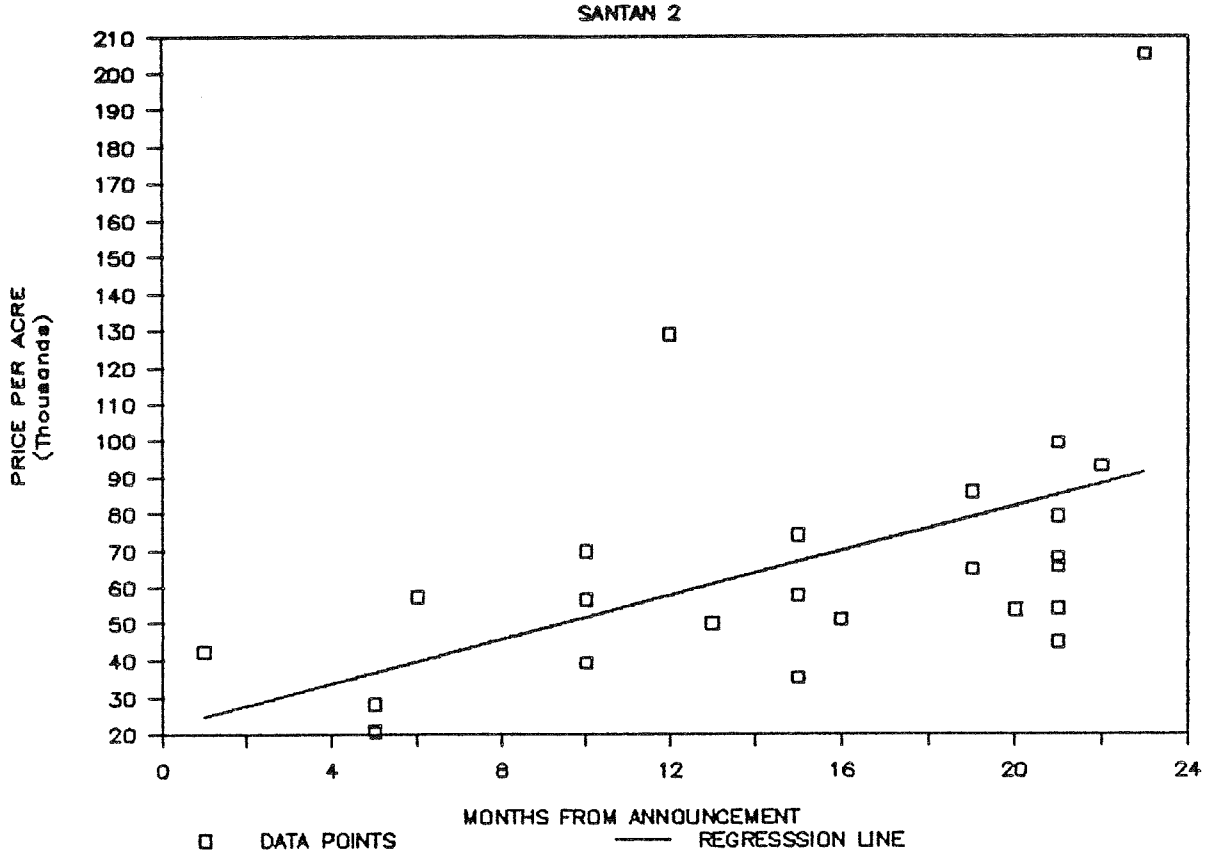

REGRESSION LINE
SANTAN CONTROL 1
PRICE PER ACRE
(Thousands)
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-26
-22
-18
-14
-10
-6
-2
MONTHS TO ANNOUNCEMENT
DATA POINTS
REGRESSION LINE

SALE NUMBER	ASSESSOR'S TAX PARCEL	APPROXIMATE LOCATION	DATE OF SALE	SALES PRICE	AREA (ACRES)	PRICE PER ACRE	MONTHS FROM 4/85	REGRESSION LINE
1	304-75-004B	LINDSAY/OCOTILLO	9/84	$300,000	38	$7,895	-8	36715
2	304-80-003D	SANTANBLVD/CHANDLERHTS	12/84	$500,000	40	$12,500	-5	39823
3	304-20-002C	SEC ELLIOT/GREENFIELD	1/85	$1,612,000	61.45	$26,233	-4	40858
4	304-71-005	VAL VISTA/QUEEN CREEK	12/84	$2,850,000	65	$43,846	-5	39823
5	303-37-001A	ALMA SCHL/QUEEN CRK	12/84	$20,426,000	700	$29,180	-5	39823
6	304-01-005	BASELINE/HAWES	7/84	$3,552,500	161.33	$22,020	-10	34644
7	303-45-001A	MCQUEEN/OCOTILLO	2/85	$700,000	19.5	$35,897	-3	41894
8	303-46-013A	MCQUEEN S OF OCOTILLO	9/83	$340,000	19.5	$17,436	-20	24287
9	303-45-008	COOPER/CHANDLER HGTS	11/83	$1,180,000	38.409	$30,722	-18	26358
10	304-72-002	VAL VISTA/QUEEN CRK	2/85	$1,459,872	39.39	$37,062	-4	40858
11	304-72-015	VAL VISTA N OCOTILLO	3/85	$7,760,000	57.807	$134,240	-2	42930
12	304-76-007D	VAL VISTA/CHANDLER HTS	2/84	$840,000	75.05	$11,193	-15	29465
13	303-54-011B	NWC RIGGS/COOPER	8/83	$485,000	30.916	$15,688	-21	23251
14	303-54-013C	RIGGS W OF COOPER	9/83	$195,000	14.318	$13,619	-24	20144
15	304-10-002	GUADALUPE/LINDSAY	8/83	$3,000,000	72.19	$41,557	-25	19108
16	304-10-001B	GUADALUPE/LINDSAY	8/84	$2,546,120	63.653	$40,000	-25	19108

Regression Output:

Constant	45001.22
Std Err of Y Est	29164.36
R Squared	0.093708
No. of Observations	16
Degrees of Freedom	14
X Coefficient(s)	1035.7336843
Std Err of Coef.	860.85283584

REGRESSION LINE

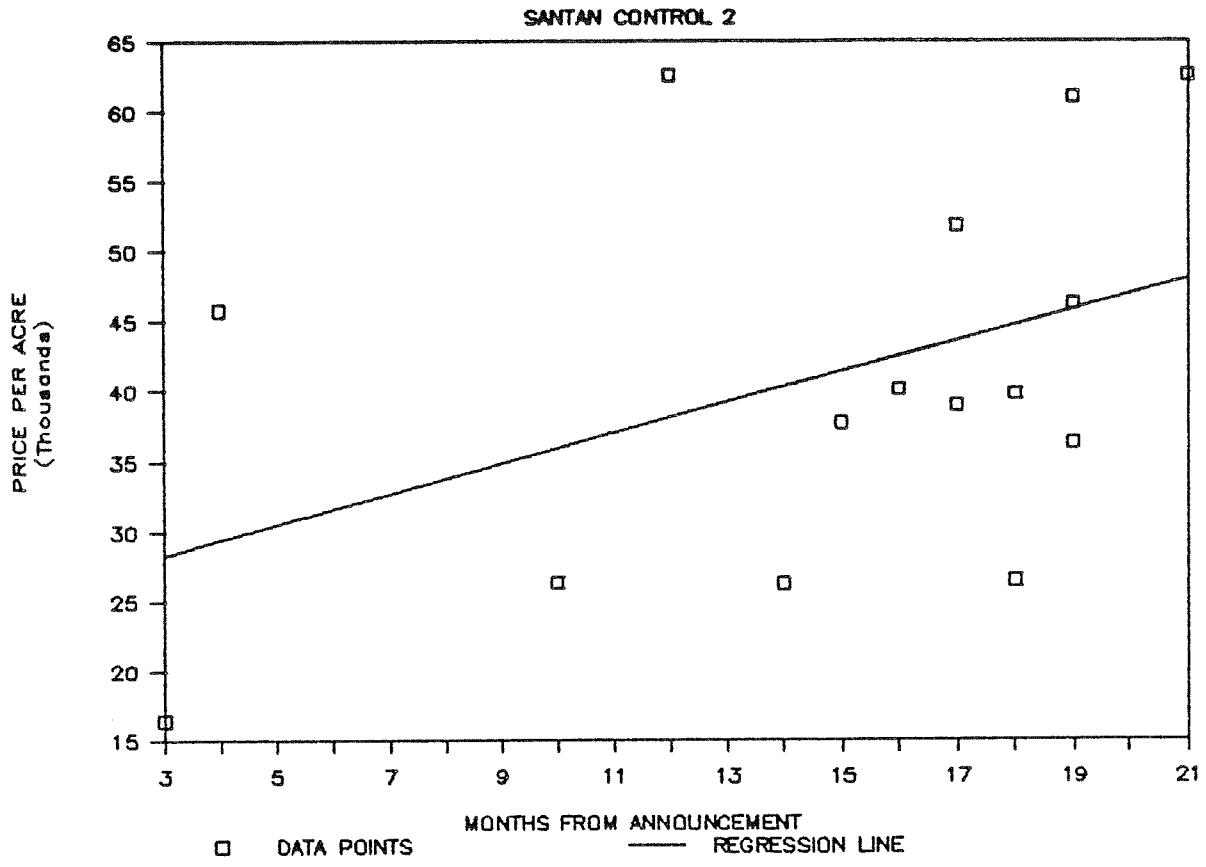


SALE NUMBER	ASSESSOR'S TAX PARCEL	APPROXIMATE LOCATION	DATE OF SALE	SALES PRICE	AREA (ACRES)	PRICE PER ACRE	MONTHS FROM 4/85	REGRESSION LINE
1	303-04-004	GUADALUPE/ELLSWORTH	12/86	$2,100,000	38.78	$54,152	21	85108
2	304-03-014J	ELLIOT/ELLSWORTH	6/86	$1,481,760	20	$74,088	15	66990
3	304-04-001B	HAWES/ELLIOT	10/86	$2,972,500	45.868	$64,806	19	79068
4	304-30-007D	WARNER/SOSSMAN	3/86	$1,255,972	9.75	$128,818	12	57931
5	304-03-002M	ELLSWORTH/GUADALUPE	10/86	$40,279,046	469.417	$85,807	19	79068
6	304-03-007B	HAWES/ELLIOT	12/86	$1,900,000	19.167	$99,129	21	85108
7	304-03-018	HAWES/ELLIOT	6/86	$1,481,760	25.659	$57,748	15	66990
8	304-03-022B	HAWES/ELLIOT	6/86	$345,600	9.783	$35,327	15	66990
9	304-03-024	HAWES/ELLIOT	6/86	$1,481,760	25.659	$57,748	15	66990
10	303-24-017C	RAY/RECKER	2/87	$3,756,640	18.315	$205,113	23	91147
11	303-27-007	GERMANN/ALMA SCHL	4/85	$1,656,500	39	$42,474	1	24715
12	304-13-004F	GILBERT/GALVESTON	9/85	$360,000	6.29	$57,234	6	39813
13	303-24-021Q	PECOS W OF DOBSON	1/86	$1,682,987	24.08	$69,891	10	51891
14	304-45-010	WILLIAMS FLD/VAL VISTA	1/86	$7,882,400	200.24	$39,365	10	51891
15	304-28-012	HIGLEY/KNOX RD	4/86	$350,000	7	$50,000	13	60950
16	303-30-006E	PECOS E OF COOPER	1/86	$2,208,000	39	$56,615	10	51891
17	303-29-006	GERMANN/MCQUEEN	7/86	$2,085,273	40.81	$51,097	16	70009
18	303-27-017	GERMANN E OF ALMA SCHL	11/86	$2,100,000	39	$53,846	20	82088
19	304-03-007B	BASELINE /HAWES	12/86	$1,900,000	19.17	$99,113	21	85108
20	303-30-006F	COOPER/PECOS	12/86	$2,788,290	41	$68,007	21	85108
21	303-25-012	WILLIS/PRICE	12/86	$3,088,000	39	$79,179	21	85108
22	304-05-007	PECOS/GILBERT	12/86	$5,267,031	80.38	$65,527	21	85108
24	304-27-001F	HIGLEY S OF WARNER	12/86	$445,000	9.9	$44,949	21	85108
25	304-55-009G	PECOS W OF GILBERT	1/87	$2,136,870	23	$92,907	22	88127
26	304-03-22B	GUADALUPE/HAWES	8/85	$200,000	9.77	$20,471	5	36793
27	304-31-005	HAWES/ELLIOT	8/85	$840,000	39.9	$21,053	5	36793
28	304-52-006B	GREENFIELD/GERMANN	8/85	$4,560,000	161.6	$28,218	5	36793

Regression Output:

Constant	21694.91
Std Err of Y Est	32353.24
R Squared	0.274867
No. of Observations	27
Degrees of Freedom	25
X Coefficient(s)	3019.6491057
Std Err of Coef.	980.91859619

REGRESSION LINE



SALE NUMBER	ASSESSOR'S TAX PARCEL	APPROXIMATE LOCATION	DATE OF SALE	SALES PRICE	AREA (ACRES)	PRICE PER ACRE	MONTHS FROM 4/85	REGRESSION LINE
1	304-76-013B	VAL VISTA/CHANDLER HTS	6/85	$160,000	9.75	$16,410	3	28291
2	304-13-010	ELLIOT/VAL VISTA	7/85	$7,312,360	160	$45,702	4	29385
3	303-55-006	COOPER N OF RIGGS	1/86	$5,836,590	221.89	$26,304	10	35948
4	304-76-007D	VAL VISTA/CHANDLER	5/86	$1,962,096	75.05	$26,144	14	40323
5	303-44-022	COOPER/OCTILLO	8/86	$1,915,701	37	$51,776	17	43604
6	304-75-004R	LINDSAY/OCTILLO	10/86	$711,156	15.4	$46,179	19	45792
7	304-16-005	ELLIOT W OF POWER	10/86	$2,900,000	80	$36,250	19	45792
8	304-72-001A	VAL VISTA/QUEEN CRK	9/86	$2,111,081	79.99	$26,392	18	44698
9	304-73-008B	LINDSAY/OCOTILLO	12/86	$1,546,739	38.91	$39,752	18	44698
10	304-76-010C	GREENFIELD/OCOTILLO	3/87	$640,000	10.24	$62,500	21	47979
11	304-02-002B	ELLSWORTH/ELLIOT	8/86	$760,000	19.5	$38,974	17	43604
12	303-45-006E	CHANDLER HGHTS/MCQUEEN	10/86	$2,134,541	35.021	$60,950	19	45792
13	303-37-006J	QUEEN CREEK/DOBSON	6/86	$1,115,552	29.621	$37,661	15	41417
14	304-70—007A	GREENFIELD/QUEEN CRK	7/86	$448,400	11.192	$40,064	16	42510
15	304-75-007R	GREENFIELD/OCOTILLO	10/86	$711,155	15.395	$46,194	19	45792
16	304-76-010B	GREENFIELD/OCOTILLO	3/87	$640,000	10.239	$62,506	12	38135

Regression Output:

Constant	25009.93
Std Err of Y Est	12804.18
R Squared	0.182023
No. of Observations	16
Degrees of Freedom	14

X Coefficient(s)	1093.7734768
Std Err of Coef.	619.68331566

10.3.3 Summary and Conclusions

From our regression analysis we found an increase of speculation within the impact area about eight months prior to the announcement. After the announcement, increases in value were almost double those found outside of the corridor.

This study was restricted by the limited number of transactions and the location of the control group east of the impact area. The location near the White Tank Mountains made a sampling west of the area almost impossible.

