Technical Report Documentation Page

1. Report No. FHWA/TX-95/1390-2F	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle CHARACTERISTICS OF REMAINDERS OF PARTIAL TAKINGS SIGNIFICANTLY AFFECTING RIGHT-OF-WAY COSTS		5. Report Date July 1995
		6. Performing Organization Code
7. Author(s) Jesse L. Buffington, Margaret K. Chui, Jeffery L. Memmott, and Frida Saad		8. Performing Organization Report No. Research Report 1390-2F
9. Performing Organization Name and Address Texas Transportation Institute The Texas A&M University System College Station, Texas 77843-3135		10. Work Unit No. (TRAIS)
		11. Contract or Grant No. Study No. 0-1390
12. Sponsoring Agency Name and Address Texas Department of Transportation Research and Technology Transfer Office P.O. Box 5080 Austin, Texas 78763-5080		13. Type of Report and Period Covered Final: September 1993 - August 1994
		14. Sponsoring Agency Code

15. Supplementary Notes
Research performed in cooperation with the Texas Department of Transportation and the U.S. Department of Transportation, Federal Highway Administration.
Research Study Title: Determination and Evaluation of Remainder Characteristics Which Significantly Affect Right-of-Way Costs

16. Abstract

Highway right-of-way costs have accelerated in recent years, especially in suburban and urban areas of Texas. Thus, further efforts are being made by Texas Department of Transportation (TxDOT) officials to find ways to reduce or hold down such costs. One of the efforts helped to enact a new law determining the compensation paid property owners for partial takings of right-of-way for highways. This law, subsequently declared unconstitutional by the Texas Supreme Court, allowed consideration of special or direct benefits arising from the highway improvement in awarding compensation for the taking or assessing damages to the remainder, and it did help to reduce right-of-way costs. The purchase of partial takings can cause some remainders to suffer considerable severance and/or proximity damages. The state only gains title to the partial taking, and the property owner keeps title to the remainder. Although enhancements can offset some of these damages, purchasing agencies are still paying many property owners more than the taking value. Often, small and irregularly shaped remainders are created and damaged to 100% of value (the whole property's value).

This study seeks to determine which remainder characteristics significantly affect right-of-way costs. The more specific objectives of the study are to determine (1) the significant remainder property, access, and location characteristics that affect right-of-way costs and (2) the effects of the 1984-87 right-of-way evaluation law on right-of-way costs. A thorough study of the literature; a mail survey of selected right-of-way fee appraisers, TxDOT appraisers and attorneys on the state attorney general's staff; the preparation and analysis of a sample of old remainder case histories developed by the Texas Transportation Institute and TxDOT during the 1960s; and the collection and analysis of a new sample of remainders created before, during, and after the new law was in effect are all being accomplished under the research plan. The new sample data cover three time periods: 1) January 1, 1974 to October 1, 1984, 2) October 1, 1984 to August 17, 1987, and 3) August 17, 1987 to December 31, 1991.

The literature survey helped identify several important remainder characteristics to be tested. A total of 70 out of 91 persons surveyed responded and gave importance scores to a list of remainder characteristics. The top 10 or 12 characteristics were used in the regression models of the two data samples. The analysis of the sample of old remainder case histories identified several important characteristics related to the remainder, i.e., size, value, and use of whole property; remainder shape; value total damages paid; and proportion of taking. The analysis of the new database confirmed some of these findings and yield other characteristics, such as, method of acquisition, highway grade level, rural/urban location, type of highway access, split remainders and development limitations that significantly affect right-of-way cost. Also, analysis of the new database shows no significant difference in right-of-way costs due to a change in 1984-87 right-of-way evaluation law. Finally, an analysis of remainder sale data reveals that most remainders are not damaged. TxDOT can use the results of the study to help control and reduce right-of-way costs by 1) being able to closely monitor the appraisals of remainders of partial takings and 2) working closely with the TxDOT planning and design officials to avoid creating remainder properties that contribute significantly to right-of-way costs.

17. Key Words Right-of-Way, Remainders, Partial Takings, Physical, Access/ Locational Characteristics, Acquisition Costs, Uneconomic/Remnant Regression Model, Sample Studies, Case Studies	18. Distribution Statement No restrictions. This document is available to the public through NTIS: National Technical Information Service 5285 Port Royal Road Springfield, Virginia 22161

19. Security Classif.(of this report)	20. Security Classif.(of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	124	

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CHARACTERISTICS OF REMAINDERS OF PARTIAL TAKINGS SIGNIFICANTLY AFFECTING RIGHT-OF-WAY COSTS

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Research Report 1390-2F
Research Study Number 0-1390
Research Study Title: Determination and Evaluation of Remainder Characteristics
Which Significantly Affect Right-of-Way Costs

Sponsored by the
Texas Department of Transportation
in Cooperation with
U.S. Department of Transportation
Federal Highway Administration

July 1995

TEXAS TRANSPORTATION INSTITUTE
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IMPLEMENTATION STATEMENT

The findings of this study can be used to improve some right-of-way acquisition practices and to recommend legislation giving TxDOT authority to acquire "uneconomic remainders."

The findings indicate that closer attention should be paid to right-of-way acquisitions that would create small, odd-shaped remainders of low value. This could be implemented immediately by including more remainder information in the preliminary planning process prior to right-of-way acquisition. Potential uneconomic remainders could be identified before the acquisition is undertaken.

The findings also support initiation of legislation authorizing TxDOT to purchase remainders that are identified as uneconomic. The determination of an uneconomic remainder could be made on the basis of the estimated department cost of a whole taking versus a partial taking plus damages.

DISCLAIMER

The contents of this report reflect the views of the authors who are responsible for the facts and accuracy of the data presented within. The contents do not necessarily reflect the views or policies of the Texas Department of Transportation or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation. It is not intended for construction, bidding, or permit purposes. The report was prepared by Jesse L. Buffington, Research Economist and Study Supervisor, Jeffery M. Memmott, Research Economist, Margaret K. Chui, Associate Research Economist, and Frida Saad, Research Associate.

ACKNOWLEDGMENT

The authors want to thank Mr. Jon Underwood, Director, Research and Technology Transfer Office, and staff members Lana Ashley and Klaus Alkier for assistance in handling TxDOT administrative matters pertaining to the study. Special thanks are given to the TxDOT technical panel members, Jerry Loven, Project Director, Jackie Barnett, James Blackburn, John Dawson, Richard Hubbard, and Vicki Sullivan for providing oversight and direction to the study. The research team is especially appreciative of Mr. Gary Bernethy, Director of Right-of-Way Division, Howard Knippa, Chief of Staff Services for Right-of-Way Division, and Nancy Johnson, Staff Services Assistant for the Right-of-Way Division. Not all of the data could have been collected without the valuable assistance from right-of-way personnel in the TxDOT districts involved in the study. The authors also wish to acknowledge the Federal Highway Administration for providing funding and technical support for the study.

Other members of the Texas Transportation Institute gave valuable assistance to the study. Dr. W.F. McFarland, Research Economist and Head of the Transportation Economics Program, and Mr. Dock Burke, Head of the Economics and Planning Division gave administrative support. Mrs. Cheryl Kruse, Secretary for the Transportation Economics Program took care of much of the paperwork for the study.

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SUMMARY

This is a summary of findings of Research Study 0-1390 to determine which remainder characteristics significantly affect right-of-way costs. The findings are based on an extensive literature review, a survey of right-of-way experts in and out of the state government, a selected sample of old remainder case histories performed in the state during the 1960s by the Texas Transportation Institute (TTI) and the Texas Department of Transportation (TxDOT), and a new sample of remainders created during the 70s and 80s. The primary objective of the study was to determine the significant characteristics of remainders of partial takings that affect right-of-way costs. A second objective was to determine the effect of the 1984-87 right-of-way valuation law, known as House Bill No. 101, and other legislation that might be needed to address significant characteristics of remainders.

LITERATURE REVIEW

This report presents a brief review of the historical background of right-of-way acquisition problems and federal and state laws and regulations enacted to solve these problems. It reviews some of the legal and economic aspects of purchasing right-of-way remainders of partial takings. The findings from the literature review are as follows.

- Several prior studies identified a number of right-of-way remainder characteristics that are important contributors to right-of-way costs. Some of these are physical characteristics and others are locational/access characteristics. Many of these characteristics were included in the list of characteristics given individual importance scores by a large number of highway right-of-way experts over the state. Most of these characteristics will be evaluated with one or two of the state-wide right-of-way remainder databases assembled by this study.

- A couple of studies present findings on surveys of different types of right-of-way acquisition laws in effect in other states. Among the laws reviewed are those dealing with right-of-way access, excess condemnation, and the extent of the use of special benefits to remainders in reducing damages to remainder and taking costs. Federal law authorizes excess condemnation for purposes of purchasing remnant (uneconomic) remainders, and several states have passed laws allowing excess condemnation to purchase such remainders. A total of 32 states allow special benefits to be used to offset damages only; 13 others allow them to offset both damages and the value of the taking.

REMAINDER CHARACTERISTICS AFFECTING RIGHT-OF-WAY COSTS

As mentioned above, the literature survey identified a large number of remainder characteristics that may significantly affect right-of-way costs. These underwent subjective evaluation by right-of-way experts in the state and an objective evaluation by using a database of old remainder case studies called Sample I, conducted in the 1960s, and a new database of more recent remainder case studies called Sample II.

Opinion Survey Findings

The right-of-way experts were asked to give an importance score of 1 to 10 (1=least and 10=highest score) to a list of remainder characteristics. The scores for each characteristic were averaged for all 64 respondents and then used to rank the characteristics. The results were as follows.

- The top 12 physical characteristics receiving an average importance score of 5.0 or more are: changes in highest and best use of remainder, size of remainder, development capabilities, shape of remainder, width of remainder, grade of abutting highway, length or depth of remainder, highest and best use of original property, compliance with local ordinances, land use of original property, drainage/topography of remainder, and size of original property.

- The top six locational/access characteristics receiving an average importance score of 5.0 or more are as follows: location of access to abutting highway, amount of access to abutting highway, location of taking, functional class of abutting highway, location and number of driveways to abutting highway, and access to cross street or road.

Several of these characteristics were confirmed by the analysis of both the Sample I and Sample II databases to be statistically significant characteristics affecting right-of-way costs. Those findings are presented below.

Sample I Analysis and Findings

Sample I is a selected sample of 196 old case studies of remainders conducted in the 1960s. These remainder parcels, created during the 1946-64 period, were primarily negotiated parcels located in urban areas and on interstate highways. They represent most areas of the state and show a wide diversity of sizes, shapes, and original land uses.

Researchers used the least squares regression method to analyze the different characteristics of the remainders in this database. As stated above, several of the characteristics given high importance scores in the survey of experts show up in one or both of the regression equations as being statistically significant independent variables affecting right-of-way costs. A total of 33 independent variables were defined and analyzed in the two regression models.

Analysis of Total Taking Cost

The first model estimated the relationship between total taking cost and the 33 variables. A total of six independent variables were highly related to total taking costs. These significant variables are as follows: appraised value of entire property, value of the remainder, improvement cost per square foot, ratio of size of the taking to the parcel size, shape (irregular triangle), and land use (commercial) of original property.

The above variables explain 85.6% of the variation in total taking cost, which is high for this type of analysis. All of the signs on the coefficients to these variables are logical.

Analysis of Partial Taking Cost Versus Whole Taking Cost

The second regression model identifies the characteristics (variables) that significantly influence the choice between a partial taking and a whole taking. It measures the proportional difference between the cost of a partial taking and the cost of a whole taking for all of the remainders in the sample and determines the influence that each remainder characteristic has on that proportional difference.

Again, many remainder characteristics were used in the regression equation. Those that significantly affected the proportional difference between the partial taking cost and whole taking cost remained in the equation and explained 85% of the variation. The significant variables are as follows: ratio of size of taking to total parcel, size of taking, value of the remainder, cost of improvements and cost of damages, value of improvement on entire parcel, and different land uses (commercial and residential). All of the signs on the coefficients to these variables were logical.

Sample II Database

The Sample II database is composed of 300 of the more recent remainders of partial takings created during the 1974-91 period. This time period was divided into three periods as follows: Period 1 (spanning from 1974 to August 1984), Period 2 (spanning from August 1984 through October 1987), and Period 3 (spanning from October 1987 through 1991).

General Characteristics

A sample of 100 remainder parcels was obtained from each of the three periods. The middle period, Period 2, is the period in which the new right-of-way acquisition law was in effect.

This sample is a stratified random sample that covers all regions of the state. Negotiated purchases compose about one half of the sample and condemnation purchases compose the other half. The majority are of a rural type in agricultural use, most of them abutting a non-interstate highway.

Data Collection and Analysis

Data was collected and returned on 196 remainder parcels and used in the analysis of characteristics of remainders as they relate to right-of-way cost. TxDOT district personnel filled out the case study forms and returned them to TTI for reduction and analysis.

The same regression analytical method was used on the Sample II database as in the case for Sample I. Many more of the physical, locational, and access characteristics are defined and analyzed.

The findings from the analysis of the Sample II database were reported in a technical memorandum to TxDOT on April 28, 1995. These findings are also reported in this report. Also, a combined database of 377 remainders from both Samples I and II was prepared and analyzed. The results are presented in this report. Finally, a remainder resale analysis was performed and are summarized in this report. These findings are summarized below.

Analysis of Total Taking Cost

A total of 76 variables were analyzed based on data collected on Sample II remainders. Only 33 variables were defined and analyzed in Sample I. Therefore, the Sample II database allowed a much more extensive evaluation of remainder characteristics to determine which significantly affect right-of-way costs.

A total of 15 independent variables were found to be highly related to total taking costs. These significant variables are as follows: ratio of size of taking to total property size, commercial land use, acquisition size, remainder size, acquisition value, rectangular shape, location in rural/suburban area, depressed grade of abutting highway, parking restrictions, zoning restrictions, lack of water lines and gas lines, and split remainders. All except two of the above variables are newly significant variables not found in the Sample I analysis. This analysis confirmed those two, the taking size ratio and commercial land use. The new database greatly expanded the list of significant variables affecting total taking cost.

This regression model explained 59% of the variation in total taking cost. Such is a reasonably high level of explained variation.

Analysis of Partial Taking Cost Versus Whole Taking Cost

Again, this regression identifies the characteristics or variables that significantly influence the choice between a partial taking and a whole taking. Again, the defined independent variables were used in this regression model to explain as much variation as possible with the statistically significant variables. A total of nine variables were found to be statistically significant in explaining 65% of the variation in the dependent variable, partial taking versus whole taking cost (PROVAL). Three of these variables confirmed the findings of Sample I. These were the taking size ratio, commercial land value, and rectangular shape. The six new variables that were significantly related to the dependent variable, partial taking versus whole taking cost, are as follows: total acquisition cost, negotiated acquisition, below grade level of abutting highway, suburban location, access only on a side street, and split remainder.

Again, the Sample II database identified several new variables that are statistically significant in affecting right-of-way costs.

Combined Analysis of Samples I and II

The combined database of Samples I and II yielded 377 remainders for analysis. The combined database was more balanced between urban/rural, functional class of highways, remainder size, and use than using Samples I and II databases separately. All of the common variables of the two models were used in the same regression models defined in the analysis of the other two databases. Also, all variables with dollar amounts were converted to 1992 dollars, thus removing the effects of general inflation. These findings are summarized below.

Analysis of Total Taking Cost

The total taking cost model identified 13 significant variables related to the total taking cost dependent variable and explained 82% of the variation. Therefore, a very high amount in variation was explained, as in the Sample I analysis. Two new variables were defined for this analysis. These variables were PROLAND, the proportion of land of the entire property compared to the total value, and SALECHG, the percent change in remainder value from taking to sale of remainder property. Eight of the 13 variables confirmed the significance of variables in either the Sample I or Sample II analysis. The other five were newly identified variables, namely, original total cost, remainder improvement value, and two other remainder shapes. Neither of the new variables were significant.

Analysis of Partial Taking Cost Versus Whole Taking Cost

A total of seven variables were significantly related to the partial taking cost versus whole taking cost. One of these variables was the newly coined variable, PROLAND, defined above. Three of the seven variables were significant in one or both of the other databases. The other four were newly identified variables that related to the dependent variable. These variables were: PROLAND, amount of access on a frontage road, condemned method of taking, and below grade. A total of 59% of the variation was explained.

Analysis of Change in Value of Remainders

The new variable, SALECHG, was converted to a dependent variable to determine its relation to the other variables in an attempt to analyze what causes changes in the value of remainders selling after acquisition. The database was limited to only remainders with a sales history, of which 177 qualified. A total of nine variables were identified as being significantly related changes in the value of remainders sold later. These variables were: original cost or value of the entire property, total cost of the taking, remainder land value before taking, size of taking, damages paid per square foot, vacant land, functional class of highway, condemned method of acquisition, and below grade level of abutting highway. These seven variables explained a total of 82% of the variation. This latter analysis proved to be helpful in explaining what affects the amount the remainder changes in value after the acquisition.

None of the above mentioned analyses had the acquisition period variable to be significantly related to right-of-way cost or changes in remainder value after taking.

The list of conclusions and recommendations are presented in the last section of this report. Therefore, they are not repeated here. However, the data evaluated in the study seems to support the overall conclusion that right-of-way costs would be reduced significantly if TxDOT could legally purchase whole takings when a small odd shaped remainder would be created in a partial taking.

INTRODUCTION

STUDY PROBLEM

Many of the planned highway improvements require extensive amounts of right-of-way which add significantly to the total cost of such improvements. Therefore, the state, cities, and counties involved are faced with a sizable bill to purchase the necessary right-of-way. Much of the right-of-way being purchased requires only a partial taking of the abutting property, thus creating an equal number of remainder tracts. Many of these remainders are small and irregular in shape and may suffer considerable severance and/or proximity damages in the market place. Others may suffer damages due to changes in the type or amount of access. Frequently, the small and irregularly shaped remainders are damaged to 100% of value, thus amounting to the value of the whole property. However, the state only gains title to the partial taking, and the property owner keeps title to the remainder. Although enhancements can offset some of these damages, purchasing agencies are still paying many property owners more than the value of the taking.

Determining the amount of enhancements and/or damages to a remainder is a real problem to real estate appraisers, leading to a greater number of properties having to be acquired through condemnation proceedings. TxDOT's right-of-way personnel estimate that right-of-way costs could be reduced approximately 5% or $7 million per year by offsetting some right-of-way payments to landowners with the value of enhancement to their remaining land. This estimate is based on the historical experience of TxDOT for the 1984-1987 period when state law allowed consideration of enhanced values. Due to uncertainties of the future value of the remaining land, the amount of "real" enhancements or damages that may accrue due to right-of-way taking remains in doubt. Prior case studies conducted in the 1950s and 1960s show "real" damages exceeding the paid damages on some remainders studied. Many access and property characteristics of right-of-way remainders may contribute significantly to right-of-way costs. They also may contribute differing amounts to damages and/or enhancements to remainders. Therefore, remainder properties created in later years, including those created during the 1984-1987 period, will be researched to determine which remainder characteristics contribute significantly to "real" damages and/or enhancements of remainders, and ultimately, to right-of-way costs. Also, we will compare remainders created during the 1984-1987 period with those created in periods before and after this period to determine the effect on right-of-way costs attributable to changing laws. Finally, we will compare these results to the findings of a sample of 486 remainder case studies conducted in the 1950s and 1960s.

PURCHASING RIGHT-OF-WAY REMAINDERS

Legal Aspects

The establishment of the Interstate Highway System (IHS) set in motion vastly accelerated right-of-way acquisition programs through the cooperation of state highway and/or transportation agencies. Since the IHS is a limited access facility, and placed to a considerable extent on new locations, many right-of-way acquisition problems occurred, particularly those involving partial takings [1,2]. As a result, many new rules, regulations, and laws were put into effect on a federal and state level to guide these expanded right-of-way acquisition programs. Acquisition laws were further interpreted by the courts of each state [3]. In Texas, the Carpenter case was supplemented through the succeeding years by rulings of other cases, such as the Meyers and Vaughn cases [4]. More recently, several court cases have dealt with the consideration of 1) "special enhancements" to the remainder being used to offset damages to the remainder and 2) "right of access" in the determination of the fair market value of a remainder, such as State v. The Enterprise Co., 728 S.W. 2d 812 (Tex. 1986); State v. Schmidt, 805 S.W. 2d 25 (Tex. App.--Austin 1991, n.w.h.); and

State v. Munday Enterprises, (3-90-236-CV), 1/15/92, Aust. ST., [5,6,7].

Presently, TxDOT officials are considering legislation that would allow the acquisition of "uneconomic remainders" of partial takings. Federal law already allows the purchase of such remainders under the provisions of the "Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, P.L. 91-646, 84 Stat. 1894" [8]. However, such authorization conflicted with provisions of the "Federal-Aid Highway Act of 1944, P.L. 78-521, December 20, 1944, 58 Stat. 838" [8]. This conflict was apparently resolved in "State of New Mexico, ex rel. New Mexico Highway Department v. United States, 665 F.2d 1023 (Ct.Cl. 1981)" [8]. Currently, the Texas Constitution does not allow condemning authorities, such as TxDOT, to acquire excess right-of-way or to use "special benefits" to reduce what is paid for the part taken. A total of 28 states do not allow "special benefits" to be charged against the value of the part taken [9].

Actually, current federal law requires an offer to acquire "uneconomic remnants of land that may remain after a partial taking" [8]. Therefore, states that are authorized under state law to make excess purchases of right-of-way are required to look for, identify, and provide for the acquisition of land meeting the description of "uneconomic remnant" as defined by the Federal Highway Administration. Its definition is as follows: "a remaining part of land, after a partial acquisition, that is of little or no utility or value to the owner" [8].

Cost and Economic Aspects

Highway right-of-way acquisition research on a national and state level was accelerated in the late 1950s and early 1960s as a result of problems incurred from purchasing right-of-way for the interstate highway system [10,11,12,13,14]. Previous research was conducted on the following right-of-way topics: (1) study of property evaluations for right-of-way acquired in Texas [4], (2) analysis of right-of-way appraisal problems [10,15,16], (3) effects of access on highway right-of-way costs [17], (4) determination of special benefits [17,18], (5) rules of compensability and approaches to compensation for right-of-way takings [19,20], (6) right-of-way remainder and severance damage evaluations [8,11,12,13,14,17,21], and (7) excess condemnation [8, 13, 22]. Most of these and other studies have been outdated by the passage of new laws and new court rulings. However, some of these studies are useful to this study. For example, Franklin and Evans's study determined the effect of access, size of part taken and remainder, land use of original property and the remainder after, and several other variables on right-of-way cost by conducting an empirical analysis on a random sample of 343 right-of-way acquisitions in 11 different counties in Texas [17]. The study identified and analyzed many property and locational/access characteristics of these acquisitions to determine their significance on the total cost of a parcel of land, cost of land taken, and damages to the remainder. The authors concluded that the granting of access had the effect of reducing the amount paid for damages on these property acquisitions. This study uses many of these same variables.

A more recent study was conducted to determine the benefits of increased land accessibility due to highway projects and to determine the key factors that affect the appraised values in highway condemnation cases [23,9]. Also, a literature review and survey of current practice in other states was used to identify some of the benefits of increased land accessibility, and a small sample of right-of-way acquisitions was studied in an attempt to determine the key factors affecting the appraised values in condemnation cases. The study concluded that there was too much variety in the small sample of cases studied to clearly identify the key factors affecting the appraised values. Another major deficiency of the study was the lack of an after acquisition market sales history of the sample of remainders studied. The study concluded that a much larger sample of right-of-way acquisitions should be selected for a follow-up study. The survey of other states determined which states permitted the use of general and/or special benefits to offset damages to the remainder and/or the value of the taking. Only five states would not allow any benefits to offset damages to the remainder. A total of 32 states allowed special and/or general benefits to offset damages to the remainder, but not the value of the taking. The remaining 13 states allow special benefits to offset damages to the remainder and also the value of the taking.

As a result of the right-of-way remainder research performed by Buffington and Adkins [13,14] in the early 1960s, TxDOT set up a data bank of right of way remainders that was researched to determine whether each remainder was, in fact, damaged in value after the taking [23]. This data bank has helped TxDOT's review appraisers to evaluate fee appraisals on remainder parcels created over the state. The case studies developed by Buffington and Adkins indicate that a majority of remainders are enhanced in value over and above their before-taking value [13,14]. However, a significant number are damaged, especially the small and/or irregularly shaped ones. In a 1967 survey of TxDOT's right-of-way personnel, Adkins and Buffington found that the vast majority of the respondents thought that purchasing whole takings is the best way to minimize overcompensation for right-of-way takings [15]. The same survey revealed that a majority of those responding thought that the application of the acquisition rules established by the Carpenter case to appraise partial takings leads to higher right-of-way costs. The Right-of-Way Division of TxDOT conducted a limited aggregative analysis of 300 of the 486 remainder case histories published through April 1970 and concluded that a real estate market exists for all types, sizes, and shapes of remainders, but that size apparently plays the most important role in the value of remainders after acquisition [23].

