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Right-of-Way (ROW) acquisition for highways and other transportation improvements can be very expensive, time-consuming, and socially sensitive. Accurate ROW cost estimation, efficient acquisition practices, and appropriate federal and/or state laws can be keys to successful completion of ROW acquisition. This report reviews the literature related to ROW acquisition, and highlights the findings of expert interviews.
Hedonic price models were proposed using recent acquisition data from several Texas corridors and separate databases of full-parcel commercial sales transactions for Texas' largest regions. For the latter, the method of feasible generalized least squares (FGLS) was employed to correct the standard error terms for heteroskedasticity. The models presented here add considerably to the literature and research in this area and should prove valuable to ROW professionals, transportation planners, developers, appraisers, and others involved in ROW cost estimation and commercial property valuation. A cost estimation tool developed in Excel, accompanied by a supporting document providing instructions on its application, was presented to Texas ROW administrators as a potential budget estimation tool for future tasks.
Furthermore, state condemnation statutes were aggregated and then compared and contrasted for ROW acquisition, noting their associated weaknesses and strengths. This report recommends modifications to current laws in order to expedite the acquisition process, minimize cost, and build property owners' trust in government actions. Additionally, it describes how state characteristics impact real property condemnation rates. Results indicate that states with the lowest condemnation rates allow early taking of land, land consolidation and land exchange techniques; mandate early public involvement; and require that appraisal details be reported to property owners. They also emphasize negotiation and mediation before filing for condemnation proceedings, while providing comprehensive and detailed laws regarding compensable items. This research also found that variables like rural highway mileage, fraction of land owned by the Federal Government, urban area population, and educational attainment are statistically significant in predicting condemnation rates.</td></tr>
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RIGHT-OF-WAY COSTS AND PROPERTY VALUES: ESTIMATING THE COSTS OF TEXAS TAKINGS AND COMMERCIAL PROPERTY SALES DATA

Kara M. Kockelman
Jared D. Heiner
Shadi Hakimi
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Center for Transportation Research
The University of Texas at Austin
3208 Red River
Austin, TX 78705

www.utexas.edu/research/ctr

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Project Engineer: Kara M. Kockelman
Professional Engineer License State and Number: California No. C057380 & Texas No. 93443
P. E. Designation: Kara M. Kockelman

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Products

This report contains two products in Section 6: (P2) a right-of-way (ROW) cost estimation worksheet, to assist ROW administrators in future ROW acquisition budgeting efforts, and (P1) a supporting document that provides instructions on its application.

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1. Project Overview and Objectives

1.1 Introduction

Right-of-Way (ROW) acquisition for highways and other transportation improvements can be very expensive, time-consuming, and socially sensitive. Accurate ROW cost estimation, efficient acquisition practices, and appropriate federal and/or state laws can be keys to successful completion of ROW acquisition.

Acquisition of ROW can be a significant part of total project costs. ROW acquisition frequently involves partial takings, which may be associated with damages to the remainder parcel, such as loss of parking, loss of signage, or loss of other improvements. (Please see the glossary at the end of this chapter. for definitions of partial takings, damages, and other key terms.) In severe cases, damages to the remainder may impose a change in existing or future use of the land. These damages to the remainder are difficult to predict and can add significantly to the cost of ROW. The acquisition of ROW and planned highway construction may necessitate utility relocations. Because of these and other factors, the acquisition process can be very costly and time-consuming, resulting in project delays and budget overruns. Accurate cost estimation procedures are needed to facilitate budgeting and timely completion of projects.

This research examined the difficulties and challenges associated with ROW cost estimation, with emphasis placed on projects in metropolitan areas and the treatment of commercial properties. ROW administrators and other real estate professionals were interviewed in order to identify specific challenges and best practices. A part of the literature studied addresses formal procedures required for ROW acquisition on federal projects, property appraisal, and the effects of transportation improvements on property values. Within the body of property value research, studies of home prices are plentiful, but very few studies of commercial properties or actual ROW purchases have been undertaken. Chapter 2 reviews the ROW acquisition literature and the findings of ROW expert interviews. Chapter 3 summarizes results of a survey regarding different U.S. states' approaches to various ROW-related issues and challenges. Chapter 4 describes various property value data sets and their analysis. ROW purchase data and commercial sales data for Texas' major metropolitan areas were gathered from several sources. These include the Texas Department of Transportation (TxDOT), the Travis Central Appraisal District (TCAD), which serves the central Austin area, and the CoStar Group, a national provider of commercial real estate information services and comparable sales data for metropolitan areas (CoStar, 2003). Models for each of the data sets were developed and the data were analyzed using least squares regression techniques. Statistical regression models called hedonic price models, which typically rely on structural characteristics, parcel size, and location information were applied.

A total cost model for the ROW purchase data was proposed and various model forms were analyzed using ordinary least squares regression. The influence of land area, land use, timing, and location on real acquisition costs was studied. The total cost model incorporates the value of improvements through attributes such as structure age and condition. The value of damages was modeled implicitly through factors thought to have an effect on the value of the remaining land, e.g. a resulting change in land use or change in frontage length. Chapter 4 provides more details on this discussion.

Price models were developed for the commercial sales data gathered for Texas' top regions, to provide predictions of land and improvement values for commercial properties. The method of feasible generalized least squares (FGLS) was used to correct for bias in the standard error terms for data which exhibit heteroskedasticity (a non-constant variation in the dependent variable across observations). Of the commercial sales data sets, the CoStar data was more extensive in geographic coverage and in the type and number of observations. Chapter 5 discusses this in more depth.

ROW staff members are further challenged by what generally is a series of complex statutes, rules, and regulations. They may confront reasonable and logical owner complaints, but may not be able to mediate them because of statute provisions. Of course, changing statutes requires time-consuming legislation, and there are no guarantees that revised provisions will resemble what staff have requested and/or envisioned (Burnside, 1996).

The Federal Government remains concerned about the acquisition of real property for federally assisted projects in order to: (1) meet the Fifth Amendment mandates of due process and just compensation, (2) acquire property without delaying public projects, and (3) ensure that public dollars are spent in an appropriate fashion (FHWA, 2004). Therefore, public satisfaction, time and cost are important performance indicators for ROW agencies. Condemnation proceedings can result in higher acquisition costs and usually indicate an owner's dissatisfaction with agency actions. A useful indicator of time, cost, and customer satisfaction in ROW acquisition is the agency's rate of property condemnation. Condemnation proceedings are to be avoided, when possible, because they often delay project plans, increase acquisition costs, and reflect a lack of public trust in government actions (FHWA, 2004). Lower condemnation rates generally are desired, although at times condemnation may result in faster and/or less costly acquisition (FHWA, 2004). Although such cases do exist, where an agency begins condemnation proceedings to expedite acquisition, such actions are usually out of necessity to meet stringent project timelines.

Under the Uniform Act (specifically, 49 CFR 24 of the implementing federal regulations), agencies must first exhaust all efforts to reach amicable agreements with the property owner through negotiations (FHWA, 2004). Thus, if early condemnation proceedings occur often, the agency is not abiding by the Uniform Act and/or state laws are restricting ROW staff actions. Recognizing the value of this single, simple statistic, condemnation rates were employed as performance indicators for comparing and evaluating state ROW statutes.

The remainder of this report is structured as follows. Chapter 2 reviews the literature and the results of expert interviews, and Chapter 3 summarizes results of a survey regarding different U.S. states' approaches to various ROW-related issues and challenges. Chapters 4 and 5 describe the analysis of various property value data sets. Chapter 6 describes the products of this research, which includes a ROW cost estimate worksheet and an accompanying instruction document on its application. Chapter 7 identifies key ROW laws across U.S. states, and Chapter 8 compares states' condemnation rates vis-à-vis their ROW requirements; it also presents the results of a statistical model of condemnation rates based on various state characteristics. Chapter 9 summarizes the important findings from this project and highlights their implications for ROW acquisition budgets, laws, and practices.

Table 1.1 Definitions of Important Terms

Term	*Definition*
Acquisition	"The process of acquiring real property (real estate) or some interest therein." (FHWA, 2002b, p. 3)
Appraisal	"A written statement independently and impartially prepared by a qualified appraiser setting forth an opinion of defined value of a adequately described property as of a specific date, supported by the presentation and analysis of relevant market information." (FHWA, 2001, p. 13)
Condemnation	"The legal process of acquiring private property for public use or purpose through the acquiring agency's power of eminent domain. Condemnation is usually not used until all attempts to reach a mutually satisfactory agreement through negotiations have failed. An acquiring Agency then goes to court to acquire the needed property." (FHWA, 2002b, p. 3)
Damages	"In some instances, the acquisition, planned use, or construction may cause a loss in value of the remaining property. Normally the value of the damage is based on the before and after appraisal or cost to cure. An owner is entitled to payment of damages and receives this as a part of just compensation." (FHWA, 2001, p. 52)
Eminent Domain	"The right of a government to take private property for public use. In the United States, just compensation must be paid for private property acquired for federally funded programs or projects." (FHWA, 2002b, p. 3)
Fair Market Value	The price that a willing buyer will pay a willing seller for a piece of real estate.
Highest and Best Use	"The legal use (or development/redevelopment) of a property which makes it most valuable to a buyer or the market." (FHWA, 2001, p. 53)
Just Compensation	"The price an Agency must pay to acquire real property. The price offered by the Agency is considered to be fair and equitable to both the property owner and the public. The Agency's offer to the owner is just compensation and may not be less than the amount established in the approved appraisal report as the fair market value for the property. If it becomes necessary for the acquiring Agency to use the condemnation process, the amount paid through the court will be just compensation for the acquisition of the property." (FHWA, 2002b, p. 4)
Negotiation	"The process used by acquiring agencies to reach amicable agreements with property owners for the acquisition of needed property. An offer is made for the purchase of property in person or by mail, and the offer is discussed with the property owner." (FHWA, 2002b, p. 4)
Parcel	Any plot of land. For the purposes of this report, "parcel" generally refers to the part being acquired, but it may also be used in association with original or remainder parcels.
Partial Taking	Acquisition in which the original property is severed to form two parcels, leaving a "remainder". Damages are most often associated with partial takings, which may require the removal of access, parking, buildings, or other improvements.
Whole Taking	Acquisition which involves the taking of the original parcel in its entirety.

2. Legal Background and Literature Review

The literature review presented here is divided into four subsections, as follows:

- ROW Acquisition Cost Estimation – Issues and Challenges: This section provides recent statistics for the costs of different ROW acquisition elements, highlighting their significant contribution to total project cost. It also describes the findings of ROW expert interviews on challenges and issues ROW staff most often encounter in estimating acquisition costs.
- The Uniform Act and Property Appraisal: This section briefly reviews the Uniform Act's objectives and the three different methods of property appraisal.
- Enhanced Value – Research and Models: This section reviews previous research on the land value impacts of constructing new facilities versus upgrading existing facilities.
- Best Acquisition Practices: This section summarizes best acquisition strategies by U. S. states and other countries. It reports the recent results of several FHWA pilot projects.

2.1 ROW Acquisition Cost Estimation – Related Issues and Challenges

2.1.1 Literature Review Findings

Right of way (ROW) acquisition for highway and transportation projects can be very expensive. Nearly $1.2 billion in federal-aid for highway projects was spent for ROW acquisition in fiscal year (FY) 2002, at an average cost of $43,200 per parcel (FHWA, 2003). An additional $2.2 million was paid to displaced business and property owners for reestablishment and relocation assistance (FHWA, 2003). Local public agencies[1] spent $1.2 million for ROW acquisition in 2002; just under half of this total was for projects which received federal funding or assistance (FHWA, 2003). The federal-aid totals represent nearly 4 percent of all federal-aid highway obligations in 2002 (AASHTO, 2002). Total acquisition costs and relocation payments for the top ten states in FY 2002 are shown in Table 2.1.

A review of these acquisition statistics is enlightening. Florida had the highest acquisition costs at $350 million, and the highest condemnation rate among the states shown. The Florida Department of Transportation, in conjunction with the Federal Highway Administration (FHWA), is conducting a pilot program to add incentives to approved compensation. The goal is to save costs by reducing administrative settlements, overhead costs, and property owner fees that are typically reimbursed by the condemning authority under Florida State law (Kockelman, *et al*., 2003). Texas spent nearly $153 million on acquisition, third among all states, and reported a moderate condemnation rate of 18.3%. Virginia acquired the greatest number of parcels, 4,717, more than double the number of parcels acquired by Florida, and nearly three times as many parcels as Texas.