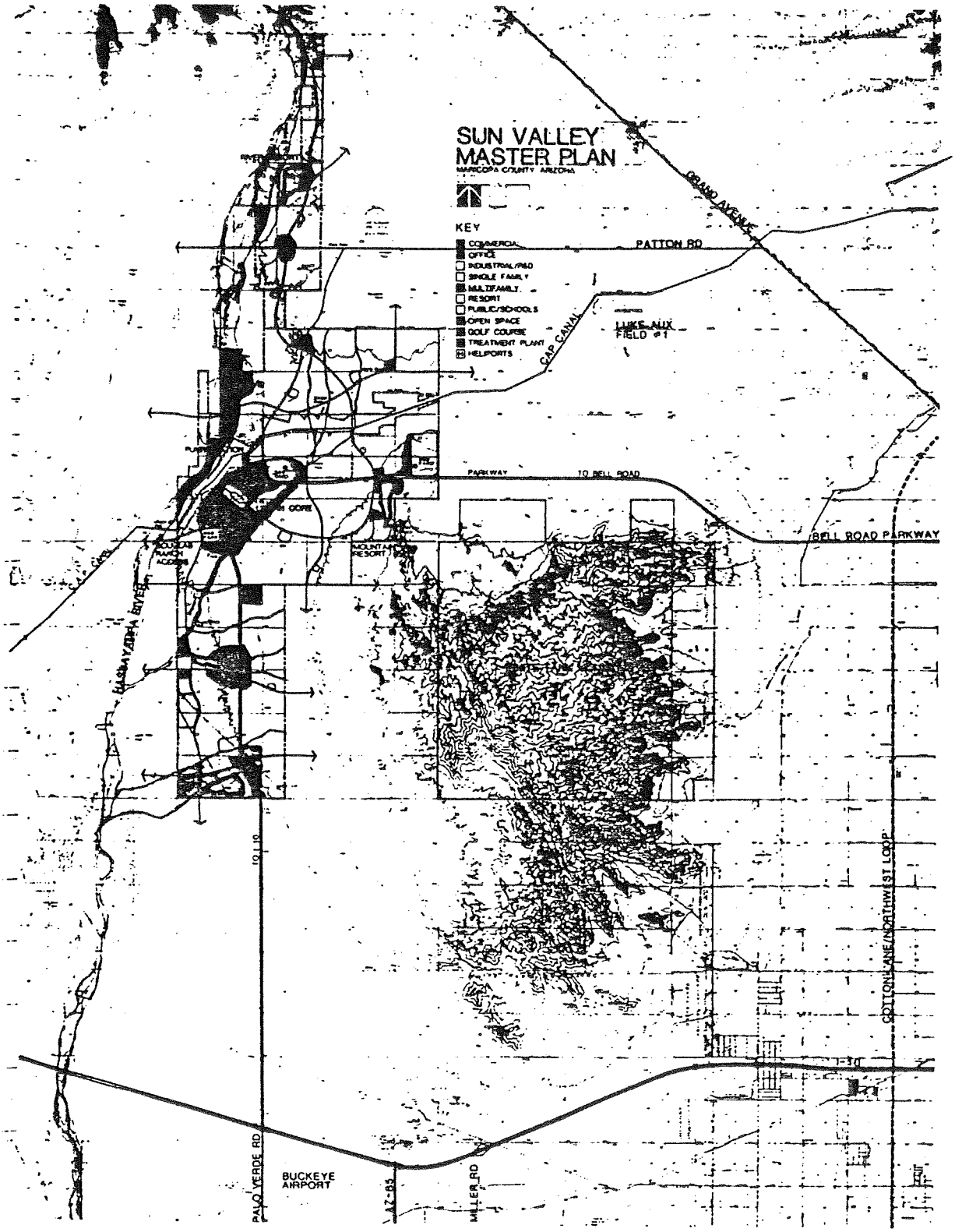
Our survey of vacant land transactions appears more relevant than the tracking of all sales recorded between 2/83 and 9/86 for the study areas. In all cases, however, the number of sales actually declined after the announcement of the Estrella Freeway.

10.4 Sun Valley Expressway

With land prices about one-fourth those for large development parcels in other portions of the Phoenix area and the largest untapped watershed in Arizona, developers Edward Robson and Joe Adams saw real potential for a new master planned retirement community. The only problem with development potential was perceived to be access.

Though all sources do not agree, it is generally accepted that the announcement to build a privately funded expressway along the Palo Verde Road alignment north from Interstate Highway 10, curving east along the Granite Reef Aqueduct and connecting with Bell Road just east of the White Tank Mountains, occurred in April 1986. Maricopa County gave its approval August 11, 1986 for the Sun Valley Parkway, which is to be dedicated to the County after completion. The County has sold tax exempt bonds for financing the Parkway and is holding the funds in escrow pending completion of bid awards and related matters. All participating land owners are subject to a $1,687 minimum per acre assessment under a Bond Deed of Trust, for the Sun Valley Parkway. The assessment varies in rate from 6.5 percent to 7.5 percent. It is to be paid over 15 years, commencing in March 1988.

An enhancement assessment of a minimum of $500 upward to $750 per acre is also imposed, carrying interest at 9 3/8 percent. Interest is to accrue during the first three years, with payments to be made semiannually in years 4 through 10.



MOUNTAIN WEST

These assessments are made to secure the $82,000,000 in bonds for the Parkway. Funds raised by the bond issue will supply the necessary capital to construct the Parkway, which was estimated at approximately $42,000,000, in addition to soft costs, interest carry, reserves, and miscellaneous expenses. Our understanding is that the difference between the bid of $27.8 million and $42 million is not to be reallocated back to the land owners for an approximate 3 to 4 year period to insure that there are not unaccounted costs in the construction phase.

The design of the Parkway is being done by the cooperative land owners' architects and engineers. Construction will be done under the supervision of the cooperative land owners' agents. County cooperation is provided by a Maricopa County Highway Department project engineer.

Bids were opened in mid-May 1987 with the $27.8 million low bid well below initial forecasts. It is expected that the construction contractor will be signed by mid-June 1987 and that construction will start in mid-July or early August 1987. The construction timetable is expected to run 15 to 20 months. As a result, the Parkway is expected to open by late 1988 or January 1989.

10.4.1 Regression Analysis

As in the former study, transactions of raw land were tracked both before and after the April 1986 announcement and within the one mile to two mile corridor versus control areas outside of the impact area.

Thirty sales were found within the corridor prior to the announcement. Our regression analysis demonstrates an appreciation rate between January 1983 and April 1986 to be 1.877 percent per month, simple yield or approximately 22.5 percent per annum.

The control group outside of the corridor, using 27 sales, yielded an increase of 1.438 percent per month or 17.3 percent per year. We believe that some of the disparity between corridor and control groups rests with the location of the control groups. Both the southerly control group (between 309th Avenue and 355th Avenue, I-10 and Indian School Road) and the northerly control group (between 195th Avenue to Johnson Road, along Patton Road) are located further outside of the development perimeters for the Phoenix metropolitan area than the corridor. Further, we were

unable to control groups east and south of the corridor due to proximity to the White Tank Mountains.

Once the announcement was given, average land prices within the corridor jumped from $2,346 per acre to $5,329 per acre. The array of data points on Sun Valley I regression line shows that speculation had been building just prior to the announcement. After the announcement, corridor prices continued to escalate at an average of 6.571 percent per month, or 78.9 percent per year.

Our control group also experienced substantial appreciation. While virtually no sales activity occurred within the corridor area for 1987, we were able to track some of these for the control groups. The rate of appreciation parallels the corridor at an average yield of 6.845 percent per month, or 82.1 percent per year.

We did find many of the same buyers and sellers within all four samples.

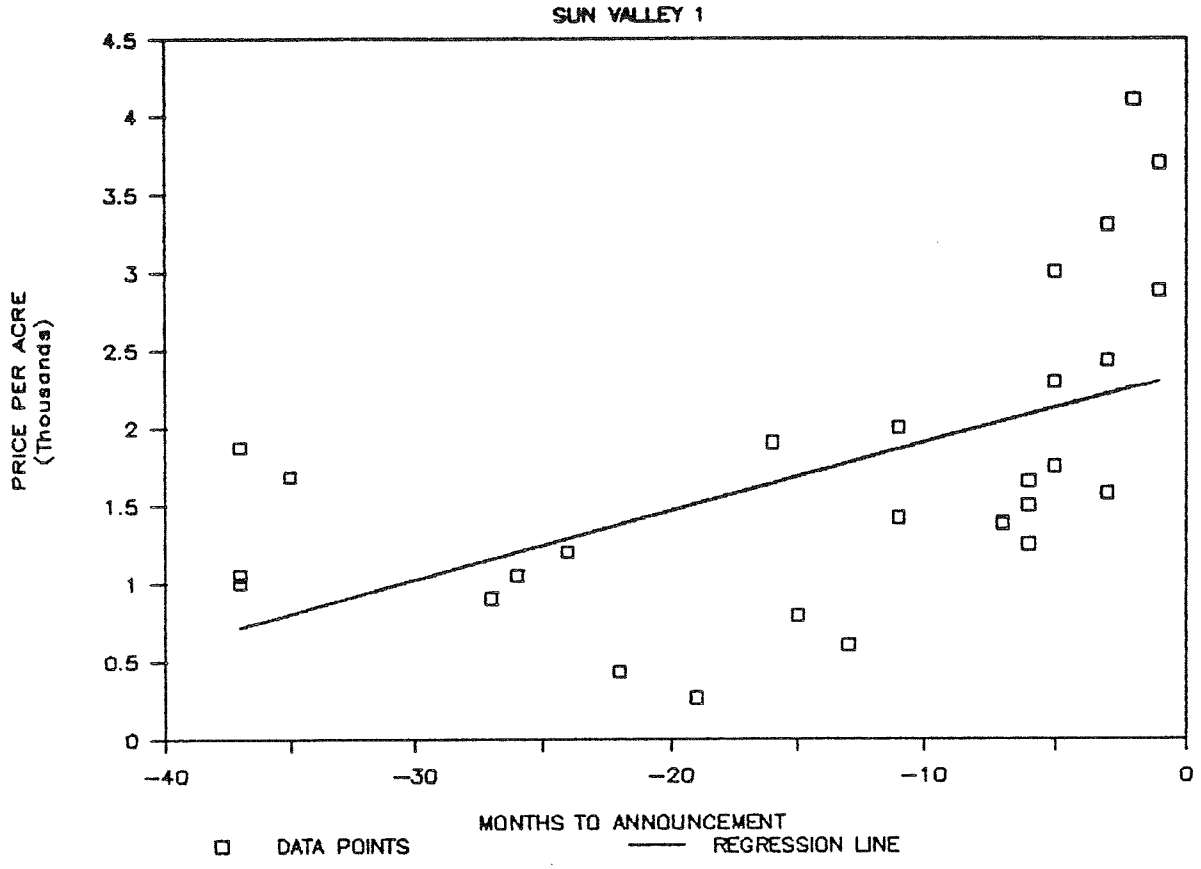
10.4.2 Survey of Transactions

The following sales summary includes all transactions recorded within the corridor and control areas used for this study. Because of programming, all transactions in both the corridor and control groups were held to the April 1985 announcement rather than 1986. The results of the survey are summarized below:

	Before Announcement 2/83 to 4/85		After Announcement 4/85 to 9/86	
	Corridor	Control	Corridor	Control
Average All Values	2,417,778	39,330	311,050	209,786
No. of Transactions	70	60	107	73
Average Vacant Values	21,236	35,603	213,267	125,063
No. of Transactions	22	44	45	28

As the announcement dates do not agree, we cannot comment on date-specific valuation from announcement. However, the differences between corridor and control groups since April 1985 indicate a flurry of activity in the corridor and a decline of transactions within the control areas.

REGRESSION LINE



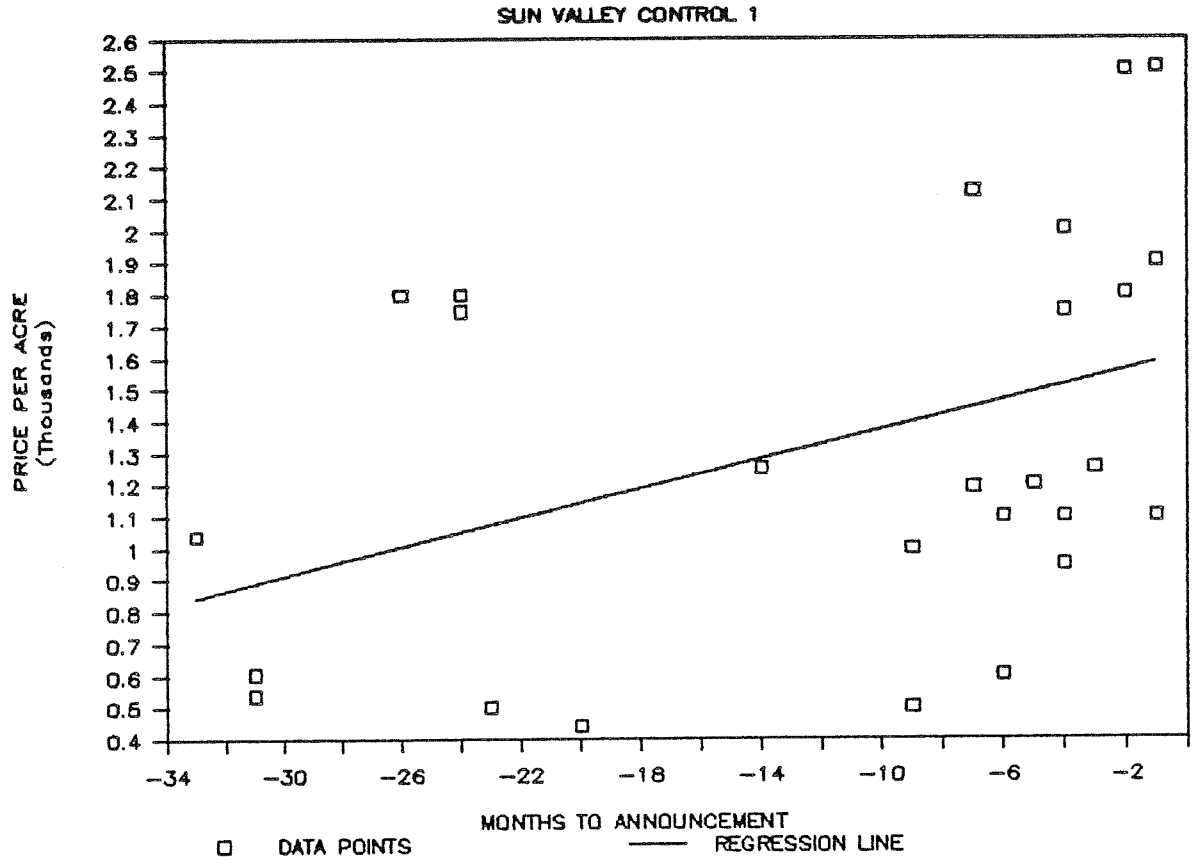
SALE NUMBER	ASSESSOR'S TAX PARCEL	APPROXIMATE LOCATION	DATE OF SALE	SALES PRICE	AREA (ACRES)	PRICE PER ACRE	MONTHS FROM 4/86	REGRESSION LINE
1	504-06-016	3 MILES N. OF I-10	9/85	$220,000	160	$1,375	-7	2037
2	504-06-017	3 MILES N. OF I-10	11/85	$280,000	160	$1,750	-5	2125
3	504-04-012	6 MILES N. OF I-10	3/86	$920,750	320	$2,877	-1	2301
4	504-04-015	6.5 MILES N. OF I-10	3/86	$920,750	320	$2,877	-1	2301
5	504-06-004	3 MILES N. OF I-10	3/86	$592,000	160	$3,700	-1	2301
6	504-07-011	3 MILES N. OF I-10	9/85	$222,000	160	$1,388	-7	2037
7	504-07-004A	3 MILES N. OF I-10	10/85	$16,500	10	$1,650	-6	2081
8	504-07-004B	3 MILES N. OF I-10	10/85	$16,500	10	$1,650	-6	2081
9	504-15-032E	1 MILE N. OF I-10	11/85	$60,000	20	$3,000	-5	2125
10	504-15-047A	1 MILE N. OF I-10	3/84	$3,000	2.5	$1,200	-24	1289
11	504-15-047A	1 MILE N. OF I-10	12/84	$4,750	2.5	$1,900	-16	1641
12	504-15-575C	1 MILE N. OF I-10	11/85	$33,000	14.393	$2,293	-5	2125
13	504-15-590	1 MILE N. OF I-10	1/86	$13,000	5.356	$2,427	-3	2213
14	504-16-007C	1 MILE N. OF I-10	5/85	$116,000	81.76	$1,419	-11	1861
15	504-16-012A	1 MILE N. OF I-10	10/85	$237,500	190	$1,250	-6	2081
16	504-16-032	.5 MILE N. OF I-10	10/85	$15,000	10	$1,500	-6	2081
17	503-77-001B	8 MILES W. OF GRAND	5/85	$10,000	5	$2,000	-11	1861
18	503-77-001B	8 MILES W. OF GRAND	1/86	$16,500	5	$3,300	-3	2213
19	503-77-012D	8 MILES W. OF GRAND	2/83	$8,000	4.27	$1,874	-37	716
20	503-77-012E	8 MILES W. OF GRAND	4/83	$16,000	9.5	$1,684	-35	804
21	503-78-001	9 MILES W. OF GRAND	3/85	$96,000	160	$600	-13	1773
22	503-78-008G	9 MILES W. OF GRAND	8/84	$10,000	38.025	$263	-19	1509
23	503-78-008G	9 MILES W. OF GRAND	1/85	$30,000	38.025	$789	-15	1685
24	503-78-008G	9 MILES W. OF GRAND	1/86	$60,000	38.025	$1,578	-3	2213
25	503-78-009G	9 MILES W. OF GRAND	5/84	$8,000	18.525	$432	-22	1377
26	503-78-009G	9 MILES W. OF GRAND	2/86	$76,050	18.525	$4,105	-2	2257
27	503-78-010S	9 MILES W. OF GRAND	2/83	$20,000	20	$1,000	-37	716
28	503-78-010T	9 MILES W. OF GRAND	2/83	$20,000	19	$1,053	-37	716
29	503-80-024B	10 MILES W. OF GRAND	1/84	$4,500	5	$900	-27	1157
30	503-82-004M	11 MILES W. OF GRAND	2/84	$21,000	20	$1,050	-26	1201