Highway right-of-way costs have been accelerating in recent years, especially in suburban and urban areas of the state. Therefore, further efforts are being made by TxDOT officials to find ways to reduce or hold down such costs. One of the efforts helped to enact a new law determining the compensation paid property owners for partial takings of right-of-way for highways. Such a law allowed consideration of special or direct benefits arising from the highway improvement in awarding compensation for the taking and/or assessing damages to the remainder. The Texas Supreme Court later declared this law unconstitutional in the State v. Munday Enterprises case. However, this law was in effect during the 1984-1987 period and helped to reduce right-of-way costs by an estimated $7 million [9]. TxDOT is also considering the possibility of obtaining the legal authority to purchase uneconomic remainders of partial takings. Some states already have this authority [12, 22]. The results of the current study may be helpful to TxDOT in making a decision to ask for passage of an excess condemnation law in Texas.

The above-cited studies give some indication of the problem of having to purchase partial takings, and a study of the literature has been helpful in determining the magnitude of the problem and has furnished some guidance on what remainder characteristics should be evaluated in this study. Also, additional guidance has come from a recently completed study that investigated the value of access rights.

STUDY OBJECTIVES

The general study objective is to determine which remainder characteristics significantly affect right-of-way costs. The more specific objectives of the study are as follows:

1. Determine the significant remainder property access and locational characteristics that affect right-of-way costs; and
2. Determine the effects of the 1984-87 right-of-way evaluation law on right-of-way costs.

DATA SOURCES

The data sources for the study are relevant reports cited in the literature; a survey of highway right-of-way appraisers, attorneys (TxDOT's and State Attorney General's staff) and other right-of-way officials; a sample of old case studies of remainders of partial takings created during the 40s, 50s, and 60s; and a sample of new case studies of remainders of partial takings created during the 70s, 80s, and early 90s in Texas. The base data for each of the case studies making up each sample are from TxDOT files.

The study's interim report, published as Research Study 1390-1, also summarizes the findings from the literature; a survey of right-of-way fee appraisers, TxDOT appraisers, supervisors and attorneys and State Attorney General's Office right-of-way attorneys; and the analysis of a sample of prior right-of-way case studies conducted by TxDOT and Buffington and Adkins in the 1950s and 1960s [24].

REMAINDER CHARACTERISTICS AFFECTING RIGHT-OF-WAY COSTS

Again, the primary objective of this study is to identify and determine the remainder characteristics that most influence right-of-way costs. The second objective is to determine the effects of the 1984-87 right-of-way evaluation law on right-of-way costs. Two types of data collections were conducted to achieve both objectives. The first type is a subjective measurement based on the results of a survey of government personnel or professionals who have expertise in issues of right-of-way costs. The respondents to the survey gave their opinions on the relevancy of the various remainder characteristics. The second type is an objective measurement based on data from two sets of remainder case studies, a non-random sample of 196 case studies conducted by TxDOT and TTI during the 1960s, and a stratified random sample of 300 case studies conducted by TTI (in cooperation with TxDOT) in 1994. Sample I is composed of 196 case studies done by TxDOT and 43 case studies done by TTI. Sample II is the primary database used to determine which of the remainder characteristics identified in the literature search and ranked high by the survey respondents significantly affect right-of-way costs.

Both Sample I and Sample II are composed of case studies representing all regions of the state. Figure 1 shows the state divided into seven regions with at least two TxDOT districts per region. Figures 2 and 3 show the percentage of remainder case studies located in each region. Since Sample II is a stratified sample, it is more evenly distributed over the state than Sample I.

OPINIONS OF EXPERTS SURVEYED

To identify the relevant factors in the determination of remainder awards and damages, a survey form was developed and sent to the above mentioned right-of-way government personnel and professionals. A total of 91 survey instruments were sent

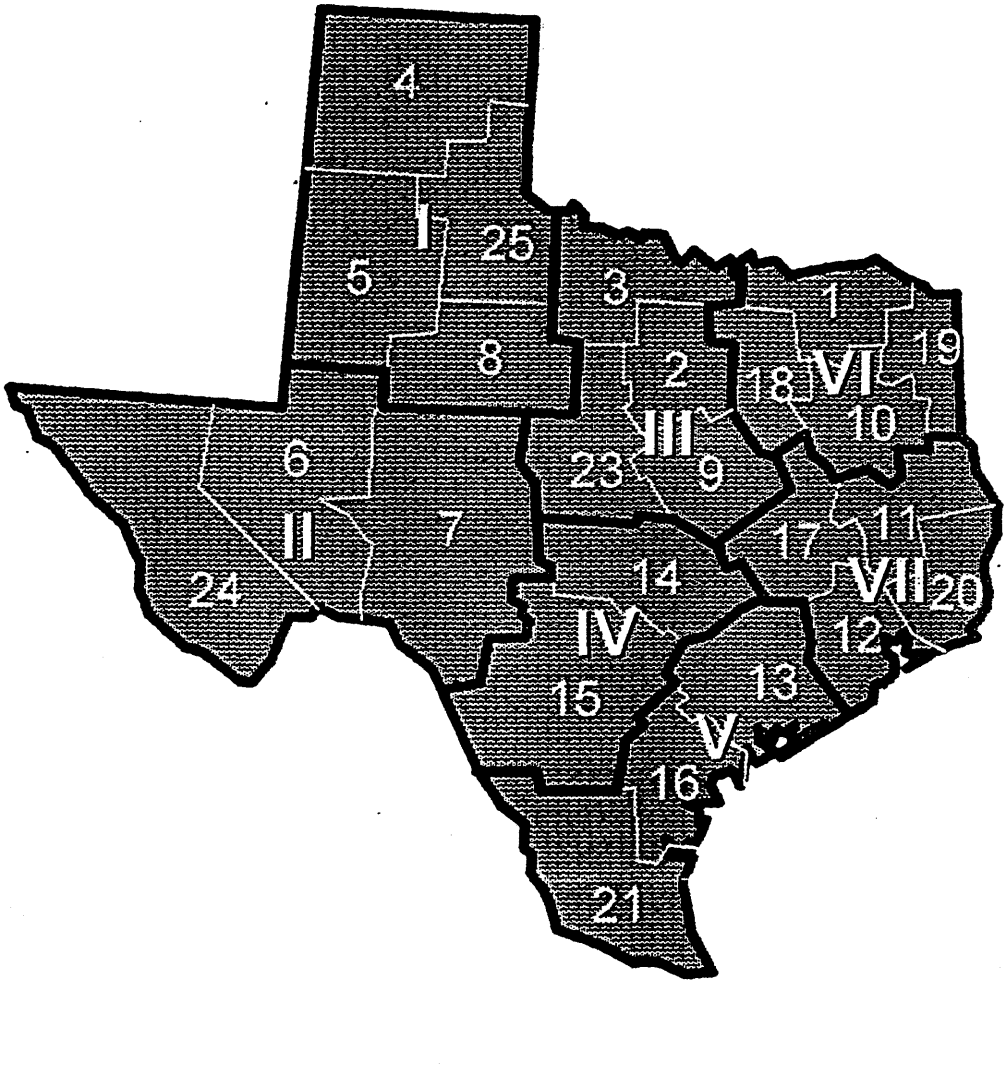

Figure 1. Map of Texas Divided into Seven Regions with the TxDOT Districts Included in Each Region

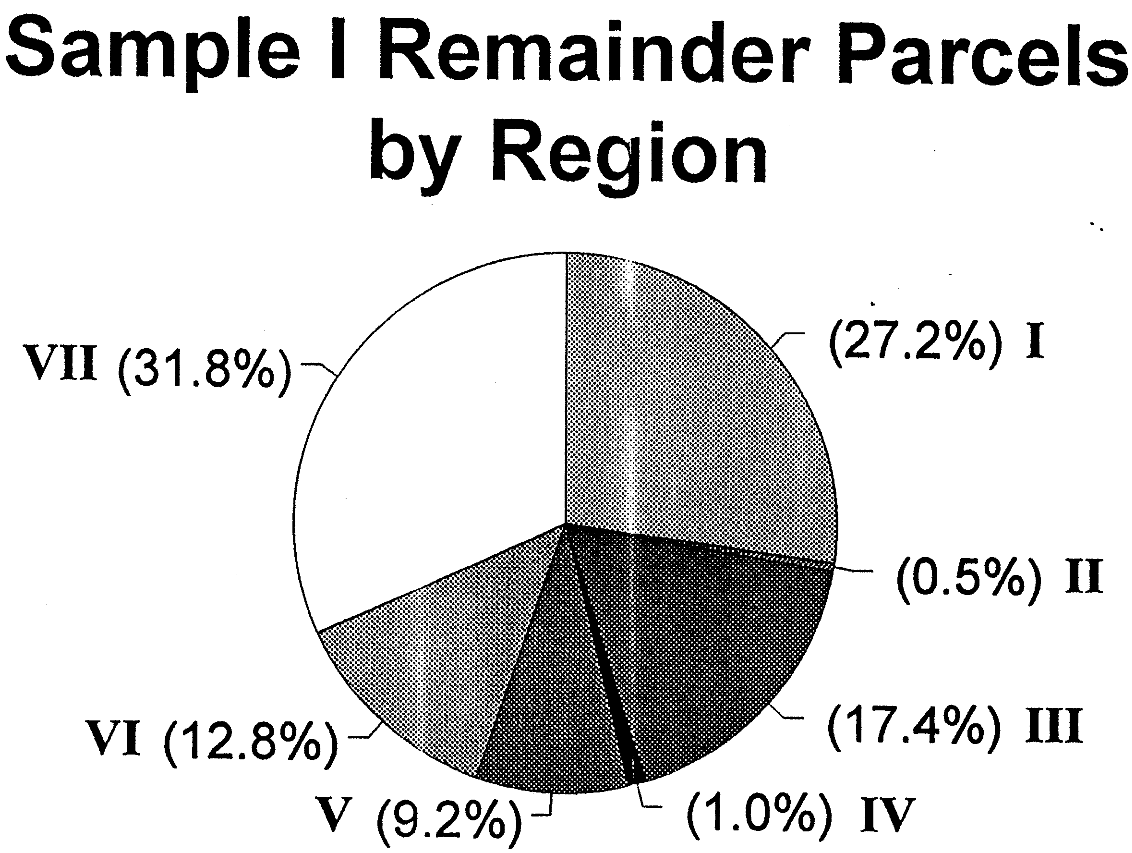

Figure 2. Chart Showing the Percentage of Sample I Remainder Parcels in Each Region of the State

Sample II Remainder Parcels by Region

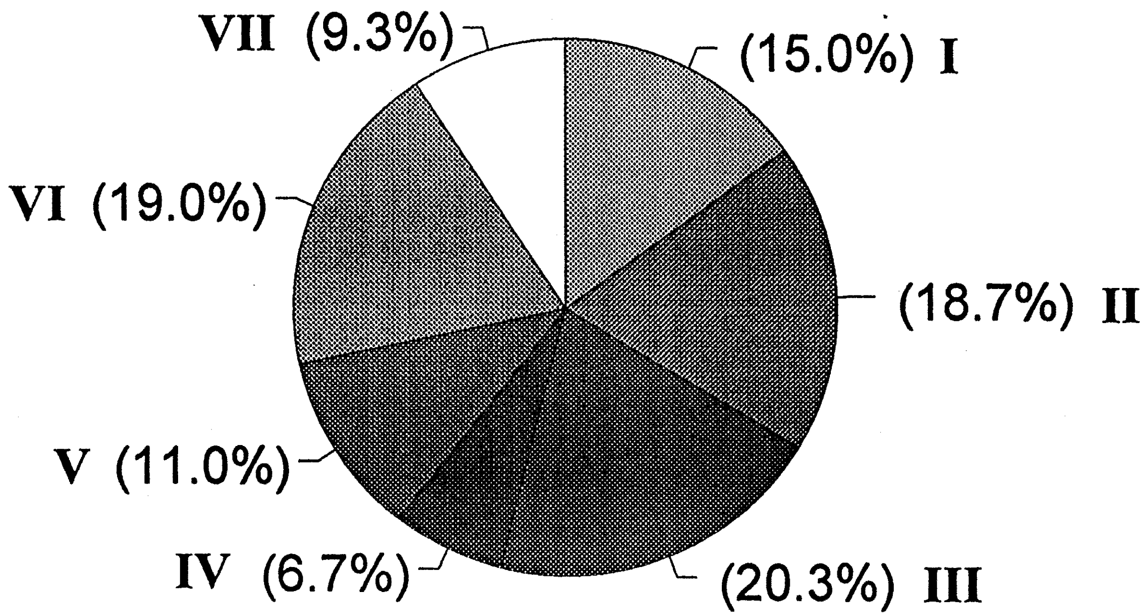

Figure 3. Chart Showing the Percentage of Sample II Remainder Parcels in Each Region of the State

to public as well as private personnel, selected for their expertise in highway right-of-way and remainder acquisitions and sales (see Appendix for a copy of the survey instrument). This survey targeted five types of respondents to solicit their opinions on the physical as well as locational/access characteristics of right-of-way remainders which may be factors in determining remainder awards and damages. The types of respondents are: 1) TxDOT right-of-way appraisers; 2) fee appraisers; 3) TxDOT right-of-way attorneys; 4) staff attorneys in the attorney general office; and 5) other TxDOT right-of-way officials.

TxDOT right-of-way appraisers handle the appraisal issues on behalf of the state, including such issues as assigning parcels to be appraised, advising fee appraisers, evaluating appraisers' qualifications and their final submitted appraisal reports, recommending appraisal values, and furnishing appraisal support for accepting the commissioner's awards, and recommended settlements of eminent domain lawsuits. They also serve in an advisory role in engineering matters relating to right-of-way costs. In addition, they maintain a file on comparable sales information on each right-of-way project in the state. The fee appraisers are independent real estate appraisal experts contracted by the state to carry out formal appraisals. They conduct the field work, perform appraisal analyses, and write the appraisal report. The TxDOT right-of-way attorneys are state employees hired by TxDOT to handle all legal matters pertaining to right-of-way cases.

When disputes arise between landowners and TxDOT regarding the value placed on right-of-way being acquired by eminent domain, special commissioners are appointed at the county level to hear each case and arrive at a value. These special commissioners are property owners who do not have any interests in the disputed property but offer their experiences gained from their various occupational backgrounds. If either party is not satisfied with the value placed on the property to be acquired and want a county jury to set the value, the attorney general's office will become involved to represent the state.

The last category of personnel to be surveyed represents people who do not belong to the above four categories but have knowledge in right-of-way acquisition (for example, the district right-of-way supervisors).

SURVEY INSTRUCTIONS

We asked the respondents to first identify themselves with one of the five respondent types listed on the survey form (see copy in Appendix). Then respondents were instructed to place an importance score, between 1 and 10 (1 being the least important and 10 being the most important) on each of the remainder characteristics listed in both categories of the physical and locational/access characteristics. These characteristics were identified in the literature to be potentially relevant in influencing remainder awards and damages [12,14,15,17,21,22].

SURVEY RESULTS

Out of the 91 survey instruments sent out, 70 of them were returned, and out of the 70 returned, 6 were blank either because of wrong addresses or because the person had since changed jobs. The 70 returns represents a 77% return rate, which is an excellent return rate in any mail-out survey.

Tables 1 through 5 present the results of the survey by type of respondent, giving the mean scores, variances for each characteristic, and the overall ranking of each characteristic across both categories. When comparing the results by type of respondent, the rankings do not differ much, especially in the top rankings. While the appraisers place more importance in the highest and best use of the remainder, the attorneys and their staff place more importance on the length and shape of the remainder; but the differences in the order of ranking are actually insignificant. When both categories are considered together for an overall respondent type ranking, the first three characteristics capture the highest rankings of the two categories, with the first and the second from the physical category and the third from the location/access category. Therefore, the physical category plays a more dominant role.

Table 1. Survey Results and Ranking of Remainder Characteristics for TxDOT Right-of-Way Appraisers

Type of Respondent: TxDOT Right-of-Way Appraiser				
No. of Respondents of the Type: 16				
	Mean Score	**Variance**	**Ranking by Category**	**Overall Ranking**
Category I. Physical Characteristics				
Change in highest & best use of remainder	8.8	2.3	1	1
Size of remainder	8.4	1.8	2	2.5
Width of remainder (abutting hwy)	7.6	2.9	3	4
Grade level of abutting hwy	7.5	3.8	4	5
Shape of remainder	7.4	5.0	5	6
Length of remainder (depth from hwy)	7.3	3.8	6	7
Development capabilities	7.2	2.8	7	8.5
Highest and best use of original property	6.9	5.1	8	10
Compliance with local ordinances	6.6	4.2	9	13.5
Drainage/topology of remainder	6.1	4.1	10	15
Land use of original property	5.9	3.5	11	16.5
Size of original property	5.2	6.9	12	19
Category II. Locational/Access Characteristics				
Location of access to abutting hwy	8.4	2.1	1	2.5
Amount of access to abutting hwy	7.2	3.4	2	8.5
Functional hwy class (abutting remainder)	6.7	6.5	3.5	11.5
Location & # driveways to abutting hwy	6.7	3.7	3.5	11.5
Location of taking	6.6	4.6	5	13.5
Access to cross street/road	5.9	3.9	6	16.5
Distance to cross street/road	5.3	4.9	7	18
Distance to major hwy	4.5	2.8	8	20
Distance to major shopping center	4.4	2.6	9	21
Distance to CBD of nearest town	4.0	2.8	10	22

Table 2. Survey Results and Ranking of Remainder Characteristics for Fee Appraisers

Type of Respondent: Fee Appraiser				
No. of Respondents of the Type: 27				
	Mean Score	**Variance**	**Ranking by Category**	**Overall Ranking**
Category I. Physical Characteristics				
Change in highest & best use of remainder	9.5	0.9	1	1
Size of remainder	7.6	5.8	2	2.5
Development capabilities	7.2	5.4	3	4
Compliance with local ordinances	7.1	6.8	4	5.5
Grade level of abutting hwy	7.0	5.4	5	7
Shape of remainder	6.9	3.7	6	8.5
Highest & best use of original property	6.3	10.3	7.5	12.5
Length of remainder (depth from hwy)	6.3	5.9	7.5	12.5
Width of remainder (abutting hwy)	6.0	6.1	9	14
Land use of original property	5.4	7.6	10	16
Drainage/topology of remainder	5.3	7.0	11	17
Size of original property	4.4	9.4	12	19
Category II. Locational/Access Characteristics				
Location of access to abutting hwy	7.6	4.0	1	2.5
Location of taking	7.1	6.3	2	5.5
Amount of access to abutting hwy	6.9	5.2	3	8.5
Location & # driveways to abutting hwy	6.8	2.6	4	10
Functional hwy class (abutting remainder)	6.5	7.3	5	11
Access to cross street/road	5.7	5.2	6	15
Distance to cross street/road	4.6	3.1	7	18
Distance to major shopping center	4.0	3.0	8	20
Distance to CBD of nearest town	3.9	2.9	9.5	21.5
Distance to major hwy	3.9	2.0	9.5	21.5

Table 3. Survey Results and Ranking of Remainder Characteristics for TxDOT Right-of-Way Attorneys

Type of Respondent: TxDOT Right-of-Way Attorney				
No. of Respondents of the Type: 1				
	Mean Score	**Variance**	**Ranking by Category**	**Overall Ranking**
Category I. Physical Characteristics				
Size of remainder	10.0	0	2	2
Length of remainder (depth from hwy)	10.0	0	2	2
Shape of remainder	10.0	0	2	2
Change in highest & best use of remainder	9.0	0	4	4.5
Width of remainder (abutting hwy)	8.0	0	5.5	7
Development capabilities	8.0	0	5.5	7
Highest and best use of original property	5.0	0	7	10.5
Land use of original property	3.0	0	8.5	14
Compliance with local ordinances	3.0	0	8.5	14
Drainage/topology of remainder	2.0	0	10.5	17.5
Grade level of abutting hwy	2.0	0	10.5	17.5
Size of original property	1.0	0	12	20.5
Category II. Locational/Access Characteristics				
Location of access to abutting hwy	9.0	0	1	4.5
Functional hwy class (abutting remainder)	8.0	0	2	7
Amount of access to abutting hwy	6.0	0	3	9
Location of taking	5.0	0	4	10.5
Location & # driveways to abutting hwy	3.0	0	6	14
Access to cross street/road	3.0	0	6	14
Distance to major hwy	3.0	0	6	14
Distance to cross street/road	1.0	0	9	20.5
Distance to CBD of nearest town	1.0	0	9	20.5
Distance to major shopping center	1.0	0	9	20.5

Table 4. Survey Results and Ranking of Remainder Characteristics for Attorney General Staff Attorneys

Type of Respondent: Attorney General Staff Attorney				
No. of Respondents of the Type: 7				
	Mean Score	**Variance**	**Ranking by Category**	**Overall Ranking**
Category I. Physical Characteristics				
Land use of original property	8.2	2.5	1	1
Highest and best use of original property	7.9	6.7	2	2
Width of remainder (abutting hwy)	7.8	0.8	3	3
Change in highest & best use of remainder	7.7	4.8	4	4
Size of remainder	7.5	4.9	5	5
Development capabilities	7.3	4.5	6	6
Compliance with local ordinances	6.8	3.0	7	7
Length of remainder (depth from hwy)	6.4	5.1	8	8
Size of original property	6.0	2.6	9	12
Drainage/topology of remainder	5.8	1.5	10	14
Grade level of abutting hwy	5.3	4.5	11	16
Shape of remainder	5.0	5.7	12	18.5
Category II. Locational/Access Characteristics				
Functional hwy class (abutting remainder)	6.3	8.8	1.5	9.5
Location & # driveways to abutting hwy	6.3	0.8	1.5	9.5
Amount of access to abutting hwy	6.1	9.0	3	11
Location of access to abutting hwy	5.9	9.8	4	13
Location of taking	5.7	12.2	5	15
Distance to CBD of nearest town	5.1	7.3	6	17
Distance to cross street/road	5.0	5.4	7	18.5
Access to cross street/road	4.9	5.8	8	20
Distance to major hwy	4.6	6.0	9	21
Distance to major shopping center	3.7	5.3	10	22

Table 5. Survey Results and Ranking of Remainder Characteristics for Other TxDOT Officials

Type of Respondent: Other TxDOT Officials				
No. of Respondents of the Type: 13				
	Mean Score	**Variance**	**Ranking by Category**	**Overall Ranking**
Category I. Physical Characteristics				
Size of remainder	9.2	1.2	1	1
Change in highest & best use of remainder	8.2	3.6	2	2
Width of remainder (abutting hwy)	7.8	3.2	3	3
Shape of remainder	7.5	3.5	4	4
Grade level of abutting hwy	7.4	3.3	5	5.5
Development capabilities	7.1	4.2	6	7
Length of remainder (depth from hwy)	7.0	4.2	7	8
Highest and best use of original property	6.8	5.1	8.5	10
Drainage/topology of remainder	6.8	3.6	8.5	10
Land use of original property	6.6	5.3	10	12
Size of original property	6.0	4.6	11	15
Compliance with local ordinances	5.9	6.4	12	16
Category II. Locational/Access Characteristics				
Location of access to abutting hwy	7.4	6.9	1	5.5
Location of taking	6.8	8.2	2	10
Amount of access to abutting hwy	6.3	6.8	3	13
Functional hwy class (abutting remainder)	6.2	4.6	4	14
Location & # driveways to abutting hwy	5.5	6.6	5	17
Access to cross street/road	5.4	4.9	6	18
Distance to cross street/road	4.3	5.1	7	19
Distance to major hwy	3.6	4.2	8	20
Distance to CBD of nearest town	3.3	3.4	9	21
Distance to major shopping center	3.2	2.2	10	22

Table 6 shows the overall results across all five respondent types. In Category 1, a change in highest and best use of the remainder and the size of the remainder are ranked as the two most important physical characteristics affecting right-of-way costs, while in Category 2, the locational/access characteristics category, both location and amount of access to the abutting highway are ranked the highest.