[1] Not all states report spending by local public agencies.

Table 2.1 Acquisition and Relocation Statistics for Top Ten States (FHWA, 2003)

Acquisition and Relocation Statistics for Top Ten States, FY 2002					
State	Number of Parcels	Condemnation Rate	Acquisition	Residential Relocation	Business & Farm Payments
FL	2,259	46.3%	$350,480,636	$3,459,390	$2,583,496
NC	2,830	14.0%	$226,344,200	$4,919,933	$4,959,716
TX	1,659	18.3%	$152,955,796	$4,197,330	$5,177,279
VA	4,717	11.0%	$148,702,534	$4,847,796	$895,362
CA	1,837	12.9%	$135,587,438	$2,804,770	$2,102,216
MN	2,330	10.8%	$133,141,726	$3,740,087	$2,153,351
IL	3,402	11.6%	$96,516,723	$1,196,835	$1,372,291
TN	1,781	21.6%	$75,568,106	$3,193,244	$591,295
MO	2,041	5.2%	$71,131,369	$1,376,497	$950,250
PA	2,063	22.6%	$59,304,719	$4,431,218	$4,407,839

2.1.2 Interview Findings

Professionals in the field report a number of challenges routinely encountered in ROW cost estimation (Kockelman, *et al*., 2003). First, early estimates are based on planning-level maps, so project administrators must anticipate the extent of takings based on limited information. Second, administrators often have limited time to prepare estimates, thus restricting the amount of research that can be undertaken for complex parcels. Third, they typically prepare ROW estimates several years in advance of actual ROW acquisition, during which time significant inflation and speculation can occur, resulting in property and damage appreciation. Texas ROW administrators (both urban and rural) report that this time interval is typically three years, but it may stretch to seven years in some cases (Kockelman, *et al*., 2003). These factors can easily combine to bias ROW cost estimates low.

In addition to these challenges, ROW professionals cite uncertainties associated with damages and court costs as obstacles to accurate estimation. As mentioned previously, ROW acquisition involves partial takings, which may damage the remainder. Common damages include loss of parking, which compromises the use intensity of the remainder, loss of visibility, which compromises the value of signage, and restriction or removal of access. The value of such damages is often difficult to predict, and can be a source of substantial estimation error. Moreover, court costs are highly variable, and are particularly high for projects in highly developed commercial corridors, where condemnation proceedings are common. Condemnation awards can add significantly to the total cost of acquisition; ROW cost estimators in metropolitan areas routinely add from 25 to 40 percent to the projected base cost of acquisition, in anticipation of these costs (Kockelman, *et al*., 2003)

In cases where access rights are removed, such as in the upgrade of public highways to controlled-access freeways, property owners are entitled to compensation. Kockelman, *et al.* (2002) calculated a range of access costs using data from Westerfield's (1993) and Gallego's (1996) regression models for Texas settlements. Access costs ranged from $0 to $2,421 per linear foot of frontage, with an average value of $511 per linear foot (2003$). They suggested that proactive access management and corridor preservation strategies may reduce future damages arising from loss of access. Transportation agencies should be careful in their use of police power; the restriction of access or other development rights in anticipation of future ROW needs may be considered a taking, and the property owner is entitled to just compensation in such cases (TRB, 2003, Sneckner, 2002, FHWA, 2000).

The shape, access, and other characteristics of property remainders resulting from partial takings may warrant a reduction in the property's highest and best use. Using surveys of public and private experts and regression analyses of historical ROW cost data for the State of Texas, Buffington, *et al.* (1995) identified several key characteristics. Their survey responses suggested that the most significant variables affecting acquisition cost for partial takings are the size and shape of the remainder, reductions in the highest and best use, location of remaining access points, and length of remaining frontage.

In addition to the surveys, two data sets were utilized for this research. The first was a sample of 196 parcels acquired from 1946-1964. The second was a sample of 191 parcels acquired during 1974-1991, which was stratified initially to provide better representation of the entire state. Two model specifications were developed and ordinary least squares regression was performed on each data set. The first specification used the total taking cost as the dependent variable. A second model was specified using the proportional difference between the partial and the total taking cost as the dependent variable. For the second sample this proportional difference consisted of a ratio of the land cost to the original property value. Their regression results indicated that commercial properties increase the total taking cost by $24,000 (2003$) per acre, compared to other land uses. The shape of the remainder was also significant: a rectangular remainder reduced the total taking cost by nearly $12,000 (2003$), compared to other, odd shapes.

Aside from property acquisition costs, transportation professionals must estimate the budget impact of utility relocations. These costs can run very high, and may even exceed property acquisition costs. For example, current cost estimates for utility relocations required in the expansion of Interstate 10 in Houston, Texas, exceed $200 million (Kockelman, *et al.*, 2003). This represents a unit cost of $10 million per mile for this 20-mile stretch of roadway, or 30% of the total ROW and utilities budget. The costs of utility relocations are beyond the scope of this paper; this example is only cited for illustration.

2.2 The Uniform Act and Property Appraisal

In addition to ROW costs and uncertainties, there are many formal ROW procedures required of transportation agencies. The federal Uniform Act establishes standards and guidelines for real property acquisition on projects which receive federal funds (or federal assistance) for any project phase or task. Its purpose is to provide for the fair treatment of property owners where real property must be taken for any federal (or federally-assisted) project. Among other things, its procedures seek to "expedite the acquisition of real property, avoid litigation, and promote public confidence in Federal land acquisition practices." (49 CFR 24, Section 4651). It requires that the acquiring agency offer the property owner "just compensation", based on an independent appraisal of fair market value.

Formal property appraisals play a key role in the final determination of individual property values, and therefore in the final determination of parcel-specific ROW costs. The most common and accepted valuation method is the sales comparison approach, which requires access to recent and relevant arms-length sales data. Other accepted valuation methods include the income and the cost approaches (FHWA, 2002a, Wurtzebach and Miles, 1991). The income approach may be appropriate for commercial or investment properties, by considering gross rent, vacancy rates, and typical operating expenses. These factors are capitalized, in order to estimate net income. The cost approach evaluates the replacement cost, less any depreciation or obsolescence of the existing structure. The cost approach is only used in cases where special purpose improvements develop the property to its highest and best use (FHWA, 2002a). The reproduction or replacement cost must be supported by calculations and construction cost data. Cost data may be obtained through published manuals, such as *RS Means* or *Marshall and Swift*. The land value used in the cost approach to value should be supported by market data, as in the sales comparison approach.

In addition to being the most common and accepted, the sales comparison approach is generally the easiest method to use. Comparable sales, listings, or rental data may be obtained from appraisal districts, title companies, private appraisers, and/or online data services. This method is most helpful in assessing the value of single-family residential properties and raw land, where sales data are plentiful (Wurtzebach and Miles, 1991). Sales data for commercial properties are relatively limited and more difficult to obtain (Carey, 2001, Gatzlaff and Geltner, 1998). This research enhances the literature by providing predictions of commercial property values, based on a large sample of commercial sales transactions for Texas's major metro areas. These data and models are described in more detail in Chapters 5.

2.3 Enhanced Value: Research and Models

The effect of highway construction on property values has been studied by many, using statistical regression tools. Ten Siethoff and Kockelman (2002) estimated land, and improvement value models to determine the effects of the expansion of US 183 in Austin, Texas on commercial property values between 1982 and 1999. Land values were estimated to fall $52,000 (2003$) per acre one-half mile from the facility, compared to lots that fronted the new facility. Corner lots at signalized intersections were valued $55,000 (2003$) higher per acre, and their built improvements $4.61 higher per square foot. Thus, location and access characteristics can be strong determinants of property value. And transportation projects can dramatically enhance land and improvement values. The study showed a dramatic peak in the average assessed land value in 1986, the year most of the ROW acquisition took place. Assessed land values increased 125-percent from the previous year, and then declined for the next nine years. The main reason cited for this peak and subsequent decline is the real estate speculation that occurred in Austin and throughout the United States in the early 1980's. However, TxDOT's ROW acquisition may have caused the land values to rise above actual market conditions.

In another study, Vadali and Sohn (2001) employed hedonic models to examine variation in home sales prices along the North Central Expressway (NCE) in Dallas, Texas from 1979 to 1997. They obtained sales data for residential properties from a private tax database and Dallas County Appraisal District records; then used geographic information system (GIS) tools to distinguish spatial data and code location and environmental variables. A light rail transit line was constructed in the NCE ROW simultaneously with the roadway improvements. Comparison of corridor house prices with hedonic property value indices for Dallas[2] revealed significant price effects of the corridor improvement phases. During the pre-planning phase, housing prices in the immediate vicinity of the freeway were negatively affected, while those further away were positively affected. During the planning phase, houses in the corridor appreciated at twice the rate of other Dallas properties. Prices declined more rapidly than those elsewhere in Dallas during the early construction phases (from 1987-1994). However, prices again improved during the final construction phase, as sections of the freeway began to reopen, and access improved.

Carey (2001) studied the impacts from the construction of the Superstition Freeway (US60) on adjacent land uses and home values in Phoenix, Arizona[3]. He obtained repeat sales data through a local title company, in order to make paired sales comparisons and perform time-series regression for the twenty-year period from 1980 to 2000, for both single-family detached homes and condominiums/townhouses. The results revealed that homes less than one-half mile from the freeway were negatively impacted, based on reductions in sales prices and lower appreciation rates, compared to homes greater than one-half mile from the facility. Carey suggests that homes greater than one-half mile may have benefited from greater accessibility, without suffering the negative effects of noise and pollution. His study of condominiums/townhouses explained less variation in prices (R^2 =0.646 vs. R^2=0.795 for single-family homes) but suggested that buyers of condominiums and townhomes place a higher premium on access to major streets and freeways, than those buying single-family homes. Carey was not able to locate sufficient commercial property sales data to support statistical regression analysis.

Haider and Miller (2000) studied the effects of transportation infrastructure and location on real estate values for the Greater Toronto Area, using housing sales data from the Toronto Real Estate Board and census data. The data were spatially coded to create location variables for proximity to highways, subways, waterfront, and malls. Their study found that structural characteristics and neighborhood attributes, such as the average household income, are strong predictors of housing values, while proximity to transportation facilities explained less variation in housing values. Like Kockelman (1997), they recognized that a simple distance-to-CBD measure can be a very strong predictor of property values (even in the presence of far more sophisticated measures of accessibility), with home prices following a negative exponential trend with increasing distance from the CBD.

Many real estate journals and other sources were searched for studies of commercial property prices, but few relevant articles were found. The study of ROW acquisition for U.S. 183 mentioned earlier in this chapter illustrates the effects of highway construction on commercial property values. In another study, Gatzlaff and Geltner (2000) applied repeat sales regression techniques to estimate a commercial property price index for Florida, using transaction prices obtained from property tax records. They compared their results with the appraisal based National Council of Real Estate Investment Fiduciaries Florida Index, and found little difference in overall performance.

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[2] These were obtained from the Real Estate Research Center at Texas A&M University.

[3] Carey was unable to locate sufficient sales data to analyze *commercial* property prices.

In addition to models of private transactions, some data sets and one or two formal models have been developed to assist public transportation agency personnel with ROW cost estimation. Several public agencies and their private consultants[4] have developed databases to track ROW acquisition tasks and project costs. In addition, some transportation agencies maintain a separate database for administrative settlements and court awards, which they use to predict future costs and prepare estimates The Texas DOT (TxDOT) implemented a ROW information system (ROWIS) in 1997, and Bentley Transportation recently developed a system for the Indiana Department of Transportation (ITE, 1999). Both the Indiana DOT and the TxDOT software use a relational database, and have the ability to monitor different acquisition functions and provide user level identification and access. However, they are limited in the variables they track, and they do not provide a model for prediction. The Virginia DOT (VDOT) recently developed an Excel based construction cost estimation model that includes ROW and utility components (VTRC, 2003). The VDOT cost estimation model suggests values for different categories of residential homes; however, it does not provide values for commercial properties.

As evident from the preceding discussion, models of home prices are plentiful, but few examples exist of commercial property value models. And while many transportation agencies maintain databases of ROW acquisition costs, few models of ROW costs have been published. This work addresses both of these limitations through acquisition and analysis of actual partial and full property purchases, for public roadway projects and via private commercial sales transactions.