Regression Output:

Constant	2345.527
Std Err of Y Est	805.5450
R Squared	0.306832
No. of Observations	30
Degrees of Freedom	28

X Coefficient(s)	44.036670198
Std Err of Coef.	12.5084539164

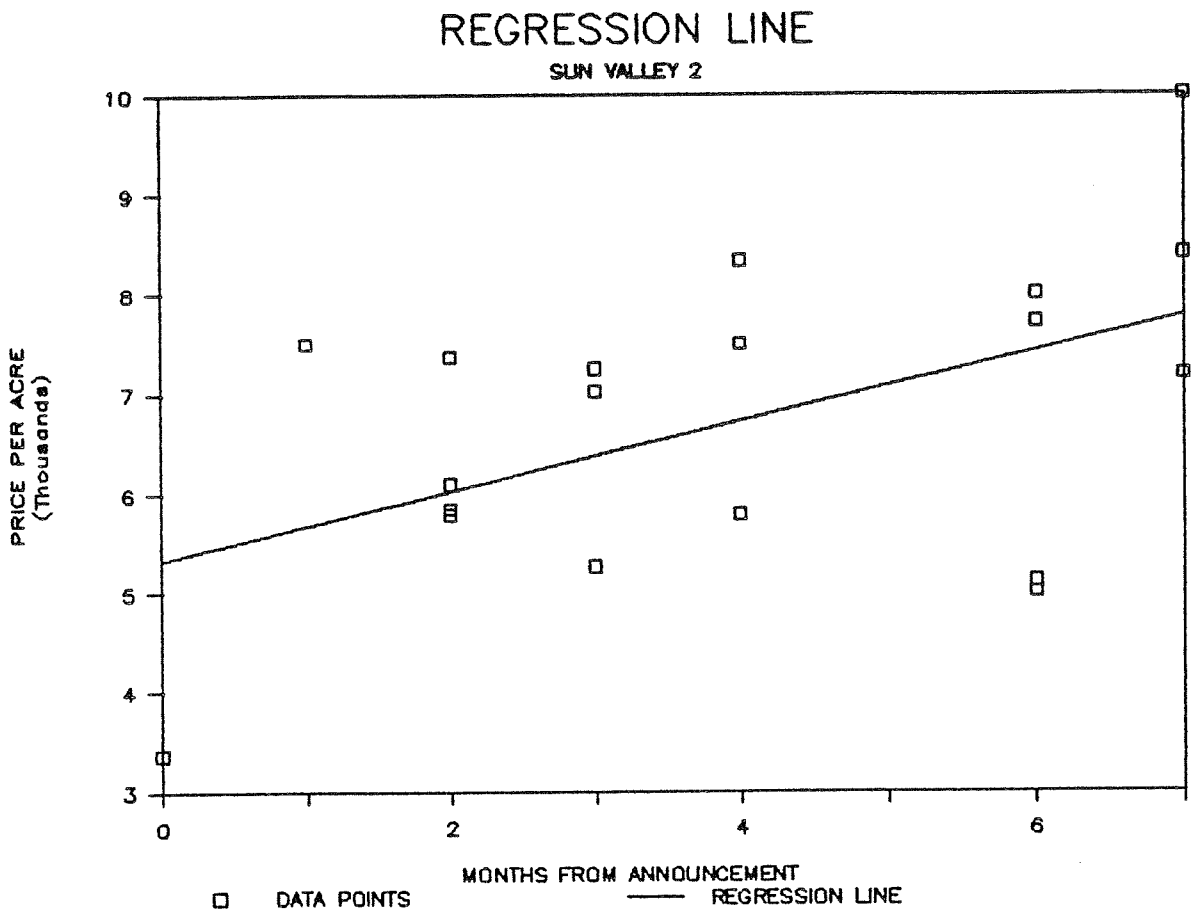
REGRESSION LINE



SALE NUMBER	ASSESSOR'S TAX PARCEL	APPROXIMATE LOCATION	DATE OF SALE	SALES PRICE	AREA (ACRES)	PRICE PER ACRE	MONTHS FROM 4/86	REGRESSION LINE
1	504-08-002B	3 MILES N. OF I-10	2/86	$36,000	20	$1,800	-2	1558
2	504-08-002H	3 MILES N. OF I-10	3/86	$22,000	20	$1,100	-1	1581
3	504-08-004E	3 MILES N. OF I-10	2/86	$300,000	120	$2,500	-2	1558
4	504-08-006A	3 MILES N. OF I-10	11/85	$144,000	120	$1,200	-5	1488
5	504-08-006C	3 MILES N. OF I-10	12/85	$40,000	20	$2,000	-4	1512
6	504-08-006D	3 MILES N. OF I-10	12/85	$40,000	20	$2,000	-4	1512
7	504-08-059	3 MILES N. OF I-10	3/86	$5,267	2.1	$2,508	-1	1581
8	504-08-079	3 MILES N. OF I-10	9/83	$1,250	2.066	$605	-31	889
9	504-08-091	3 MILES N. OF I-10	9/83	$1,250	2.321	$539	-31	889
10	504-08-177	3 MILES N. OF I-10	9/85	$2,500	2.1	$1,190	-7	1442
11	504-09-001	3 MILES N. OF I-10	10/85	$60,000	100	$600	-6	1465
12	504-09-001	3 MILES N. OF I-10	3/86	$190,000	100	$1,900	-1	1581
13	504-10-001A	4 MILES N. OF I-10	7/84	$88,000	200	$440	-20	1143
14	504-10-002G	5 MILES N. OF I-10	4/84	$40,000	80	$500	-23	1073
15	504-10-002M	4 MILES N. OF I-10	12/85	$22,000	20	$1,100	-4	1512
16	504-10-002R	5 MILES N. OF I-10	7/85	$5,000	10	$500	-9	1396
17	504-10-004	2 MILES N. OF I-10	12/85	$113,500	120	$946	-4	1512
18	504-10-008D	2 MILES N. OF I-10	7/85	$110,000	110	$1,000	-9	1396
19	504-10-009	1 MILE N. OF I-10	12/85	$139,600	80	$1,745	-4	1512
20	503-32-002C	6 MILES W. OF GRAND	1/86	$25,000	20	$1,250	-3	1535
21	503-32-013X	6 MILES W. OF GRAND	7/83	$36,400	35.071	$1,038	-33	843
22	503-34-001W	3 MILES W. OF GRAND	10/85	$5,500	5	$1,100	-6	1465
23	503-34-027A	3 MILES W. OF GRAND	3/84	$35,000	20.055	$1,745	-24	1050
24	503-34-028	3 MILES W. OF GRAND	1/84	$72,000	40.085	$1,796	-26	1004
25	503-34-029	3 MILES W. OF GRAND	9/85	$85,000	40.075	$2,121	-7	1442
26	503-34-034	3 MILES W. OF GRAND	3/84	$72,000	40.082	$1,796	-24	1050
27	503-35-010	1 MILE W. OF GRAND	2/85	$12,500	10	$1,250	-14	1281

Regression Output:

Constant	1603.786
Std Err of Y Est	580.4528
R Squared	0.158120
No. of Observations	27
Degrees of Freedom	25
X Coefficient(s)	23.057733636
Std Err of Coef.	10.640879953


REGRESSION LINE
SUN VALLEY 2
PRICE PER ACRE
(Thousands)
10
9
8
7
6
5
4
3
0
2
4
6
MONTHS FROM ANNOUNCEMENT
DATA POINTS
REGRESSION LINE

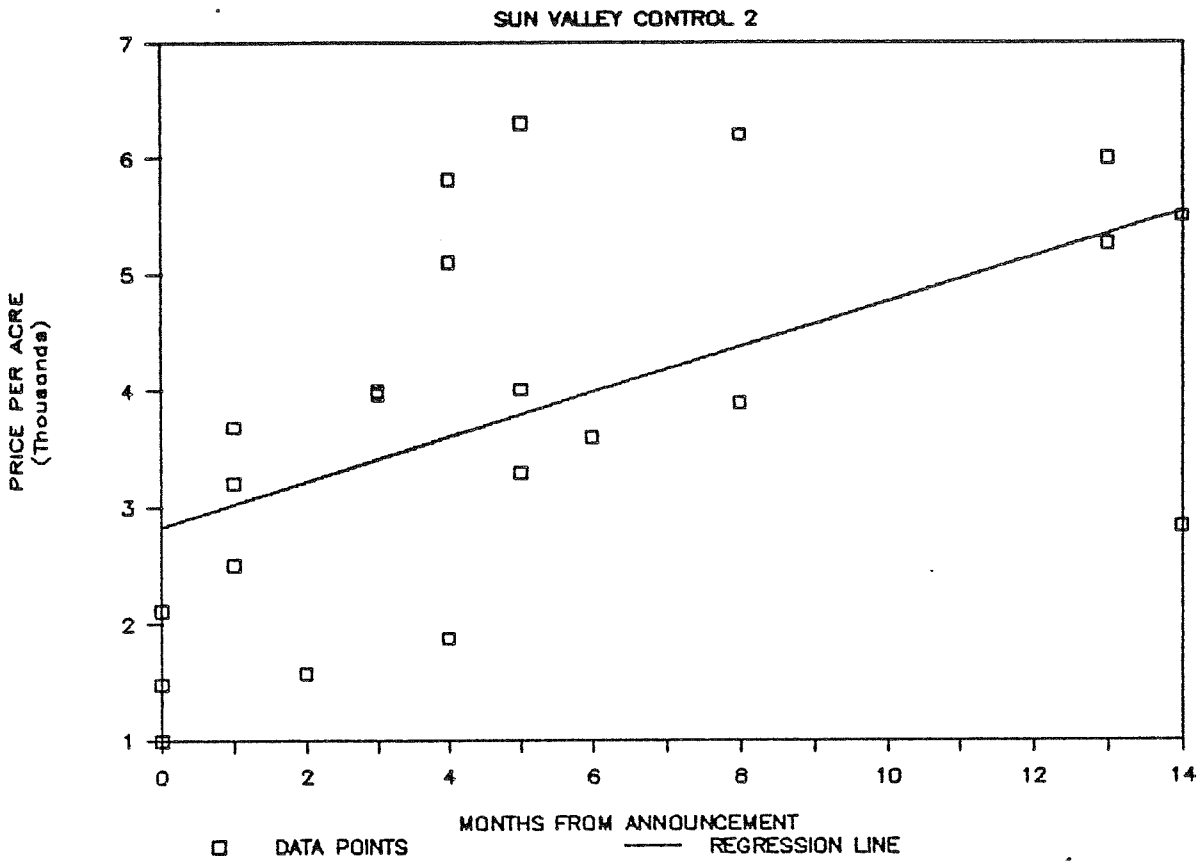
SALE NUMBER	ASSESSOR'S TAX PARCEL	APPROXIMATE LOCATION	DATE OF SALE	SALES PRICE	AREA (ACRES)	PRICE PER ACRE	MONTHS FROM 4/86	REGRESSION LINE
1	504-16-015	1 MILE N. OF I-10	11/86	$400,000	40	$10,000	7	7780
2	504-16-005A	1 MILE N. OF I-10	10/86	$8,600,000	1113.71	$7,722	6	7430
3	504-16-005A	1 MILE N. OF I-10	10/86	$5,698,306	1113.71	$5,117	6	7430
4	504-16-011	1 MILE N. OF I-10	10/86	$400,000	80	$5,000	6	7430
5	504-16-012A	1 MILE N. OF I-10	8/86	$1,563,002	187.578	$8,333	4	6730
6	504-16-049	1 MILE N. OF I-10	8/86	$55,000	9.5	$5,789	4	6730
7	504-16-004F	1 MILE N. OF I-10	8/86	$75,000	10	$7,500	4	6730
8	504-16-013C	1 MILE N. OF I-10	7/86	$290,000	40	$7,250	3	6380
9	504-16-026	1 MILE N. OF I-10	7/86	$100,000	19	$5,263	3	6380
10	504-16-024A	1 MILE N. OF I-10	7/86	$50,000	9.5	$5,263	3	6380
11	504-16-024B	1 MILE N. OF I-10	7/86	$200,000	28.5	$7,018	3	6380
12	504-16-035	1 MILE N. OF I-10	6/86	$70,000	9.5	$7,368	2	6030
13	504-16-030	1 MILE N. OF I-10	6/86	$55,560	9.5	$5,848	2	6030
14	504-16-003C	1 MILE N. OF I-10	6/86	$61,000	10	$6,100	2	6030
15	504-16-003D	I MILE N. OF I-10	6/86	$61,000	10	$6,100	2	6030
16	504-16-046	1 MILE N. OF I-10	6/86	$55,000	9.5	$5,789	2	6030
17	504-16-004B	1 MILE N. OF I-10	5/86	$300,000	40	$7,500	1	5679
18	504-06-005	1 MILE N. OF I-10	4/86	$3,750,000	1113.71	$3,367	0	5329
19	504-72-006B	12 MILES N. OF I-10	11/86	$8,071,148	959.84	$8,409	7	7780
20	503-84-040	16 MILES W. OF GRAND	11/86	$4,118,682	573.05	$7,187	7	7780
21	503-81-041	16 MILES W. OF GRAND	10/86	$1,278,085	159.69	$8,004	6	7430