Table 6. Overall Survey Combined Results and Rankings of Remainder Characteristics for All Respondents

Type of Respondents: All				
Total Number of Respondents: 64				
	Mean Score	**Variance**	**Ranking by Category**	**Overall Ranking**
Category I. Physical Characteristics				
Change in highest & best use of remainder	8.9	2.6	1	1
Size of remainder	8.2	4.1	2	2
Development capabilities	7.2	4.3	3	4
Shape of remainder	7.0	4.8	4.5	5
Width of remainder (abutting hwy)	7.0	4.9	4.5	6
Grade level of abutting hwy	6.9	5.2	6	7
Length of remainder (depth from hwy)	6.8	5.2	7	8.5
Highest and best use of original property	6.7	7.7	8.5	10
Compliance with local ordinances	6.7	6.0	8.5	10
Land use of original property	6.0	6.3	10	15
Drainage/topology of remainder	5.8	5.4	11	16
Size of original property	5.1	7.6	12	18
Category II. Locational/Access Characteristics				
Location of access to abutting hwy	7.6	5.2	1	3
Amount of access to abutting hwy	6.8	5.6	2	8.5
Location of taking	6.7	7.0	3	10
Functional hwy class (abutting remainder)	6.5	6.7	4	13
Location & # driveways to abutting hwy	6.4	3.9	5	14
Access to cross street/road	5.6	5.0	6	17
Distance to cross street/road	4.7	4.5	7	19
Distance to major hwy	4.1	3.2	8	20
Distance to major shopping center	3.9	3.3	9.5	21.5

ANALYSIS OF SAMPLE I - OLD CASE STUDIES

Although the Sample I right-of-way case studies were not selected in a random manner over the state, they are well scattered geographically and should be fairly representative of the population of remainders resulting from right-of-way purchases occurring during the 1946-64 time period. Also, the size of Sample I, being 196 remainder parcels, is large enough to be used to analyze a fairly large number of remainder characteristics in the same regression model.

The general characteristics, analysis, and findings of Sample I are presented below.

GENERAL CHARACTERISTICS OF SAMPLE I

Figures 4 and 5 show the percentage of Sample I remainder parcels by location. As can be seen in Figure 4, over 80% of the parcels were located in urban areas; Figure 5 shows that over 90% of parcels were located along interstate highways. Figure 6 shows nearly 70% of the parcels were purchased by negotiation.

Figures 7 through 9 show the percentage of Sample I remainder parcels with different physical characteristics. These graphs show a fairly wide diversity of sizes, shapes, and original land uses of remainder parcels making up Sample I. As shown in Figure 7, nearly 50% of the parcels were under 929 square meters or 10,000 square feet in size. Figure 8 shows nearly 50% of the parcels were of an irregular rectangular shape. Last, Figure 9 shows over 50% of the parcels were originally in residential use.

ANALYSIS AND FINDINGS OF SAMPLE I

The Sample I database was analyzed statistically by using the least squares regression method. The purpose of the regression analysis is primarily to determine

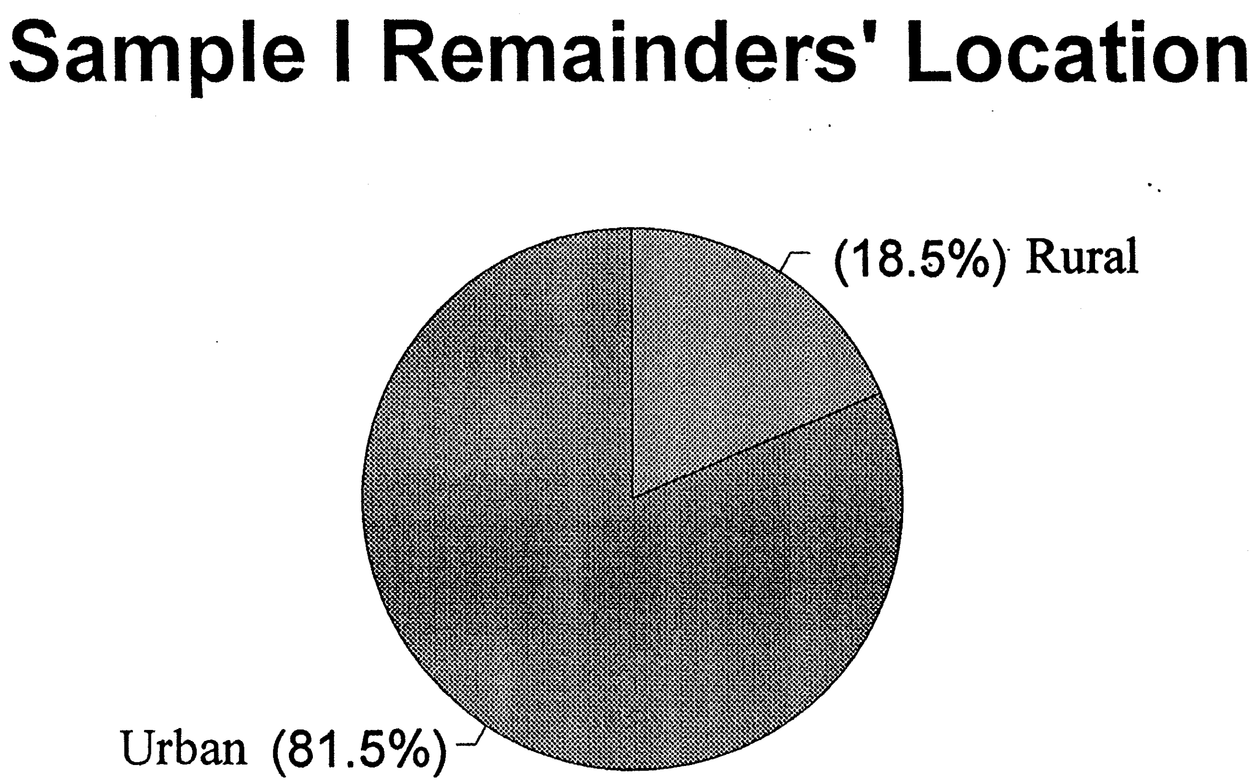

Figure 4. Chart Showing the Percentage of Sample I Remainder Parcels by Rural and Urban Location

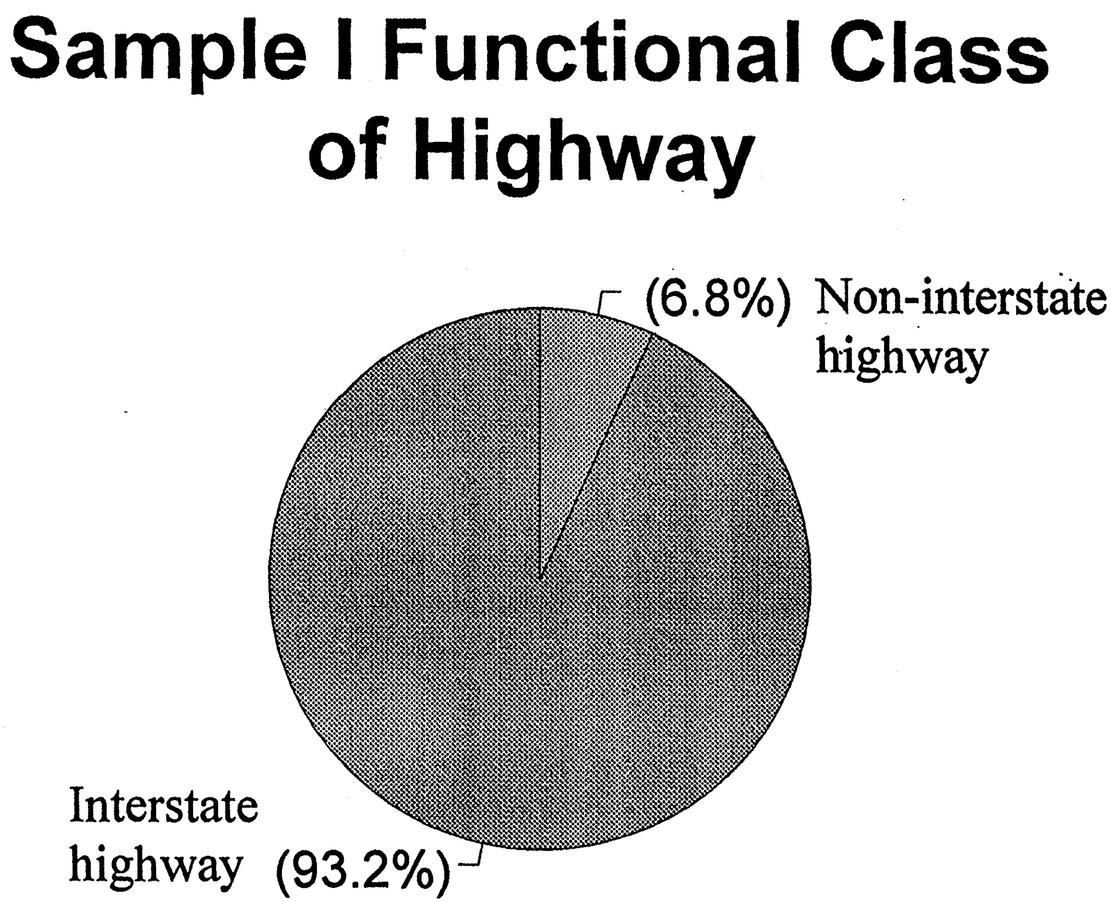

Figure 5. Chart Showing the Percentage of Sample I Remainder Parcels by Functional Class of Highway

Sample I Methods of Acquisition

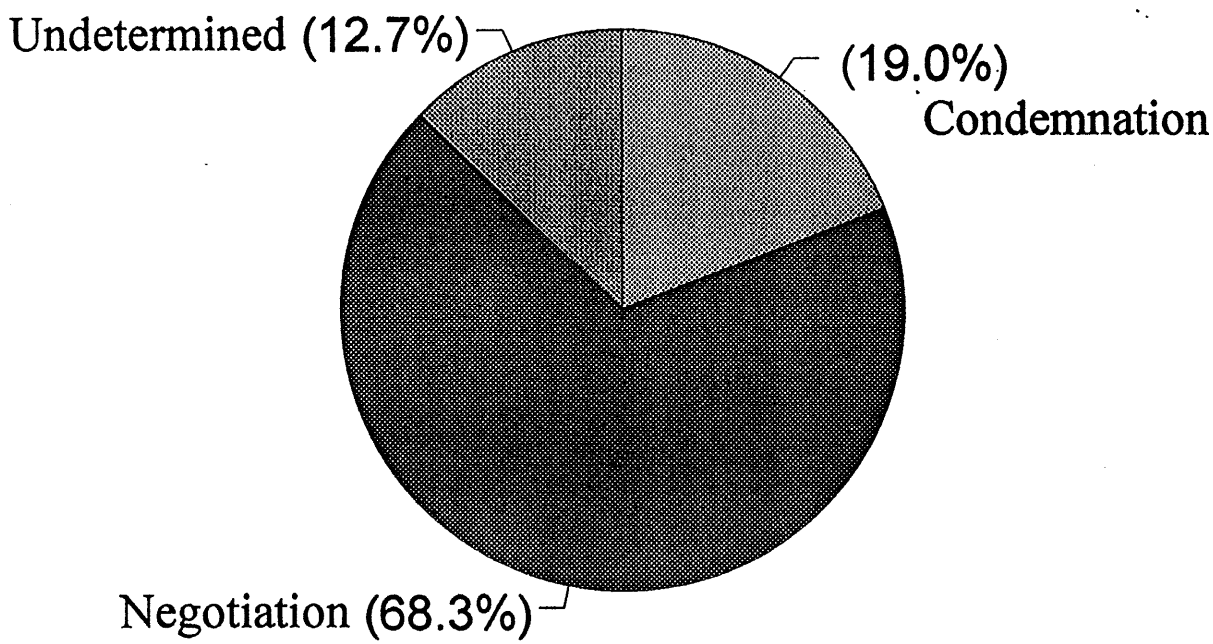

Figure 6. Chart Showing the Percentage of Sample I Remainder Parcels by Method of Acquisition

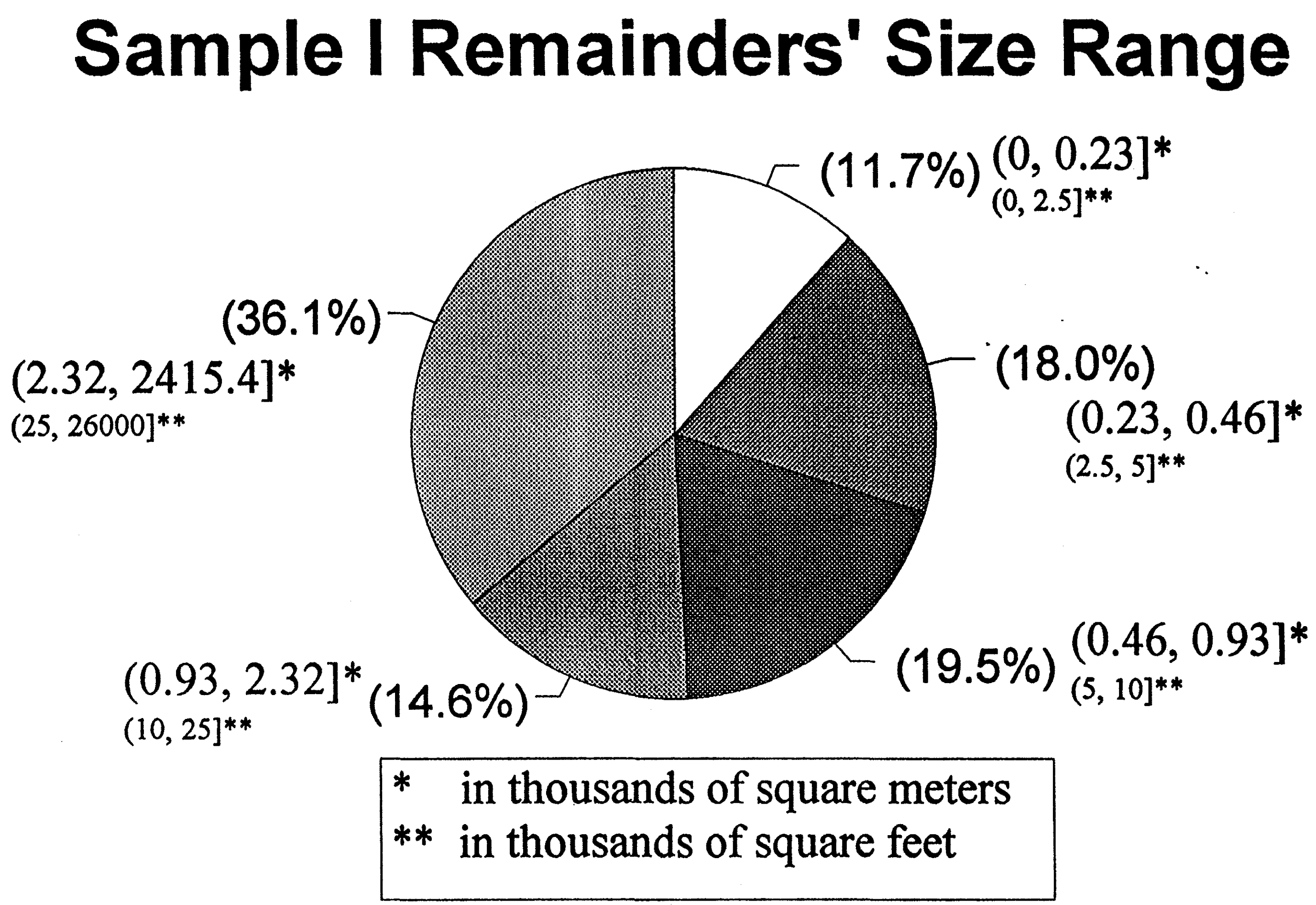

Figure 7. Chart Showing the Percentage of Sample I Remainder Parcels by Size Range

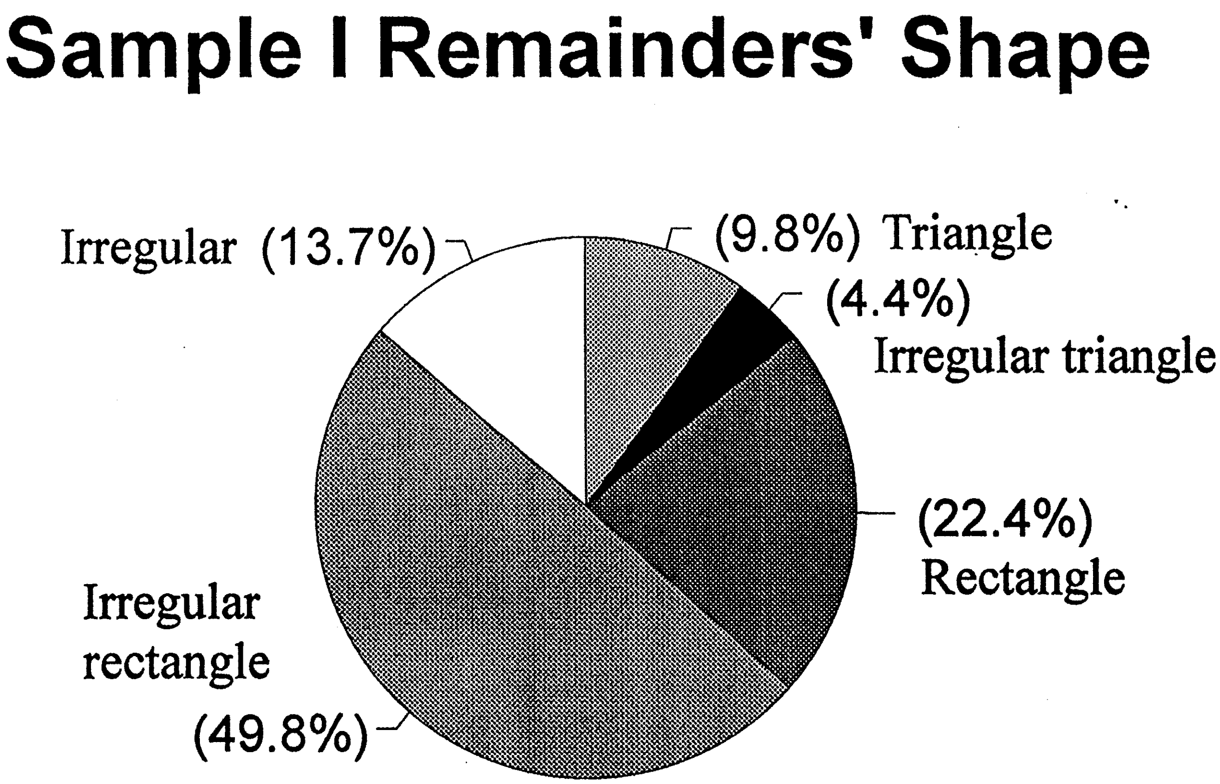

Figure 8. Chart Showing the Percentage of Sample I Remainder Parcels by Shape

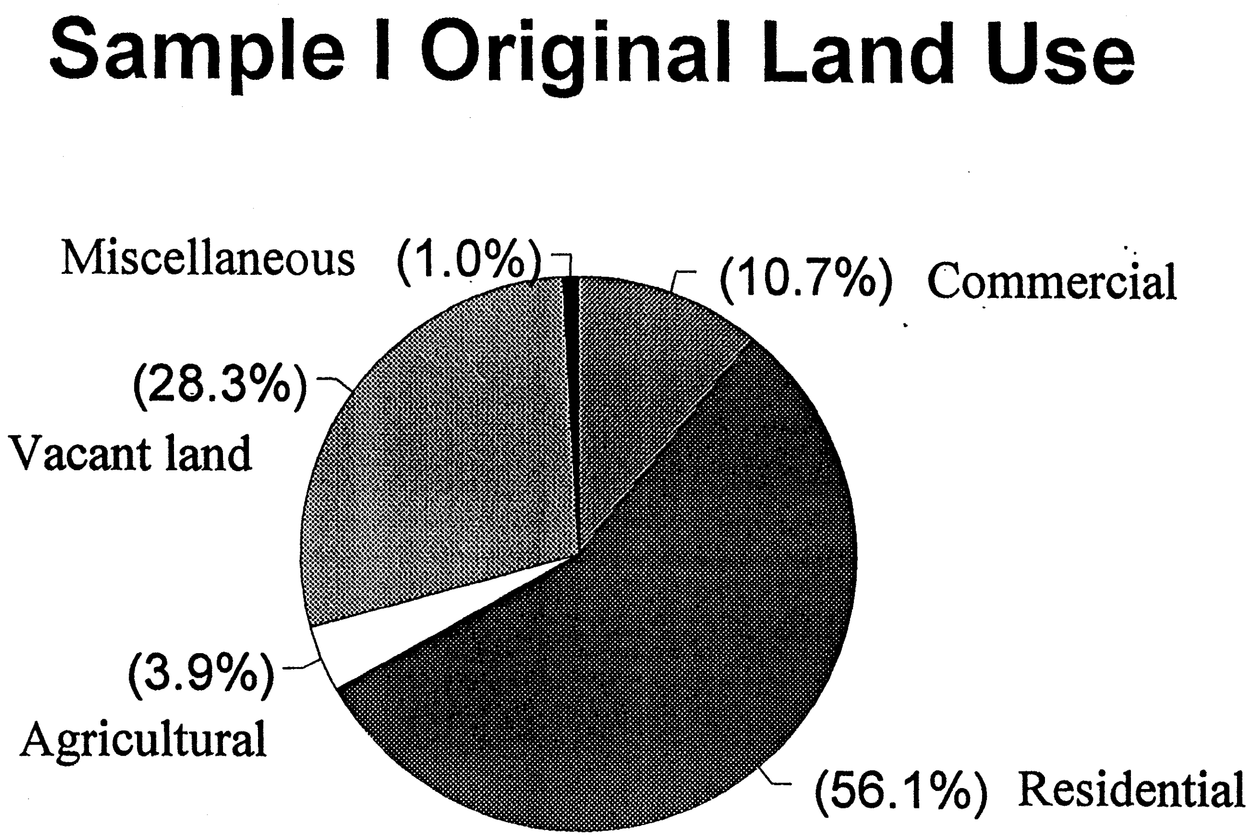

Figure 9. Chart Showing the Percentage of Sample I Remainder Parcels by Original Land Use

from the data the factors affecting the cost of a partial taking, and secondly to determine those factors affecting the cost of a partial taking versus a whole taking. The cost of a partial taking includes the cost paid for the land, any improvements, and damages to the remainder. In some cases, enhancements may partially or completely offset the damage costs. The damage costs used in the following analyses are net of any enhancements.

In looking at the data, it is apparent that in many cases the partial taking cost, including damages paid, is close to the appraised value of a whole taking. This result can occur if the property goes into condemnation. At least one of these cases is known to have been a condemnation case. Therefore, the data suggests that TxDOT could reduce right-of-way costs if it were allowed the option to purchase whole takings rather than a partial taking, especially if such a purchase created a small remainder. In two cases the partial taking cost is actually higher than the appraised value of a whole taking. Again, this brings up the issue of "uneconomic remainders." An uneconomic remainder could be defined as a condition where it would cost nearly as much, or more, to undertake a partial taking than a whole taking. Under current law, TxDOT can only acquire the amount of property necessary for highway use. This results in a large number of partial takings and a number of uneconomic remainders. It could be cost-effective for TxDOT to have authority to acquire the whole parcel if the estimated total expenditure is close to the amount for a partial taking. A rule of thumb could be used (for example, if the anticipated total cost of a partial taking is more than 80% of the appraised value of a whole taking), and then the desirability of whole taking could be explored in detail. Potentially, part of the cost of a whole taking could be offset by selling the remainder at the market price. This would have the potential of generating significant savings for right-of-way acquisition and avoiding large damage awards for "uneconomic remainders."

The following sections describe the data used in the regression analyses, an analysis of the factors affecting the total partial taking cost, and factors which would affect the desirability of a partial taking versus a whole taking.

Data Items and Variables

Several factors identified in previous studies were examined, along with some additional variables unique to this study. The variables can be divided into two groups, continuous and binary. The continuous variables include such things as property size, appraised value, costs, and amount of frontage road access. Binary variables are used to measure the impacts of categories, such as rural/urban, method of acquisition, type of land use, and shape of remainder. The binary variables are assigned a value of "0" or "1," depending on the presence or absence of a particular attribute. In the case of a variable with more than two categories, multiple binary variables are used, one for each attribute. Given the way the binary variables are used in regression analysis, one attribute has to be excluded. There has to be one attribute that always has "0." This attribute becomes the base case to which the other attributes are compared. For example, the acquisition category of unknown is always "0;" the land use category of miscellaneous is always "0;" and the remainder shape size of irregular is always "0."