2.4 Best Acquisition Practices

Agencies, administrators, and others have sought to identify best acquisition practices. Useful results are described in an NCHRP research report (NCHRP, 2000), AASHTO Right-of-Way and Utilities subcommittee reports, project development and quality reviews performed by several U.S. state DOTs, various papers developed by the FHWA Office of Real Estate Services on ROW acquisition practices, and a recent survey of ROW administrators and other real estate professionals. These are summarized here.

The National Cooperative Highway Research Program (NCHRP) developed a synthesis of successful practices used by transportation agencies to expedite the acquisition of real estate needed for project construction. This synthesis draws from the experiences of 36 survey respondents and a literature review. And it provides a detailed view of the state of the practice for accelerating ROW delivery. This research found that well-trained ROW staffs (including consultant appraisers) are key to acquisition success. They recommended cross training of personnel in more than one ROW function, as well as training in nontraditional subjects (including information systems, project development, and consultant contract management). They highlighted a need for better coordination, including better systems for ROW acquisition scheduling, data, and communications, and a higher quality of interaction with other disciplines in the project development process (such as design engineers and transportation planners). Several states including California, Florida, Iowa, Utah, and Washington have restructured their project development process to place authority and responsibility in multifunctional project

[4] Public agencies may employ a team of private consultants to perform or assist with the ROW acquisition, and design-build contracts are being used increasingly by transportation agencies. Private consultants are still subject to the requirements of the Uniform Act on projects that receive federal funding (FHWA, 2001).

teams. The structure and scope of control of the teams varies from state to state. A shared element is that all functions, including ROW, participate as equal partners. In addition, the partners strive to perform their functions in parallel and to avoid sequential hand-offs that extend project lead times while lessening coordination (NCHRP, 2000).

AASHTO's Highway Subcommittee on Right of Way and Utilities has issued recommended guidelines and best practices for the acquisition process (AASHTO, 2003). Like NCHRP (2000), AASHTO's report emphasizes staff and appraiser qualifications and training, coordination, and use of technology. It also calls for streamlining of value determinations and reporting procedures, as well as appraisal review and property titling procedures. It recommends acquisition activities that build owner confidence in the agency and encourage rapport with owners, and further recommends legal statutes that provide as much independent negotiation and settlement authority as possible to acquisition agents.

The Federal Highway Administration, the American Association of State Highway and Transportation Officials, and the National Cooperative Highway Research Program sponsored a scanning study of England, Germany, Norway and the Netherlands to review best practices in ROW and utilities services. The scanning team's recommendations for U.S. application included encouraging property owner input by involving owners in the design phase and using an in-depth interview process, creating a voluntary land consolidation pilot program, developing education programs for ROW professionals, and promoting greater coordination and communication between State transportation departments and utilities.

The team developed the following list of practices with potential for implementation in the United States to help ensure timely procurement and clearance of highway ROW and adjustment of utilities.

- Early Involvement of Property Owners in Design Process
- Property Owner Interviews
- Limited Use of Appraisal Reviews
- Appraisal and Negotiation Functions Performed by the Same Person
- Voluntary Land Consolidation Pilot Program
- Business Reestablishment and Relocation
- Pre-Employment and Employee Education and Training
- Mentoring Methods

An implementation team was formed to encourage state DOTs to pilot procedures evaluated during the European trip. Several state DOTs initiated pilots in 2001 and have analyzed the results. The *Right-of-Way and Utilities Pilot Project Summary and Evaluation*, May 2004, contains information for each pilot that includes evaluations and lessons learned. Pilots covered the following initiatives: waiver of appraisals, modified appraisal reviews, acquisition and relocation incentive payments, conflict of interest, land consolidation, and preliminary engineering cost reimbursement for utilities. Several pilot projects that have been pursued, along with their published results to date, are described below. (Note that in many states these projects were still underway when results were first published. Thus, some changes to these results may be expected.)

2.4.1 California Conflict of Interest

The purpose of this project was to identify benefits and risks in changing Caltrans' conflict of interest policy to allow the same ROW agent to both appraise and acquire parcels valued up to $25,000 as a potential means of accelerating project delivery. (Like most states, California DOT (Caltrans) policy is to provide full appraisal reports for parcels valued at $10,000 and above. And this basic policy was unchanged during the pilot program implementation.). This project started in March 2001, and while time and cost savings were not noticeably changed, ROW agents gained knowledge of the market and of the specific parcels during the appraisal function, which benefited the acquisition activities. Moreover, the relationship between owner and agent was enhanced.

The implementation team has thus far concluded that: (1) pressure to accelerate project delivery must not be allowed to weaken adherence to sound, accepted ROW principles that assure fair and equitable treatment and just compensation, (2) management must assure that staff is qualified in both appraisal and acquisition functions or be prepared to supervise staff more closely, (3) appraisal reports should contain a body of basic information common to the general property type so that short supplements for the various participating parcels can be attached, (4) and, acquisition managers should evaluate the capabilities of agents. Otherwise, supervisory control must be intensified.

The team also felt that the strategy of employing a single agent for both appraisal and parcel acquisition tasks can be an additional tool for managers to consider when delivering ROW products. However, it was not demonstrated to be key to low-cost, quick, ROW project delivery. From pilot results, traditional appraisals containing multiple parcel valuations and separate acquisition activities appeared to be equally effective.

2.4.2 Florida Appraisal Review Modification

The purpose of this pilot was to test the effectiveness and efficiency in the use of software in the appraisal review process. As expected, waiver of the technical appraisal review showed a substantial reduction in the time normally required for this function. The obvious advantage here was an extended time for negotiation opportunities. The results indicated significant cost savings as well. The implementation team recommended this strategy if the agency has relatively complete software programs, capable of effectively assessing the quality of an appraisal.

2.4.3 Florida Incentive Offer

The purpose of this project was to assess the potential for incentive offers, on issues related to just compensation, to reduce overall project costs and project delivery time. The greatest difference in projects with and without these incentives was noted in the time required to acquire parcels. The pilot projects required an average of 104 days (from initiation of negotiations to a signed agreement), compared to 168 for the control project (and thus a 38% improvement). When looking at the time between initiation of negotiations and suit filing, the pilot projects averaged 168 days, as compared to 346 for the control projects (a 51% improvement).

A telephone survey was conducted of the property owners for both the pilot and control projects. Seven questions were evaluated on a 1 to 5 scale, with 5 representing the most favorable response. The pilot projects averaged 4.66 compared to an average score of 4.57 for the control projects. Moreover, property owners on the pilot projects felt they were better informed than those on the control projects. This may be due, in part, to agents taking extra time to explain the operation of the incentive offer.

The rate of negotiation (defined as the percentage of parcels acquired by negotiation and real estate closing rather than through eminent domain) was markedly better for both urban and rural parcels under the pilot project. Negotiation rate results for suburban projects were inconclusive. In addition, the urban parcels faced a rapidly increasing market which somewhat negated the impacts of the incentive offer. By simply delaying negotiations, the owner appeared to achieve a better increase than was being offered through the incentive program.

As noted above, the most favorable result has been in the area of decreased project time. All projects have not yet been certified for construction letting, so the final impact on project delivery cannot yet be determined. Although the implementation group believes the final results of this pilot will be positive, their belief is that it is still too early to determine whether the concepts can be recommended for expansion to other states. Expenditures were not sufficiently complete to allow for an effective comparison of cost factors.

2.4.4 North Carolina Appraisal Waiver

The purpose was to evaluate the use of an appraisal waiver threshold amount of $20,000. NCDOT saw significant time and cost savings in the acquisition process by using the increased waiver limit under the pilot program for acquisitions in both the rural and the more urban areas. A review of the program confirmed that NCDOT was using the waiver provision correctly and effectively without diminishing the level of service or protection of the rights of impacted property owners. 25% of all claims were settled on initial contact, 50% settled within 1 month, and, 25% settled within 6 months.

The use of the increased appraisal waiver threshold has allowed for considerable time savings to the department, which in turn impacted the project timeline in a positive manner.

The pilot was determined to be highly successful. The appraisal waiver was most useful in rural environments where undeveloped farmland and acreage parcels were more common. In urbanized areas the waiver provision was found to allow for more expeditious acquisition in small strip takes, although the opportunity to use the waiver was hampered by acquisitions that tended to be more complex in nature due to their urbanized setting.

A summary of results of all pilot projects can be viewed on FHWA website (http://www.fhwa.dot.gov).

3. Synopsis of Surveys of State Departments of Transportation Survey

3.1 Synthesis of U.S. States' Survey Results

3.1.1 Introduction

A survey of state departments of transportation was undertaken for this project. An email survey instrument was sent to state DOTs in February and March 2003. The survey aimed to learn about ROW methods and procedures that ROW personnel feel help forecast and/or minimize acquisition costs, predict legal damages accurately, and speed property acquisition. It also asked whether any are using software or databases to better predict costs or any other innovations (such as ADR, corridor preservation strategies, revolving funds for very early purchase of critical parcels, and revenue enhancement through temporary leasing of ROW property). The email survey instrument can be viewed in Appendix A, while respondent answers to each question can be found in Appendix B, and respondent contact information is contained in Appendix C.

To enhance the number of responses, one follow-up email reminder was sent to states in June 2003 and a second follow-up reminder to non-responding larger states, in mid-July 2003. 36 states responded in some fashion.

3.1.2 General Findings

There is considerable experimentation underway among the states responding, with cost minimization strategies taking a variety of forms:

- Condemnation—States are attempting to reduce the incidence of condemnation through approaches such as landowner incentives (Florida), a second internal review (South Carolina), and different negotiation techniques (Missouri-mediation; Alaska—Attorney General's Office)

- Internal costs are being reduced by raising threshold limits for appraisals (many states), eliminating duplication through work simplification (Massachusetts), cutting costs where feasible (Maryland—titling procedures for low-cost parcels), and increased specialization (Kansas—special unit for acquiring non-complex parcels).

- Improvement in service provider efficiency is underway in Oklahoma, where 90% of ROW work is contracted out.

- Quantitative models are being used by an increasing number of states for different operations.

- Estimates of Project and Parcel Valuation—Alaska, Connecticut, Iowa, Michigan, Virginia, Washington

- Management Information Systems—Idaho, Massachusetts, Oklahoma

- Estimation of Administrative Costs—Wisconsin

- Corridor preservation or advanced purchasing is being undertaken in such states as Iowa, Kansas, Michigan, Minnesota, and Washington.

- Other interesting approaches underway in the states include new public information efforts (Alaska—open houses for affected landowners; Oklahoma—advance contact) and leasing, which is underway in numerous states.

The complete set of survey responses is included in Appendix B.

3.2 Synthesis of Texas Districts' Survey Results

3.2.1 Introduction

A survey of Texas Department of Transportation (TxDOT) districts was also conducted through an email survey instrument sent to districts in February and March 2003.
All but seven of the TxDOT district offices provided information about:

(1) Current procedures used in the district to forecast ROW costs for projects;
(2) The types of parcels and other issues, which present the most difficulty in preparing estimates;
(3) What changes and improvements, if any, should be made to the current procedures?
(4) What new or additional information would aid staff's work in estimating costs; and
(5) Other aspects about the estimation process.

The seven non-responsive districts were mostly rural: Pharr, Paris, Childress, with a sprinkling of medium-sized regions: San Angelo, Wichita Falls, Laredo. El Paso was the only metro district not to respond. Because all but one metro, most urban, and many rural districts provided data, the information should cover the major problems throughout the state. The email survey instrument can be viewed in Appendix D, complete responses to each question can be found in Appendix E, and respondents' contact information is contained in Appendix F.

3.2.2 General Findings

The findings of this survey are as follows:

- Issues and concerns vary greatly by the type and size of district (metro-urban-rural).
- Many of the difficult parcels or problems in estimating ROW costs are either present or absent in any one district. For example, utility relocation was identified by a number of districts as presenting major problems, while in other districts, it was never mentioned.