Regression Output:

Constant	5329.171
Std Err of Y Est	1339.823
R Squared	0.247009
No. of Observations	21
Degrees of Freedom	19

X Coefficient(s)	350.18561295
Std Err of Coef.	140.26827316

REGRESSION LINE



SALE NUMBER	ASSESSOR'S TAX PARCEL	APPROXIMATE LOCATION	DATE OF SALE	SALES PRICE	AREA (ACRES)	PRICE PER ACRE	MONTHS FROM 4/86	REGRESSION LINE
1	504-03-005	4 MILES N. OF I-10	5/86	$800,000	320	$2,500	1	3026
2	504-08-061	3 MILES N. OF I-10	4/86	$5,000	3.382	$1,478	0	2832
3	504-08-135	3 MILES N. OF I-10	9/86	$17,680	4.4	$4,018	5	3801
4	504-10-002H	2 MILES N. OF I-10	5/86	$256,413	80	$3,205	1	3026
5	504-10-005D	1 MILE N. OF I-10	6/86	$90,000	57.244	$1,572	2	3220
6	504-10-008F	2 MILES N. OF I-10	4/86	$78,000	78	$1,000	0	2832
7	504-10-008H	1 MILE N. OF I-10	8/86	$220,000	37.818	$5,817	4	3607
8	503-31-003	6 MILES W. OF GRAND	4/86	$3,375,509	1600	$2,110	0	2832
9	503-32-011C	6 MILES W. OF GRAND	7/86	$160,000	40	$4,000	3	3414
10	503-32-011D	6 MILES W. OF GRAND	7/86	$320,000	80	$4,000	3	3414
11	503-32-011E	6 MILES W. OF GRAND	7/86	$160,000	40	$4,000	3	3414
12	503-34-001B	3 MILES W. OF GRAND	5/86	$32,500	8.825	$3,683	1	3026
13	503-34-001R	3 MILES W. OF GRAND	7/86	$35,000	8.825	$3,966	3	3414
14	503-34-001R	3 MILES W. OF GRAND	8/86	$45,000	8.825	$5,099	4	3607
15	503-34-003A	2 MILES W. OF GRAND	9/86	$378,000	60	$6,300	5	3801
16	503-30-002B	6 MILES W. OF GRAND	8/86	$150,000	80	$1,875	4	3607
17	503-30-011A	5 MILES W. OF GRAND	9/86	$528,000	160	$3,300	5	3801
18	503-30-018B	5 MILES W. OF GRAND	10/86	$144,000	40	$3,600	6	3995
19	503-30-018B	5 MILES W. OF GRAND	6/87	$220,000	40	$5,500	14	5546
20	503-30-024G	5 MILES W. OF GRAND	5/87	$180,000	30	$6,000	13	5352
21	504-03-005	6 MILES N. OF I-10	5/87	$1,685,785	320	$5,268	13	5352
22	504-09-002C	3 MILES N. OF I-10	6/87	$56,798	20	$2,840	14	5546
23	504-10-002M	1 MILE N. OF I-10	12/86	$78,000	20	$3,900	8	4383
24	504-10-010	1 MILE N. OF I-10	12/86	$62,000	10	$6,200	8	4383

Regression Output:

Constant	2832.071
Std Err of Y Est	1324.536
R Squared	0.309326
No. of Observations	24
Degrees of Freedom	22
X Coefficient(s)	193.85110181
Std Err of Coef.	61.756826575

The average price per transaction before the announcement was $2,417,778 versus the average price after the announcement being $311,050. The decline is primarily due to the fact that there were numerous large multiple transactions which took place within the corridor. Subsequent to the announcement, a larger number of transactions took place having smaller size making the data less significant.

Of some relevance is the fact that:

1. the average price of vacant land within the corridor increased at a greater rate after the announcement than land within the control area; and

2. the number of transactions within the corridor doubled after the announcement, while the number of transactions in the control area declined significantly suggesting a shift in location to the corridor, as well as an increase in value.

10.4.3 Summary and Conclusions

For the Sun Valley Expressway Corridor, it is important to note that the land owners are privately supporting this venture. To a certain extent, the opportunity costs are reflected within the purchase prices and the differential is expressed in the constant used in the regression equations after April 1986:

Corridor	$5,329
Control	2,832
Difference	$2,497

Please note that the average assessment per acre for the expressway will be about $2,200.

We believe that the announcement of the expressway in conjunction with a master planned community enhanced speculation within and outside of the impact area. A further study should be undertaken upon completion of the expressway.

10.5 South Mountain Parkway

Known as the Southwest Loop, the South Mountain Parkway will begin from Interstate Highway 10 and head west along Pecos Road. The alignment essentially skirts

the Gila River Indian Reservation until it reaches 59th Avenue, jogging through Laveen and connecting with the Papago Freeway.

Very little controversy surrounds this parkway along the reservation boundary. However, the Laveen Planning Committee wishes to have the alignment moved to between 75th and 83rd Avenues. It is also uncertain whether, given the 59th Avenue alignment, the interchange will be at 59th Avenue when linked to the Papago, or something further east.

Completion of this freeway is anticipated for 1995.

10.5.1 Regression Analysis

Of all of the corridors we surveyed, South Mountain was the most difficult for adequate sales information. To keep use constant, a substantial number of industrial sales were dropped, leaving less than ten each for sales prior to the announcement. Sales obtained after the announcement were not much better, but were used due to the curious nature of the samples drawn.

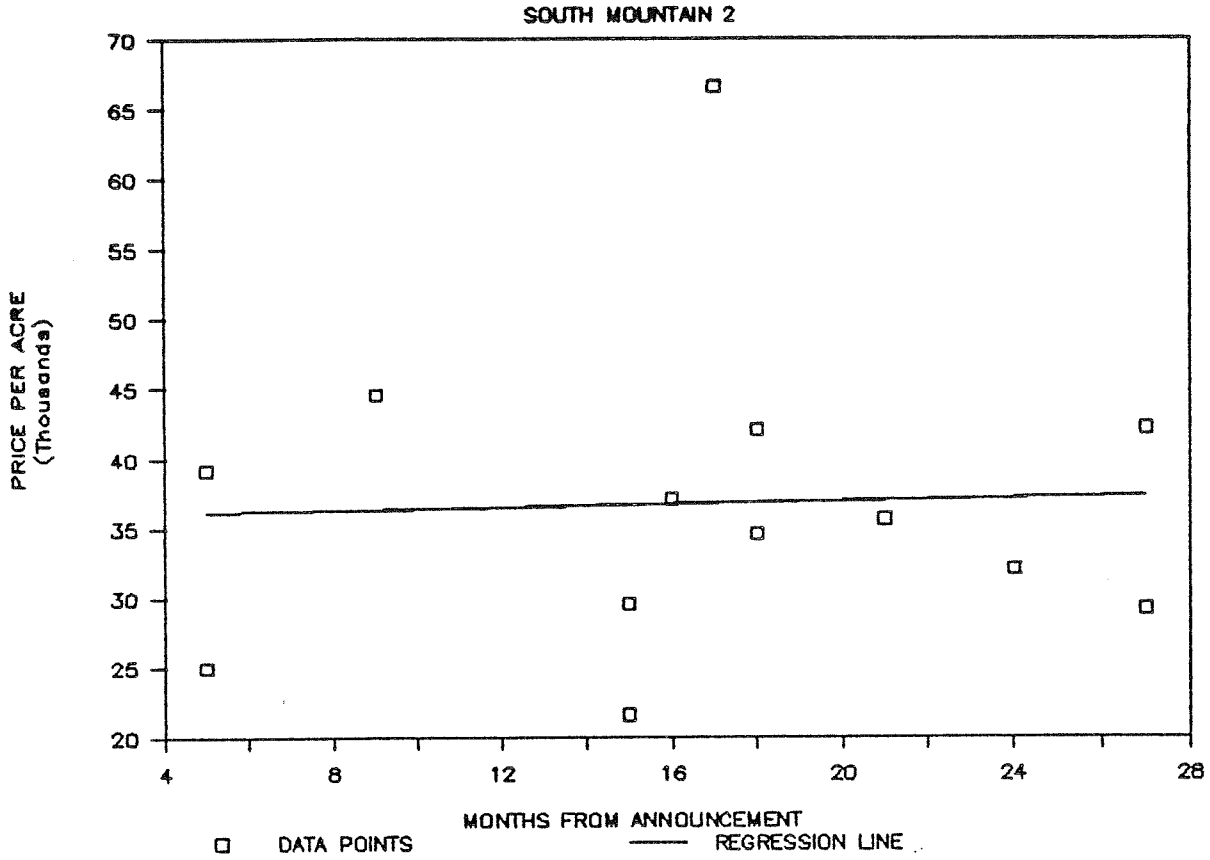
In the case of graph, South Mountain 2, the corridor shows a growth of less than 2/10 percent per month; but, the coefficient of dispersion (R squared) suggests that the distribution about the mean is extremely relevant. For the control group the overall values are lower, but the appreciation rate is 4.73 percent per month.

No reasonable conclusion can be drawn due to the nature of the sample used for analysis.

10.5.2 Survey of Transactions

For this analysis we used 2,703 recorded sales transactions prior to the announcement and 1,629 after the announcement. Of these, only 447 total land transactions could be found, most of these vacant residential lots. A summary of our findings is as follows:

REGRESSION LINE



SALE NUMBER	ASSESSOR'S TAX PARCEL	APPROXIMATE LOCATION	DATE OF SALE	SALES PRICE	AREA (ACRES)	PRICE PER ACRE	MONTHS FROM 4/85	REGRESSION LINE
1	104-48-001	L.BUCKEYE/67TH AVE	8/85	$1,974,692	78.95	$25,012	5	36153
2	104-45-002	L. BUCKEYE/51ST AVE	8/85	$3,000,000	76.61	$39,159	5	36153
3	104-47-001B	L.BUCKEYE/59TH AVE	6/86	$577,019	19.5	$29,591	15	36647
4	104-47-003E	L. BUCKEYE/63RD AVE	9/86	$1,680,280	40	$42,007	18	36795
5	301-79-006A	24TH S OF WILLIAMS FLD	12/86	$2,723,955	76.505	$35,605	21	36944
6	104-26-002H	BUCKEYE/59TH AVE	6/87	$1,343,402	31.923	$42,083	27	37240
7	104-47-001B	L. BUCKEYE/59TH AVE	6/86	$420,686	19.5	$21,574	15	36647
8	104-72-003H	59TH AVE/SOUTHERN	7/86	$263,843	7.128	$37,015	16	36696
9	104-59-001D	55TH AVE/BROADWAY	3/87	$200,000	6.251	$31,995	24	37092
10	301-89-001D	RURAL/PECOS	8/86	$4,538,400	68.179	$66,566	17	36746
11	301-70-006A	AREA 32ND ST/PECOS	12/86	$2,723,955	76.505	$35,605	21	36944
12	301-70-007B	AREA 32ND ST/PECOS	6/87	$2,652,000	91.014	$29,138	27	37240
13	104-26-002D	59TH AVE/BUCKEYE	12/86	$1,100,000	24.696	$44,542	9	36350
14	104-28-001	BUCKEYE/67TH AVE	9/86	$4,007,955	116	$34,551	18	36795

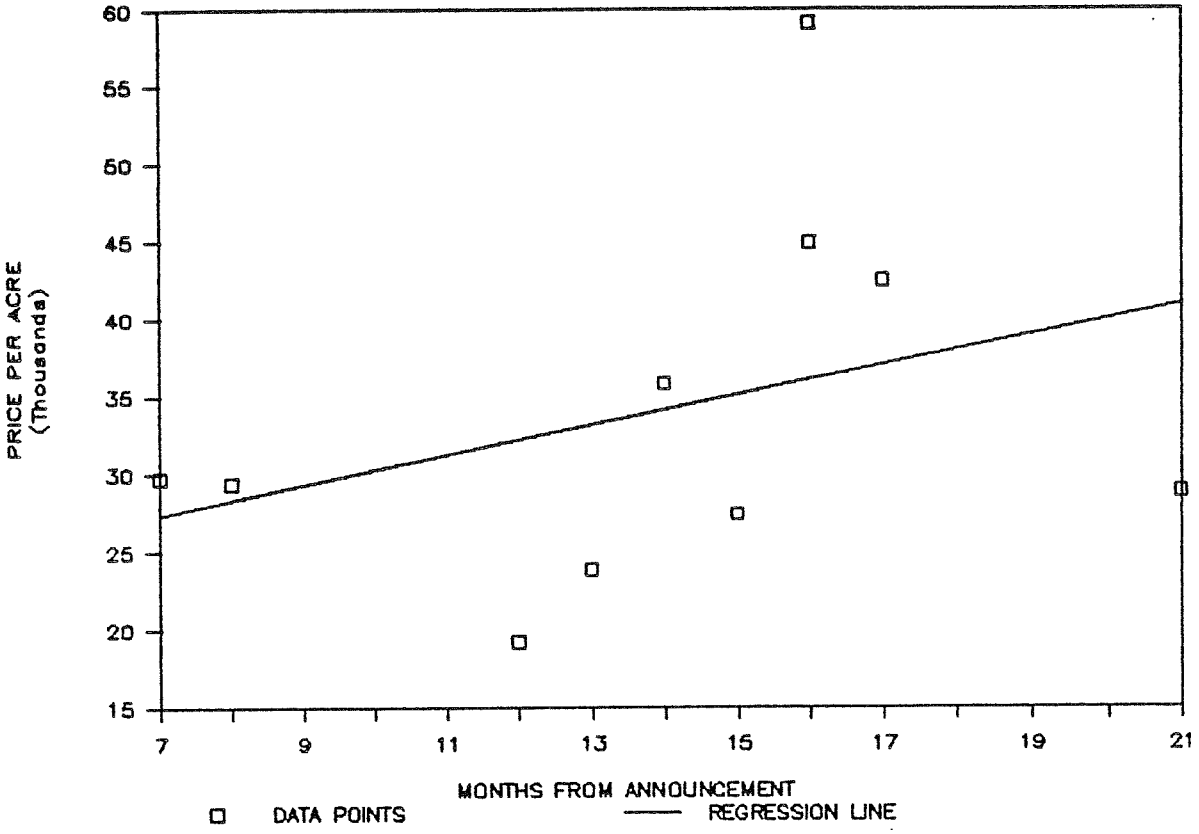
Regression Output:

Constant	35905.40
Std Err of Y Est	11245.13
R Squared	0.001036
No. of Observations	14
Degrees of Freedom	12

X Coefficient(s)	49.439351618
Std Err of Coef.	443.12054211

REGRESSION LINE

SOUTH MOUNTAIN CONTROL 2



SALE NUMBER	ASSESSOR'S TAX PARCEL	APPROXIMATE LOCATION	DATE OF SALE	SALES PRICE	AREA ACRES)	PRICE PER ACRE	MONTHS FROM 4/85	REGRESSION LINE
1	104-30-002D	75TH AVE S OF BUCKEYE	7/86	$1,722,723	38.33	$44,945	16	36130
2	104-35-002 L	BUCKEYE E OF 75TH AV	10/85	$2,349,300	79	$29,738	7	27378
3	104-32-01A	BUCKEYE/83RD AVE	8/86	$3,199,740	75.29	$42,499	17	37102
4	104-33-003 L	BUCKEYE E OF 83RD AV	12/86	$548,905	19	$28,890	21	40992
5	104-54-004	BROADWAY/75TH AVE	4/86	$930,632	39	$23,862	13	33212
6	104-55-004	BROADWAY/67TH AVE	3/86	$750,000	39	$19,231	12	32240
7	104-35-003	L BUCKEYE/75TH AVE	5/86	$1,374,084	38.333	$35,846	14	34185
8	104-30-002D	BUCKEYE/83RD AVE	7/86	$1,722,723	29.167	$59,064	16	36130
9	104-35-003	L BUCKEYE/75TH AVE	6/85	$1,051,594	38.33	$27,435	15	35157
10	104-35-002	L BUCKEYE/75TH AVE	11/85	$2,349,300	80	$29,366	8	28350

Regression Output:

Constant	20570.50
Std Err of Y Est	11752.27
R Squared	0.118386
No. of Observations	10
Degrees of Freedom	8
X Coefficient(s)	972.45156525
Std Err of Coef.	938.23273758

	Before Announcement 2/83 to 4/85		After Announcement 4/85 to 9/86	
	Corridor	Control	Corridor	Control
Average All Values	909,433	121,096	1,863,555	144,284
No. of Transactions	1,376	1,327	921	708
Average Vacant Values	392,325	130,516	786,086	162,742
No. of Transactions	115	194	48	90

The average price per transaction before the announcement was $909,433 versus the average price after the announcement being $1,863,555. The increase is primarily due to the fact that there were numerous large multiple transactions which took place within the corridor. Subsequent to the announcement, a larger number of transactions took place having a large size making the data significant. The increase in total value within the control area is a similar scenario with lower priced property.