Data items and variables utilized in the analysis include:

Variable Name	Definition
ACCESS	amount of frontage road access for remainder, ft.
ACQDUM1	method of acquisition binary variable one, =1 if negotiated, =0 otherwise
ACQDUM2	method of acquisition binary variable two, =1 if condemned, =0 otherwise
ACQSIZE	size of taking, sq. ft.
ACQTOT	land cost of taking, $
ACQVAL	land cost per square foot, ACQTOT/ACQSIZE, $/sq. ft.
DUMFCL	functional class binary variable, =1 if interstate, =0 otherwise

DUMLAND1	land use binary variable one, =1 if commercial, =0 otherwise
DUMLAND2	land use binary variable two, =1 if residential, =0 otherwise
DUMLAND3	land use binary variable three, =1 if agricultural, =0 otherwise
DUMLAND4	land use binary variable four, =1 if vacant, =0 otherwise
DUMSHP1	remainder shape binary variable one, =1 if triangle, =0 otherwise
DUMSHP2	remainder shape binary variable two, =1 if irregular triangle, =0 otherwise
DUMSHP3	remainder shape binary variable three, =1 if rectangle, =0 otherwise
DUMSHP4	remainder shape binary variable four, =1 if irregular rectangle, =0 otherwise
IMPRTOT	improvement cost of taking, $
IMPRVAL	improvement cost per square foot, IMPRTOT/ACQSIZE, $/sq. ft.
DAMTOT	damages paid, $
DAMVAL	damages paid per square foot, DAMTOT/REMSIZE, $/sq. ft.
LOCDUM	location binary variable, =1 if rural, =0 otherwise
ORGCOST	total appraised value of entire property, ORGTOT+ORGIMTOT, $
ORGIMTOT	appraised improvements on entire property, $
ORGIMVAL	value of property improvements per square foot, ORGIMTOT/ORGSIZE, $/sq. ft.
ORGSIZE	size of entire property, sq. ft.
ORGTOT	appraised land value of entire property, $

ORGVAL	property land value per square foot, ORGTOT/ORGSIZE, $/sq. ft.
PROVAL	proportional difference between partial taking and whole taking cost (ORGCOST-TOTCOST)/ORGCOST
REMSIZE	remainder size, sq. ft.
REMTOT	appraised value of remainder, $
REMVAL	value of remainder per square foot, REMTOT/REMSIZE, $/sq. ft.
TAKRATIO	proportion of taking to total property size ACQSIZE/ORGSIZE
TOTCOST	total acquisition cost, ACQTOT+IMPRTOT+DAMTOT

Analysis of Total Taking Cost

Researchers used a multiple regression model to estimate the relationship between total taking cost, TOTCOST, and the variables listed above. Using ordinary least-squares, each of the variables were tried separately and in numerous combinations with other variables. One of the problems with this type of analysis is the interdependence of a variable with one or more other variables. This can affect the estimates in the equation as well as the statistical significance of the estimated coefficients. For that reason, considerable effort was made to identify the statistically significant variables affecting total taking cost.

The results of the analysis are shown in Table 7. All variables are significant at the 1% level, as can be seen in the far right column, 2-Tail Significance. The R^2 value of 0.86 is high for this type of analysis, indicating the independent variables explain about 86% of the variation in the dependent variable. This is quite high given the variation in geographic area and time periods the data cover.

Several points can be made concerning the results presented in Table 7.

- The most significant independent variable is ORGCOST, the total appraised value of the entire property. The coefficient of 0.423

Table 7. Regression Results for Total Taking Cost

Dependent Variable: TOTCOST
Number of Observations: 196

Independent Variable	Coefficient	Standard Error	T-Statistic	2-Tail Significance
Constant	-4305.4605	1150.4397	-3.7424479	0.000
ORGCOST	0.4226117	0.0158561	26.652971	0.000
REMTOT	-0.2407237	0.0334707	-7.1920658	0.000
TAKRATIO	11615.610	2203.6570	5.2710607	0.000
IMPRVAL	2024.9726	508.59866	3.9814745	0.000
DUMSHP2	9755.0984	2696.0928	3.6182354	0.000
DUMLAND1	6758.6135	1898.6790	3.5596399	0.000

R-Squared	0.858094
Adjusted R-Squared	0.853589
S.E. of regression	7784.337
Sum of squared resid	1.15E+10
F-statistic	190.4772

indicates that on average, the total taking cost is 42.3% of the total property value, holding other impacts constant.

- The value of the remainder, REMTOT, has a negative impact on the total taking cost. This means that the lower the remainder value, the higher the total taking cost. The coefficient of -0.241 indicates that about a fourth of the remainder value is reflected in lower taking costs, holding other impacts constant.
- The improvement cost per square foot, IMPRVAL, has a positive impact on the total taking costs. This is expected since the total improvement cost is part of the total taking cost. However, it does not dominate the results, and the other component costs, in square feet, ACQVAL and DAMVAL were not significant.
- The ratio of the size of the taking to the total parcel size, TAKRATIO, is also significant and has a positive coefficient. This can be interpreted as indicating that the higher the proportion of the taking, the higher the taking cost (holding other impacts constant). This further implies that when a taking results in a small remainder, the taking cost, including damages, is higher than it would be otherwise.
- One remainder shape binary variable is significant and has a positive coefficient. This variable is DUMSHP2, the irregular triangle shape. This indicates that an irregular triangle shape adds to the cost of the taking, probably by increasing damages, as compared to the other remainder shapes.
- One land use binary variable is significant, DUMLAND1, commercial use. The coefficient is positive, giving the expected results that existing commercial activity increases the taking cost relative to other land use activities.

Figure 10 is a graph showing the relationship between total cost and the amount of acquired land ratio to total land. As this ratio increases in size, the total

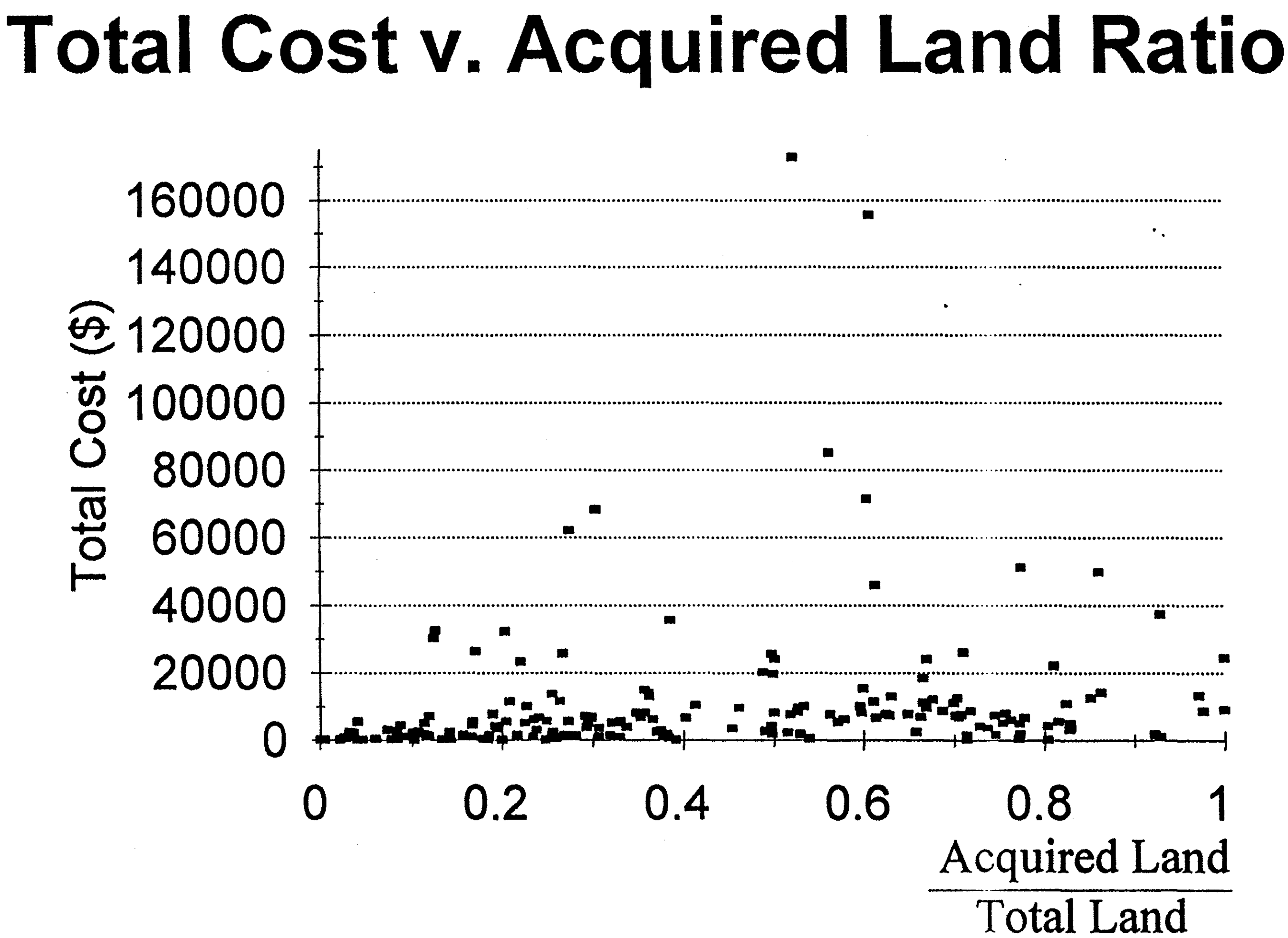

Figure 10. Graph Showing the Relationship between Total Right-of-Way Cost and the Ratio of Acquired Land to Total Land

cost of right-of-way tends to increase. In other words, as the amount of land taken or acquired increases in relation to the whole property, total right-of-way costs increase. Again, this result indicates that smaller remainders are being created as the ratio increases, and the total right-of-way cost also increases.

Similar results were obtained in a regression model that excluded the amount paid for improvements involved in the taking. The R^2 was over 0.90, and many of the same variables were found to be significantly affecting right-of-way costs.

Analysis of Partial Taking Cost versus Whole Taking Cost

Another analysis was undertaken to determine what factors were influencing the relative cost of a partial taking versus a whole taking. For that purpose, the proportional difference between the two costs, PROVAL, was used as the dependent variable. As mentioned previously, in two instances the total taking cost for the partial taking is higher than the appraised value of the entire parcel. When that occurs, the variable PROVAL becomes negative. A proportional difference was used rather than the absolute difference to avoid a few expensive takings dominating the analysis. The purpose of the analysis is to identify those factors significantly influencing the choice between a partial taking and a whole taking. These factors could be used as the basis for identifying potential "uneconomic remainders" if laws are changed to allow whole takings in some circumstances.

Table 8 shows the results of the analysis. All variables are significant at the 10% level. The R^2 value of 0.85 is again high for this type of analysis, indicating the independent variables explain about 85% of the variation in the dependent variable. Again, this is quite high given the variation in geographic area and time periods the data covers.

Several points can be made concerning the results presented in Table 8.

- The most significant variable is the ratio of the size of the taking to the total parcel size, TAKRATIO. The large negative coefficient indicates that the higher the proportion taking, the more likely it is that the

Table 8. Regression Results for Proportional Difference between Partial and Whole Taking Cost

Dependent Variable: PROVAL
Number of Observations: 196

Independent Variable	Coefficient	Standard Error	T-Statistic	2-Tail Significance
Constant	0.9383569	0.0224768	41.747855	0.000
TAKRATIO	-1.0008474	0.0422934	-23.664392	0.000
ACQSIZE	9.876E-08	4.467E-08	2.2107728	0.027
REMVAL	0.0870448	0.0230960	3.7688321	0.000
IMPRVAL	-0.1548122	0.0125313	-12.354060	0.000
DAMVAL	-0.1610122	0.0367370	-4.3828377	0.000
ORGIMVAL	0.1563486	0.0269249	5.8068320	0.000
DUMLAND1	-0.0836614	0.0348701	-2.3992325	0.016
DUMLAND2	-0.1044484	0.0248847	-4.1972851	0.000
DUMSHP1	0.0699925	0.0367523	1.9044382	0.057

R-Squared	0.854952
Adjusted R-Squared	0.847934
S.E. of regression	0.130523
Sum of squared resid	3.168732
F-statistic	121.8152

partial taking costs will be as great as the whole taking cost, holding other impacts constant. This is almost certainly related to the diminished value of a small remainder and the high damages paid in those circumstances.

- The size of the taking, ACQSIZE, is also significant. A positive coefficient indicates that the larger the taking, the more likely that a whole taking would be more expensive than a partial taking, holding other impacts constant.
- The value of the remainder per square feet, REMVAL, has a positive coefficient and is significant. This indicates that the more valuable the remainder, the more likely that a whole taking would cost more than a partial taking, holding other impacts constant. This further reinforces the proposition that "uneconomic remainders" could be defined in terms of costs of whole takings versus partial takings.
- The cost of the improvement per square foot, IMPRVAL, and the cost of damages per square foot, DAMVAL, are both significant and have negative coefficients. This indicates that the more valuable the improvements and the more damages that have to be paid, the more likely it is that a partial taking would be as costly as a whole taking.
- The value of the improvements on the entire parcel per square foot, ORGIMVAL, has a positive coefficient and is significant. This indicates that the more valuable the improvements to the land, the more likely that a whole taking would cost more than a partial taking, holding other impacts constant.
- One binary remainder shape variable is significant, DUMSHP1, the triangle shape. This indicates that a triangular shaped remainder increases the likelihood that a partial taking will be less expensive than a whole taking compared to other remainder shapes.
- Two land use variables are significant, DUMLAND1, commercial development, and DUMLAND2, residential development. The negative coefficients indicate that a partial taking of commercial land or

residential land is likely to be as expensive as a whole taking, compared to other land uses.

Figure 11 is a graph showing the relationship between the PROVAL ratio and taking cost. As the PROVAL ratio gets lower, partial taking costs approach whole taking costs in increasing amounts. Takings with PROVAL ratios of 0.2 or less are likely to involve small uneconomic remainders.

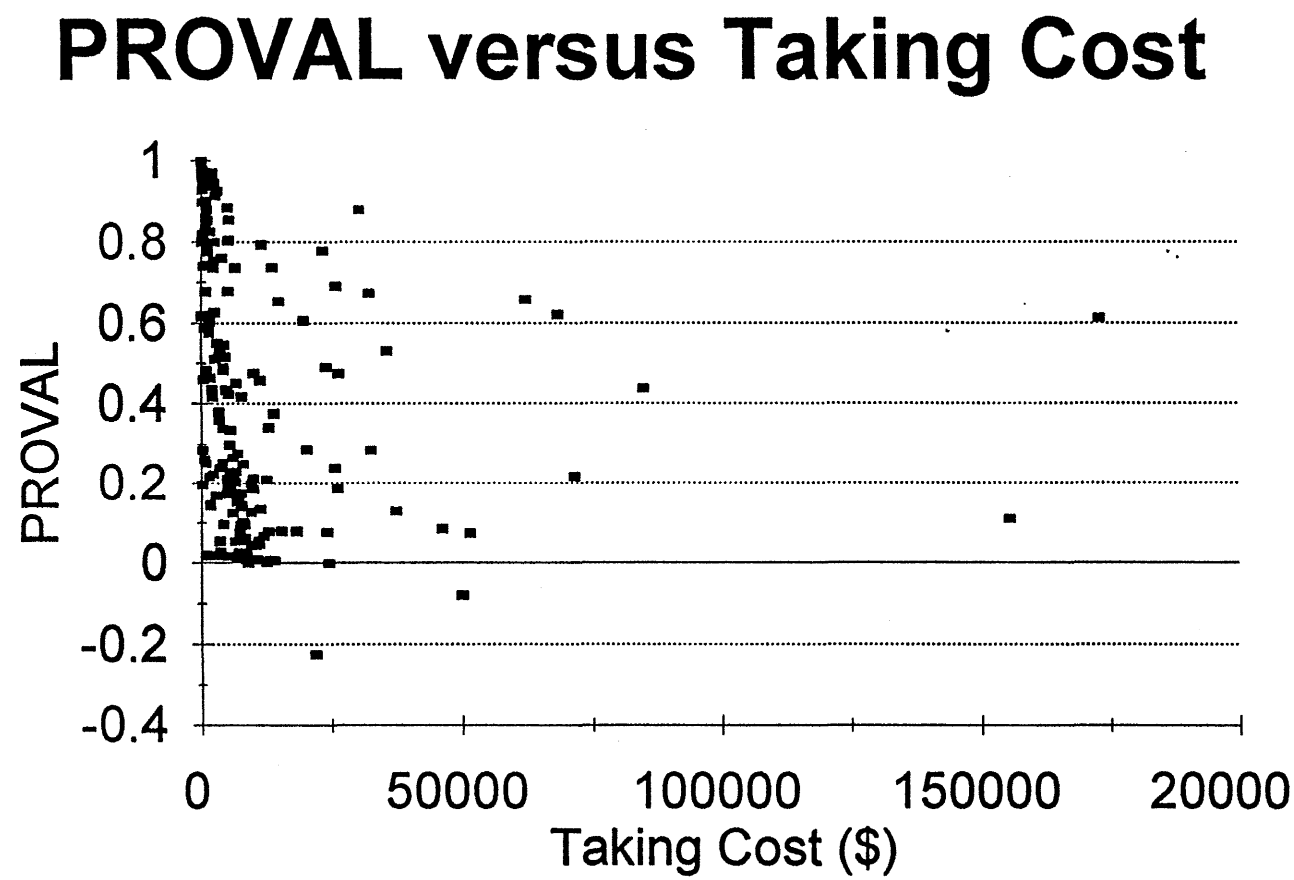

Figure 11. Graph Showing the Relationship between the PROVAL Ratio and Taking Cost

SAMPLE II - NEW CASE STUDIES

This section of the report explains in detail the drawing of the sample of study projects and the subsequent sample of study remainders that make up Sample II. It also describes the general characteristics of Sample II. The same analytical process used on the Sample I database is repeated on the Sample II database.

PROJECT SELECTION PROCESS

A total of 665 highway right-of-way projects were closed out by TxDOT between 1974 and 1990. TxDOT right-of-way division personnel furnished TTI some basic information (such as, project number, TxDOT district number, county number, location or area type [urban versus rural], highway functional class [interstate versus non-interstate], and date closed out) on each of these projects. TTI computerized these data and also classified each project into the one of the three time periods and regions of the state defined in an earlier section of this report. Then the database was sorted, and a sample of 75 projects was selected from this list of closed projects. Table 9 shows the number of closed-out projects that fell into the different categories used to define characteristics of the population of closed-out projects. The selection process chosen was designed to obtain a sample that was balanced in representation of each of the basic population characteristics of closed projects in each of the three defined time periods. To keep the size of the sample project manageable in size and scope, a decision was made to limit the number of projects per period to 25. Also, in order to have as acceptable a locational representation as possible in the analysis, the 25 projects per period were grouped into the seven defined regions of the state.
The 25 projects in each period were chosen in such a way that the area types, highway types, and the regions would be proportionally represented in any sample pulled for study. Table 9 shows the number of the 665 projects represented by each highway type, area type, and region for each time period and the resulting number of

Table 9. Number of Projects Selected by Period, Area Type, and Highway Type

Region	Period I 1974 -1984								Period II 1984 - 1987								Period III 1987 - 1990							
	Rural				Urban				Rural				Urban				Rural				Urban			
	Number of Records		Number Selected		Number of Records		Number Selected		Number of Records		Number Selected		Number of Records		Number Selected		Number of Records		Number Selected		Number of Records		Number Selected	
	NIH	IH	NIH	IH	NIH	IH	NIH	IH	NIH	IH	NIH	IH	NIH	IH	NIH	IH	NIH	IH	NIH	IH	NIH	IH	NIH	IH
1	42	14	2	1	7	2	1	0	8	1	2	1	1	0	1	0	1	0	1	0	0	0	0	0
2	28	13	1	1	10	1	1	0	5	0	1	0	5	0	1	0	2	0	1	0	0	0	0	0
3	79	6	3	0	13	1	0	1	11	1	3	1	7	0	1	0	9	0	7	0	2	0	1	0
4	38	1	1	0	3	4	1	0	9	0	2	0	0	0	0	0	5	0	4	0	1	0	1	0
5	47	4	2	0	5	1	0	0	12	0	3	0	3	0	1	0	5	0	4	0	0	0	0	0
6	101	6	4	1	30	2	2	0	13	1	3	1	4	0	1	0	5	1	4	1	0	0	0	0
7	62	2	3	0	6	6	0	0	15	1	3	0	0	0	0	0	3	0	1	0	0	0	0	0
TOTAL	397	46	16	3	74	17	5	1	73	4	17	3	20	0	5	0	30	1	22	1	3	0	2	0
	443		19		91		6		77		20		20		5		31		23		3		2	
	Total number of records for Period I = 534 Total number of selected records for Period I = 25								Total number of records for Period II = 97 Total number of selected records for Period II = 25								Total number of records for Period III = 34 Total number of selected records for Period III = 25							
Total number of records for Periods I, II, and III = 665 Total number of selected records for Periods I, II, and III = 75																								

projects selected.

REMAINDER PARCEL SELECTION PROCESS

TxDOT's right-of-way division personnel were asked to furnish enough detail on each of the 75 projects to draw a representative sample of remainder parcels for study. TTI needed to know the type of taking (whole or partial), property type (land use), grantor type (owner or leaseholder), method of acquisition (negotiation or condemnation), and date of acquisition of each parcel in the sample of projects. After TTI received the right-of-way parcel information requested on each of the 75 study projects, these data were added to the computerized database.

After deleting all parcels irrelevant to the study (such as, whole takings, easements, non-owner grantors, and condemnation methods [not regular negotiation or condemnation settlements]), the resulting data set contained a total of 2,033 partial takings. As shown in Table 10, these remainders of partial takings contained 1,797 rural and 236 urban parcels, 1,795 of non-interstate and 238 for interstate highway parcels, and 1,651 negotiation and 382 condemnation parcels for all three time periods combined. Table 10 also shows the time period breakdown by land use category, with a total of 738 parcels in Period I, 623 in Period II, and 672 in Period III. Table 11 shows a more detailed breakdown of the method of acquisition, location (rural and urban), and original property use of each remainder by time period.

Before selecting the sample of study remainders, TTI researchers thought it necessary to know the size of each remainder and part taken represented by the 2,033 partial takings. TxDOT's computerized files could not produce this type of information. Therefore, the researchers requested copies of the right-of-way maps on the 75 sample projects. When these maps were received from the relevant districts represented in the sample, the remainder and part taken sizes were recorded on the computerized database for most of the projects. There were a few which did not record the remainder size, primarily due to the part taken being appraised using the

Table 10. Number of Parcels from Selected Projects by Property Type, Area Type, Highway Type, Period, and Acquisition Method

Property Type	Area Type			Highway Type			Period				Acquisition Method					
											Negotiation			Condemnation		
	Rural	Urban	Total	NIH	IH	Total	I	II	III	Total	Rural	Urban	Total	Rural	Urban	Total
Acreage	1092	40	1132	1019	113	1132	394	346	392	1132	933	28	961	159	12	171
Vacant	126	25	151	125	26	151	43	74	34	151	82	17	99	44	8	52
Residential	299	27	326	296	30	326	97	96	133	326	256	18	274	43	9	52
Commercial Residential	15	6	21	17	4	21	10	5	6	21	11	2	13	4	4	8
Commercial Business	260	134	394	332	62	394	190	99	105	394	205	91	296	55	43	98
Industrial	5	4	9	6	3	9	4	3	2	9	5	3	8	0	1	1
Total Non-easement Partial Taking	1797	236	2033	1795	238	2033	738	623	672	2033	1492	159	1651	305	77	382

Table 11. Number of Parcels from Selected Projects by Acquisition Method, Period, and Area Type

Property Type	Negotiation						Condemnation					
	Period I		Period II		Period III		Period I		Period II		Period III	
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Acreage	324	4	284	21	334	3	62	4	44	6	53	2
Vacant	16	17	35	0	22	0	3	7	30	0	11	1
Residential	58	13	81	2	117	3	21	5	11	2	11	2
Commercial Residential	3	0	4	1	4	1	3	4	0	0	1	0
Commercial Business	74	52	58	30	73	9	30	34	6	4	18	5
Industrial	1	3	2	0	2	0	0	0	1	1	0	0
TOTAL	476	89	464	54	552	16	119	54	92	13	94	10

short form. However, the remainder size arrays for each time period seemed more than adequate for drawing a sample of remainders for study.