- The major metro areas share some similarity in problems but also exhibit diversity. Dallas does not have problems with the same types of parcels as Houston, and no area seems to have Houston's problems with condemnation attorneys. Austin and San Antonio appear not to have similar problems.
- Accuracy of estimates are deemed to be primarily a result of many factors: the amount and quality of information available, need for quick turnaround of an estimate, complex parcels, commercial establishments, parking for businesses, as well as many unknown and uncontrollable items. (For example, the rate of condemnation, legal damages, and current state statutes relating to obtaining clear titles are issues.) For most districts, the problems are primarily technical in nature; yet for Houston, the biggest issues are thought to be political and legal.
- Because of the uncontrollable factors, complexity of some parcels, and unpredictability of legal proceedings, many ROW administrators do not believe significant improvements in cost estimates can be achieved through a more systematic approach or quantitative model. Several district administrators, however, do believe greater quantification would improve estimates, and they suggested characteristics of a reliable and useful estimation technique.
- Most ROW administrators are unaware of any potential improvements in estimation from other states, and only a handful suggested anyone who might be contacted for further information.
- A number of ROW administrators would like to regularly discuss possible solutions and approaches in parcel cost estimation with other ROW administrators.

Detailed survey results are included in Appendix E.

4. Right-of-Way Data for Texas Corridors

4.1 Introduction

In order to better understand and predict the cost of acquisition, a sample of actual right-of-way (ROW) purchase data was collected. Projects were chosen from various metropolitan areas in the state of Texas. Parcels in metropolitan areas were selected for study, since these properties are more complex than rural or agricultural land, and offer more variety in terms of land use types and other valuation issues.

4.2 Data Assembly

Historical ROW cost data were obtained from the Texas Department of Transportation (TxDOT). To the extent possible, the ROW purchase data were extracted from the newly implemented ROW Information Systems (ROWIS), which includes costs and parcel detail for roadway projects areas around the state. Acquisition of properties for the selected projects occurred relatively recently (after 1998), so much of the cost and parcel information was available in the ROWIS database. Additional parcel detail was obtained from appraisal reports and ROW maps. Data was collected for projects in Abilene, Corpus Christi, El Paso, Fort Worth, Houston, and San Antonio. The projects generally required the purchase of additional ROW necessary for the widening and expansion of existing facilities. Combined, the projects included over 20 centerline miles of highway, represented nearly $70 million in total acquisition costs, and yielded 285 parcels for detailed study.

More specifically, the Houston project consisted of a 1 mile section of Interstate 10. The section chosen was a small part of a larger project; the majority of observations in the section sampled were whole-parcel takings of homes. Houston property values tended to be high; the project included several million-dollar settlements. The Corpus Christi project consisted of an expansion of FM 1889 (FM designates Farm to Market road), from an existing two-lane highway to a 4-lane facility. The Corpus project was located approximately 20 miles from the city center, and included a number of agricultural parcels. The El Paso project widened FM 76, the city's North Loop road, and provided the greatest diversity in land uses. The Fort Worth project was a widening and improvement of East Rosedale Street, a major arterial. The San Antonio project improved a 6-mile section of US 281, and took in a number of very expensive commercial properties. The Abilene project involved improvements to FM 604 in Callahan County, and consisted largely of takings of single family homes.

4.3 Model Estimation

A cost of acquisition per parcel model was developed using the TxDOT corridor data set. Each taken property's total cost represents only the cost paid for land, improvements, damages and court awards; it does not include appraisal fees, personal or business relocation assistance, utilities, or other direct or indirect costs associated with acquisition. These also are real costs, and should not be overlooked in the preparation of estimates. Dollar values were corrected for inflation using the Consumer Price Index (CPI), using a daily inflation rate (BLS, 2003).

In theory, the total acquisition cost should be roughly the value of the taking plus damages. The value of the taking can be separated into the value of the land taken and the value of improvements taken (where applicable). Since land values should be fundamentally related to parcel size, the parcel size variable was interacted with a explanatory variables thought to influence land values. Similarly, the improvement area was interacted with variables thought to influence the value of improvements. Of course, the value of some improvements is independent of the structure size; examples include fencing, signage, or other improvements. An attempt was made to code indicator variables in the model for these takings; however, due to inconsistencies in reporting they were not used. Finally, damages may be associated with either the remaining land or remaining improvements. The general model form is shown here.

$$TOTALCOST = \beta_0 + LANDSF\sum_i \beta_{i,land} X_{i,land} + IMPSF\sum_j \beta_{j,imp} X_{j,imp} + REMSF\sum_k \beta_{k,dam} X_{k,dam} + \varepsilon$$

where *LANDSF* is the land area of the acquired parcel (in square feet), and $X_{i,land}$ is a vector of explanatory variables related to the land value; e.g. a constant term, the original frontage length, the number of driveways, an indicator variable for irregularly shaped parcels, a corner indicator variable, a trend variable for the year of acquisition, land use and location indicator variables. *IMPSF* is the square footage of any structures that were acquired, and $X_{j,imp}$ is a vector of explanatory variables linked to the structure's value, such as use type, age, and condition. *REMSF* is the area of the remainder parcel in square feet, and $X_{k,dam}$ is a vector of explanatory and indicator variables thought to affect the value of damages to the remainder (e.g., a reduction in the highest and best use, a change in the parcel shape, the loss of frontage in feet, and the ratio of the remainder size to the original parcel size). Of course, ε is an error term, capturing the effects of unobserved/unrecorded variables, and recognizing that no model of such data can provide perfect predictions. An indicator variable was considered for partial takings, but it was not used in the model because of high correlation with location indicator variables. Descriptions of all variables and their associated statistics are given in Table 4.1.

The data for the Texas corridors was analyzed using ordinary least squares regression, because of the continuous nature of the total cost variable and the lack of clear heteroskedasticity in the results. Due to the small sample size, a threshold p-value of 0.25 was used to test variable significance and develop final model specifications for the Texas corridor data. Removed variables were reintroduced separately to check for possible, later significance.

A variety of explanatory variables and model forms were tested, in order to discover important interactions and achieve the best model fit. These included log-linear, quadratic and log-log transformations. The log-linear model used the natural log of the total acquisition cost as the dependent variable and included a quadratic term on improvement area. The log-log model returned the highest R-squared value (0.906) and exhibited the best model fit. Therefore, the log-log model was chosen as the preferred specification.

The log-log specification for the Texas Corridor sample used the natural log of the total acquisition cost as the dependent variable, and log transformations of all explanatory variables, except in the case of zero values. Since the log is not defined for zero values, they were ignored, in order to retain indicator variables and their interactions in the model. The time trend variable for year of acquisition was assigned values of 1 through 7, compatible with the natural log transformation. The quadratic terms used in earlier models were removed from the log-log model specification. A weighted population-density variable was coded for each corridor based on census tract data and length of frontage. This population density variable was interacted with improvement area, in lieu of location indicator variables[5].

4.3.1 Variance Model and Investigation of Heteroskedasticity

A variance model was performed for the log-log model specification to investigate the presence of heteroskedasticity. The variance model used the squared residuals obtained from the log-log regression as the dependent variable, and regressed these on the matrix of transformed explanatory variables, as shown below:

$$E(Var) = \beta_i X_i + \varepsilon$$

where *E(Var)* is the expected value of the variance, β_i is the estimated coefficient, X_i is a set of explanatory variables, including a constant term, and ε is the error term, assumed to be normally distributed. The adjusted R-squared for the log-log variance model for the Texas Corridor data was 0.038. Based on this result, there is no clear source of heteroskedasticity, so feasible generalized least squares estimation was not performed for the Texas Corridor data.

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5 Location indicator variable and improvement square footage interacted variables exhibited collinearity issues in early models, and were excluded.

Table 4.1 Description of Variables for Texas Corridor Sample

Description of Variables for Texas Corridor Sample			
Variable Name	Variable Description	Mean	S.D.
TOTALCOST	Total acquisition cost ($2003)	245300	894400
LNTOTALCOST	Natural log of total cost	10.36	2.091
LANDSF	Land area of part acquired (SF)	12120	23850
FRONTAGE	Length of frontage (feet)	211.1	314.9
DRIVEWYS	Number of driveways for original parcel	1.323	0.600
SHAPEIRR	Indicator variable for irregularly shaped original parcel	0.2491	0.4333
CORNER	Indicator variable for corner parcels	0.3614	0.4813
TIME TREND	Trend variable for year of acquisition (1=1997, 2=1998,…7=2003)	4.393	1.517
IMPSF	Area of improvements taken (SF)	1545	6276
IMPAGE	Age of improvements taken (years)	35.746	21.226
IMPCOND	Appraised condition of improvements (1=Poor, 2=Fair, 3=Average, 4=Good)	3.136	0.846
IMPSF2	Area of improvement squared (SF^2)	41640000	448300000
REMSF	Land area of remainder parcel (SF)	188200	745600
CHGHBUSE	Indicator variable for a reduction in highest and best use	0.116	0.321
FRNTLOSS	Loss in frontage (feet)	53.70	159.0
RATIO	Ratio of remainder area to original area	0.5390	0.4264
SHAPECHG	Indicator variable for an acquisition which effected a change in parcel shape	0.1159	0.3209
PARTIALTKG	Indicator variable for partial takings	0.8070	0.3953
VACANT	Indicator variable for vacant land	0.1263	0.3328
AGRI	Indicator variable for agricultural land	0.0772	0.2674
SFAM	Indicator variable for single-family residential	0.5018	0.5009
MFAM	Indicator variable for multi-family dwellings	0.0351	0.1843
RETAIL	Indicator variable for retail uses (e.g., shopping & restaurants)	0.1754	0.3810
SERVICE	Indicator variable for auto repair and service	0.0456	0.2090
OTHER	Indicator variable for other uses (e.g. churches, medical and dental offices)	0.0351	0.1843
ABILENE	Indicator variable for Abilene	0.0561	0.2306
CORPUS	Indicator variable for Corpus Christi	0.2000	0.4007
ELPASO	Indicator variable for El Paso	0.3193	0.4670
FTWORTH	Indicator variable for Fort Worth	0.1439	0.3516
HOUSTON	Indicator variable for Houston	0.1754	0.3810
SANANTONIO	Indicator variable for San Antonio	0.1053	0.3074

4.4 Analysis and Results

The regression results of the log-log model are printed in Table 4.2, and a plot of the predicted values is shown in Figure 4.1. The adjusted R-squared for the log-log model was 0.906, and the plot showed very good predictions and model fit. Many of the explanatory variables and land area interacted terms are statistically significant at the 0.10 level. Most notably, the time trend variable for the year of acquisition has a positive effect on land value, but is predicted to have a negative effect on improvement value. Considering these results together, the time trend has a net positive effect for the average property in the sample.

The land use types are all statistically significant at the 0.10 level; consistent with the expectation that differences in value arising from land use should be linked to the land value. Retail use is predicted to have a positive effect on land values, but predicted to have a negative effect on improvement value. The combination of these indicator variables has a positive net effect on the acquisition cost. The location variables for El Paso, Ft. Worth, Houston, and San Antonio are all statistically significant. Abilene was removed from the model and included with Corpus Christi as the base scenario. Abilene is perhaps the most similar in nature to Corpus Christi; these two projects were the most rural in nature, occurring outside of city limits.

Approximately 40 percent of the parcels involved the taking of improvements. The improvement area is a strong predictor of value in these cases; transportation planners and ROW cost estimators seek to avoid taking structures and pay special attention to these properties in the preparation of estimates. The estimated coefficient for the weighted population density was negative. It may be that for higher densities near the city center, older homes prevail, and therefore lower structure values. Several of the variables used to predict damages to the remainder parcel are statistically significant in the model. However, the coefficients for these variables (change in the highest and best use, change in parcel shape, and reduction of frontage length) are all negative; whereas one would expect these damage indicators to increase the total cost of acquisition.

4.5 Summary of ROW Purchase Data

This chapter presented the analysis of actual ROW purchase data, for projects in Texas' metropolitan areas. The ROWIS database maintained by the TxDOT was used to the maximum extent possible in the data collection. Additional data were gathered from individual parcel appraisal reports and ROW maps. In all, data was collected for 285 parcels, in six different areas of the state.

A total taking cost model was proposed and analyzed using ordinary least squares regression. The model included land, improvements, and damage value components. A log-log transformation offered the best model fit and generally produced intuitive results (See Figure 4.1). Retail land use was predicted to have the highest value. Many of the location indicator variables were significant, and likely reflect regional differences in land values. A time trend variable for the year of acquisition picked up much of the value, perhaps hiding the effects of other variables. A log transformation of the time trend variable was performed, which imposes a structure on this relationship. It might be helpful to look more closely at this relationship and specify this trend variable in some other manner.