Of some relevance is the fact that:

1. the average price of vacant land within the corridor increased at a greater rate after the announcement than land within the control area; and
2. the number of transactions within both areas declined significantly after the announcement, suggesting a shift in location to the corridor.

10.5.3 Summary and Conclusions

The sampling problems inherent with this study area suggest that additional research according to use should be pursued. Further, the sample prior to the announcement date should be expanded to include data, say, back to 1980.

10.6 Agua Fria Freeway

Part of the Outer Loop, the Agua Fria portion of the freeway system, begins at Yuma Road, and is aligned along 99th Avenue. Heading north, it jogs over and around the New River and Skunk Creek, then aligns with Beardsley Road and connects with Interstate Highway 17. Unlike most of the corridors which are the subjects of this report, the corridor begins within the agricultural areas along 99th Avenue and travels northward through residential, commercial, and industrial areas.

Now somewhat "media mature," major controversy centered along the northern alignment. The areas for consideration began at Bell Road and went north to Deer Valley Road. A final alignment along 99th Avenue needs to be established prior to acquisition, but has received considerably less publicity due to lack of improvements.

10.6.1 Regression Analysis

Controlling for a change in use over the four years surveyed posed a considerable problem in this study area. It did, however, provide us with an opportunity to consider the impact of the announcement on uses other than agricultural land or raw land. Hence, our regression analysis for the Agua Fria considered the appreciation of commercial property. Further, we were able to limit the scope of our searches to the corridor between Peoria Road and Union Hills Road, with our control group approximately one mile east.

Prior to April, 1985, we found a negligible increase in values per month in either the impact area or the control area. For the Agua Fria Corridor, increases of 1/10th of one percent, and for the control 6/10ths of one percent were measured. However, referring to graph, Agua Fria 1, the reader will note an increase in speculative activity within the corridor prior to the announcement. For the control area, the sales are not so clustered.

After the announcement, a significant jump in value occurred within the corridor for sampling purposes. Note that the line leaves graph, Agua Fria 1 at $2.15 per square foot and begins on Agua Fria 2 at $3.47 per square foot. This does not mean that all of the increase occurred in April, 1985; but rather that increases in value were more profound for the 24 months following the announcement than the 24 months prior. The control area left graph, Agua Fria Control 1 at $3.13 per square foot and began graph, Agua Fria Control 2 at $3.47 per square foot.

Percentage increases monthly after the announcement ran 1.52 for the impact area and 1.24 for the control area, suggesting that the presence of the freeway corridor does favorably influence those properties already zoned for commercial use. Annual increases equate to 18.2 and 14.8 percent respectively.

10.6.2 Survey of Transactions

Total activity within the Agua Fria corridor for the four years surveyed was considerable. A summary of the transactions follows:

	Before Announcement 2/83 to 4/85		After Announcement 4/85 to 9/86	
	Corridor	Control	Corridor	Control
Average All Values	319,451	831,262	3,232	102,273
No. of Transactions	4,729	2,525	3,060	202
Average Vacant Values	834,686	326,742	495,717	306,920
No. of Transactions	129	691	76	64

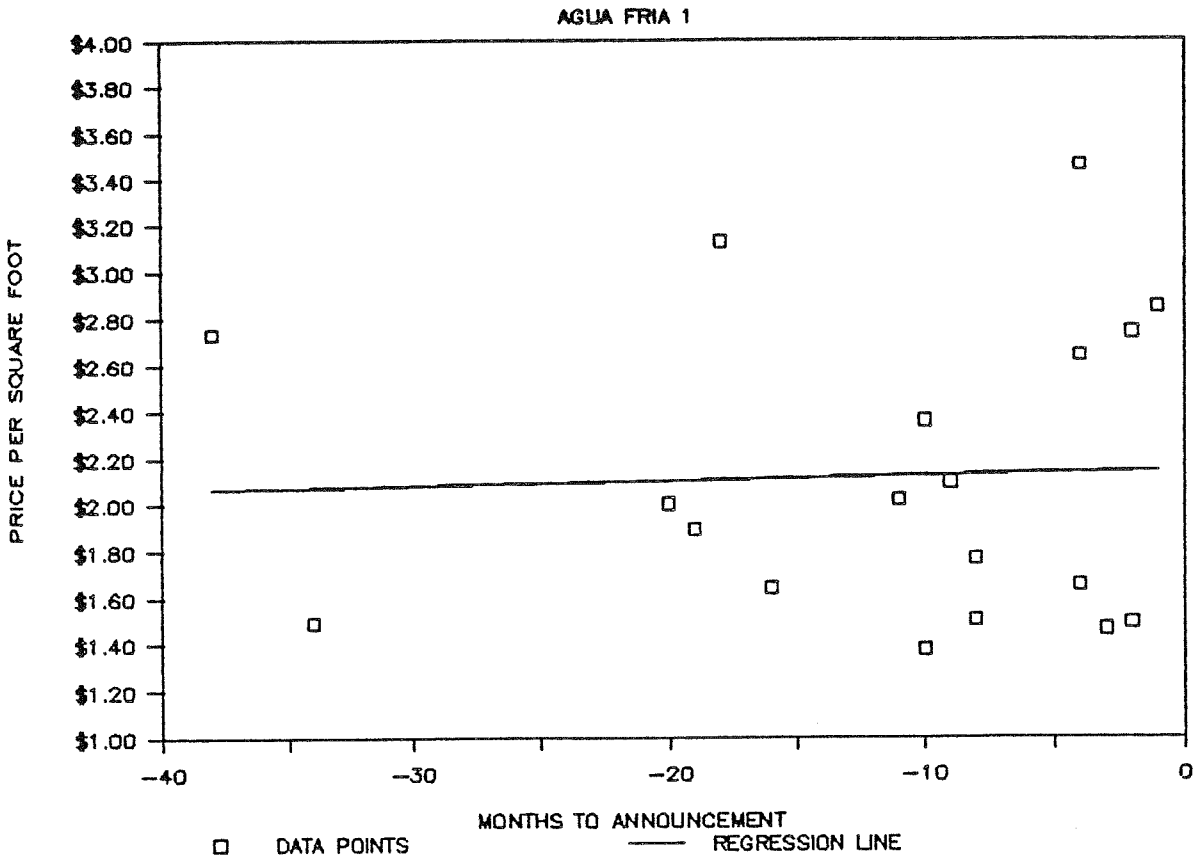
The average price per transaction before the announcement was $319,451 versus the average price after the announcement being $3,232. The decline is primarily due to the fact that there were numerous large transactions which took place within the corridor. Subsequent to the announcement, a larger number of bulk lot transactions took place having smaller size making the data less significant.

Of some relevance is the fact that:

1. The average price of vacant land within the corridor and control area declined; and
2. The number of transactions within the corridor halved after the announcement, while the number of transactions in the control area declined significantly.

As a significant number of single family residential sales were tracked, we tested these data separately. The first table following shows 4,133 corridor houses for which transactions were recorded for our four-year study. The average sales price was $98,890. Within the control area, 2,990 transactions were tracked with an average price of $110,000. Though there are significant variables to consider, these data would suggest that a freeway corridor is not favorable to single family residential development.

REGRESSION LINE

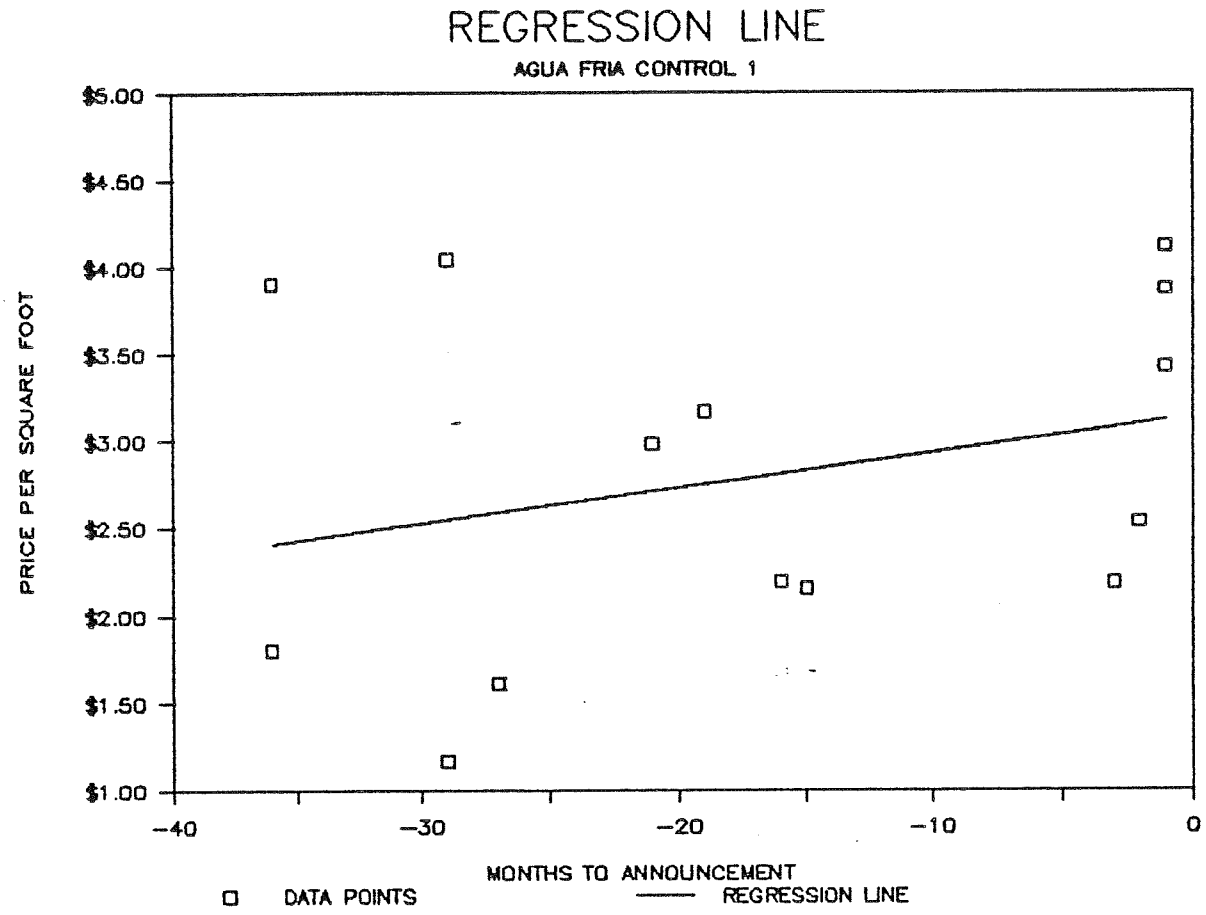


SALE NUMBER	ASSESSOR'S TAX PARCEL	APPROXIMATE LOCATION	DATE OF SALE	SALES PRICE	AREA (SQ. FT.)	PRICE PER SQ. FT.	MONTHS FROM 4/85	REGRESSION LINE
1	200-79-195B	T'BIRD & 83RD AVE.	6/84	$1,191,000	504555	$2.36	-10	2.125564684
2	142-53-002V	E OF PEORIA & 99TH AVE	8/83	$90,000	44954	$2.00	-20	2.103225855
3	142-53-0006	PEORIA W OF 99TH AVE	11/83	$315,000	100650	$3.13	-18	2.107693621
4	142-53-002M	PEORIA E OF 99TH AVE	12/84	$100,000	60375	$1.66	-4	2.138967982
5	142-53-002M	PEORIA E OF 99TH AVE	2/82	$165,000	60375	$2.73	-38	2.063015962
6	142-53-0004	PEORIA W OF 91ST AVE	2/85	$150,000	100650	$1.49	-2	2.143435748
7	200-54-007C	BELL W OF 83RD AVE	12/83	$930,000	566846	$1.64	-16	2.112161387
8	200-54-010F	NE CNR 91ST AVE GRNWAY	8/84	$600,000	399271	$1.50	-8	2.130032450
9	200-53-0015	BELL E OF 75TH AVE	6/84	$3,265,189	1616947	$2.02	-11	2.123330801
10	200-53-015E	SE CNR BELL & 91ST AVE	6/82	$1,300,000	871200	$1.49	-34	2.071951494
11	200-53-015E	SE CNR BELL & 91ST AVE	9/83	$1,650,000	871200	$1.89	-19	2.105459738
12	200-42-001E	SEC 91ST AVE UNION HLS	12/84	$2,428,500	701403	$3.46	-4	2.138967982
13	200-42-001F	91ST AVE S OF UNION HL	12/84	$2,300,000	871200	$2.64	-4	2.138967982
14	200-42-006K	BELL W OF 83RD AVE	2/85	$883,260	322213	$2.74	-2	2.143435748
15	200-42-006M	BELL W OF 83RD AVE	3/85	$883,286	310016	$2.85	-1	2.145669630
16	200-42-007C	BELL E OF 91ST AVE	1/85	$2,437,000	1667999	$1.46	-3	2.141201865
17	200-42-009B	UNION HLS E OF 91ST AV	9/84	$450,000	254390	$1.77	-8	2.130032450
18	200-42-011B	BELL W OF 83RD AVE	7/84	$1,166,962	556610	$2.10	-9	2.127798567
19	200-42-011C	BELL W OF 91ST AVE	6/84	$2,160,209	1569292	$1.38	-10	2.125564684

Regression Output:

Constant	2.147903
Std Err of Y Est	0.652384
R Squared	0.001354
No. of Observations	19
Degrees of Freedom	17