In the process of selecting the sample of study remainders by time period, discrepancies were found in the number of remainder parcels falling within a particular period if the parcel acquisition dates were used instead of the closed-out dates used earlier for selection of the 75 projects. Many parcels were acquired long before the project finally was closed out. Since the acquisition dates should be used in selecting the final sample, the parcels purchased before 1974 were removed from the working database. As a result, the size of the database used in selecting the final sample was severely reduced, especially affecting the availability of remainder parcels for Period III.

The selection plan called for the final study sample data set to contain 100 parcels per time period, with an even split between the two acquisition methods, that is, 50 by negotiation and 50 by condemnation. The final selection of the parcels, after meeting the period and method of acquisition requirements, was to be done mainly on a random basis. In the sampling process, attempts were made to retain as closely as possible the same rural/urban split, as well as the IH/Non-IH split represented in the final database set of remainder parcels. However, the number of urban and condemned parcels was insufficient to make up a reasonable sample. As a result, partial takings from six additional projects, obtained from TxDOT's right of way division, were added to the final database set. Even after this addition, the number of condemned parcels comes out to be only 39, short of the 50 needed. Therefore, it was decided that all 39 parcels would be included in the final sample data set and, instead of relying on the planned total of 50, randomly selecting 61 negotiated parcels to add up to 100 parcels for this period. Table 12 shows the makeup of the final base data set of remainder parcels and the final study sample data set, called Sample II, classified by period, rural/urban, IH/Non-IH, and acquisition method.

Table 12. Final Base and Sample II Data Sets for Each Study Period by Type of Acquisition, Area Location, and Highway Class

Data Set		Negotiation						Condemnation					
		Rural	Urban	Total	NIH	IH	Total	Rural	Urban	Total	NIH	IH	Total
Period I	Final Base	421	55	476	433	43	476	81	19	100	79	21	100
	Sample II	44	6	50	45	5	50	39	11	50	40	10	50
Period II	Final Base	214	33	247	245	2	247	62	10	72	71	1	72
	Sample II	36	14	50	48	2	50	42	8	50	49	1	50
Period III	Final Base	26	64	90	90	0	90	12	27	39	39	0	40
	Sample II	17	44	61	61	0	61	12	27	39	39	0	39
TOTAL	Final Base	661	152	813	768	45	813	155	56	211	189	22	211
	Sample II	97	64	161	154	7	161	93	46	139	128	11	139

GENERAL CHARACTERISTICS OF SAMPLE II

The last section describes in considerable detail the selection process for Sample II, and Table 12 shows the number of sample remainder parcels representing the basic or general characteristics of the population of remainder parcels in each time period. To supplement the above description of the general characteristics of Sample II, several graphs are presented in this report to show the percentage breakdown of the general characteristics of the sample. Figures 12 and 13 show the percentage of Sample II parcels by area location (rural/urban) and highway functional class, respectively. As seen in Figure 12, over 60% of the sample parcels are located in rural areas of the state. In contrast, Sample I is made up by mostly urban parcels. Figure 13 shows over 90% of Sample II being along non-interstate highways. Again, in contrast, Sample I is made up of over 90% of its parcels that abut interstate highways.

Figure 14 shows that slightly over 50% of the Sample II remainder parcels involved takings purchased by negotiation, compared to nearly 70% for Sample I. Figure 15 shows the percentage breakdown of Sample II by land use of the original parcel. Over 50% of the sample parcels are classified as agricultural (acreage) or vacant lots, compared to a little over 30% in Sample I. Figure 16 shows the percentage breakdown of Sample II by remainder size range. Less than 20% of the sample parcels were under 929 square meters (10,000 square feet) compared to nearly 50% in Sample I. Figure 17 shows the breakdown of Sample II by remainder shape. A little over 40% of the sample parcels are classified as irregular rectangle in shape compared to nearly 50% in Sample I. Therefore, the general characteristics of Sample II are considerably different from those of Sample I, perhaps reflecting different populations of remainder parcels created by right-of-way acquisitions in their respective time periods.

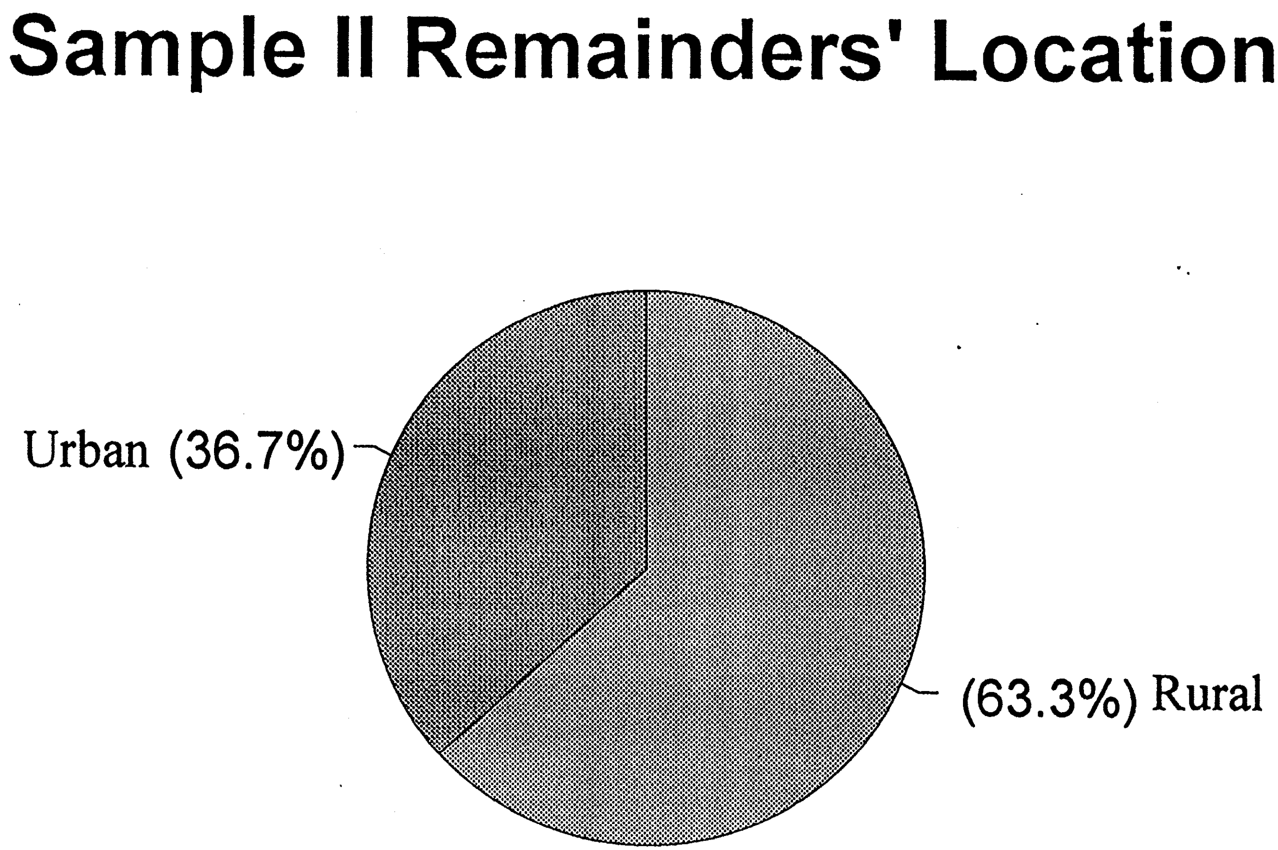

Figure 12. Chart Showing the Percentage of Sample II Remainder Parcels by Rural and Urban Location

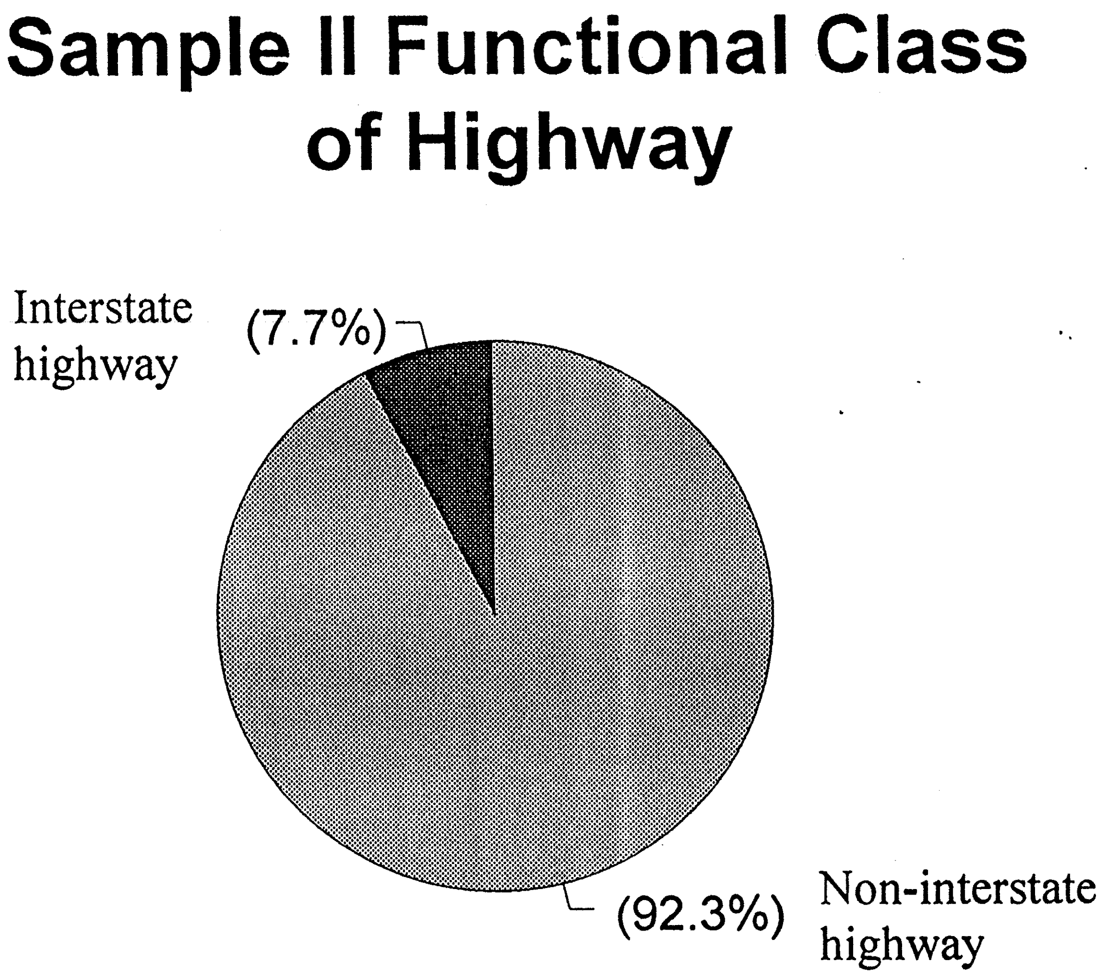

Figure 13. Chart Showing the Percentage of Sample II Remainder Parcels by Functional Class of Highway

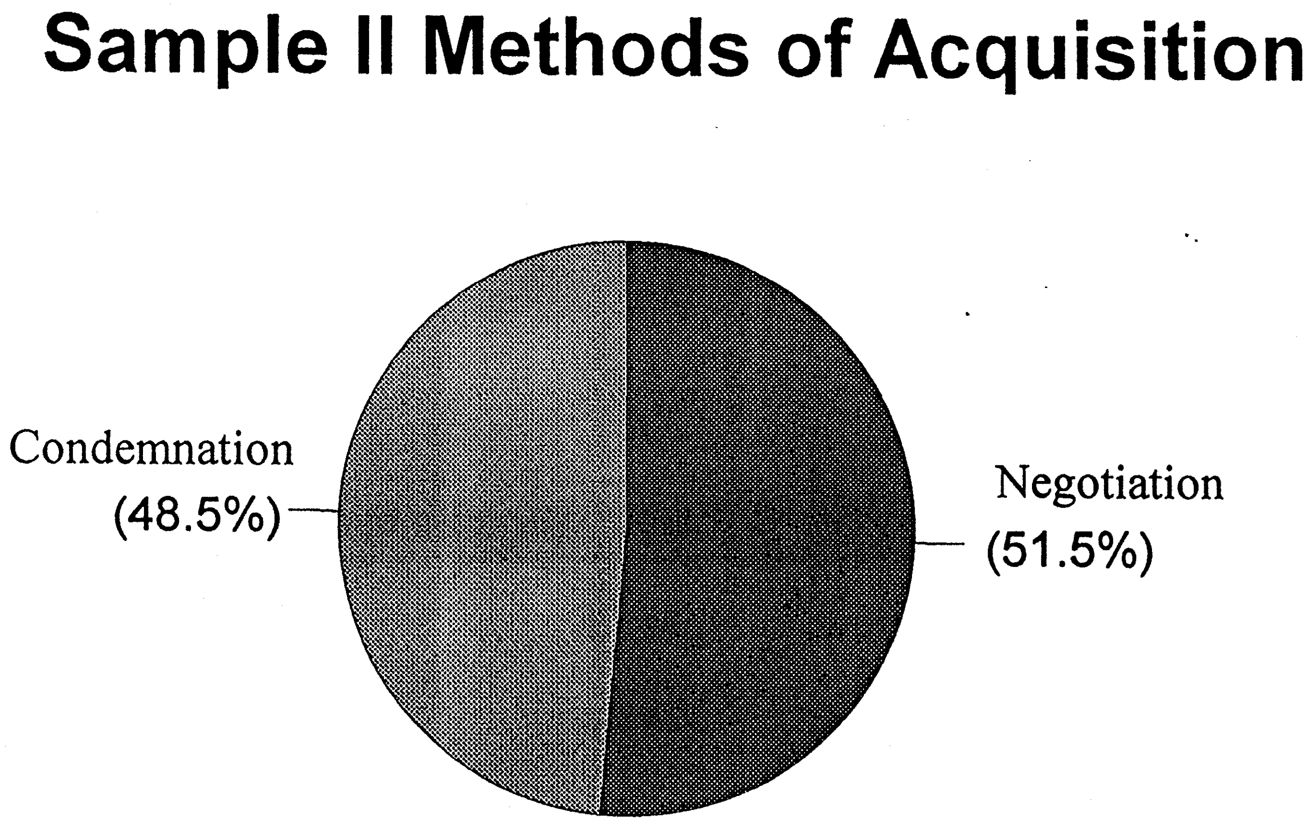

Figure 14. Chart Showing the Percentage of Sample II Remainder Parcels by Method of Acquisition

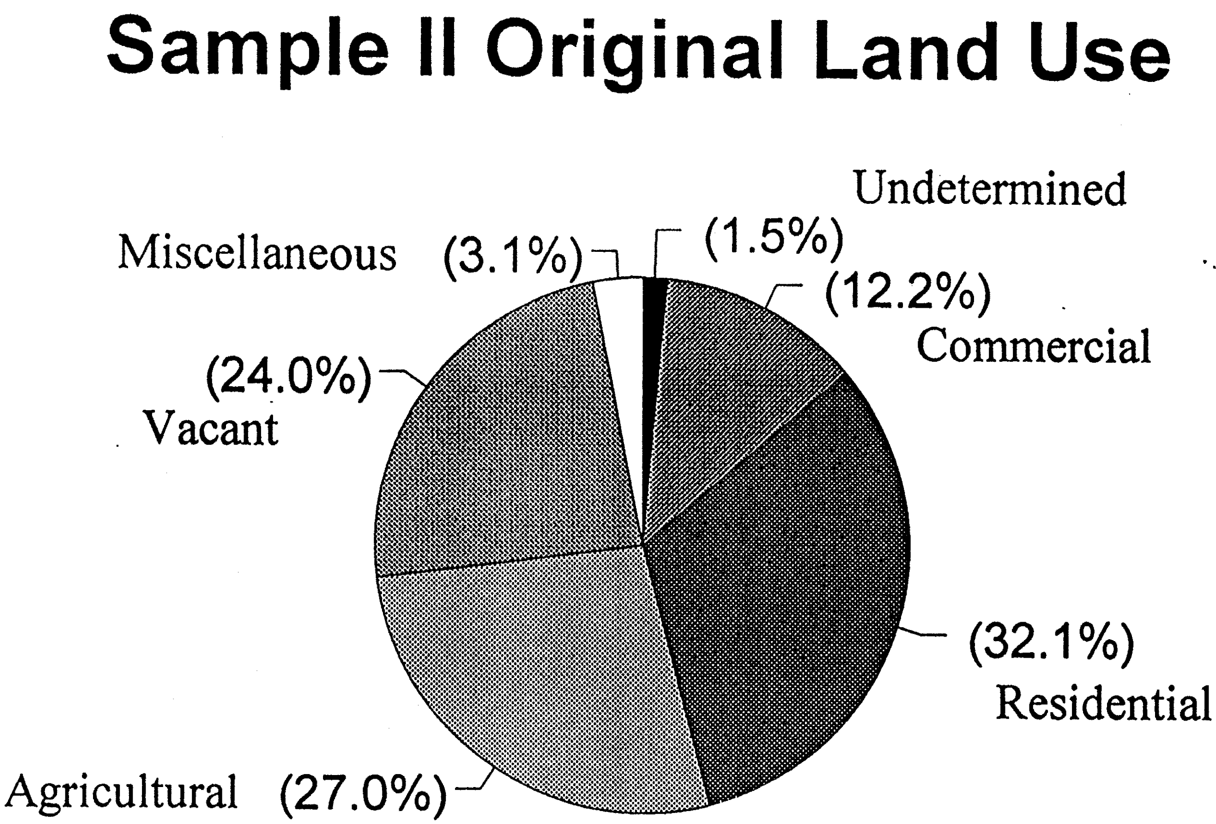

Figure 15. Chart Showing the Percentage of Sample II Remainder Parcels by Original Land Use

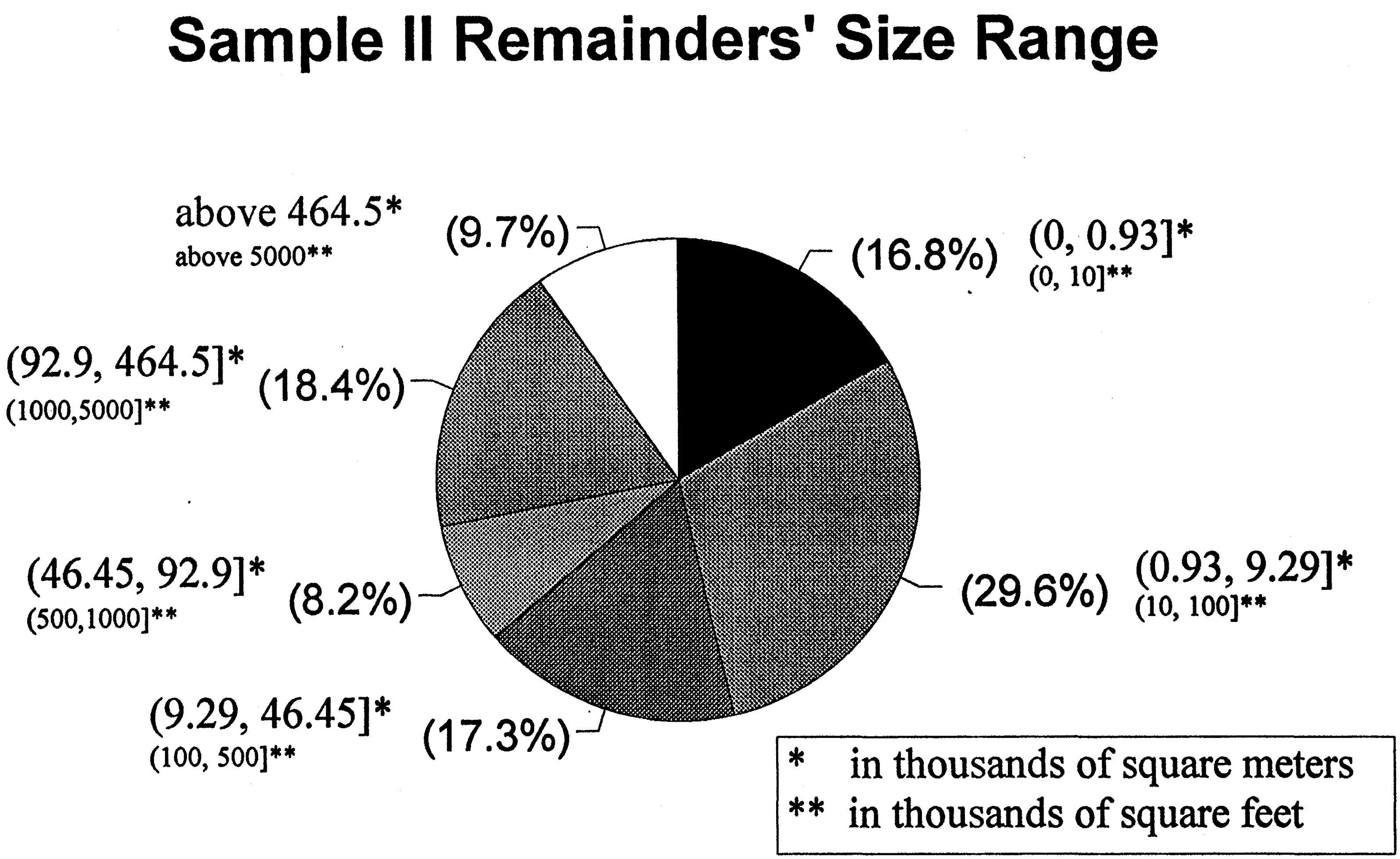

Figure 16. Chart Showing the Percentage of Sample II Remainder Parcels by Size Range

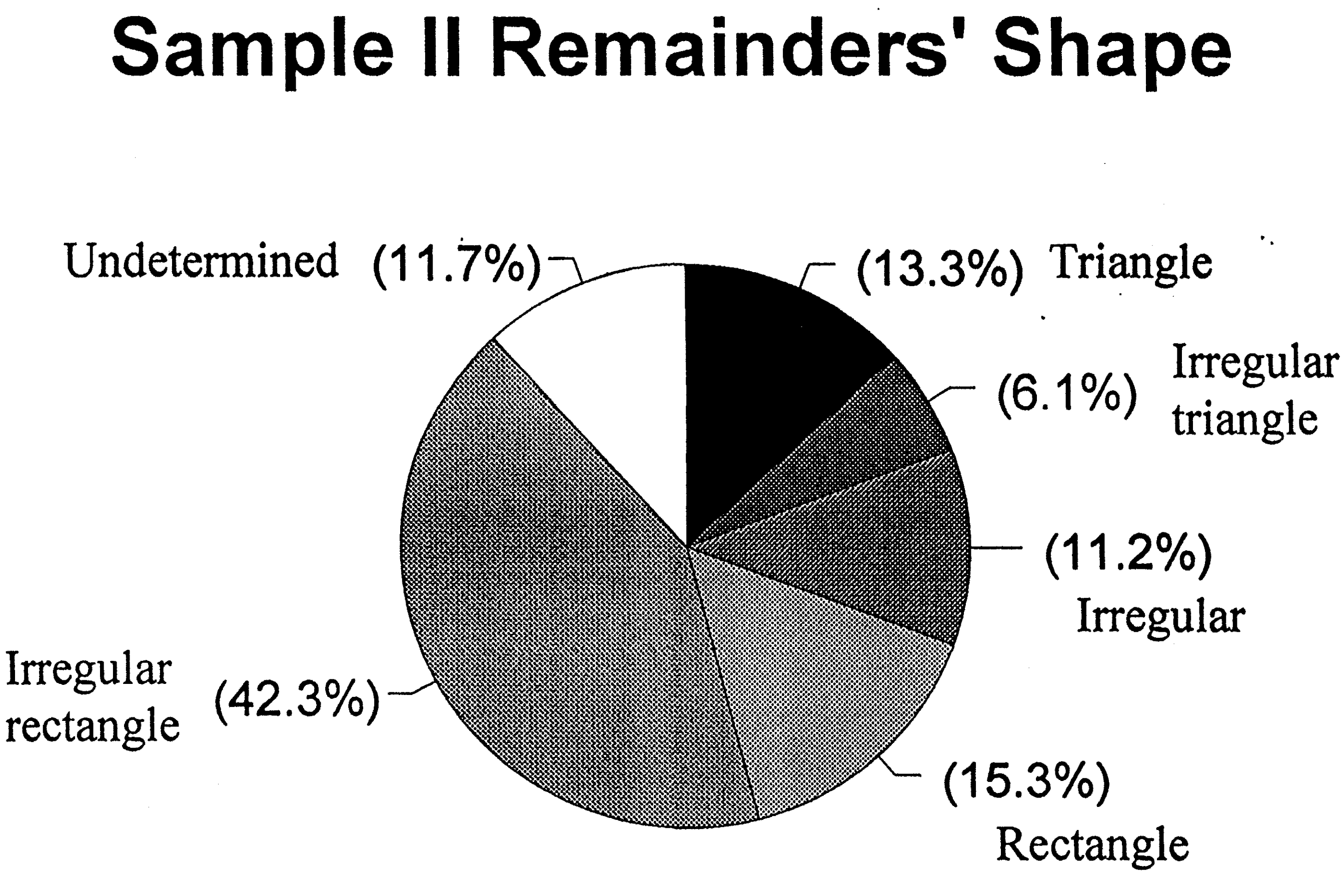

Figure 17. Chart Showing the Percentage of Sample II Remainder Parcels by Shape

COLLECTION OF DATA FOR SAMPLE II

Table 12 shows the makeup of the final base data set of 1024 remainder parcels and the final study sample data set of 300 remainder parcels, called Sample II, classified by period, rural/urban, IH/Non-IH, and acquisition method. Data forms on the 300 remainder parcels were prepared to be sent out to the TxDOT districts via the Right-of-Way Division for the district right-of-way personnel, preferably review appraisers, for completion. (See copy in Appendix.) The case study form is designed to allow many other remainder characteristics to be defined. Table 13 shows the total number of surveys sent out and the number of surveys completed and returned by district, highway number, nearest town/city, and project number. Actually 299 were sent out when it was discovered that one was not really a remainder parcel.