Damages were assumed to be associated with the remainder parcel area; however, the model results here were less than satisfactory. A related issue that has implications in the accuracy of estimates and the models presented here is the value of court awards and administrative settlements. The total cost model presented here does not predict court costs. Further work and research with this type of data should study the likelihood and magnitude of damages and court awards.

Table 4.2 Log-Log Regression Results for Texas Corridor Sample

Log-Log Regression Results for Texas Corridor Sample			
Dependent Variable:	Natural Log of Total Acquisition Cost		
Number of Observations	285		
Adjusted R-squared	0.906		
Variables	Coefficient	Std. Coef.	p-value
(Constant)	2.73786		0.000
LANDSF	-	-	-
LANDSF*CORNER	0.02105	0.0422	0.047
LANDSF*TIMETREND	0.49643	0.3612	0.000
LANDSF*vacant	0	n/a	n/a
LANDSF*AGRI	-0.04532	-0.0536	0.081
LANDSF*SFAM	0.08536	0.1765	0.000
LANDSF*MFAM	0.07404	0.0538	0.020
LANDSF*RETAIL	0.13481	0.2176	0.000
LANDSF*SERVICE	0.07239	0.0556	0.096
LANDSF*OTHER	0.07900	0.0609	0.011
LANDSF*BASE SITEs[1]	0	n/a	n/a
LANDSF*ELPASO	0.24731	0.4545	0.000
LANDSF*FTWORTH	0.12397	0.1731	0.000
LANDSF*HOUSTON	0.33290	0.5822	0.000
LANDSF*SAN ANTONIO	0.40861	0.5443	0.000
IMPSF	0.72522	1.3190	0.003
IMPSF*TIMETREND	-0.38778	-0.8360	0.020
IMPSF*BASE USES[2]	0	n/a	n/a
IMPSF*RETAIL	-0.06910	-0.0716	0.038
IMPSF*SERVICE	0.05461	0.0328	0.324
IMPSF*POPDENSITY	-0.10035	-0.3606	0.094
REMSF	0.03095	0.0769	0.040
REMSF*CHGHBUSE	-0.04654	-0.0689	0.005
REMSF*SHAPECHG	-0.01723	-0.0232	0.258
REMSF*FRNTLOSS	-0.01251	-0.0320	0.145

[1]*BASE SITES* include Abilene and Corpus Christi.
[2]*BASE USES* include all other uses, e.g. single-family, multi-family, and other uses.

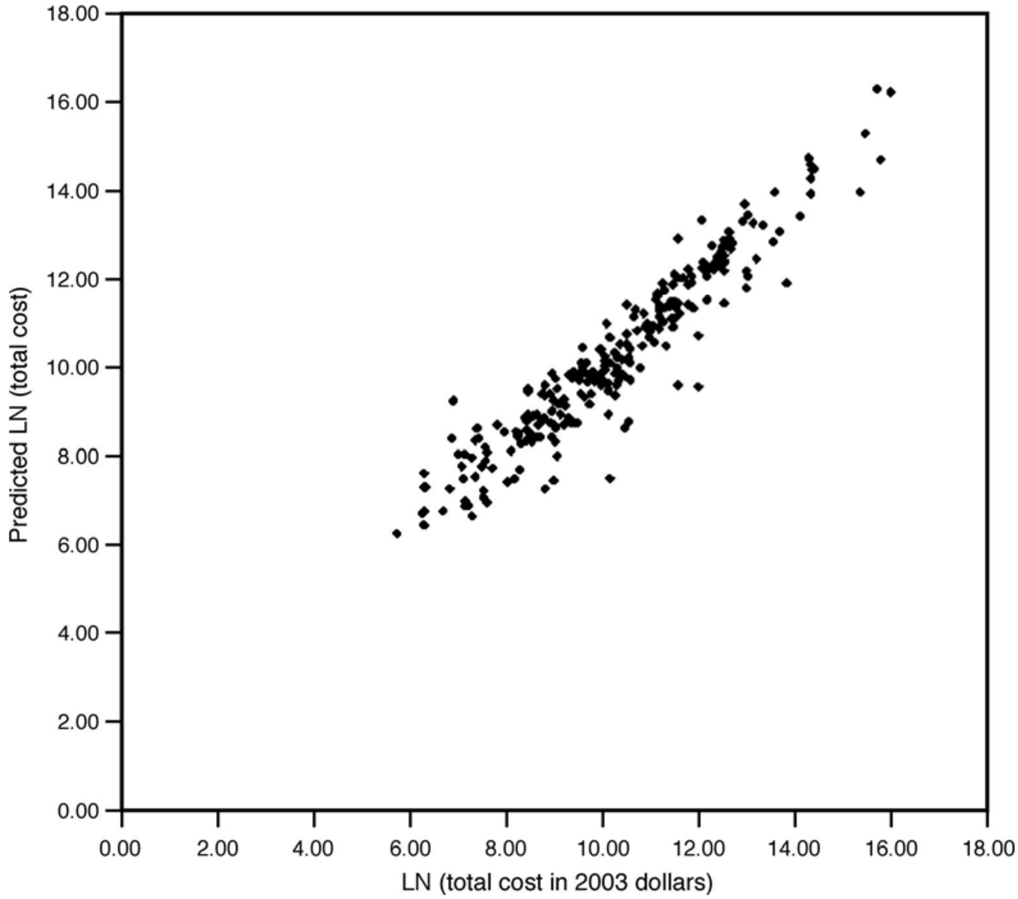


Figure 4.1 Plot of Predicted Values for Texas Corridor Log Regression

5. Commercial Property Value Models

5.1 Introduction

In addition to the sample of actual ROW purchase data, full-parcel commercial sales transactions for Texas' top regions were obtained from two independent sources. Commercial sales data for Travis County were obtained from the Travis Central Appraisal District (TCAD), which serves the central Austin area. Sales data for Texas' major metropolitan areas were obtained from CoStar Group, a national provider of commercial real estate information services and comparable sales. The data sets and models presented here greatly enhance the literature and provide estimates of commercial property values.

5.2 Data Assembly

5.2.1 Data Assembly for TCAD Commercial Sales

A database of commercial sales transactions for Travis County, Texas was obtained from the TCAD, which actively seeks sales data[6] in order to 100-percent (by law) appraise private real property for local tax collection. The database contained 1,354 commercial sales transactions that occurred between January 2000 and January 2003. The Consumer Price Index (CPI) was used to correct dollar values for inflation (BLS, 2003). The TCAD database was relatively limited, and only provided information on lot size, improvement square footage, condition (or "grade") of improvements, and year of construction. The properties were coded into improvement types according to the structure improvement code assigned by the Appraisal District. These use types were aggregated where reasonable and logical groupings could be made. The geographic area codes used by the District were coded into location indicator variables, and again grouped to provide a reasonable percentage in each sub-sample.[7] An indicator variable was specified for cases where the "list price" (i.e., the asking price) was substituted for the sales price. A full description of variables, improvement types, and location indicator variables used in the TCAD sales price model is given in Table 5.1.

5.3 Data Assembly for CoStar Commercial Sales

A database of commercial sales transactions for Texas' major metropolitan areas was purchased from CoStar Group, a national provider of commercial real estate information (CoStar, 2003). The initial database contained over 24,000 records of commercial property transactions, but only 10,987 observations had documented sales prices. These latter observations represented $43.2 billion in total sales and spanned a 7-year time period, from June 1996 to June 2003. The sales prices were again adjusted for inflation using the CPI index (BLS 2003). The database contained information on lot and improvement size, land use, location, frontage length, year of

[6] Texas is one of very few non-disclosure U.S. states, where real property transactions do not have to be communicated to tax collection agencies.

[7] The SW and the NW areas are separated by the Colorado River (north/south). The SE and NE areas are separated by 45th Street. The east/west boundary for these four groups is Loop 1, also known as the MoPac Expressway. The Round Rock area includes land in the Round Rock school district in north Travis County.

construction, condition of improvements, and finally the number and type of parking spaces. An indicator variable was coded for unconfirmed sales, to see if these listings introduced bias in the model predictions. A full description of variables and associated statistics for the CoStar sales data are shown in Table 5.2.

5.4 Model Estimation

As previously mentioned, hedonic price models are popular tools to estimate value (e.g., ten Siethoff and Kockelman, 2002, Vadali and Sohn, 2001, Carey, 2001, Haider and Miller, 2000, Kockelman, 1997). These typically rely on structural characteristics, parcel size, and location information. The models applied here follow work done by Kockelman (1997) and ten Siethoff and Kockelman (2002), wherein land and improvement areas are interacted with explanatory variables thought to influence land and structure values. In this way land rents per unit area can be distinguished.

5.4.1 TCAD Linear Model Specification

The TCAD commercial sales model used market sales price as the dependent variable, and separated land and improvement value. A quadratic term was proposed for the improvement area, in order to recognize marginal rates of return. The general model form follows here:

$$SALEPRICE = \beta_0 + LANDSF\sum_i \beta_{i,land} X_{i,land} + IMPSF\sum_j \beta_{j,imp} X_{j,imp} + IMPSF2\sum_k \beta_{k,imp} X_{k,imp} + \varepsilon$$

where *LANDSF* is the parcel area in square feet, $X_{i,land}$ is a vector of explanatory

Table 5.1 Description of Variables for TCAD Commercial Sales Data

Description of Variables for TCAD Commercial Sales			
Variable	Description	Mean	S.D.
SALEPRICE	Sale or list price (2003$)	1861000	137200
LANDSF	Land area (SF)	2407000	1050000
IMPSF	Improvement area (SF)	21390	1304
IMPSF2	Improvement area squared (SF^2)	2.762E+09	1.460E+10
IMPAGE	Age of improvement in years	18.45	0.3827
IMPCOND	Improvement condition (1=poor, 2=fair, 3=average, 4=good, 5=excellent)	1.855	1.735
LISTPRICE	Indicator variable for list, or asking price	0.2171	0.4124
TIMETREND	Time trend variable for year of acquisition (1=2001, 2-2002, and 3=2003)	1.852	0.8033
APARTMENT	Indicator variable for apartment	0.1654	0.0101
HIRISE	Indicator variable for hi-rise condominium	0.1750	0.0103
LGOFFICE	Indicator variable for office larger than 35,000 SF	0.0458	0.2092
MDOFFICE	Indicator variable for medium office (10-35K SF)	0.0318	0.0048
SMOFFICE	Indicator variable for small office less than 10,000 SF	0.1596	0.3664
MDSTORE	Indicator variable for shopping center, grocery or discount store	0.0273	0.0044
SMSTORE	Indicator variable for small store or strip center less than 10,000 SF	0.0517	0.0060
RESTRNT	Indicator variable for restaurant, night club, fast food	0.0391	0.0053
CONVSTORE	Indicator variable for convenience store, gas station, auto repair and service	0.0480	0.0058
SMWAREHS	Indicator variable for warehouse less than 20,000 SF	0.0702	0.0069
LGWAREHS	Indicator variable for bulk warehouse, flex space, research and development, and manufacturing	0.1115	0.0086
HOTEL	Indicator variable for hotel or motel	0.0096	0.0027
RESTHOME	Indicator variable for rest home or treatment center	0.0126	0.0030
NWAREA	Northwest Travis County	0.0650	0.2466
SWAREA	Southwest Travis County	0.1137	0.3176
NEAREA	Northeast Travis County	0.2696	0.4439
SEAREA	Southeast Travis County	0.5170	0.4999
RRAREA	Round Rock (north Travis County)	0.0310	0.1734