X Coefficient(s)	0.0022338829
Std Err of Coef.	0.0147117883

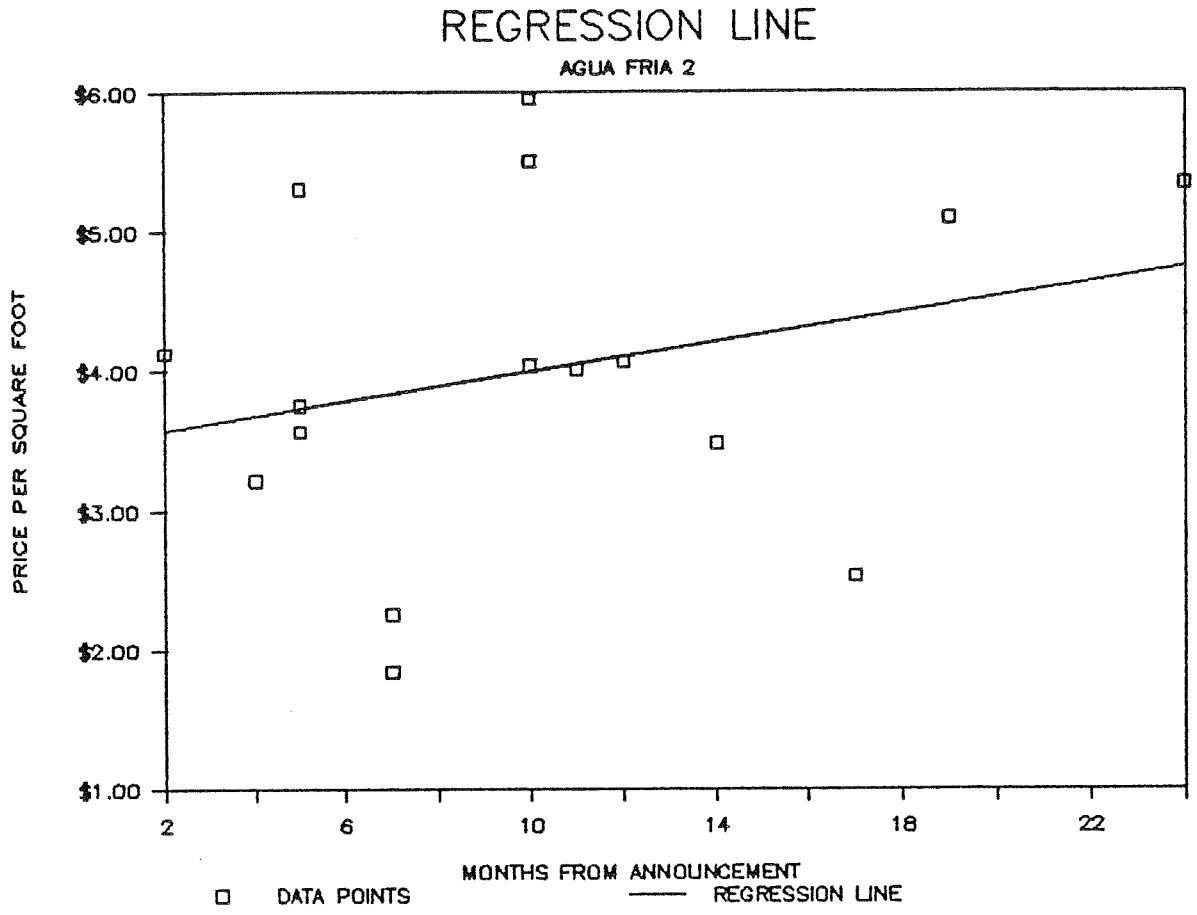

REGRESSION LINE
AGUA FRIA CONTROL 1
$5.00
$4.50
$4.00
$3.50
$3.00
$2.50
$2.00
$1.50
$1.00
PRICE PER SQUARE FOOT
-40
-30
-20
-10
0
MONTHS TO ANNOUNCEMENT
DATA POINTS
REGRESSION LINE

SALE NUMBER	ASSESSOR'S TAX PARCEL	APPROXIMATE LOCATION	DATE OF SALE	SALES PRICE	AREA (SQ. FT.)	PRICE PER SQ. FT.	MONTHS FROM 4/85	REGRESSION LINE
1	142-12-003A	SWC 75TH AVE & PEORIA	1/85	$1,000,000	457511	$2.19	-3	3.074591161
2	143-06-004E	SEC 75TH AVE & CACTUS	12/83	$1,050,000	478158	$2.20	-16	2.813787683
3	200-76-011F	SWC 59TH AVE & T'BIRD	8/83	$80,000	25265	$3.17	-19	2.753602265
4	200-75-001G	SEC 59TH AVE & T'BIRD	1/83	$1,850,000	1149984	$1.61	-27	2.593107816
5	200-51-001H	SEC 63RD AVE & BELL	7/83	$1,775,000	594333	$2.99	-21	2.713478653
6	200-51-002H	NEC 67TH & GREENWAY	2/85	$935,450	369084	$2.53	-2	3.094652967
7	200-51-006G	SWC 59TH & PARADISE	3/85	$299,000	77275	$3.87	-1	3.114714774
8	200-45-002G	NEC 67TH AVE & BELL	1/84	$443,887	206126	$2.15	-15	2.833849489
9	200-76-013S	NEC 67TH AVE & CACTUS	3/85	$1,328,896	388512	$3.42	-1	3.114714774
10	200-45-012H	NWC 63RD AVE & BELL	12/82	$150,000	128328	$1.17	-29	2.552984204
11	200-48-007D	NEC 65TH AVE & BELL	12/82	$897,048	221895	$4.04	-29	2.552984204
12	200-51-006F	SWC 59TH & PARADISE	4/82	$312,245	173369	$1.80	-36	2.412551562
13	200-51-001C	SWC 59TH AVE & BELL	4/82	$75,000	19200	$3.91	-36	2.412551562
14	143-03-003E	NEC 67TH AVE & PEORIA	3/85	$1,425,000	346520	$4.11	-1	3.114714774

Regression Output:

Constant	3.134776
Std Err of Y Est	0.981519
R Squared	0.074844
No. of Observations	14
Degrees of Freedom	12

X Coefficient(s)	0.020061806
Std Err of Coef.	0.0203613978

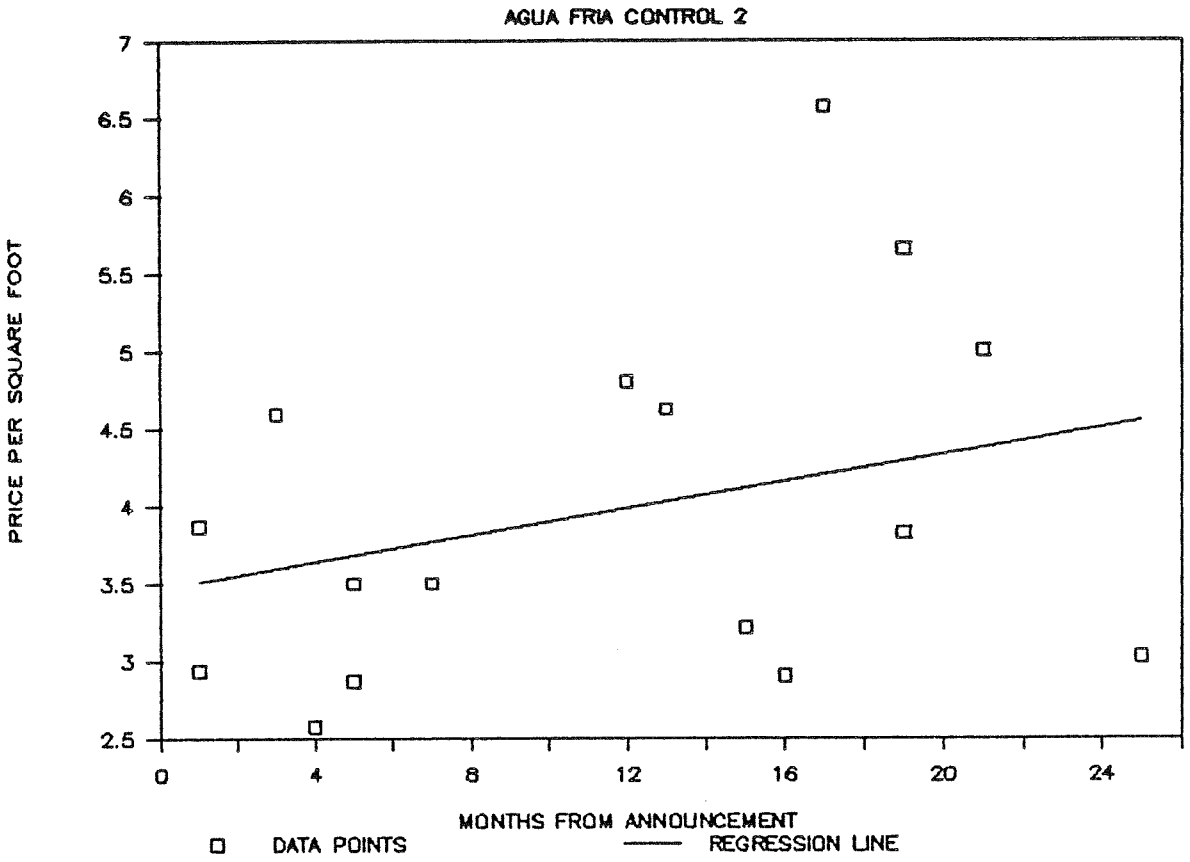

REGRESSION LINE
AGUA FRIA 2
$6.00
$5.00
$4.00
$3.00
$2.00
$1.00
PRICE PER SQUARE FOOT
2
6
10
14
18
22
MONTHS FROM ANNOUNCEMENT
DATA POINTS
REGRESSION LINE

SALE NUMBER	ASSESSOR'S TAX PARCEL	APPROXIMATE LOCATION	DATE OF SALE	SALES PRICE	AREA (SQ. FT.)	PRICE PER SQ. FT.	MONTHS FROM 4/85	REGRESSION LINE
1	200-79-011B	T-BIRD E OF 91ST AVE	5/85	$204,000	49440	$4.13	2	3.574335609
2	200-54-0006	BELL W OF 83RD AVE	1/86	$3,300,000	599821	$5.50	10	3.998003256
3	200-54-015F	BELL E OF 91ST AVE	8/85	$4,083,750	1088913	$3.75	5	3.733210977
4	200-54-016A	BELL E OF 91ST AVE	8/85	$9,318,373	2615520	$3.56	5	3.733210977
5	200-42-007C	BELL E OF 91ST AVE	2/86	$6,685,243	1667999	$4.01	11	4.050961712
6	200-42-007G	91ST AVE N OF BELL	10/85	$1,650,000	732505	$2.25	7	3.839127889
7	200-42-006J	BELL W OF 83RD AVE	3/87	$207,000	38768	$5.34	24	4.739421639
8	200-42-007B	BELL & 91ST AVE	10/85	$1,650,000	895158	$1.84	7	3.839127889
9	200-42-007A	BELL & 91ST AVE	3/86	$6,685,243	1646568	$4.06	12	4.103920168
10	200-42-011B	BELL W OF 83RD AVE	7/85	$2,800,000	871200	$3.21	4	3.680252521
11	200-42-004D	T-BIRD W OF 83RD AVE	8/86	$975,000	386116	$2.53	17	4.368712448
12	200-62-016G	T-BIRD E OF 83RD AVE	1/86	$466,242	115565	$4.03	10	3.998003256
13	200-62-016H	T-BIRD E OF 83RD AVE	1/86	$852,558	211310	$4.03	10	3.998003256
14	142-52-003Q	99TH AVE N OF PEORIA	1/86	$367,515	61768	$5.95	10	3.998003256
15	142-53-0006	PEORIA W OF 91ST AVE	5/86	$350,000	100624	$3.48	14	4.209837080
16	142-53-0006	PEORIA W OF 91ST AVE	10/86	$900,000	176900	$5.09	19	4.474629359
17	142-53-005A	PEORIA W OF 91ST AVE	8/85	$275,000	51850	$5.30	5	3.733210977

Regression Output:

Constant	3.468418
Std Err of Y Est	1.162348
R Squared	0.069506
No. of Observations	17
Degrees of Freedom	15
X Coefficient(s)	0.0529584559
Std Err of Coef.	0.0500304173

REGRESSION LINE



SALE NUMBER	ASSESSOR'S TAX PARCEL	APPROXIMATE LOCATION	DATE OF SALE	SALES PRICE	AREA (SQ. FT.)	PRICE PER SQ. FT.	MONTHS FROM 4/85	REGRESSION LINE
1	142-12-001A	SE CNR PEORIA & 83RD	8/85	$1,500,206	522720	$2.87	5	3.683399397
2	148-27-002F	SW CNR CACTUS & 51ST	4/85	$3,500,000	904306	$3.87	1	3.511541395
3	142-12-0003	SW CNR PEORIA & 75TH	10/85	$1,524,600	435600	$3.50	7	3.769328397
4	143-12-001M	SE CNR PEORIA & 67TH	4/85	$768,648	261360	$2.94	1	3.511541395
5	200-51-001H	BELL W OF 59TH AVE	6/85	$2,380,000	517754	$4.60	3	3.597470396
6	142-15-003A	SW CNR PEORIA & 75TH	10/86	$1,750,000	457380	$3.83	19	4.284902401
7	143-12-007F	SW CNR PEORIA & 59TH	3/86	$1,582,469	342282	$4.62	13	4.027115399
8	142-15-003C	NE CNR OLIVE & 83RD	7/85	$1,346,800	522720	$2.58	4	3.640434896
9	148-27-002F	SW CNR CACTUS & 51ST	4/85	$3,500,000	904306	$3.87	1	3.511541395
10	148-27-002F	SW CNR CACTUS & 51ST	6/86	$3,171,168	987070	$3.21	15	4.113044400
11	200-78-170	NW CNR CACTUS & 75TH	10/86	$2,178,000	385070	$5.66	19	4.284902401
12	148-24-004K	PEORIA W OF 51ST	8/86	$592,377	90169	$6.57	17	4.198973400
13	148-22-001P	59TH AVE N OF OLIVE	3/86	$1,362,835	284011	$4.80	12	3.984150899
14	231-07-157B	SE CNR GRNWAY & 67TH	8/85	$1,524,600	435600	$3.50	5	3.683399397
15	231-02-001B	NW CNR GRNWAY & 59TH	12/86	$1,713,522	342861	$5.00	21	4.370831402
16	142-12-001C	SE CNR PEORIA & 79TH	7/86	$1,450,000	500199	$2.90	16	4.156008900
17	142-12-001C	SE CNR PEORIA & 59TH	4/87	$1,512,182	500199	$3.02	25	4.542689403
18	142-12-003A	SW CNR PEORIA & 75TH	10/86	$1,750,000	457511	$3.83	19	4.284902401

Regression Output:

Constant	3.468576
Std Err of Y Est	1.046279
R Squared	0.101307
No. of Observations	18
Degrees of Freedom	16
X Coefficient(s)	0.0429645003
Std Err of Coef.	0.0319915213

SINGLE FAMILY RESIDENTIAL PROPERTY
MARKET VALUE DISTRIBUTION

Range	PRIMARY MARKET AREA			MARICOPA COUNTY		
	Number of Houses	Percent of Total	Mean	Number of Houses	Percent of Total	Mean
Less than $40,000	2.	0.0	39873.	18715.	4.4	29207.
$40,000 - $49,999	10.	0.2	44087.	23804.	5.6	45572.
$50,000 - $59,999	332.	8.0	57286.	45199.	10.5	55338.
$60,000 - $69,999	551.	13.3	65730.	55707.	13.0	64901.
$70,000 - $79,999	701.	17.0	75709.	58226.	13.6	74862.
$80,000 - $89,999	651.	15.8	84440.	54589.	12.7	84617.
$90,000 - $99,999	414.	10.0	95023.	42559.	9.9	94551.
$100,000 - $109,999	310.	7.5	104432.	30899.	7.2	104516.
$110,000 - $119,999	271.	6.6	114819.	20244.	4.7	114537.
$120,000 - $129,999	195.	4.7	124845.	14074.	3.3	124651.
$130,000 - $139,999	160.	3.9	134507.	10522.	2.5	134658.
$140,000 - $149,999	102.	2.5	145113.	8372.	2.0	144729.
$150,000 - $174,999	198.	4.8	161181.	15458.	3.6	161138.
$175,000 - $199,999	116.	2.8	184356.	8854.	2.1	186385.
$200,000 - $224,999	55.	1.3	209599.	5566.	1.3	211368.
$225,000 - $249,999	36.	0.9	235878.	3867.	0.9	236495.
Greater than $250,000	29.	0.7	281509.	11950.	2.8	386785.
TOTALS	4133.	100.0%	98890.	428605.	100.0%	95397.