Figure 18 shows the location of study projects with one or more of the study remainders making up Sample II by item number in Table 13. A total 103 remainder survey forms were not returned. Of that number, the files on 17 remainders could not be located. Another 53 were not returned because they were in rural projects that had been initially misclassified as urban. Attempts to find available information on other remainder parcels in urban projects that fit the same time periods as these 53 remainders were unsuccessful.

ANALYSIS AND FINDINGS OF SAMPLE II

The regression analysis of the old remainder case histories, Sample I, identified several important characteristics related to the remainder, i.e., size, value, and use of whole property; remainder shape, value of total damages paid; and proportion of taking. The overall analysis used on the Sample II database is similar to that used on the Sample I database. However, since the Sample II database will define more remainder characteristics, the analysis is more complex and extensive.

The same two models were used as well. Of the 196 returned surveys, five

Table 13. Total Number of Sample II Surveys Sent Out and Total Numbers of Surveys Returned by District, Highway Number, and Nearest Town/City

No.	District	Highway Number	Nearest Town/City	Total Surveys Sent Out	Total Surveys Returned
1	1	US 69	Celeste	2	2
2	3	US 287	Iowa Park	2	2
3	3	IH 35	Gainesville	1	1
4	4	IH 27	Canyon	3	3
5	5	US 60	Summerfield	2	2
6	8	SH 350	Big Springs	3	3
7	8	SH 6	Albany	1	1
8	8	US 277	Stamford	32	32
9	9	Loop 340	Bellmead	5	5
10	9	SH 53	Rosebud	11	9
11	9	SH 53	Temple	11	7
12	10	SH 149 & US 259	Longview	10	10
13	10	US 69	Tyler	2	2
14	11	SH 87	Shelbyville	2	2
15	11	SH 204	Cushing	12	12
16	13	SH 71	Columbus	5	5
17	14	Loop 360	Austin	1	1
18	15	SH 16	San Antonio	3	3
19	15	US 181	Floresville	5	5
20	15	Loop 1604	Universal City	1	1
21	15	Loop 534	Kerrville	1	1
22	15	SH 55	Uvalde	2	2
23	15	Loop 539	Schertz	7	7
24	16	US 281	Premont	5	5
25	17	SH 21	Caldwell	5	5

Table 13. Total Number of Sample II Surveys Sent Out and Total Numbers of Surveys Returned by District, Highway Number, and Nearest Town/City (continued)

No.	District	Highway Number	Nearest Town/City	Total Surveys Sent Out	Total Surveys Returned
26	18	US 75	Dallas	2	2
27	18	Loop 288	Denton	6	6
28	18	IH 20	Balch Spring	17	8
29	19	US 259	Lone Star	5	0
30	19	US 67	Texarkana	1	0
31	19	US 59	Jefferson	8	0
32	19	Loop 179	Pittsburg	4	0
33	20	US 69	Rockland	1	1
34	20	SH 62	Orange	8	7
35	21	US 77	Armstrong	2	0
36	21	Spur 241	Hidalgo	2	0
37	21	Loop 499	Harlingen	11	6
38	21	Loop 374	Mercedes	8	7
39	23	US 283	Rockwood	1	1
40	23	US 377	Winchell	1	1
41	23	US 190	Lampasas	29	25
42	24	IH 10	El Paso	3	3
43	24	US 67	Presidio	53	0
44	25	IH 40	Shamrock	2	0
45	25	US 82	Guthrie	1	1
			TOTAL	299	196

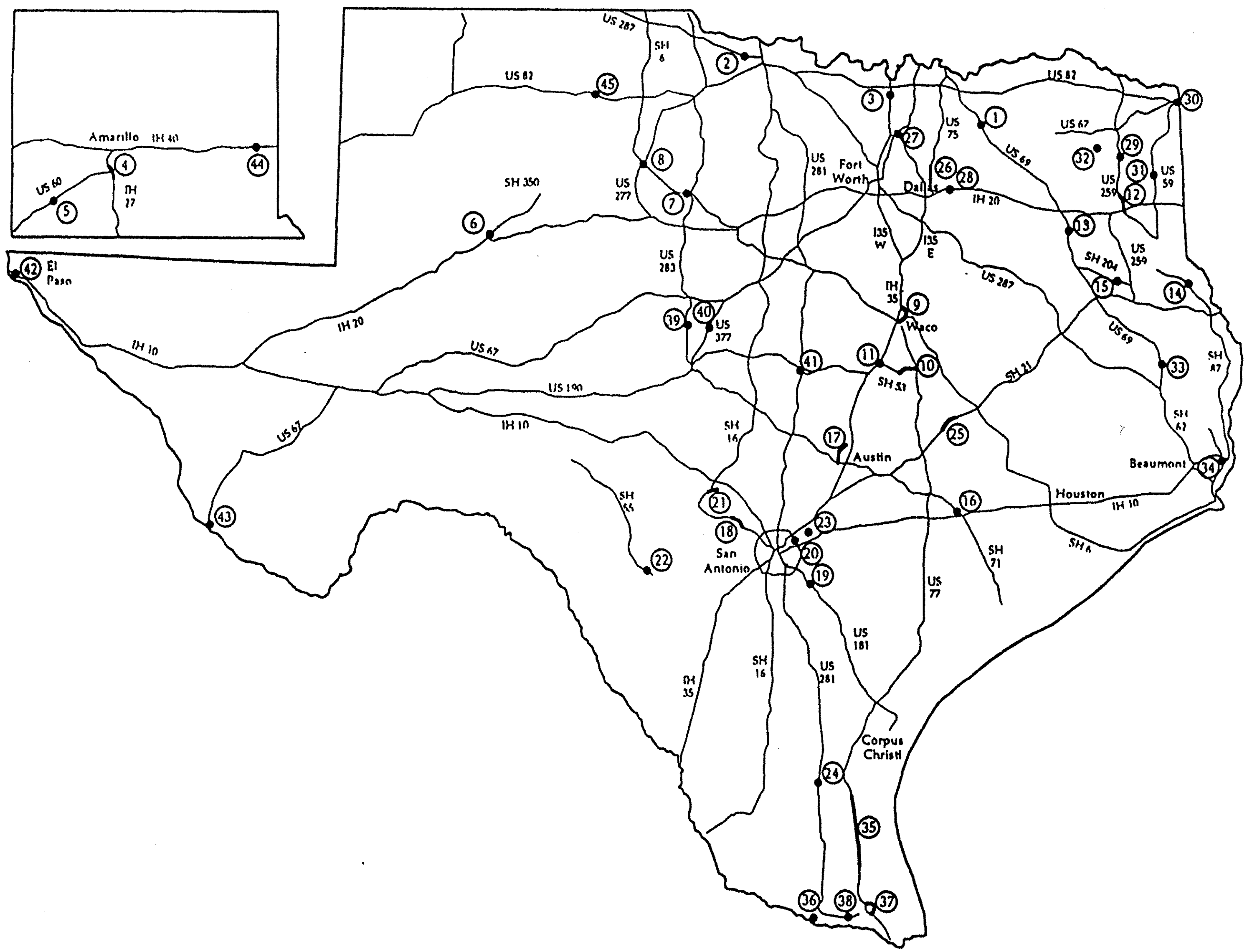

Figure 18. Location of Sample II Projects Including Study Remainders by Item Number as Described in Table 13

were not complete enough to be useful in the regression analysis.

Data Items and Variables

Similar to the analysis for Sample I, the factors used in Sample I, along with several other factors collected in the survey were used in the regression analysis. The variables can again be divided into two groups, continuous and binary. The continuous variables include such things as property size, approved value, costs, and amount of frontage road access. Binary variables are used to measure the impacts of categories, such as rural/urban, method of acquisition, type of land use, shape of remainder, period of acquisition, highest and best use of property, grade level of abutting property, development restrictions, topography, and remainder access. The binary variables are assigned a value of zero or one depending on the presence or absence of a particular attribute. In the case of a variable with more than two categories, multiple binary variables are used, one for each attribute. Given the way the binary variables are used in regression analysis, one attribute has to be excluded. There has to be one attribute that always has zero. This attribute becomes the base case to which the other attributes are compared. For example, the land use category of miscellaneous is always zero; the remainder shape size of irregular is always zero; the before period is always zero; the unknown or miscellaneous highest and best use category is always zero; and the at grade or unknown grade level of abutting property is always zero.

Data items and variables utilized in the analysis include:

Variable Name	Definition
ACCESS	amount of frontage road access for remainder, feet
ACQDUM1	method of acquisition binary variable one, =1 if negotiated, =0 if condemned
ACQSIZE	size of taking, sq. ft.

ACQTOT	land cost of taking, $
ACQVAL	land cost per square foot, ACQTOT/ACQSIZE, $/sq. ft.
DAMIMPR	damages paid on land, $
DAMLAND	damages paid on improvements, $
DAMTOT	total damages paid, DAMLAND+DAMIMPR, $
DAMVAL	damages paid per square foot, DAMTOT/REMSIZE, $/sq. ft.
DISTCITY	distance of remainder to CBD of nearest city or town, miles
DISTSHOP	distance of remainder to nearest major shopping center, miles
DRIVHWY	number of driveways to abutting highway
DRIVSIDE	number of driveways to abutting side street
DUMCONF	use of adjacent property binary variable, =1 if conflicting/unsightly use, =0 if not
DUMDRA	drainage binary variable, =1 if poor drainage, =0 if not
DUMELEC	lack of electricity on remainder binary variable, =1 if yes, =0 if no
DUMFCL	functional class binary variable, =1 if interstate, =0 other
DUMFLD	flood plain binary variable, =1 if property in flood plain, =0 if not
DUMGAS	lack of gas on remainder binary variable, =1 if yes, =0 if no
DUMGRD1	above grade level of abutting highway binary variable, =1 if above grade, =0 otherwise
DUMGRD2	below grade level of abutting highway binary variable, =1 if below grade, =0 otherwise
DUMLAND1	land use at taking binary variable one, =1 if commercial, =0 otherwise
DUMLAND2	land use at taking binary variable two, =1 if residential,

	=0 otherwise
DUMLAND3	land use at taking binary variable three, =1 if agricultural, =0 otherwise
DUMLAND4	land use at taking binary variable four, =1 if vacant, =0 otherwise
DUMML	remainder access to main lanes binary variable, =1 if there is direct access, =0 if not
DUMPARK	parking restrictions binary variable, =1 if there are local ordinance parking restrictions, =0 if not
DUMREM1	highest and best use remainder binary variable 1, =1 if highest and best use of remainder is commercial, =0 otherwise
DUMREM2	highest and best use remainder binary variable 2, =1 if highest and best use of remainder is residential, =0 otherwise
DUMREM3	highest and best use remainder binary variable 3, =1 if highest and best use of remainder is agricultural, =0 otherwise
DUMREM4	highest and best use remainder binary variable 4, =1 if highest and best use of remainder is vacant, =0 otherwise
DUMSALE1	remainder sales history binary variable 1, =1 if sold within 1 year, =0 otherwise
DUMSALE2	remainder sales history binary variable 2, =1 if sold after 1 to 2 years, =0 otherwise
DUMSALE3	remainder sales history binary variable 3, =1 if sold after 2 to 5 years, =0 otherwise
DUMSALE4	remainder sales history binary variable 4, =1 if sold after 5 years, =0 otherwise
DUMSEW	lack of sewer lines on remainder binary variable, =1 if yes, =0 if no

DUMSHP1	remainder shape binary variable one, =1 if triangle, =0 otherwise
DUMSHP2	remainder shape binary variable two, =1 if irregular triangle, =0 otherwise
DUMSHP3	remainder shape binary variable three, =1 if rectangle, =0 otherwise
DUMSHP4	remainder shape binary variable four, =1 if irregular rectangle, =0 otherwise
DUMSLOP	topography slope binary variable, =1 if steep slope, =0 if not
DUMSPLT	location of taking binary variable, =1 if taking is split, =0 if not
DUMSR	remainder access to service roads binary variable, =1 if there is access to service roads, =0 if not
DUMSS	remainder access to side street/road binary variable, =1 if there is access to side streets or roads only, =0 if not
DUMSURF	topography surface binary variable, =1 if too irregular surface, =0 if not
DUMUSE1	highest and best use of whole property binary variable 1, =1 if highest and best use of whole property is commercial, =0 otherwise
DUMUSE2	highest and best use of whole property binary variable 2, =1 if highest and best use of whole property is residential, =0 otherwise
DUMUSE3	highest and best use of whole property binary variable 3, =1 if highest and best use of whole property is agricultural, =0 otherwise
DUMUSE4	highest and best use of whole property binary variable 4, =1 if highest and best use of whole property is vacant, =0 otherwise

DUMWAT	lack of water on remainder binary variable, =1 if yes, =0 if no
DUMZON	zoning restrictions binary variable, =1 if there are local ordinance zoning restrictions, =0 if not
IMPRTOT	improvement cost of taking, $
IMPRVAL	improvement cost per square foot, IMPRTOT/ACQSIZE, $/sq. ft.
LOCDUM1	location binary variable, =1 if rural, =0 otherwise
LOCDUM2	location binary variable, =1 if suburban, =0 otherwise
ORGCOST	total approved value of entire property, ORGTOT+ORGIMTOT, $
ORGIMTOT	approved improvements on entire property, $
ORGIMVAL	value of property improvements per square foot, ORGIMTOT/ORGSIZE, $/sq. ft.
ORGSIZE	size of entire property, sq. ft.
ORGTOT	approved land value of entire property, $
ORGVAL	property land value per square foot, ORGTOT/ORGSIZE, $/sq. ft.
PERDUM1	during period binary variable, =1 if acquired between Oct. 1 1984 and Aug. 17, 1987; =0 otherwise
PERDUM2	after period binary variable, =1 if acquired after Aug. 17, 1987; =0 otherwise
PROVAL	proportional difference between partial taking and whole taking cost (ORGCOST-TOTCOST)/ORGCOST
PROVALLN	proportional difference between partial taking and whole taking land cost (ORGTOT-ACQTOT)/ORGTOT
REMDEPTH	average depth of remainder, feet
REMIMPR	approved value of improvement remainder, before taking, $
REMIMPR1	approved value of improvement remainder, after taking, $

REMLAND	approved value of land remainder, before taking, $
REMLAND1	approved value of land remainder, after taking, $
REMSIZE	remainder size, sq. ft.
REMTOT	total approved value of remainder, before taking, REMLAND+REMIMPR, $
REMTOT1	total approved value of remainder, after taking, REMLAND1+REMIMPR1, $
REMVAL	value of remainder per square foot, REMTOT/REMSIZE, $/sq. ft.
TAKRATIO	proportion of taking to total property size ACQSIZE/ORGSIZE
TOTCOST	total acquisition cost, ACQTOT+IMPRTOT+DAMTOT

Analysis of Total Taking Cost

A multiple regression model was used to estimate the relationship between total taking cost, TOTCOST, and the variables listed above. Using ordinary least-squares, each of the variables was tried separately and in numerous combinations with other variables. One of the problems with this type of analysis is the interdependence of a variable with one or more of the other variables. This can affect the estimates in the equation as well as the statistical significance of the estimated coefficients. For that reason, considerable effort was made to identify the statistically significant variables affecting total taking cost.

The results of the analysis are shown in Table 14. All variables are significant at the 10% level, as can be seen in the far right column, 2-Tail Significance. The R^2 value of 0.59 is fair for this type of analysis, indicating the independent variables explain about 59% of the variation in the dependent variable. Even though this number is relatively high, the Sample I analysis had a much higher number of 0.86. The most significant variable in the Sample I results, ORGCOST (the value of the entire property), is not significant in this analysis. This may be due to the large

Table 14. Regression Results for Total Taking Cost

Dependent Variable: TOTCOST
Number of Observations: 191

Independent Variable	Coefficient	Standard Error	T-Statistic	2-Tail Significance
Constant	13208.140	5476.9568	2.4115838	0.016
ACQSIZE	0.0670059	0.0061137	10.959883	0.000
REMSIZE	-0.0005556	0.0003408	-1.6301667	0.103
ACQVAL	1055.4555	386.84074	2.7283979	0.006
TAKRATIO	28186.313	7091.2141	3.9748219	0.000
DUMLAND1	20594.823	5301.2462	3.8849023	0.000
DUMSHP3	-9702.9670	4666.1176	-2.0794519	0.038
LOCDUM1	-10441.476	4275.5730	-2.4421232	0.015
LOCDUM2	-12631.827	6426.4848	-1.9655888	0.049
DUMGRD2	11276.508	4192.0590	2.6899687	0.007
DUMPARK	-25038.790	14432.021	-1.7349470	0.083
DUMZON	-13841.973	4910.1522	-2.8190517	0.005
DUMWAT	-14406.513	6083.6288	-2.3680789	0.018
DUMGAS	12208.126	4897.4551	2.4927490	0.013
DUMML	-8006.7611	3892.2885	-2.0570831	0.040
DUMSPLT	-19580.655	6925.6319	-2.8272734	0.005

R-Squared	0.593659
Adjusted R-Squared	0.558830
S.E. of regression	21884.87
Sum of squared resid	8.38E+10
F-statistic	17.04487

number of missing values in Sample II. Out of the 191 observations used in the analysis, 42 (22%) have missing values for the entire property. An attempt was made to estimate those values so the observations could be used in the analysis, but the adjustments undoubtedly affected the analysis results. Another surprising result was the lack of significance of the period variables. In this sample, the changes in the law, represented by the period variables, did not have a significant impact on the taking costs.

Several points can be made concerning the results presented in Table 14.

- The most significant independent variable is ACQSIZE, the size of the taking. As expected, the coefficient is positive indicating that the larger the taking, the higher the taking cost (holding other impacts constant). The coefficient of 0.067 implies that the taking costs average about 6.7 cents per square foot, holding other impacts constant.
- The remainder size, REMSIZE, is also significant and has a negative coefficient. This indicates that the larger the remainder, the lower the total taking cost, holding other factors constant. The size of the impact is quite small, however. The coefficient of 0.00056 indicates that the taking cost is reduced by .056 cents per square foot of the remainder.
- The value of the land taking per square feet, ACQVAL, has a positive coefficient and is significant. The higher the land value, the higher the expected total taking cost, holding other factors constant.
- The ratio of the size of the taking to the total parcel size, TAKRATIO, is also significant and has a positive coefficient. This can be interpreted as indicating the higher the proportion of the taking, the higher the taking cost, holding other impacts constant. This further implies that when a taking results in a small remainder, the taking cost, including damages are higher than it would be otherwise.
- One land use binary variable is significant, DUMLAND1, commercial use. The coefficient is positive, giving the expected results that existing commercial activity increases the taking cost, relative to other land use activities. The

coefficient of 20594.8 indicates that the taking cost for commercial property is about $20,600 higher than other categories of property.

- One remainder shape binary variable is significant and has a negative coefficient. This variable is DUMSHP3, the rectangular shape. This indicates that a rectangular shape decreases the cost of the taking, as compared to the other remainder shapes. The coefficient of -9702.97 indicates that the rectangular shape for the remainder reduces taking costs by about $9,700.
- Two location binary variables are significant and have negative coefficients. They are LOCDUM1, rural area; and LOCDUM2, suburban area. This indicates that the urban areas have a higher taking cost than other areas, holding other factors constant. In this sample, urban takings cost about $10,000 to $12,000 more than takings in rural or suburban areas.
- Abutting highways at below grade level has a significant positive coefficient. This means that abutting highways at below grade level increase the taking cost in this sample. The coefficient of 11276.5 indicates that the below grade level alignment increases taking cost about $11,300.
- Two local ordinance binary variables are significant, DUMPARK (parking restrictions), and DUMZON (zoning restrictions). Both coefficients are negative. This indicates that both local ordinance categories tend to lower taking costs, holding other factors constant. The DUMPARK coefficient of -25038.8 indicates parking restrictions lower taking costs by about $25,000; while the DUMZON coefficient of -13841.97 indicates that zoning restrictions lower taking costs by about $13,800.
- Two utility availability binary variables are significant, DUMWAT (lack of water lines), and DUMGAS (lack of gas lines). Surprisingly, the coefficients have opposite signs; DUMWAT is negative, while DUMGAS is positive. This indicates that the lack of water lines decreases taking cost, while the absence of gas lines increases taking cost. It is not clear why the absence of gas lines would increase the taking cost.
- Two other binary variables are significant, and their coefficients are negative,

DUMML (direct access to the highway main lanes) and DUMSPLT (remainder divided into more than one piece). This indicates that direct access to highway main lanes and a divided remainder both tend to reduce total taking cost, holding other factors constant.

Analysis of Partial Taking Cost Versus Whole Taking Cost

Another analysis was undertaken to determine what factors were influencing the relative cost of a partial taking versus a whole taking. As was the case with Sample I, the proportional difference between the two costs, PROVAL, was initially used as the dependent variable. However, as mentioned previously, there are several missing values for the value of the entire property, the denominator in this ratio. The results were not satisfactory, with a very low R^2 value. For that reason, the ratio of the land cost portion of the taking and the value of the original property was used for this sample.

The results of the analysis are shown in Table 15. All variables are significant at the 10% level. The R^2 value of 0.65 is again high for this type of analysis, indicating the independent variables explain about 65% of the variation in the dependent variable. Again, this is relatively high given the variation in geographic area and time periods the data covers.

Several points can be made concerning the results presented in Table 15.

- The most significant variable is the ratio of the size of the taking to the total parcel size, TAKRATIO. The large negative coefficient indicates that the higher the proportion taking, the more likely it is that the partial taking costs for land will be as great as the whole land taking cost, holding other impacts constant. This is almost certainly related to the diminished value of a small remainder and the high damages paid in those circumstances.
- The total acquisition cost, TOTCOST, is also significant. A negative coefficient indicates that the larger the acquisition cost, the more likely that a partial taking would be as expensive as a whole taking of land, holding other

Table 15. Regression Results for Proportional Difference between Partial and Whole Taking Cost of Land

Dependent Variable: PROVALLN Number of Observations: 191				
Independent Variable	Coefficient	Standard Error	T-Statistic	2-Tail Significance
Constant	0.9848316	0.0331706	29.689870	0.000
TAKRATIO	-1.1498061	0.0782917	-14.686183	0.000
TOTCOST	-1.540E-06	5.832E-07	-2.6415097	0.008
ACQDUM1	0.0623072	0.0349021	1.7852026	0.074
DUMGRD2	-0.0999712	0.0420516	-2.3773492	0.017
DUMLAND1	-0.1262549	0.0545662	-2.3137934	0.021
DUMSHP1	0.1548940	0.0806677	1.9201473	0.055
LOCDUM2	-0.1809311	0.0588819	-3.0727813	0.002
DUMSS	0.1331644	0.0573338	2.3226173	0.020
DUMSPLT	0.1952626	0.0648657	3.0102572	0.003
R-Squared	0.647144			
Adjusted R-Squared	0.629599			
S.E. of regression	0.233896			
Sum of squared resid	9.902061			
F-statistic	36.88419			

impacts constant.