Table 5.2 Description of Variables for CoStar Commercial Sales Data

Description of Variables for CoStar Commercial Sales Data			
Variables	Description	Mean	SD
SALEPRICE	Sale or list price (2003$)	2917000	9795000
LOGPRICE	Natural log of sales price	13.79	1.317
LANDSF	Land area (SF)	672200	6777000
FRONTAGE	Length of street frontage in feet	282.5	466.3
CORNER	Indicator variable for corner parcel	0.2898	0.4537
IMPSF	Improvement area (SF)	37520	103200
IMPAGE	Age of Improvement in years	14.27	18.04
IMPCOND	Improvement condition, 1=poor, 2=fair, 3=avg, 4=good, 5=excellent.	1.847	1.684
TIMETREND	Time Trend for year of sale, 0 for 1996, 1 for 1997, and so on, through 7 for 2003.	4.454	1.316
UNCONFIRMED	Indicator variable for unconfirmed price	0.0345	0.1825
PRKOPEN	Number of open-air parking spaces	11.65	137.8
PRKCOVER	Number of covered parking spaces	53.89	177.8
APTMT	Indicator variable for apartment use	0.1124	0.3159
COMRCL	Indicator variable for commercial land	0.2476	0.4317
HOTEL	Indicator variable for hotel or motel	0.0089	0.0940
INDSTRL	Indicator variable for industrial use	0.2015	0.4011
MOBILE	Indicator variable for mobile home park	0.0023	0.0476
OFFICE	Indicator variable for office use	0.1220	0.3272
RESID	Indicator variable for residential land	0.1032	0.3042
RETAIL	Indicator variable for retail use	0.1811	0.3851
SPECIAL	Indicator variable for special use (e.g. church, hospital, or school)	0.0210	0.1435
BEXAR	Bexar County (San Antonio)	0.0499	0.2177
COLLIN	Collin County (Dallas-Fort Worth)	0.0710	0.2568
DALLAS	Dallas County (Dallas-Fort Worth)	0.2101	0.4074
DENTON	Denton County (Dallas-Fort Worth)	0.0478	0.2133
FORTBEND	Fort Bend County (Houston)	0.0290	0.1679
HARRIS	Harris County (Houston)	0.2307	0.4213
MONTGMRY	Montgomery County (Houston)	0.0190	0.1366
TARRANT	Denton County (Dallas-Fort Worth)	0.1393	0.3463
TRAVIS	Travis County (Austin)	0.1487	0.3558
WILLIAMSON	Williamson County (Austin)	0.0544	0.2269

variables related to the land value[8], *IMPSF* is the improvement area in square feet, $X_{j,imp}$ is a vector of explanatory variables linked to the improvement value (e.g., age, condition, and use type), *IMPSF2* is the square of the improvement area, $X_{k,imp}$ includes only the improvement type indicator variables, and ε is the error term. A list price indicator (to distinguish these observations from true, sale price) was tried independently, but then kept interacted.

[8] Land use types were not interacted with land area in this model, because of collinearity with area/location indicators and lack of statistical significance. This data set only included improved properties, unlike the CoStar data set, making distinction of land values by use type less obvious.

5.4.2 CoStar Linear Model Specification

The model proposed for the CoStar data is similar to that proposed for the TCAD data, with a few exceptions. A quadratic term was not used in the CoStar commercial sales data, because it was not found to be statistically significant in early models. Parking spaces also were considered separately in the model, in order to predict the value of individual parking spaces. An indicator variable for unconfirmed sales was also considered independently. The general model used for the CoStar sales data is shown here:

$$SALEPRICE = \beta_0 + LANDSF \sum_i \beta_{i,land} X_{i,land} + IMPSF \sum_j \beta_{j,imp} X_{j,imp} + PRKCOVER + PRKOPEN + UNCONFIRMED + \varepsilon$$

where *LANDSF* and *IMPSF* are defined as in earlier models, *PRKCOVER* is the number of covered parking spaces, *PRKOPEN* is the number of uncovered parking spaces, *UNCONFIRMED* is an indicator variable for sales prices that were not confirmed, and ε is the error term.

5.4.3 Log Model Estimation

In addition to linear model, log-log models were performed for both data sets, using the natural log of the sales price as the dependent variable, and log transformations of all explanatory variables (Zero values for indicator variables and interacted terms were treated in the same manner described in Section 3.3). The adjusted R-squared for the TCAD log-log model was lower than the TCAD sales price model (0.662 vs. 0.705), which suggests that the log-log model explained less variation in the sales price for the variables used. A log model specification was also tried for the CoStar data, using ordinary least squares regression. The adjusted R-squared for the CoStar log model was 0.600, again suggesting that the log model explained less variation, compared to the initial OLS model results (0.856). The full regression results for these log-log models are not reported here.

5.4.4 Variance Model and Investigation of Heteroskedasticity

Variance models were performed for both the TCAD and CoStar commercial sales data. The variance models regressed the squared residuals obtained from the initial ordinary least squares estimation on the set of explanatory variables, as was done for the Texas Corridor sample. One problem immediately encountered was a high a number of negative variance predictions. For the TCAD sample, 23% of all predictions were negative, and 68% of the variance predictions for the CoStar variance model were negative. In order to preclude negative variance predictions, an exponential variance model was used. The general form of the variance model is shown below:

$$E(Var) = EXP(\beta_i X_i + \varepsilon)$$

where *E(Var)* is the expected value of the variance, β_i is the estimated coefficient, X_i is a set of explanatory variables, and ε is the error term, assumed to be normally distributed. A natural log transformation was applied to this exponential variance model, resulting in a linear specification, which is needed to accommodate least squares regression.

The variance model results for the TCAD data are shown in Table 5.3, and the CoStar variance model results are shown in Table 5.4. The log-variance model for the TCAD sample returned an adjusted R-squared value of 0.453, and the CoStar data returned an adjusted R-squared value of 0.259, allowing one to reject the null hypothesis of homoskedasticity in both cases.

5.4.5 Feasible Generalized Least Squares Estimation

Since the variance models revealed heteroskedasticity in the data, feasible generalized least squares (FGLS) estimation was applied to both the TCAD and CoStar commercial sales data to correct the standard errors for the presence of heteroskedasticity, a non-constant variation across observations. FGLS produces more efficient estimates for models where the data is known to be heteroskedastic. Another advantage is that FGLS does not require any underlying assumptions about the error terms' distribution. In FGLS, one uses the inverse of the variance model predictions as weights in the regression.

Table 5.3 Variance Model Results for TCAD Commercial Sales Data

Variance Model for TCAD Commercial Sales			
Dependent Variable:	Squared Residuals		
Number of Observations	1,353		
Adjusted R-squared	0.455		
Variables	Coefficient	Std. Coef.	p-value
(Constant)	23.63		0.000
LANDSF	-1.119E-08	-0.1396	0.000
LANDSF*LISTPRICE	-5.520E-09	-0.0456	0.147
landSF*base areas[1]	0	n/a	n/a
landSF*NEarea	9.865E-09	0.1055	0.022
landSF*SEAREA	5.187E-07	0.0978	0.000
landSF*RRAREA	-2.425E-06	-0.0354	0.115
IMPSF	5.440E-05	0.8427	0.000
IMPSF*IMPAGE	1.756E-07	0.0399	0.163
IMPSF*IMPCOND	5.530E-06	0.1209	0.004
IMPSF*TIMETREND	6.627E-06	0.1840	0.000
IMPSF*base uses[2]	0	n/a	n/a
IMPSF*HIRISE	-8.021E-04	-0.1372	0.000
IMPSF*LGOFFICE	-7.079E-06	-0.0773	0.268
IMPSF*MDOFFice	4.728E-05	0.0649	0.002
impsf*smoffice	-2.776E-04	-0.1587	0.028
IMPSF*mdstore	8.390E-05	0.1854	0.001
IMPSF*RESTRNT	4.592E-04	0.1568	0.006
impsf*convstore	-2.128E-04	-0.0673	0.110
IMPSF*smwarehs	2.125E-05	0.1201	0.000
IMPSF*lgwarehs	-8.326E-05	-0.0932	0.035
IMPSF*hotel	1.953E-05	0.0691	0.238
impsf*base areas[1]	0	n/a	n/a
IMPSF*SEAREA	-9.821E-06	-0.1060	0.001
impsf2	-1.636E-10	-0.7703	0.000
IMPSF2*base uses[2]	0	n/a	n/a
IMPSF2*HIRISE	-2.717E-08	-0.0297	0.164
IMPSF2*LGOFFICE	1.005E-10	0.3443	0.000
IMPSF2*SMOFFICE	4.241E-08	0.1882	0.543
IMPSF2*mdstore	-8.242E-10	-0.1286	0.986
IMPSF2*RESTRNT	-3.241E-08	-0.0931	0.100
IMPSF2*convstOr	2.107E-08	0.0871	0.036
IMPSF2*lgwarehs	2.265E-09	0.0578	0.180
IMPSF2*hotel	-1.121E-10	-0.1055	0.050

[1]*BASE AREAS* include all other areas, e.g. *NWAREA, SWAREA*.
[2]*BASE USES* include all other use types, e.g. *APARTMENT, SMSTORE,* and *RESTHOME*.

Table 5.4 Variance Model Results for CoStar Commercial Sales Data

Variance Model Results for CoStar Commercial Sales			
Dependent Variable:	Natural Log of Squared OLS Residuals		
Number of Observations	10,987		
Adjusted R-squared	0.259		
Variables	Coefficient	Std. Coef.	p-value
(Constant)	25.28		0.000
LANDSF	3.349E-07	0.7539	0.000
LANDSF*FRONTAGE	-1.215E-11	-0.0445	0.009
LANDSF*HOTEL	4.906E-06	0.0207	0.083
LANDSF*industrial	3.467E-07	0.0432	0.000
LANDSF*RETAIL	2.655E-06	0.1250	0.000
LANDSF*SPECIAL	6.010E-07	0.0305	0.000
LANDSF*BEXAR	-1.315E-07	-0.0257	0.018
LANDSF*COLLIN	2.089E-07	0.0433	0.000
LANDSF*DENTON	3.153E-07	0.0404	0.000
LANDSF*FORTBEND	-2.544E-07	-0.0877	0.000
LANDSF*harris	-1.344E-07	-0.0427	0.007
LANDSF*MONTGMRY	-2.678E-07	-0.0878	0.000
LANDSF*tarrant	-1.836E-07	-0.0535	0.000
LANDSF*TRAVIS	-2.259E-07	-0.0956	0.000
LANDSF*WILLIAMSn	-3.112E-07	-0.6509	0.000
IMPSF	8.781E-06	0.3012	0.000
IMPSF*IMPCOND	5.331E-07	0.0671	0.018
IMPSF*NUMFLOORS	-2.034E-07	-0.0927	0.000
IMPSF*HOTEL	8.383E-06	0.0243	0.042
IMPSF*INDSTRL	-1.433E-06	-0.0224	0.033
IMPSF*OFFICE	7.390E-06	0.1286	0.000
IMPSF*RETAIL	-4.418E-06	-0.0619	0.000
IMPSF*BEXAR	6.172E-06	0.0224	0.008
IMPSF*denton	-1.819E-06	-0.0395	0.008
IMPSF*HARRIS	1.776E-06	0.0394	0.012
IMPSF*montgmry	7.459E-06	0.0222	0.008
IMPSF*TRAVIS	3.448E-06	0.0295	0.002
PRKCOVER	-8.705E-04	-0.0398	0.004
PRKOPEN	2.038E-03	0.1204	0.000
UNCONFIRMED SALE	5.998E-01	0.0364	0.000

5.5 Analysis and Results

The final FGLS models were developed through a process of adding and deleting variables, based on variable significance. Only variables statistically significant at the 0.10 level, or higher, were retained in the final models. FGLS regression results for the TCAD commercial sales data are shown in Table 5.5, and FGLS regression results for the CoStar model are shown in Table 5.6. There are substantial differences in the two data sets, as described above; but each has measures of land, improvement size, age and condition of structure. The TCAD model explained more variation in the data, but the CoStar data set covers a much greater geographical area and includes more variables.

5.5.1 TCAD Sales Model Results

A number of explanatory variables were tested for the TCAD commercial sales data, using sales price as the dependent variable. The adjusted R-squared for the FGLS model was 0.856, a significant improvement upon the OLS result (0.705), and very high for this type of analysis. Several of the location indicator variables are significant in the final model. The southeast area, which includes downtown Austin, adds a premium of $14 per square foot to the value of land (northwest Austin was used as the base). The improvement codes were not interacted with land area in the model, due to issues with collinearity, and lack of statistical significance.

The coefficient for improvement area is a strong predictor of total value, judging by the high standardized coefficient for this variable (0.53). The condition of the structure is both statistically and practically significant in the model; a property in excellent condition is worth approximately $22 more per square foot than a similar property in fair condition. The list price indicator is very practically significant, and suggests that on average, list prices are 20% higher than sale prices. The time trend variable for the year of acquisition is positive, reinforcing the speculative nature of commercial real estate and suggesting a strongly positive rate of appreciation for properties in the sample.