Source: Mountain West Research, July, 1987

SINGLE FAMILY RESIDENTIAL PROPERTY
MARKET VALUE DISTRIBUTION

Range	PRIMARY MARKET AREA			MARICOPA COUNTY		
	Number of Houses	Percent of Total	Mean	Number of Houses	Percent of Total	Mean
Less than $40,000	69.	2.3	30325.	18715.	4.4	29207.
$40,000 - $49,999	35.	1.2	45279.	23804.	5.6	45572.
$50,000 - $59,999	107.	3.6	54153.	45199.	10.5	55338.
$60,000 - $69,999	220.	7.4	65167.	55707.	13.0	64901.
$70,000 - $79,999	458.	15.3	75421.	58226.	13.6	74862.
$80,000 - $89,999	442.	14.8	84760.	54589.	12.7	84617.
$90,000 - $99,999	404.	13.5	94471.	42559.	9.9	94551.
$100,000 - $109,999	258.	8.6	105320.	30899.	7.2	104516.
$110,000 - $119,999	227.	7.6	114942.	20244.	4.7	114537.
$120,000 - $129,999	129.	4.3	124743.	14074.	3.3	124651.
$130,000 - $139,999	81.	2.7	134490.	10522.	2.5	134658.
$140,000 - $149,999	58.	1.9	144751.	8372.	2.0	144729.
$150,000 - $174,999	116.	3.9	162654.	15458.	3.6	161138.
$175,000 - $199,999	124.	4.1	187454.	8854.	2.1	186385.
$200,000 - $224,999	117.	3.9	210304.	5566.	1.3	211368.
$225,000 - $249,999	66.	2.2	236132.	3867.	0.9	236495.
Greater than $250,000	79.	2.6	336429.	11950.	2.8	386785.
TOTALS	2990.	100.0%	110860.	428605.	100.0%	95397.

Source: Mountain West Research, July, 1987

10.6.3 Summary and Conclusions

The possibility of a change in use over the survey period made controlling for use critical in this corridor. Using regression analysis on commercial parcels, we found a negligible difference in appreciation prior to the announcement between the corridor and control area. After the announcement, however, corridor commercial outpaced the control area by about three and one-half percent per year.

Our surveys of transactions indicated that all transactions in the general area declined in number and value after April 1985. Residential values are generally lower within the corridor than the control area.

10.7 San Tan Freeway

A recent survey of area residents within the San Tan Corridor indicated that the ultimate alignment ran west of the Central Arizona Project canal. It links the Southeast Loop with the Red Mountain Parkway along Ellsworth Road. Originating at Price Road and the South Mountain Freeway, the Santan travels along Pecos Road, jogging south near Chandler Municipal Airport, as it heads north and east to Ellsworth Road.

Like the Estrella Freeway, the San Tan Corridor primarily impacts rural farmlands and raw desert. Residential areas obviously impacted begin north and east of Rittenhouse Road and continue to the intersection of the Santan with the Superstition Freeway. Most of the homesites, however, are large lot rural rather than higher density tracts.

Also like the Estrella, the San Tan will not be completed until 2005. We believe that much of the interest in donation of land that has occurred along the Estrella will occur along the San Tan as well. This may tend to expedite the construction, as funds allocated originally for acquisition of right-of-way will be directed into construction.

10.7.1 Regression Analysis

As previously mentioned, the Santan Freeway has many similarities to the Estrella. For this analysis, we found a dearth of sales with which we could draw reasonable conclusions. As we attempted to constrain the change of use scenario, we limited our search for comparables to farmland and raw desert. In terms of the number of

observations used for our analyses, it is clear that activity escalated considerably within the corridor after the announcement.

Prior to the announcement, values and appreciation remained relatively consistent with both the corridor and the control area. Rates of appreciation were 2.91 percent per month for the corridor and 2.30 percent per month for the control area. These equate to 34.9 and 27.6 percent per annum respectively.

After the announcement, appreciation for the corridor escalated to 13.92 percent per month, while control areas increased to 4.37 percent per month. Yearly appreciation averages 167.0 and 52.4 percent respectively. This would suggest that the freeway announcement had an enormous effect upon land appreciation within the Southeast Valley.

However, the prices per acre paid for parcels within the corridor after the announcement seem to anticipate a change in use. Of the 16 parcels identified in the control group, the highest price paid per acre is $65,506. Of the 28 parcels used for the corridor, 12 of these exceed $65,000; some of these exceed it by more than double.

10.7.2 Survey of Transactions

The uses along the Santan become many and varied as the loop ran north. Hence the tracking of recorded sales transactions within and outside of the corridor shows an interesting numeric array. We have summarized our findings as follows:

	Before Announcement 2/83 to 4/85		After Announcement 4/85 to 9/86	
	Corridor	Control	Corridor	Control
Average All Values	452,332	825,995	375,357	735,651
No. of Transactions	2,681	1,115	391	588
Average Vacant Values	445,182	141,369	381,703	395,954
No. of Transactions	95	199	31	69

The average price per transaction before the announcement was $452,332 versus the average price after the announcement being $375,357. The decline is primarily due to the fact that there were numerous commercial transactions which took place within the

corridor. Subsequent to the announcement, a larger number of bulk lot transactions took place having smaller size making the data less significant.

Of some relevance is the fact that:

1. The average price of vacant land within the corridor declined after the announcement and land within the control area increased; and
2. The total number of transactions declined after the announcement.

10.7.3 Summary and Conclusions

Regression analysis suggests that the freeway announcement has made a profound impact upon property values within the corridor. It is our belief that further study, say six months to a year from now will show a change in use.

When surveying the market place for total recorded transactions declined significantly which suggests that land owners may be holding the property due to indecision regarding final freeway alignments. There may also be a surplus of available property and decreased demand due to a depressed housing industry.

10.8 Changes in Use in Selected Areas

10.8.1 Papago Freeway

Development of Interstate Highway 10 from Phoenix to Los Angeles in the major impetus for urbanization of this area over the past decade. Bounded by Interstate Highway 10 on the north, Dysart Road on the east, Van Buren Street on the south, and Central Avenue on the west, this quarter section was partially developed prior to 1977. It is ascribed within the tax records as a portion of Book 500, Map 3.

REGRESSION LINE

Santan 1

ASSESSOR'S TAX PARCEL

REGRESSION LINE

Santan Control 1

ASSESSOR'S TAX PARCEL

REGRESSION LINE

Santan 2

ASSESSOR'S TAX PARCEL

REGRESSION LINE

Santan Control 2

ASSESSOR'S TAX PARCEL

Subdivision activity was as follows:

Subdivision Name	Period of Sales	Number of Lots	House Prices	Lot Prices*
Litchfield Shadows	1972-1979	80	$36,000-$74,000	$4,600
Arnold Manor	1976-1978	80	$30,000-$46,000	$5,000
Park Palisades	1974-1977	31	$24,000-$36,000	
Litchfield Gardens Apts.	Rental	48	N/A	
Arnold Manor 26	1982-1983	16	N/A	
Vista Del Camino Condo.	Rental	60	N/A	

* If lots were sold separately.

Tracts of developed subdivision lots sold for $24,100 to $25,700 per acre ($0.55 to $0.59 per square foot) in 1976. In 1977, agricultural land sold for $4,700 to $6,000 per acre ($0.11 to $0.14 per square foot). By 1984, the same assembler of agriculture land was paying $34,600 per acre ($0.80 per square foot); and in 1985 he paid $76,300, $119,500 and $172,700 per acre respectively for tracts of 11 to 17 acres (still undeveloped).

Much of the vacant land remaining in this area belongs to Goodyear Farms and its developers, with one large tract owned by the State, and several by the Town.

A commercial parcel of 1.72 acres sold to a Savings and Loan in 1979 for $108,900 per acre ($2.50 per square foot). Other commercial parcels ranged from $53,000 per acre in 1979, to $41,000-$49,000 in 1980, to $45,000-$50,000 in 1981, $56,000 in 1982, and then jumped to the $107,000-$339,000 range in 1983. Again, this range showed some slippage in the smaller commercial parcels in 1984 and 1985.

The aggregate 1986/87 value is:

60 acres single family @ $1.20 per square foot	$ 3,136,320
30 acres multiple family @ $1.75 per square foot	$ 2,286,900
10 acres agricultural @ $0.80 per square foot	$ 348,480
60 acres commercial @ $4.00 per square foot	$10,454,400
Total Current Value	$16,226,100

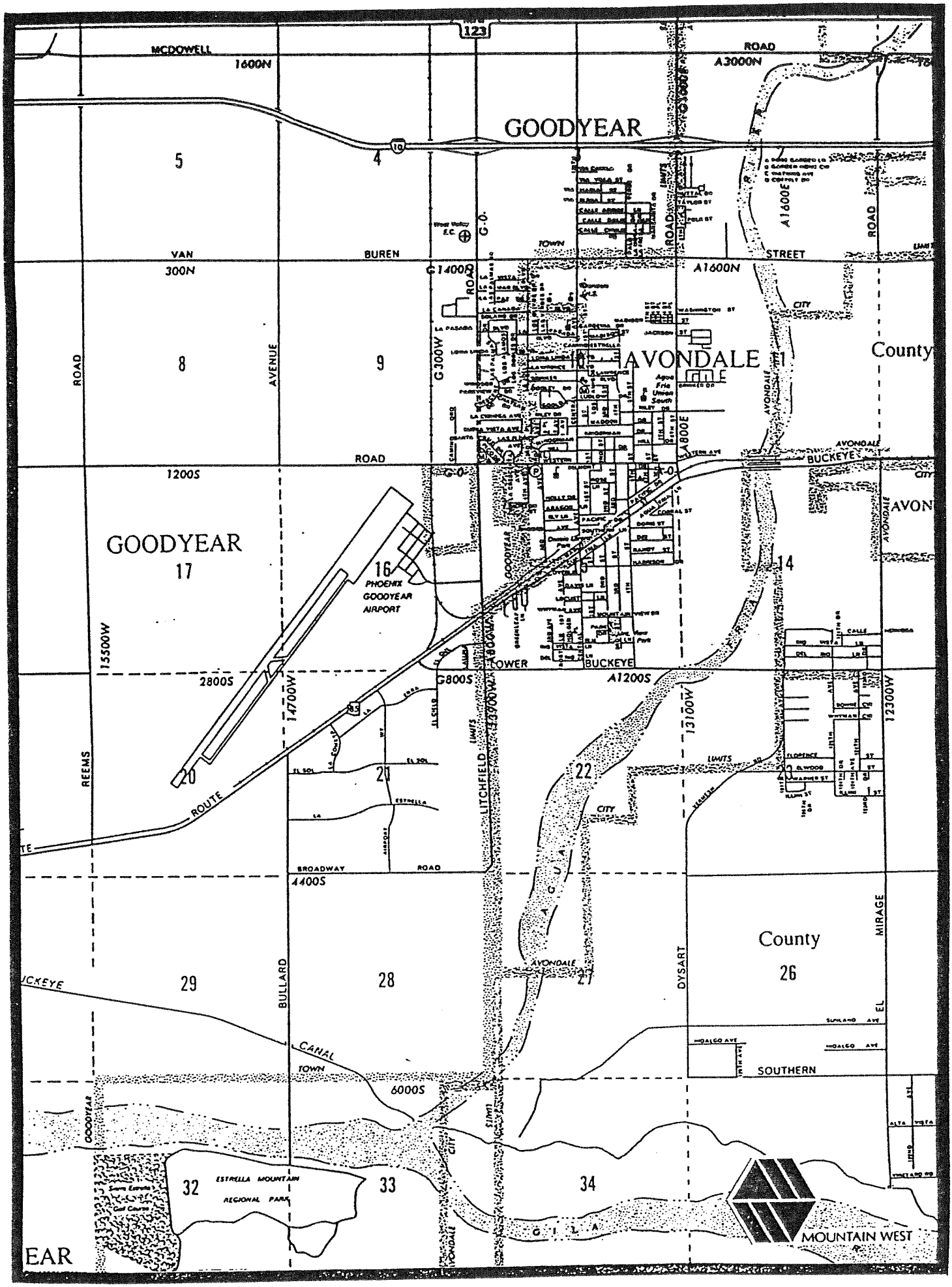
The aggregate 1976/77 values:

120 acres residential/ agricultural @ $0.14 per square foot	$ 731,800
60 acres commercial @ $0.65 per square foot	$1,698,800
Total 1977 Value	$2,430,600
Appreciation Per Annum for 10 Years	20.91%

10.8.2 Superstition Freeway

The completion of the Superstition Freeway to Val Vista Drive in 1983 was the major impetus for urbanization in this area over the past decade. The property under analysis is located at the northwest corner of Val Vista Drive and the Superstition Freeway. This quarter section was predominantly vacant land in the 1970s with improvements consisting of farm buildings. It is ascribed within tax records as Book 140, Map 57.

County records indicate no recorded sales for years 1976-1978. In 1979 (5/29/79), parcels 140-57-001E+K+002C, comprising a total of 93.679 acres, was conveyed from Hovde to Dale Bellamah Land Company, Inc. for $1,954,060 or $0.48 per square foot. On March 27, 1980, parcel 140-57-001M, consisting of 4.636 acres, was conveyed from Butler KW & GH et al to Dale Bellamah Land Company, Inc. for $103,000 or $0.51 per square foot. This land is currently improved with Fairfield Place One, Two and Three. This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BUREN
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AVONDALE
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BUCKEYE
1200S
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PHOENIX
GOODYEAR
AIRPORT
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AVON
15500W
2800S
G800S
A1200S
TOWER
BUCKEYE
14700W
13100W
12300W
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LITCHFIELD
LIMITS
CITY
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BULLARD
DYSART
AVONDALE
SOUTHERN
CANAL
TOWN
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ESTRELLA MOUNTAIN
REGIONAL PARK
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34
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MOUNTAIN WEST
EAR

RAW LAND SALES
PHOENIX, ARIZONA
1976 - 1987

Assessors No.	Date	Acres	Sq. Ft.	Total Price	Price Per Sq. Ft.
500-03-011-83 (pt)	Jan. 76	7.33	319,280	$188,600	$0.59
500-03-100+104+106+118	Aug. 76	3.14	136,800	$76,000	$0.56
500-03-094+099	Aug. 76	1.00	43,350	$24,000	$0.55
Yearly Average		11.47	499,430	$288,600	$0.58
500-03-007R	Mar. 77	4.47	194,710	$21,000	$0.11
500-03-500-03-007Q	Dec. 77	4.14	180,340	$25,000	$0.14
Yearly Average		8.61	375,050	$46,000	$0.12
500-03-010	May 78	0.16	7,105	$4,600	$0.65
500-03-270	Feb. 79	4.91	213,800	$260,000	$1.22
500-03-252B	Sep. 79	1.72	75,000	$187,500	$2.50
Yearly Average		6.63	288,800	$447,500	$1.55
500-03-269B	May 80	4.91	213,845	$240,000	$1.12
500-03-269F	Nov. 80	4.01	174,805	$165,000	$0.94
Yearly Average		8.92	388,650	$405,000	$1.04
500-03-269E	Apr. 81	3.48	151,670	$174,000	$1.15
500-03-249G	May 81	2.75	119,790	$125,000	$1.04
Yearly Average		6.23	271,460	$299,000	$1.10
500-03-269D	Mar. 82	3.56	154,945	$200,000	$1.29
500-03-269K+L+M	Mar. 83	3.10	135,000	$332,428	$2.46
500-03-269Q	Apr. 83	0.70	30,284	$121,136	$4.00
500-03-269K+L	Apr. 83	2.40	104,400	$302,574	$2.90
500-03-199+246	Nov. 83	1.88	81,675	$636,585	$7.79
Yearly Average		8.07	351,359	$1,392,723	$3.96
500-03-250A+B+251+	Oct. 84	12.93	563,325	$447,900	$0.80
500-03-007n+273	Oct. 84	2.88	125,305	$447,900	$3.57
500-03-199+246	Nov. 84	1.88	81,675	$984,000	$12.05
Yearly Average		17.68	770,305	$1,879,800	$2.44
500-03-007N+++	Jan. 85	17.68	770,300	$1,350,000	$1.75
500-03-007M	Jan. 85	1.25	54,255	$106,160	$1.96
500-03-7L	Jan. 85	0.93	40,690	$84,900	$2.09
500-03-247D+252A	May 85	11.80	514,085	$2,037,629	$2.96
500-03-007L+++	Sep. 85	17.57	765,430	$2,100,000	$2.74
Yearly Average		49.24	2,144,760	$5,678,689	$2.65

single family development began in 1984 and current single family home prices range from $70,000 to $90,000.