- The negotiated acquisition variable, ACQDUM1, is significant. The positive coefficient indicates that a negotiated partial taking is less likely to be as expensive as a whole taking of land, holding other impacts constant.
- One grade level of highway variable is significant, DUMGRD2. The negative coefficient indicates that an abutting highway below grade level is more likely to result in a partial taking of land that would be as expensive as a whole taking, holding other impacts constant.
- One land use variable is significant, DUMLAND1, commercial development. The negative coefficient on commercial development indicates that a partial taking of commercial land is more likely to be as expensive as a whole taking, compared to other land uses.
- One binary remainder shape variable is significant, DUMSHP1, the triangle shape. This indicates that a triangular shaped remainder increases the likelihood that a partial taking of land will be less expensive than a whole taking, compared to other remainder shapes.
- One location binary variable is significant, LOCDUM2, suburban areas. The negative coefficient indicates that a partial taking of land in a suburban area is more likely to be as expensive as a whole taking, compared to other areas.
- One remainder access variable is significant, DUMSS, remainder access only to side street/road. The positive coefficient indicates that a partial taking of land with remainder access limited to a side street or road is less likely to be as expensive as a whole taking, holding other impacts constant.
- One other binary variable is significant and has a positive coefficient, DUMSPLT, remainder divided into more than one piece. This indicates that a partial taking of land with the remainder split into more than one piece is more likely to be as expensive as a whole taking, holding other impacts constant.

ANALYSIS OF COMBINED SAMPLES

Since there is a wide difference in the general characteristics and selection of Samples' I and II remainders, the databases of the two samples were combined and analyzed using the same regression approach applied on each sample separately. The analysis of Sample I was based on 196 remainders, and the analysis of Sample II was based on 191 remainders making a combined total of 387 remainders for use in the combined analysis. However, 10 remainders had to be removed from the combined analysis because of missing values. By combining the two databases, the results are more balanced in terms of representing remainders created in urban and rural areas of the state. Also, a combined database contains a good representation of remainders with an after-acquisition sales history and remainders created along interstate highways and other highways in the state. Lastly, the combined sample represents nearly 50 years of right-of-way acquisitions and is located in all seven regions of the state.

The general combined sample characteristics, analysis, and findings are presented below.

COMBINED GENERAL CHARACTERISTICS

The same general characteristics used to describe Samples I and II separately are used to describe the combined database. Although both samples were of about the same size, the individual characteristics show some variation from a 50-50 percentage breakdown. Figure 19 shows the combined database to be composed of about a 46-54% split between rural and urban remainders. Figure 20 shows the combined remainder database to have about a 52-48% representation along the interstate highway system and the non-interstate system. Figure 21 shows the combined database with about 41% of its remainders representing parcels that were vacant or in agricultural use at the time of acquisition. Figure 22 shows the combined database to be composed of about 61% of the remainders representing parcels purchased by negotiation and about 29% purchased

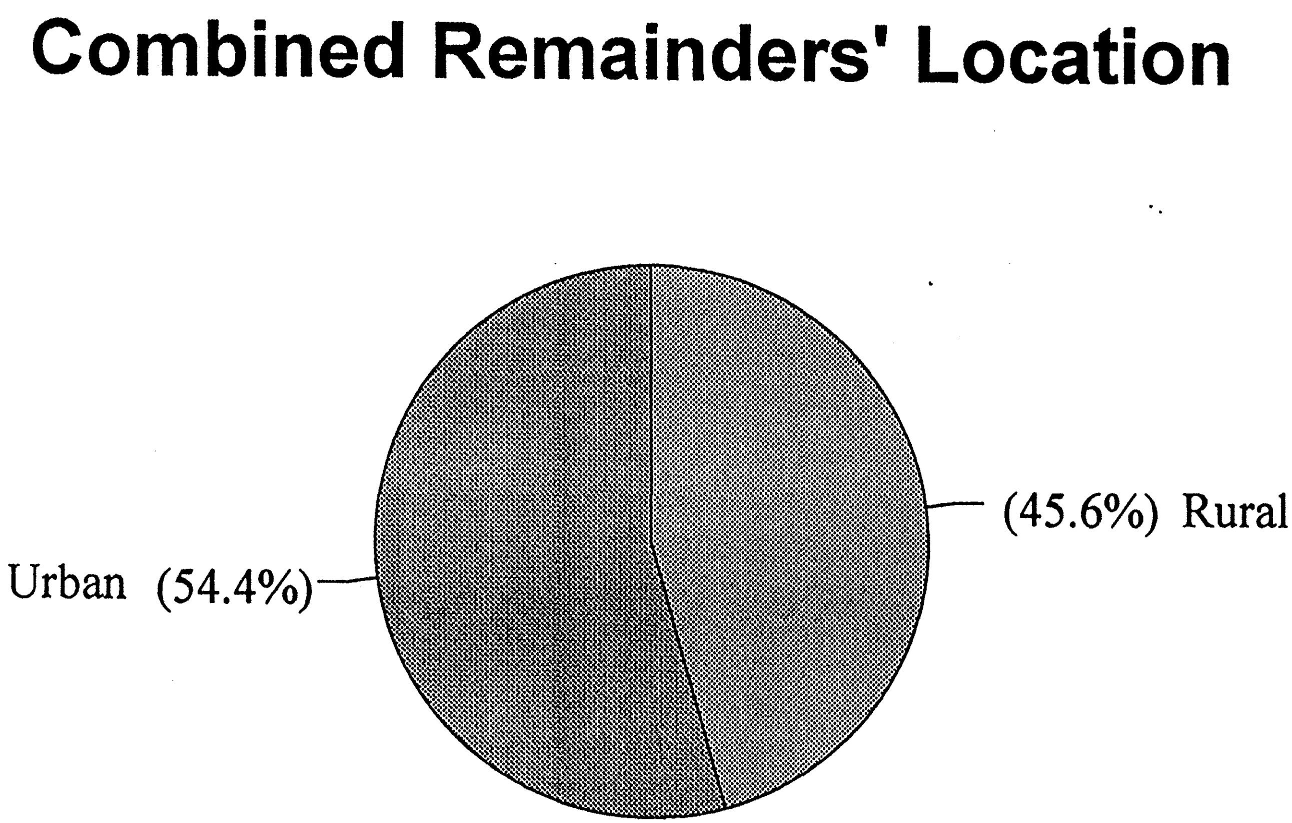

Figure 19. Chart Showing the Percentage of Combined Remainder Parcels by Rural and Urban Location

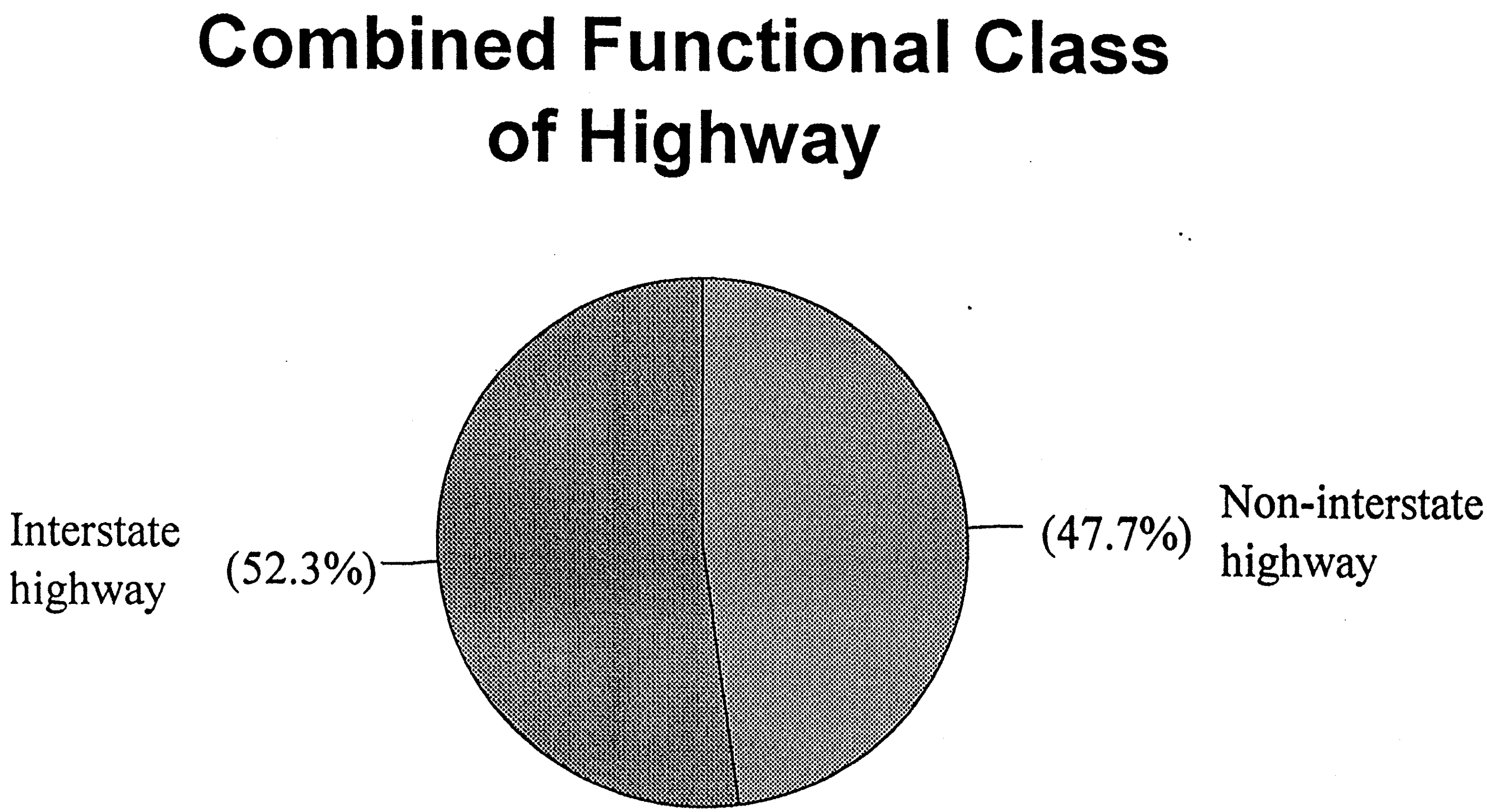

Figure 20. Chart Showing the Percentage of Combined Remainder Parcels by Functional Class of Highway

Combined Original Land Use

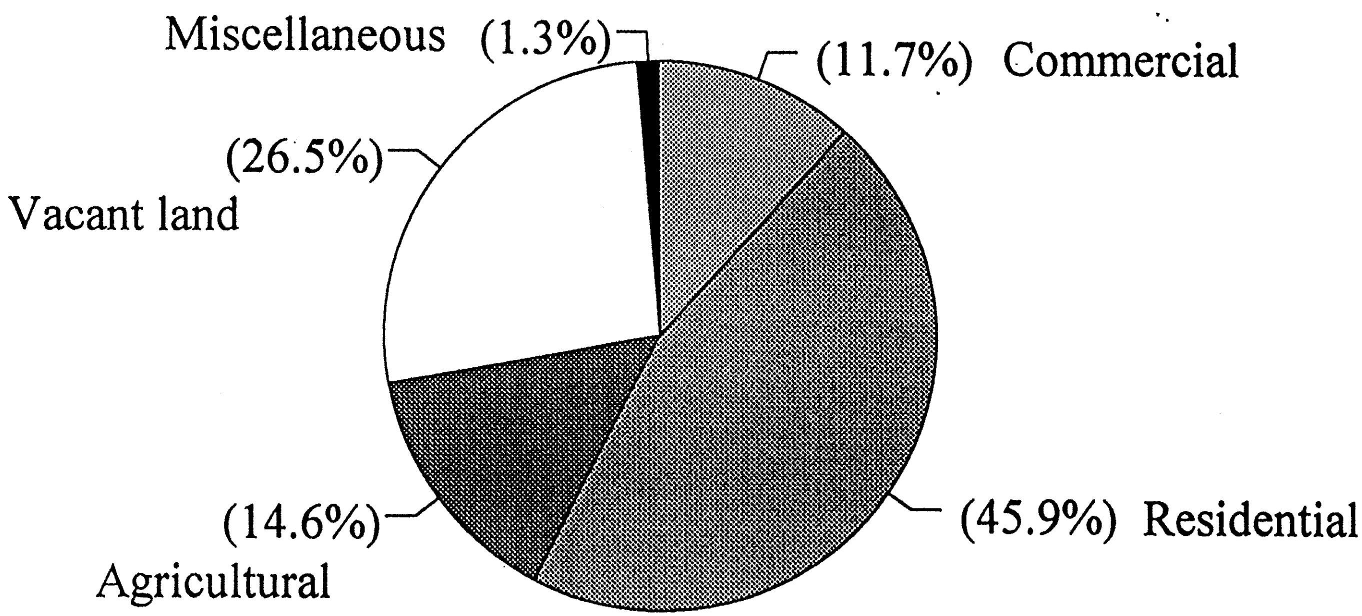

Figure 21. Chart Showing the Percentage of Combined Remainder Parcels by Original Land Use

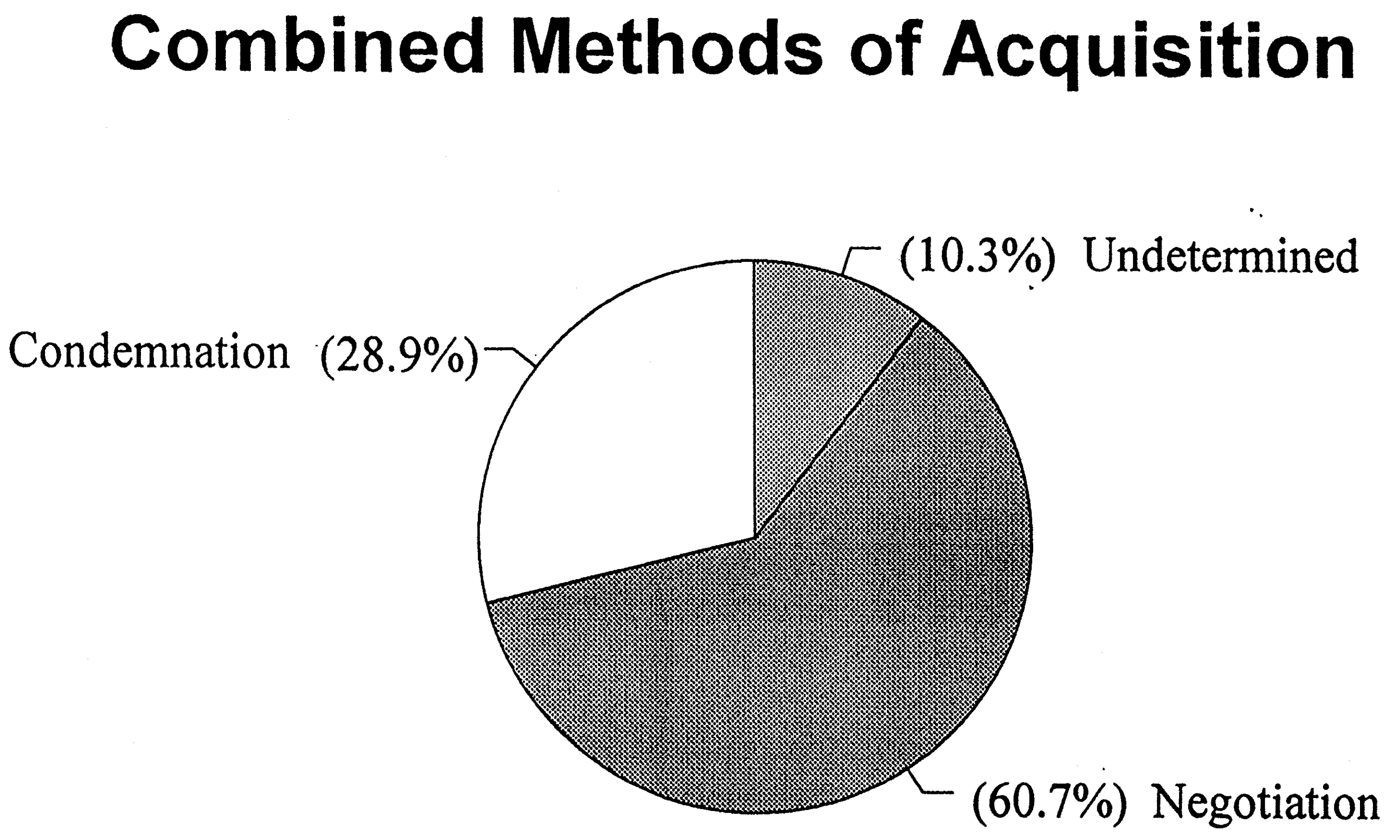

Figure 22. Chart Showing the Percentage of Combined Remainder Parcels by Method of Acquisition

by condemnation. Another 10% were unknown in terms of method of acquisition. Figure 23 shows the combined database having about 35% of its remainders of sizes from zero to 929 square meters (zero to 10,000 square feet) and about 65% of larger sizes. Finally, Figure 24 shows this combined database having about 46% of its remainders being irregular rectangle in shape and 54% of other shapes. In addition to the above mentioned characteristics, the combined database contains 232 (62%) remainders which have sold at least one time after being created, most of which came from Sample I. A review of these results indicate that the combined database is more balanced than either of the other databases.

ANALYSIS AND FINDINGS

As indicated, about the same type of analysis used on the individual sample databases is used on the combined database. The regression technique is used on the same two models used before, i.e., the total taking cost model and the partial taking costs versus whole taking cost model.

Data Items and Variables

Following the analysis for Samples I and II, the information common to both data sets were combined into a single data set for analysis purposes. Due to the long period covered by both samples, costs were adjusted to 1992 dollars using the consumer price index. This adjustment, for the most part, takes out the impact of inflation on the data.

The same structure of analysis and variables are used in this section that have been used in the previous analyses and will not be repeated here. There were two variables added in this analysis, and they are listed below.

Variable Name	Definition
PROLAND	proportion of land value of entire property as compared to the total value, ORGTOT/ORGCOST

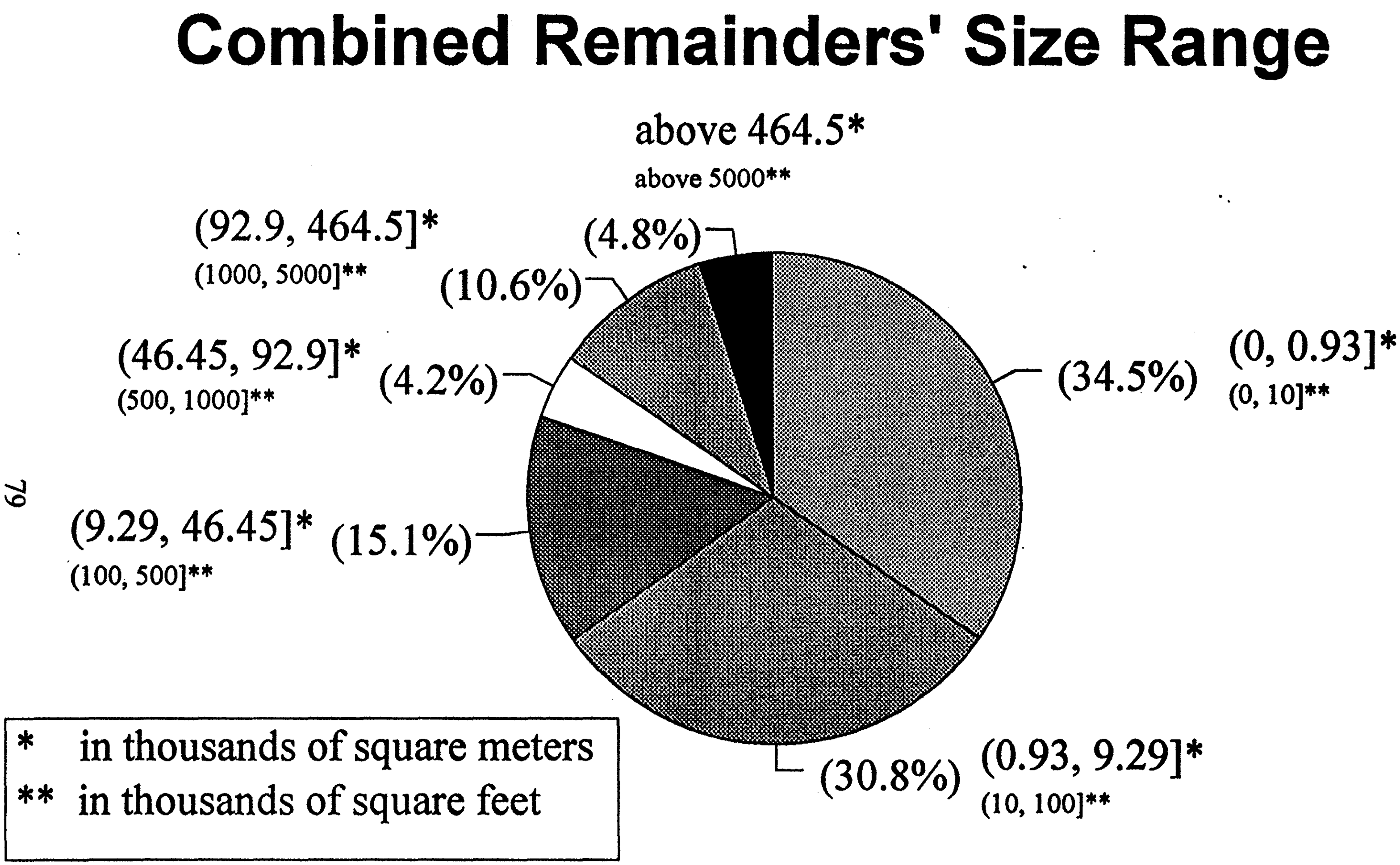

Figure 23. Chart Showing the Percentage of Combined Remainder Parcels by Size Range

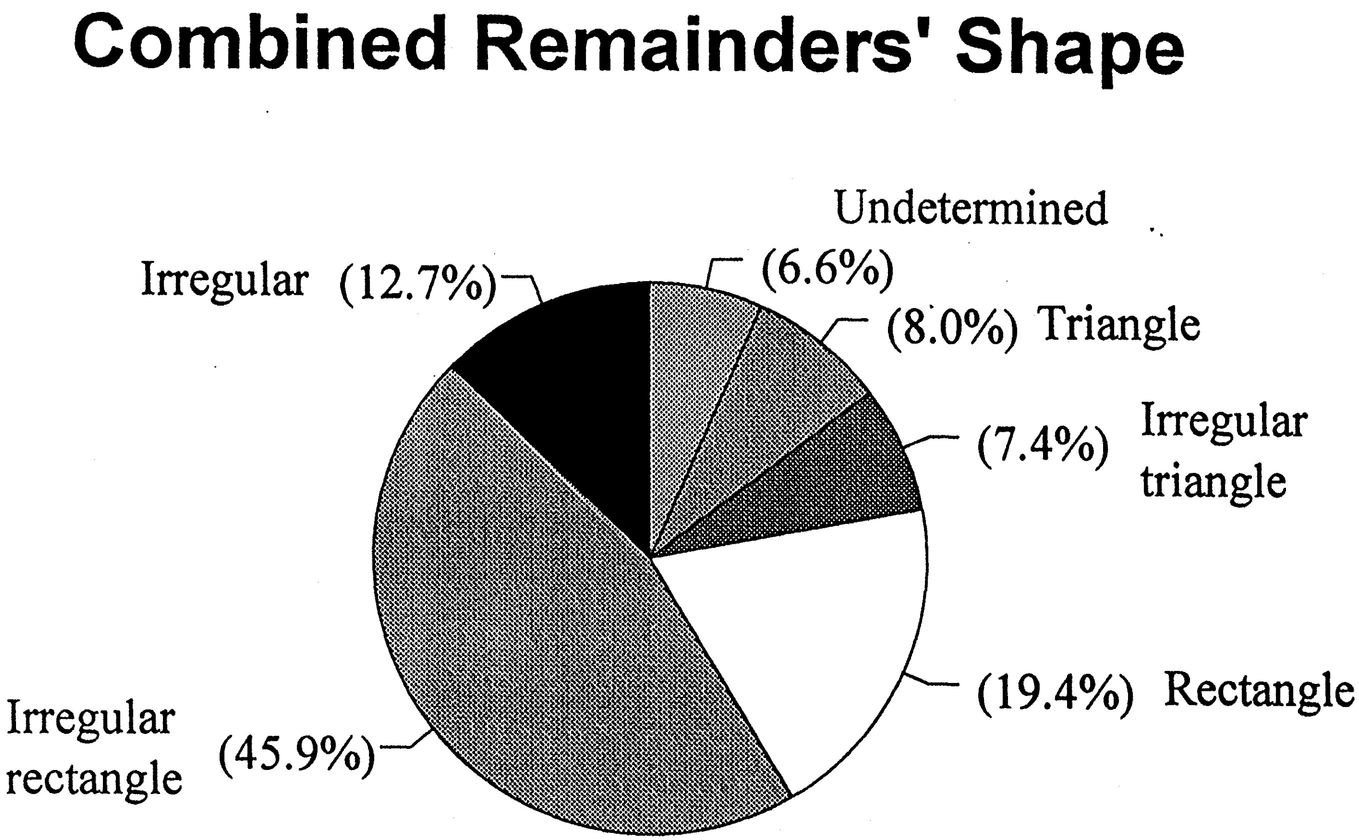

Figure 24. Chart Showing the Percentage of Combined Remainder Parcels by Shape

SALECHG percent change in remainder value from taking to sale of property

For the most part, the data items and variables common to both Sample I and Sample II databases are the same variables defined in the Sample I analysis.