A few of the improvement types are statistically significant when interacted with the improved area. A hi-rise building is worth $113.9 more per square foot, and office buildings are worth $43.13 more per square foot, than the other uses kept as the base, all other things held constant. The coefficient for large warehouses is negative when taken with the improvement area, however, this result is more than compensated by the positive coefficient for the square of the building area, which predicts increasing returns to scale for these property types. The location indicator variable for the southeast region is negative; indeed, much of the value of these properties appears to be reflected in the high value of land in this region. To be more correct, the location values should be reflected in the price of land, rather than improved area. However, since buildings cannot easily be replaced, they may begin to pick up these locational values.

Table 5.5 FGLS Regression Results for TCAD Commercial Sales

FGLS Regression Results for TCAD Commercial Sales			
Dependent Variable:	SALEPRICE (2003$)		
Number of Observations	1,353		
Adjusted R-squared	0.858		
Variables	Coefficient	Std. Coef.	p-value
(Constant)	126169		0.002
LANDSF	-0.0004678	-0.0517	0.009
landSF*nwarea	0	n/a	n/a
landSF*searea	14.5324	0.2927	0.000
landSF*SwAREA	2.635	0.0187	0.077
IMPSF	70.29	0.5327	0.000
IMPSF*condition	7.292	0.0505	0.011
IMPSF*LISTPRICE	17.67	0.0227	0.084
IMPSF*TIMETREND	12.13	0.1045	0.025
IMPSF*APARTMT	0	n/a	n/a
IMPSF*HIRISE	113.9	0.0433	0.000
IMPSF*LGOFFICE	43.13	0.3216	0.001
IMPSF*smwarehs	-28.39	-0.0221	0.048
IMPSF*lgwarehs	-103.9738	-0.1054	0.000
IMPSF*NWarea	0	n/a	n/a
IMPSF*NEAREA	-24.71	-0.0597	0.052
IMPSF*SEAREA	-65.78	-0.1200	0.000
impsf2			
IMPSF2*APARTMT	0	n/a	n/a
IMPSF2*convstore	-0.01130	-0.0189	0.069
IMPSF2*lgwarehs	0.002393	0.0390	0.093
IMPSF2*hotel	0.0002403	0.0270	0.014

Table 5.6 FGLS Regression Results for CoStar Commercial Sales Data

FGLS Regression Results for CoStar Commercial Sales			
Dependent Variable:	SALEPRICE (2003$)		
Number of Observations	10,987		
Adjusted R-squared	0.644		
Variables	Coefficient	Std. Coef.	p-value
(Constant)	538440		0.000
LANDSF	0.5541	0.4408	0.000
LANDSF*FRONTAGE	-0.00004411	-0.0544	0.000
LANDSF*base uses[1]	0	n/a	n/a
LANDSF*COMRCL	0.1482	0.0801	0.000
LANDSF*HOTEL	-12.21	-0.0320	0.015
LANDSF*indstrl	0.2556	0.0223	0.003
LANDSF*MOBILE	1.0782	0.0353	0.000
LANDSF*RETAIL	5.625	0.1068	0.000
LANDSF*SPECIAL	-1.7000	-0.0344	0.000
LANDSF*BEXAR	-0.3483	-0.0329	0.000
LANDSF*COLLIN	0.6327	0.0626	0.000
LANDSF*BASE AREAS[2]	0	n/a	n/a
LANDSF*DENTON	0.7403	0.0514	0.000
LANDSF*FORTBEND	-0.3440	-0.0784	0.000
LANDSF*MONTGMRY	-0.5359	-0.1587	0.000
LANDSF*TRAVIS	-0.2555	-0.0613	0.000
LANDSF*WILLIAMSn	-0.5083	-0.3099	0.000
IMPSF	21.16	0.2810	0.000
IMPSF*IMPAGE	-0.6854	-0.2667	0.000
IMPSF*IMPCOND	9.228	0.3986	0.000
IMPSF*NUMFLOORS	2.079	0.1232	0.000
IMPSF*HOTEL	39.09	0.0481	0.000
IMPSF*base uses[1]	0	n/a	n/a
IMPSF*INDSTRL	-13.85	-0.1120	0.000
IMPSF*OFFICE	14.97	0.0704	0.000
IMPSF*RETAIL	-13.89	-0.0627	0.000
IMPSF*SPECIAL	36.62	0.0773	0.000
IMPSF*BEXAR	-8.839	-0.0173	0.017
IMPSF*COLLIN	15.35	0.0388	0.000
impsf*Fort Bend	9.308	0.0186	0.011
IMPSF*BASE AREAS[2]	0	n/a	n/a
IMPSF*HARRIS	-4.932	-0.0364	0.000
IMPSF*TARRANT	-5.274	-0.0286	0.000
IMPSF*TRAVIS	16.12	0.0550	0.000
IMPSF*WILLIAMSON	14.49	0.0245	0.001
PRKCOVER	6026	0.0771	0.000
UNCONFIRMED	206405	0.0162	0.022

[1]*BASE USES* include all other use types, e.g. *APTMT* and *RESID*
[2]*BASE AREAS* include all other counties, e.g. *DALLAS* and *BEXAR*.

5.5.2 CoStar Sales Model Results

The adjusted R-squared for the final FGLS regression for the CoStar data was 0.644, which was lower than the adjusted R-squared for the OLS regression (0.856). The CoStar data contained a number of observations with very high values, which probably influenced the initial OLS estimates. The FGLS weights and regression likely give less weight to these extreme values, hence the lower R-squared value. However, the FGLS predictions should be more asymptotically efficient, and are therefore preferred to the OLS estimates.

The coefficient for the square footage of land is a very strong predictor of value, based on the high standardized coefficient. Many of the land use types and location indicator variables are statistically significant in the CoStar model when interacted with land area. The differences in value range from around $0.15 to just over $5 per square foot, with the higher value for retail use. Regional differences in land value vary from $0 to $1.25 per square foot, with Williamson (Austin area) and Montgomery (Houston area) Counties on the low end and Denton (Dallas-Ft. Worth) and Collin (Dallas) Counties on the high end of the scale. Improvement area is a strong predictor of value for developed properties. The coefficient on the improvement age is negative, which is not as one would expect. The condition of the structure is practically significant; a property in excellent condition is worth nearly $28 more per square foot of improvement than a similar property in fair condition, slightly higher than the value predicted by the TCAD model.

A couple of observations regarding improvement types: the coefficient for industrial properties is again negative, relative to apartments; the coefficient for retail buildings is also negative, however, this result is offset by the high positive land value for retail properties. The location indicator variables were again interacted with improvement area in the CoStar model. The effects of location are more easily observed here. The range in value is nearly $25 per square foot, with buildings in Bexar (San Antonio) County being worth the least, and buildings in Travis (Austin) County being worth the most, all other things constant. The count variable for surface parking spaces was not significant in the final model. Covered parking spaces are predicted to add $6,000 each. This estimate is probably too low, considering the high capital costs associated with parking structures. Litman (1999) reports structured parking costs to be $11,000 (2003$) per space, exclusive of land costs. He reports surface parking costs at $1,760 (2003$) per space. Finally, the indicator variable for unconfirmed sales is positive and statistically significant, and predicts that unconfirmed sales are roughly 7% higher on average.

5.6 Summary

The study and analysis of full-parcel commercial sales transactions have been presented here. The data were assembled from two independent sources, the TCAD and CoStar Group. There are substantial differences in the two data sets, but each has measures of land, improvement size, age and condition of structure. The TCAD model explained more variation in the data, but the CoStar data set provides greater geographic coverage and controls for more variables. For these reasons, the CoStar sales price model is perhaps more useful than the TCAD model.

The data were first analyzed using OLS, and interacting property attributes with land and improvement area. Variance models were estimated, which revealed heteroskedasticity in the data and model results. The method of FGLS regression was applied in both cases to correct the standard error terms for heteroskedasticity, common in property value data sets. The estimated coefficient magnitudes and signs were generally reasonable and intuitive in both models. Land and improvement square footage are strong predictors of value, as one would expect. The condition of the structure is practically significant, and has roughly the same effect on value in both models.

The models do have limitations. Both data sets consisted of whole takings via private transactions, so they do not provide actual ROW acquisition costs for partial takings by public agencies. But predictions from the final CoStar price model (Table 5.6) are likely to prove very strong indicators of commercial taking appraisals in public ROW acquisition. Whereas the TCAD database only included observations of improved properties, the CoStar data included records of both raw land and improved properties. One might therefore consider separate models of land and property values in future work.

The variance models used a log transformation to correct for negative values. However, given the high percentage of negative predictions, a quadratic or other transformation may be more appropriate. Repeat sales were observed in both data sets (instances where the same property sold at a later date). Future research might consider the inclusion of lagged variables or repeat sales regression techniques to correct for such autocorrelation (Gatzlaff and Geltner, 2000). And one might also consider removing properties with extreme sales prices or unusually high variance.

6. Project Products

6.1 Introduction

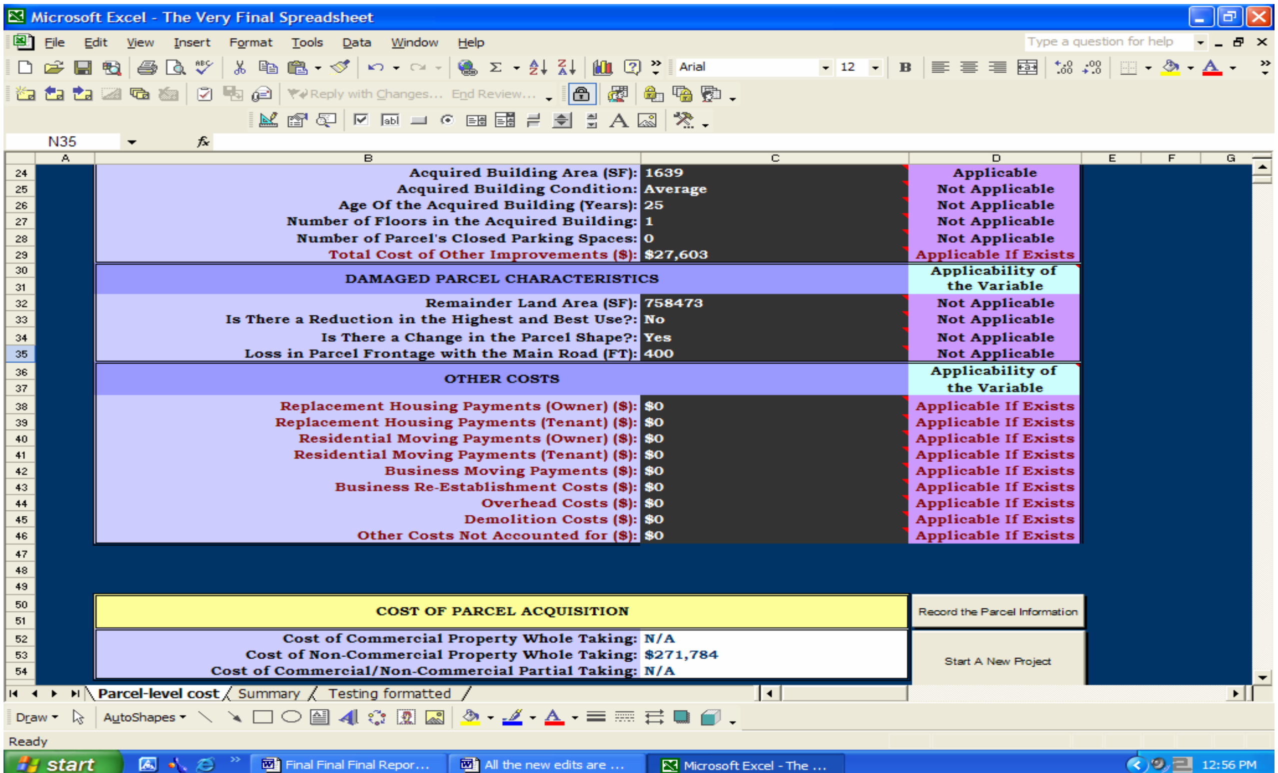
A cost estimation tool based on the calibrated models described in Chapter 5 was developed in Microsoft Excel software. Accompanied by a supporting instructions document, for its application, this product was presented to Texas ROW administrators as a potential budget estimation tool for future ROW acquisition. The spreadsheet tool then was tested/validated using additional data for TxDOT-acquired parcels, in order to evaluate the tool's accuracy and performance in estimating acquisition costs. This chapter discusses these project products in some depth, as well as the validation test results.