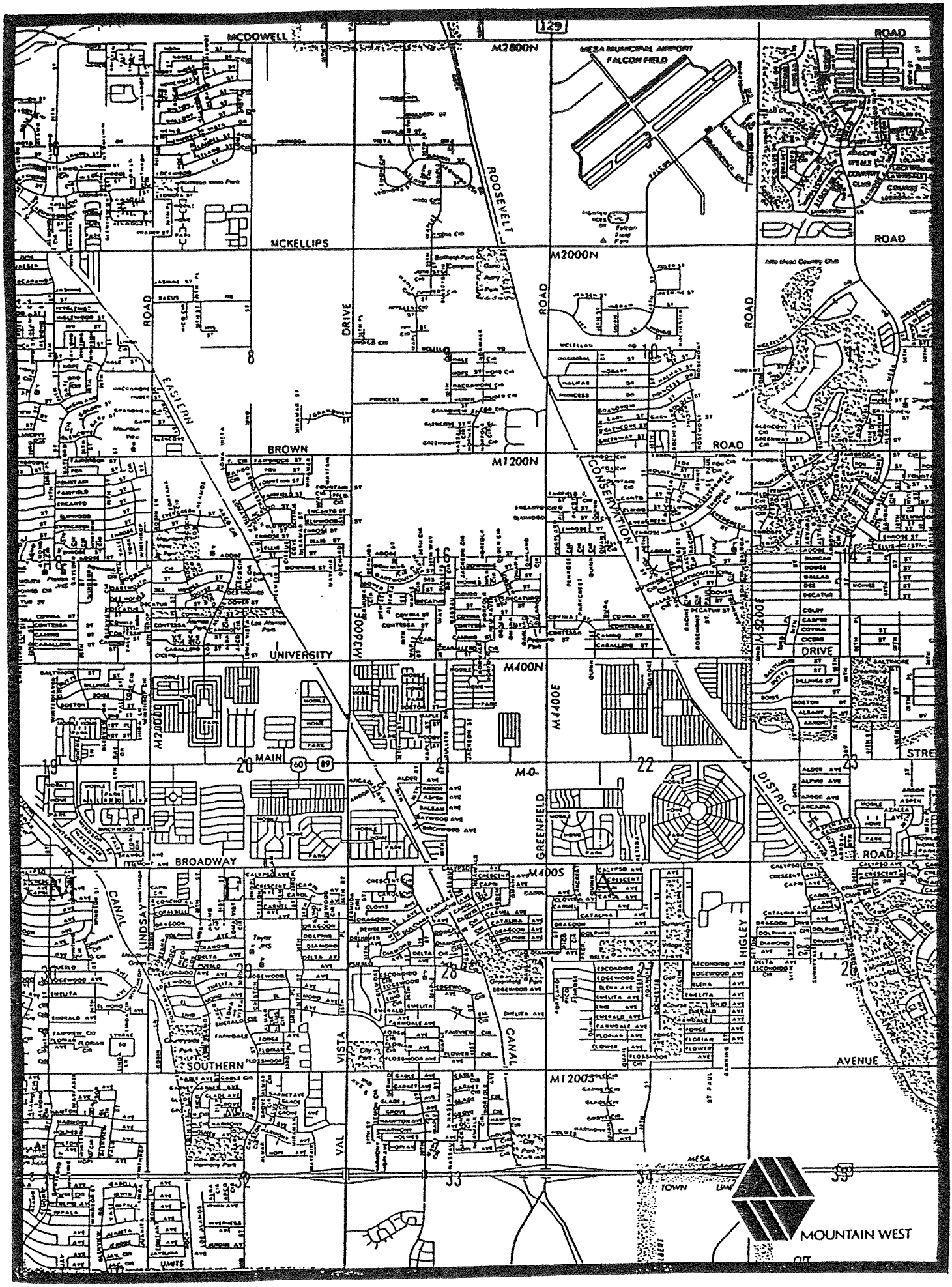
County records indicate no recorded sales for years 1981 and 1982. Subsequent to the completion of the freeway through the intersection of Val Vista Drive, along with ingress and egress ramps, sales activity and development took place from 1983 to present. In 1983, the 1.046 acre parcel at the southeast corner of Southern and Val Vista Road sold for $195,000 or $4.28 per square foot. Also recorded as a sale in 1983, parcel 140-57-001S, being 8.871, acres was sold to Spickerman, C.C. for $734,945 or $1.90 per square foot This parcel was resold in January 1984 for $1,038,000 or $2.69 per square foot. The parcel is zoned and improved with multifamily housing.

Other sales in 1984 include parcel 140-57-002D, the northeast corner of Val Vista and the Superstition Freeway. The sale price for this 4.696 acre was $756,369 or $3.70 per square foot. This parcel subsequently resold in April of 1985 for $1,032,000 or $5.05 per square foot reflecting a 37 percent increase in six months. A now vacant parcel zoned R-S Residential Service sold in November 1984 for $559,934 or $3.25 per square foot. This parcel contains 3.955 acres.

Finally, parcel 140-57-001T sold in November 1985 for $480,000 or $12.26 per square foot. This .899 acre parcel is a resale of parcel 140-57-001G less R.O.W. taken. The previous sale occurred in 1983 for $195,000 or $4.28 per square foot.

A summary of current uses and zoning follows. All changes occurred subsequent to the freeway completion. Further, as illustrated in the following Raw Land Sales Schedule, prices increased substantially since 1982.

Other than the single family Fairfield Place subdivision, land use changes include: the southwest corner of the section (northeast corner of Val Vista Drive and the Superstition Freeway) is now a commercial parcel being 4.696 acres. This currently zoned C-2-Limited Commercial parcel remains vacant. The contiguous 4 plus acre parcel (parcel 2E and a part of parcel 2C) also remains vacant, and is currently zoned R-S Residential Service. Immediately north of these parcels, located along the east side of Val Vista Drive, a 9.17± acre parcel is currently zoned and improved with a multifamily complex.


MCDOWELL
MCKELLIPS
BROWN
UNIVERSITY
MAIN
BROADWAY
SOUTHERN
ROOSEVELT
ROAD
DRIVE
EASTERN
CONSERVATION
GREENFIELD
DISTRICT
HIGLEY
CANAL
VISTA
VAL
AVENUE
STREET
MESA
TOWN
M2800N
M2000N
M1200N
M400N
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M1200S
M3600E
M2000E
M400E
M-0-
MESA MUNICIPAL AIRPORT
FALCON FIELD
MOUNTAIN WEST

RAW LAND SALES
SUPERSTITION
PHOENIX, ARIZONA
1976 - 1987

Assessors No.	Date	Acres	Sq. Ft.	Total Price	Price Per Sq. Ft.
140-57-002D	Apr. 85	4.696	204,558	$1,032,000	$5.05
140-57-001T	Nov. 85	.899	39,160	$480,000	$12.26
Yearly Average		5.595	243,718	$1,512,000	$6.20
140-57-001S	Jan. 84	8.871	386,421	$1,038,000	$2.69
140-57-002D	Oct. 84	4.696	204,558	$756,369	$3.70
140-57-002E+F	Nov. 84	3.955	172,280	$559,934	$3.25
Yearly Average		17.522	763,259	$2,354,303	$3.09
140-57-001G	Jan. 83	1.046	45,564	$195,000	$4.28
140-57-001S	Sep. 83	8.871	386,421	$734,945	$1.90
Yearly Average		9.917	431,985	$929,945	$2.16
--	1982	--	--	--	--
--	1981	--	--	--	--
140-57-001M	Mar. 80	4.636	201,944	$103,000	$0.51
140-57-001E+K+2C	May 79	93.679	4,080,657	$1,954,060	$0.48
--	1978	--	--	--	--
--	1977	--	--	--	--
--	1976	--	--	--	--

Parcel 140-57-00 2B, being 24.38 acres, is part of the Superstition Freeway. The remaining parcel is located at the northwest corner of the section (southeast corner of Southern and Val Vista Drive). This parcel is currently zoned C-2 Limited Commercial and is unimproved-vacant land being 10.935± acres in size.

11.0 Conclusions and Recommendations

This chapter presents conclusions and recommendations for future research.

11.1 Conclusions

The strongest and most obvious conclusion about the historic socioeconomic impact of freeways in metro Phoenix is that freeways are a necessary but not sufficient cause for development to occur. Other factors are equally as important, including municipal planning and zoning, land availability, existing utilities and infrastructure, and other transportation modes--railroads and arterials in the case studies and, presumably, airports. Freeways merely create a condition that improves the market opportunity for change. More importantly, development around freeways can be controlled by strong urban planning, although it is clear that income-generating properties--non-residential uses and apartments--have strong locational preferences for freeway corridors. In the absence of strong planning, private development will guide the freeway's development, as the Mesa case shows.

Classic land use theory predicts that income-generating properties will locate in freeway corridors and, generally, that has been the case in the Phoenix area. Moreover, freeway intersections are most likely to be developed into non-residential activities. However, these case studies have dramatically illustrated that residential developments are the predominant corridor activity--60 percent of the Black Canyon's and 75 percent of the Superstition Corridor's inventory.

The intensity of freeway corridor development depends on a combination of macroeconomic demand conditions and the supply of developable land. The case of the Superstition Corridor and the urban form analysis demonstrates that one of the most important effects of freeways is the development of the urban fringe that is caused by freeway accessibility. Compared to that effect, there is a surprising amount of undeveloped land which exists in the corridors themselves, especially those on the fringes. The corridor with the highest density is the centrally-located South Black Canyon Corridor, in the urban area's historic core. The expansion of the urban freeway system from approximately 80 miles to over 200 miles will certainly accelerate accessibility to more remote fringes, while it will create an oversupply of corridor land.

Beyond these broad statements, the specific kinds of land uses and their locations are very much dependent on the peculiarities of place--existing land uses, existing zoning, etc. That specific land development is so dependent on local place characteristics and that strong urban planning can control growth is an optimistic conclusion. It means that local residents can actively control land development in their neighborhoods, if city government cooperates with them.

This does not mean that development density will not increase, because there are very strong locational attributes in freeway corridors for income-generating properties. Over time, market demand for freeway corridor land will exert strong development pressures for increased density. If the market is accounted for, however, the Black Canyon and Superstition Area case studies have demonstrated that the life of quality residential neighborhoods extends far beyond freeway completion. What seems to be necessary is that quality residential neighborhoods need to be supported by complementary land uses and strong freeway design features. In particular, these include:

- Parks and schools, which are very important supporting land uses;
- Supporting freeway features that include the depressed freeway design, supplemented by ample right-of-way, walls that are high enough to contain noise, and features like pedestrian walkways to keep residential neighborhoods from becoming isolated from supporting land uses; and
- Classic land planning that buffers single family development from arterials and freeways by multifamily and non-residential uses.

In the Superstition Study Area, where this combination of design and land planning was implemented, the rate of appreciation for single family property values for houses closer than one-half mile to the freeway actually was greater than similar homes in a control area beyond one-half mile of the freeway. Although there were too few sales transactions for smaller zones to be entirely confident of the information, the appreciation rate of houses closer than 600 feet to the freeway was also greater than for similar houses in the control area.

Despite that fact, the attitudes of homeowners in the Superstition Study Area toward the freeway were ambiguous.

- People who bought their house before the freeway was built did so because of their house and the neighborhood. In contrast, people who moved there after the freeway was built bought their house because of the neighborhood, the accessibility the freeway gave them, and price.

- Late movers were more positive about the freeway than pre-freeway owners, but overall 76 percent of the homeowners thought the freeway had a positive impact on their lives.

- Accessibility is perceived to be the most positive freeway impact, and noise is the most negative, followed by air pollution.

- Extreme closeness to the freeway has negative effects. Only 24 percent of those who lived within 200 feet would ever do that again, while a majority of those who lived over 200 feet would again buy a house that close.

- People who live within 600 feet are uncertain about the property value effect of the freeway, and a majority of those think that no other factors affect their property's value.

Regarding the secone line of research in this report, the conclusions are direct and unambiguous: the announcement of freeways caused land sales in their corridors to treble in value. The following table summarizes the results:

Monthly Land Sales Appreciation

	Before Announcement		After Announcement	
	Control	Impact	Control	Impact
Estrella	3.33%	3.07%	2.60%	4.65%
Sun Valley	1.44%	1.88%	6.85%	6.57%
Agua Fria	0.60%	0.10%	1.24%	1.52%
San Tan	2.30%	2.91%	4.37%	13.92%
AVERAGE	1.92%	1.99%	3.77%	6.67%

Source: Mountain West Research.

11.2 Recommendations for Future Research

The primary research completed in this contract has raised questions as well as provided answers.

Residential Property Value Analysis

The Superstition Study Area is as beneficial and supportive of residential development as any corridor that exists in metro Phoenix, and its property value impacts may be skewed by that fact. Freeway design, in particular, is an important variable, and the freeway is depressed throughout the Study Area. Trends in values may be quite different for other areas that have at-grade or elevated freeway designs. Areas influenced by one of each of those designs need to be analyzed to provide valid comparisons. The Superstition is elevated just west of the Study Area, as it approaches I-10. There are several areas influenced by at-grade freeways along the Black Canyon.

Role of Municipal Planning and Role of Private Developer

The finding that municipal planning has guided Tempe's freeway development is of major significance and, as far as the analysis here has taken it, appears to be valid. It is clear that private developers had much to do with the Mesa Superstition development, but what is known about their role is general. A close, parcel-by-parcel historical analysis of a small piece of corridor development, using municipal documents (e.g., Planning Commission minutes) would reconstruct more exactly the roles among private developers, local residents, and municipal government in the corridor development process.

Urban Form

The analysis of urban form undertaken here is largely speculation, because good data on urban form development does not exist. However, this study's corridor analysis suggests a way to reconstruct the development of the metro area's present urban form. The corridor analysis presented here combined visual mapping with quantified inventory trends. The literature suggests that urban forms can be mapped using isobars that result from the relationship among transportation modes. An isobar map of the Phoenix area in 1987 would create the spatial structure to replicate the corridor analysis for larger areas. Using aerial photos and assessor's records (which are available from 1957), the development of the urban form can be reconstructed.

Regional Impacts

A major effect of the Superstition and Black Canyon freeways was the increased accessibility they provided to peripheral areas. That increased accessibility stimulated development. How wide is the influence area of freeways into new peripheral areas? How far will freeways extend the new urban periphery? Using the County Assessor's

information, census records, aerials, the historical development of influence areas for the North Black Canyon and Mesa Superstition can be reconstructed to answer these questions.

Land Value/Freeway Announcement

The effect of an announcement to build a freeway within a specified corridor manifests in speculation. Within some of the corridors, sales activity identified was sufficiently low so as to question the degree of speculative appreciation in one freeway corridor as opposed to another. Further, the change in use from desert or agriculture to a higher, more profitable use is assumed. Quantifying of other transitions as a result of a corridor announcement remains unaddressed. Identification of additional sales transactions is necessary to consider both questions.

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