Analysis of Total Taking Cost

A multiple regression model was used to estimate the relationship between total taking cost, TOTCOST, and the variables used in previous analyses. The combined data from Sample I and Sample II were used, with 10 data observations deleted because of insufficient information on the remainder value. A total of 377 observations were used in the analysis.

The results of the analysis are shown in Table 16. All variables are significant at the 10% level, except for the constant, as can be seen in the far right column, 2-Tail Significance. The R^2 value of 0.82 is very high for this type of analysis, indicating the independent variables explain about 82% of the variation in the dependent variable. This value is close to the Sample I analysis of 0.86, and much higher than the Sample II analysis of 0.59. The most significant variables in the results are ORGCOST, the value of the entire property, and ORGTOT, the land value of the entire property. ORGCOST was also very significant in the Sample I analysis, but was not significant in the Sample II analysis.

Several points can be made concerning the results presented in Table 16.

- The most significant independent variables are ORGCOST, the total value of the entire property, and ORGTOT, the land value of the entire property. The overall value of the property has a strong positive impact on the total taking cost, with the land cost offsetting most of that impact. The coefficient for ORGCOST is 1.15, whereas the coefficient for ORGTOT is -1.04. This would indicate that the total value of the property would have a larger impact on total taking cost the smaller the land value is of the total property value.

Table 16. Regression Results for Total Taking Cost

Dependent Variable: TOTCOST

Number of Observations: 377

Independent Variable	Coefficient	Standard Error	T-Statistic	2-Tail Significance
Constant	6122.0262	4475.3243	1.3679514	0.171
ORGCOST	1.1502269	0.0391659	29.368059	0.000
ORGTOT	-1.0392716	0.0403036	-25.786052	0.000
REMIMPR	-0.0262162	0.0120544	-2.1748305	0.030
TAKRATIO	37203.647	7795.3614	4.7725366	0.000
ACQSIZE	0.0247602	0.0052275	4.7261808	0.000
REMSIZE	-0.0044120	0.0006428	-6.8639256	0.000
ACQVAL	5518.0469	990.95488	5.5684139	0.000
DAMVAL	3758.3213	1891.8091	1.9866282	0.047
DUMLAND1	13044.063	6035.9260	2.1610707	0.031
DUMSHP1	-28106.674	8651.0032	-3.2489497	0.001
DUMSHP2	-15799.366	7749.4758	-2.0387658	0.041
DUMSHP3	-19231.222	5816.7615	-3.3061734	0.001
DUMSHP4	-17665.751	4950.1446	-3.5687343	0.000

R-Squared	0.817522
Adjusted R-Squared	0.810987
S.E. of regression	33956.91
Sum of squared resid	4.19E+11
F-statistic	125.0985

- The remainder value before taking, REMIMPR, is also significant and has a negative coefficient. This indicates that the larger the value of the remainder, the lower the total taking cost, holding other factors constant.
- The ratio of the size of the taking to the total parcel size, TAKRATIO, is also significant and has a positive coefficient. This can be interpreted as indicating the higher the proportion of the taking, the higher the taking cost, holding other impacts constant. This further implies that when a taking results in a small remainder, the taking cost, including damages, are higher than it would be otherwise.
- The size of the taking, ACQSIZE, is significant and has a positive coefficient. This indicates that the larger the taking, the higher the total taking cost, holding other factors constant.
- The remainder size, REMSIZE, is significant and has a negative coefficient. This indicates that the larger the remainder, the lower the total taking cost, holding other factors constant. The size of the impact is small, though larger than in Sample II. The coefficient of -0.00441 indicates that the taking cost is reduced by 0.411 cents per square foot of the remainder.
- The value of the land taking per square feet, ACQVAL, has a positive coefficient and is significant. The higher the land value, the higher the expected total taking cost, holding other factors constant.
- The damages paid per square foot, DAMVAL, has a positive coefficient and is significant. The higher the damages paid per square foot, the higher the expected total taking cost, holding other factors constant.
- One land use binary variable is significant, DUMLAND1, commercial use. The coefficient is positive, giving the expected results that existing commercial activity increases the taking cost, relative to other land use activities. The coefficient of 13044.1 indicates that the taking cost for commercial property in the combined sample is about $13,000 higher in 1992 dollars than other categories of property.
- All four remainder shape binary variables are significant and have negative coefficients. The variables are DUMSHP1, triangle shape; DUMSHP2, irregular

triangle shape; DUMSHP3, rectangle shape; and DUMSHP4, irregular rectangle shape. This indicates that these shapes decrease the cost of the taking, as compared to the irregular shape. The coefficients indicate the amount of each remainder shape taking cost. For example, the triangle shape, DUMSHP1, would reduce taking cost by about $28,100 in 1992 dollars, as compared to a remainder with an irregular shape.

Figure 25 shows the relationship between total cost and the amount of acquired land ratio to total land. As explained in the Sample I analysis, as this ratio increases in size, the total cost of right-of-way tends to increase.

Analysis of Partial Taking Cost versus Whole Taking Cost

This analysis was repeated for the combined sample data set. PROVAL, the dependent variable in Sample I, was again used here. The results of the analysis are shown in Table 17. All variables are significant at the 10% level. The R^2 value of 0.59 is again high for this type of analysis, indicating the independent variables explain about 59% of the variation in the dependent variable. Again, this is relatively high given the variation in geographic area and time periods the data covers. Two variables, damages paid per square foot, DAMVAL, and proportion of taking to total property size, TAKRATIO, are the most significant in the results.

Several points can be made concerning the results presented in Table 17.

- The proportion of the land value to the total value of the property, PROLAND, is significant. The positive coefficient indicates that the higher the land value is of the total value, the less likely that a partial taking will be as expensive as a whole taking, holding other impacts constant. Putting it another way, the more improved value a property has, the more likely it is that partial taking would cost at least as much as a whole taking.
- One of the two most significant variables is the ratio of the size of the taking to the total parcel size, TAKRATIO. The large negative coefficient indicates that

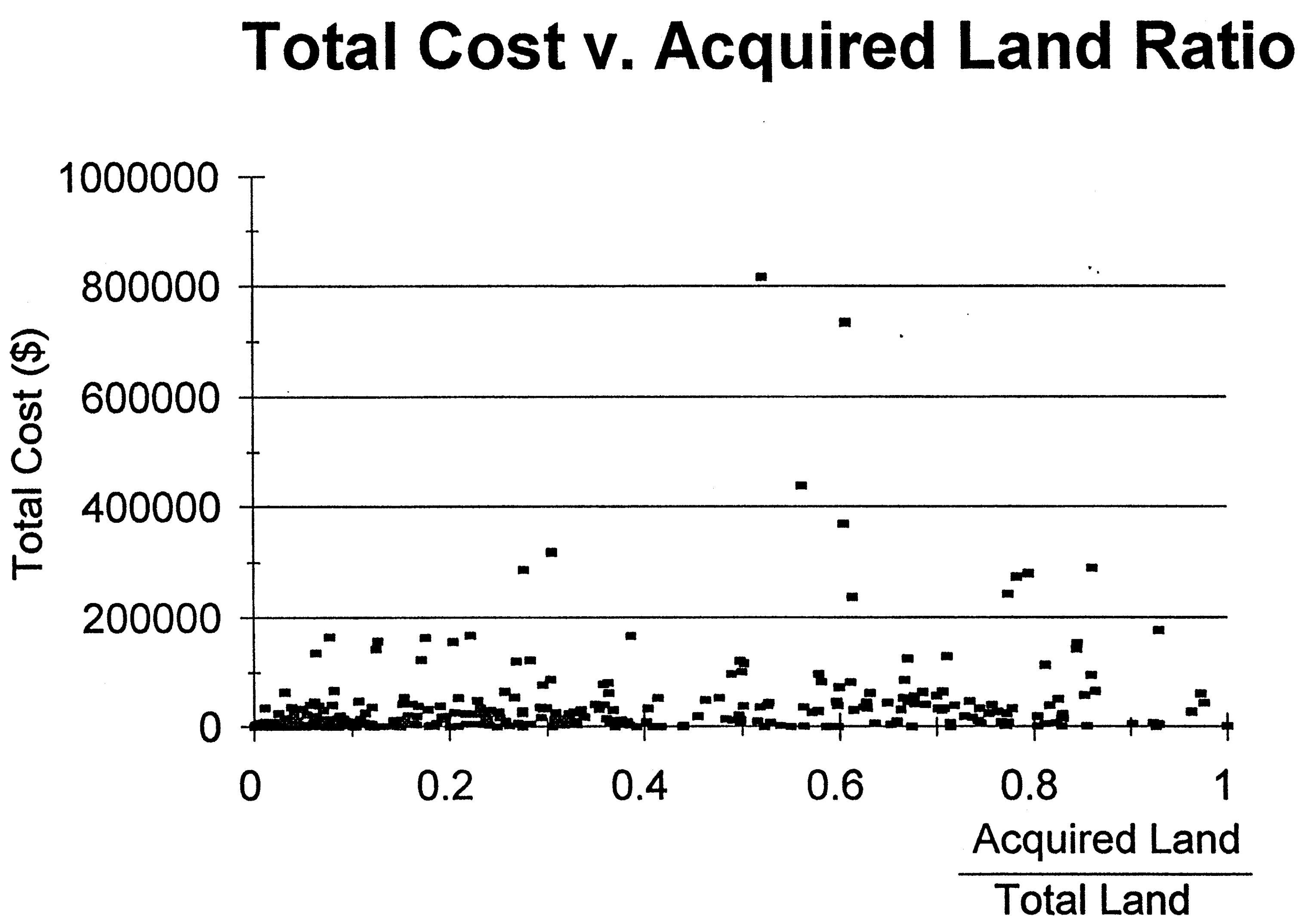

Figure 25. Graph Showing the Relationship between Total Right-of-Way Cost and the Ratio of Acquired Land to Total Land

Table 17. Regression Results for Proportional Difference between Partial and Whole Taking Cost

Dependent Variable: PROVAL
Number of Observations: 377

Independent Variable	Coefficient	Standard Error	T-Statistic	2-Tail Significance
Constant	0.5643313	0.0773415	7.2966128	0.000
PROLAND	0.3718748	0.0732515	5.0766858	0.000
TAKRATIO	-0.9378604	0.0921070	-10.182292	0.000
DAMVAL	-0.2947200	0.0216371	-13.6211021	0.000
ACCESS	4.961E-05	2.085E-05	2.3794111	0.017
DUMSHP1	0.2050614	0.0847298	2.4201804	0.016
ACQDUM2	-0.1525954	0.0461226	-3.3084706	0.001
DUMGRD2	-0.1639912	0.0517447	-3.1692334	0.002

R-Squared	0.590944
Adjusted R-Squared	0.583184
S.E. of regression	0.389763
Sum of squared resid	56.05670
F-statistic	76.15381

the higher the proportion taking, the more likely it is that the partial taking costs will be as great as the whole taking cost, holding other impacts constant. This is almost certainly related to the diminished value of a small remainder, and the high damages paid in those circumstances.

- The damages paid per square foot, DAMVAL, is also one of the most significant variables. A negative coefficient indicates that the higher the damages paid, the more likely that a partial taking would be as expensive as a whole taking of land, holding other impacts constant.
- The amount of frontage road access for the remainder, ACCESS, is significant. The positive coefficient indicates that the more access the remainder has, the more likely it is for a partial taking to be less expensive than a whole taking of land, holding other impacts constant.
- One binary remainder shape variable is significant, DUMSHP1, the triangle shape. The positive coefficient indicates that a triangular shaped remainder increases the likelihood that a partial taking will be less expensive than a whole taking, compared to other remainder shapes.
- One acquisition binary variable is significant, ACQDUM2, where property was condemned during taking. The negative coefficient indicates that a partial taking in a suburban area is more likely to be as expensive as a whole taking, compared to other areas.
- One grade level of highway variable is significant, DUMGRD2. The negative coefficient indicates that an abutting highway below grade level is more likely to result in a partial taking that would be as expensive as a whole taking, holding other impacts constant.

Figure 26 is a graph showing the relationship between the PROVAL ratio and taking cost. As explained earlier in the report, as the PROVAL ratio gets lower, partial taking costs approach whole taking costs in increasing amounts. Takings with PROVAL ratios of 0.2 or less are likely to involve small uneconomic remainders.

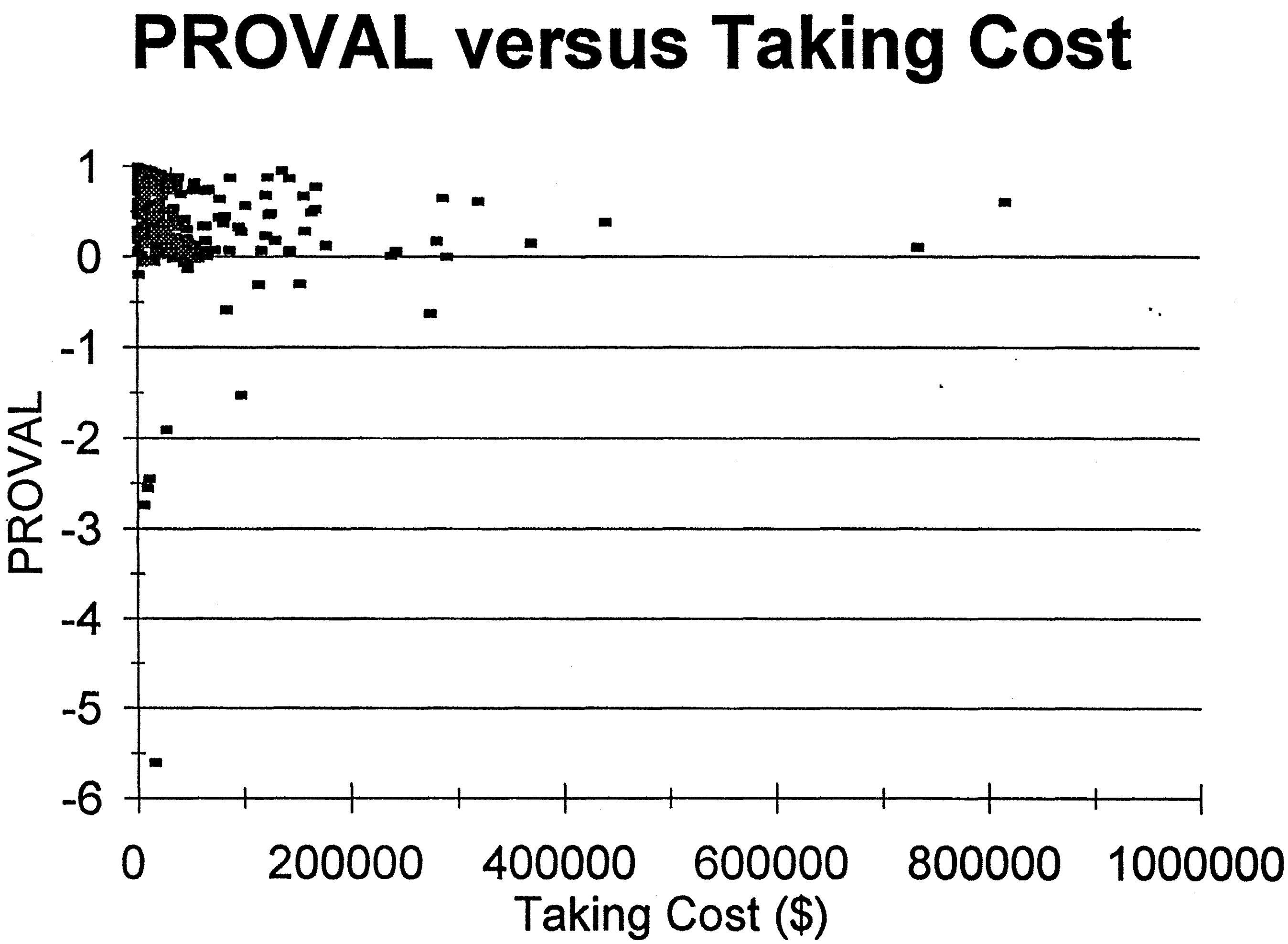

Figure 26. Graph Showing the Relationship between the PROVAL Ratio and Taking Cost

EFFECTS OF THE 1984-87 RIGHT-OF-WAY ACQUISITION LAW

The effects of the 1984-87 right-of-way acquisition law were measured in Sample II and combined sample database analyses by including a period of acquisition variable in the regression models. As indicated earlier, Period II represented the time period when this law was in effect. This period had 41% of the study remainders in Sample II, and the combined database had about 19%.

The period variable was tested along with all of the other variables and never showed up as being statistically significant. Therefore, the conclusion from this study is that the 1984-87 law failed to produce a statistically significant effect on right-of-way costs.

CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations presented here are based on all findings of the study. These findings are based on an extensive literature review, a survey of right-of-way experts in and out of the state government, a sample of old remainder case studies performed in the state during the 1960s, and a new sample of remainders created in the 70s and 80s to determine the significant characteristics of right-of-way remainders that affect right-of-way costs.

CONCLUSIONS

Based on the findings of the study, the conclusions that can be reached are as follows.

- Several physical/locational characteristics of remainders significantly affect right-of-way costs. Among those identified are size, shape, land use, type of access, grade level, functional highway class, development limitations, divided remainders, and urban/rural location.
- Several value/cost characteristics significantly affect right-of-way costs. Among those identified are appraised value of entire property, value of the remainder, value of improvements of entire property, cost of improvements taken, total acquired value, and value of damages paid.
- Several variables significantly affect the change in values after acquisition. Among those identified are total cost of entire property, total cost of taking, remainder land value before taking, damages paid, size of taking, vacant land use, functional highway class, grade level, and method of acquisition.
- The findings reported do support possible legislation to give TxDOT the authority and flexibility to purchase excess right-of-way in cases where small odd-shaped remainders of low value would be created.

- The findings reported do not support possible re-enactment of the 1984-87 right-of-way acquisition law.

RECOMMENDATIONS

The following recommendations are supported by the findings reported here:

- TxDOT right-of-way acquisition procedures should be modified to pay closer attention to right-of-way acquisitions that would create small, odd-shaped remainders of low value; and
- TxDOT should continue to seek authority to purchase "uneconomic remainders."

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APPENDIX: SURVEY AND DATA FORMS

RIGHT OF WAY REMAINDER PARCEL DATA FORM

Identification Data

Dist._____ County No.______ Hwy No.________ CSJ. No._____________

Proj. No._________ U/R Loc______ Nearest City___________________

Parcel No.___ Land Owner at taking______________________________

Lot____ Blk._____ Subdivison___________________ Survey No.______

Size (S.F./Acres): Whole Prop________, Taking_______ Rem__________

Remainder Size Demensions: (No. of Linear Ft.) Frontage_________

Depth (Sides): Right_________ Left__________ Back__________

Descriptive Data

Remainder(After) Access to Abutting Highway: (Check X one only):

Direct to ML's ____ Service Rd. ____ Side St./Rd. Only _____

No. of Driveways: Abutting Highway: _____ Abutting Side St._____

Grade Level to Highway ML's (Ft.): ______ Below ______ Above

Distance to Cross St./Rd. (Miles 00.0): __________

Distance to Major Intersecting Highway (Miles 00.0): __________

Land Use and Zoning: Use Zoning

Whole Property at Taking___________________ _______________

Remainder Use Now ___________________ _______________

Highest and Best Use: Whole Property____________________________

Remainder Before Taking_______________________________________

Remainder After Taking____

Remainder Use/Development Limitations: (Check X if applicable):

Local Ordinances: Parking ____ Zoning_____ Others (List)_______

Lack of Utilities: Electricity___Water___ Gas___ Sewer lines___

Drainage: Poor_____ In Flood Plain_____ Others ________________

Topography: Too Irregular Surface____ On Steep Slope_____

Conflicting/Unsightly Use of Adjacent or Nearby Property ____

Explain____

Remainder Distance to CBD of Nearest City or Town (Miles 00.0)____

Remainder Distance to Nearest Major Shopping Center(Miles 00.0)___

Value and Cost Data

Date of Approved Value of Right of Way Parcel: Mo.__ Da.__ Yr.__

Approved Value of Component Parts:	Land	Improvements
Property Taken	______	______
Remainder (Before)	______	______
Remainder (After)	______	______
Whole Property (Before)	______	______
Damages (Type) ______	______	______
Enhancements	______	______

Closing Payment Date on Taking/ Damages(if any): Mo.__ Da.__ Yr.__

Payment for Component Parts:	Land	Improvements
Property Taken	______	______
Damages	______	______

Payment for Acquisition Costs:	Amount
Appraisal Fees	______
Title Fees	______
Court Costs	______
Relocation Costs	______
All Other	______
Total Payments	______

Adjustments:	Amount
Sale of Improvements	______
Retention Credit	______
Gains on Donations	______

Remainder Sales Data

Subsequent Sales History of Remainder Property:

Sale No.	Date of Sale	Land Sold	Sale Price (S.F./Ac)	Land Use
1st Sale	______	______	______	______
2nd Sale	______	______	______	______
Last Sale	______	______	______	______

Improvements Included in Above Sales:

1st Sale______________________________

2nd Sale______________________________

Last Sale______________________________

RIGHT OF WAY REMAINDER SURVEY
Conducted by
Texas Transportation Institute
Texas A&M University System

1. Type of Respondent (Please check the appropriate blank.):
   a. TxDOT Right of Way Appraiser ____
   b. Fee Appraiser ____
   b. TxDOT Right of Way Attorney ____
   c. Attorney General staff attorney ____
   d. Others (including panel members) ____

2. Please give a degree of importance score to each of the following physical, locational and access characteristics of right of remainders in contributing significantly to higher right of way costs: (Note: Please choose a number from 1 to 10 to evaluate each characteristic separately. Giving the characteristic a score of (1) means it contributes very little to right of cost and a score of (10) means it contributes very much to right of cost. **More than one characteristic could have the same degree of importance score because each characteristic is evaluated independently.**)

CHARACTERISTIC OF REMAINDER	DEGREE OF IMPORTANCE SCORE (From 1 to 10)
Physical Characteristics	
Size of original property	
Size of remainder	
Width of remainder (frontage of abutting highway)	
Length of remainder (depth from abutting highway)	
Shape of remainder	
Land Use of original property	
Highest and best use of original property	
Change in highest and best use of remainder from that of original property	
Drainage/topography of remainder	
Grade level of abutting highway	
Development capabilities	
Compliance with local ordinances (zoning, parking, etc.)	
Others (Please list below and rate each one.)________	
Locational/Access Characteristics	
Functional highway class (abutting remainder)	
Location of taking (front versus back of original tract)	
Location of access to abutting highway (direct versus other street or road)	
Location and number of driveways to abutting highway	
Amount of access to abutting highway (direct versus indirect to main lanes)	
Access to cross street or road (direct or indirect)	
Distance to cross street or road	
Distance to CBD of nearest town	
Distance to major highway (in same city or general area)	
Distance to major shopping center (by way of abutting highway)	
Others (Please list and rate each one.)________	