6.1.1 Cost Estimation Worksheet

The cost estimation spreadsheet embodies all three cost models discussed previously and applies the most appropriate model accordingly, based on user inputs of land use and acquisition type. The spreadsheet requires that users enter values for final-model variables, which are those that are statistically significant. (Other variables may be relevant as well, but were not found to be statistically significant in the data sets used to calibrate the models.)

Users should note that, while it is helpful to be able to predict individual parcel acquisition costs, this tool is intended for overall ROW cost budgeting and is not to be used as an appraisal tool. Furthermore, the tool can serve as a standard starting point for all TxDOT ROW budgets, providing consistency in cost estimation procedures across districts and corridors. Modifications to the standard cost estimates can be then made explicit, and total budget values adjusted as needed.

Depending on the type of acquisition and thus the model used, the applicability of variables changes and is indicated in corresponding spreadsheet cells titled "Applicability of the Variable". The label "Enter if Exists" means that users are required to enter values for the corresponding variables if these variables apply to the present acquisition case. "Optional" means that users are given the opportunity to use their own estimates for the corresponding variable. If this variable is left as zero in the cell, the tool will use its own built-in assumptions. Figure 6.1 displays the cost estimate worksheet in two consecutive figures to show all its elements.



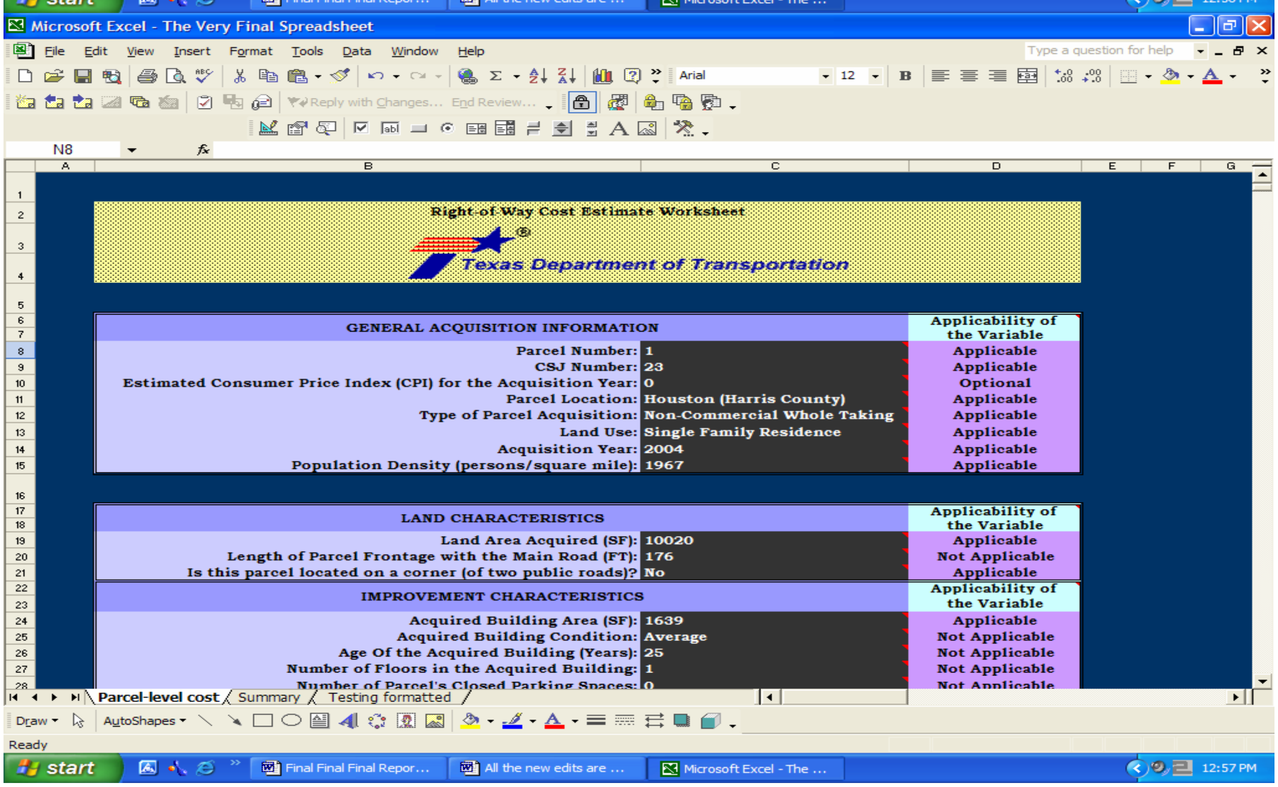


Figure 6.1 Cost Estimate Worksheet Exhibits

The parameters of each variable can be adjusted by changing values in the “Parameters” worksheet. The spreadsheet entries are divided into six sections as follows:

- General Acquisition Information: This section requires that users enter information generally applied to all acquired parcels. Some of these inputs, such as location, land use, and acquisition year are used in the models, while others, such as parcel number and project CSJ number, are solely for parcel identification purposes. Even though all TxDOT districts are not listed, metropolitan, urban, suburban, and rural designations are provided. This allows users to select the option that best resembles their parcel’s location. The project team has provided users with a variety of land uses, and users need to select the best option for their parcel case. The “acquisition year” variable allows the model to account for inflation, and users are allowed to enter their own estimate of an inflation rate or Consumer Price Index, if they are not satisfied with the spreadsheet’s default assumptions (which are as described in the “Instructions” manual).
- Land Characteristics: This section requires that users input acquired land characteristics, including taken area, parcel frontage, and corner location information. (Corner parcels are usually more expensive than other properties because of their visibility and ease of access.)
- Improvement Characteristics: This section requires that users input acquired improvement characteristics, such as interior square footage, condition, and age. The spreadsheet permits users to input estimated costs of other possible improvements as well (e.g., fencing).
- Damaged Parcel Characteristics: This section requires that users input characteristic of remainders, in the case of partial takings; these include remainder area, whether changes in the parcel’s shape and highest and best use have occurred, and loss in parcel frontage.
- Other Costs: Users are permitted to enter other acquisition costs. Values are suggested in the accompanying comment boxes.
- Total Costs: This section provides the estimated acquisition cost, according to the type of the acquisition (i.e., according to the model used for estimation).

6.2 Instructions Document

An instructions document accompanies the spreadsheet, and describes all spreadsheet variables in detail. The “Instructions” manual is included here, as Appendix G.

6.3 Cost Estimate Tool Test Results

The spreadsheet tool was tested using data on additional parcels acquired by TxDOT. Data on 60 distinct parcels, involving a variety of land uses, locations, and acquisition types (i.e., partial or whole, with and without buildings) were obtained. Three of these observations were later removed from the analyses since they involved unusually low ($0 or $1) building acquisition costs. (The models were not developed to account for such situations.) To facilitate comparisons, the remaining 57 parcels were divided into eight groups based on location, type of acquisition, and land use. These groups are as follows:

- Vacant and agricultural lands in urban and rural areas, such as Waco and Abilene
- Vacant and agricultural lands in metropolitan areas, such as Houston
- Partial taking of residential properties with no building(s) acquired
- Whole acquisition of residential properties
- Commercial property acquisition in Austin (partial and whole)
- Commercial property acquisition in San Antonio (partial and whole)
- Commercial property acquisition in Dallas (partial and whole)
- Commercial property acquisition in Houston (partial and whole)

Model mispredictions were computed as a percentage of each property's actual acquisition cost and the absolute values of these percentages were averaged across all properties within each group. Recognizing that it is more important to predict the costs of more expensive properties more closely (on a percentage basis), percentage mispredictions also were weighted by acquisition cost, in order to provide a *weighted average* misprediction percentage. Finally, a weighted average also was determined for all parcels valued over $1 million; this value is 24%. A summary of results is displayed in Table 6.1. (Tables including all variable values are presented as Appendix H.)

Table 6.1's results indicate that the tool mispredicts the cost of acquisition by under 35% for most individual property cases and for most groups of cases. However, significant mispredictions can occur. The largest errors occurred in estimation of whole commercial properties in the Dallas district. Mispredictions also are high for partial residential takings that did not involve the taking of any buildings. The tool provided very good results for agricultural and vacant land uses outside of metropolitan areas.

The group mispredictions are useful to examine, since biases may be detected by location, acquisition type and land use. For example, mispredictions for vacant and agricultural lands in metropolitan areas such as Houston are biased low by about 40%. The reason for this probably is that vacant and agricultural lands in the data set used to calibrate the cost model came mostly from rural and urban areas (Abilene, Corpus Christi, and El Paso), rather than metropolitan areas (Houston, San Antonio, and Fort Worth). Thus, we recommended that users adjust agricultural land cost estimates upward for Texas' metropolitan areas.

Estimates are generally biased quite low for (partial) takings of residential property that do not involve any taking of building – and somewhat high for whole residential takings (involving a building). The reason for this is that the data set used for model calibration mostly involved acquisition of buildings. Thus, it is probably best that users adjust the estimates of residential property acquisition costs downward, when no buildings are acquired.

While the cost estimation tool predicts within 30% of true costs for commercial properties in the 57-property test data set, there are significant upward errors for the three whole commercial properties tested in the Dallas district. The source of this error is not clear. But such estimates can be adjusted downward. (Note that cost estimates of the three partial commercial takings tested in the Dallas district are biased low.)

In general, users from different districts involving different property types can detect certain biases on their own and make adjustments as needed. Of course, while it is helpful to be able to predict individual parcel acquisition costs, this tool is intended for *overall* ROW cost budgeting and is not to be used as an appraisal tool. Thus, errors in corridor cost predictions are likely to be significantly less than those suggested in Table 6.1 since cost underpredictions will tend to offset overpredictions (as, for example, in the case of partial versus whole commercial takings in the Dallas district), across parcels. Furthermore, the tool sets a standard starting point for all TxDOT ROW budgets, which is helpful in providing consistency across districts and corridors. Educated arguments for modifications to the cost estimates can be then made, and total budget values adjusted as needed.

Table 6.1 Test Results for Cost Estimation Tool

		Obs. No.	District No.	District/County	Land use	Taking Type	Estimated Cost ($)	Actual Cost ($)	Absolute Difference	Un-weighted Average % Misprediction	Weighted Average % Misprediction	Weighted Average % Misprediction (Cost>=1M $)
Vacant and Agricultural Land (No Building Acquired)	(Urban and Rural Areas)	**1**	8	Abilene	Agri	Partial	$1,445	$1,492	3.15%	28.38%	24.97%	24.15%
		2	8	Abilene	Agri	Partial	$16,266	$17,104	4.90%			
		3	8	Abilene	Agri	Partial	$10,407	$10,677	2.53%			
		4	8	Abilene	Agri	Partial	$712	$832	14.42%			
		5	9	Waco	Agri	Partial	$13,275	$8,717	52.29%			
		6	9	Waco	Agri	Partial	$28,466	$23,453	21.37%			
		7	9	Waco	Agri	Partial	$4,849	$3,970	22.14%			
		8	8	Abilene	Vacant	Partial	$28,932	$35,000	17.34%			
		9	8	Abilene	Vacant	Partial	$24,141	$25,600	5.70%			
		10	8	Abilene	Vacant	Whole	$15,542	$11,542	34.66%			
		11	8	Abilene	Vacant	Whole	$5,668	$3,450	64.29%			
		12	8	Abilene	Vacant	Whole	$6,979	$4,560	53.05%			
		13	8	Abilene	Vacant	Whole	$4,876	$3,555	37.16%			

	Metropolitan Areas	**14**	12	Houston/Harris (IH10)	Vacant	Whole	$645,165	$950,654	32.13%	**40.34%**	**53.28%**	[redacted]
		15	12	Houston/Harris(IH10)	Vacant	Partial	$904,860	$2,408,215	62.43%			
		16	12	Houston/Harris (IH10)	Vacant	Partial	$53,059	$72,148	26.46%			
Residential	**(No Building Acquired)**	**17**	9	Waco	Rural Res.	Partial	$20,472	$3,914	423.05%	**197.22%**	**191.78%**	
		18	9	Waco	Rural Res.	Partial	$13,998	$5,171	170.70%			
		19	9	Waco	Rural Res.	Partial	$3,003	$1,105	171.76%			
		20	9	Waco	SF Res.	Partial	$4,924	$1,800	173.56%			
		21	14	Austin/Travis (SW, US 183)	SF Res.	Partial	$39,100	$39,438	0.86%			
		22	15	San Antonio/Bexar	SF Res.	Partial	$451,406	$131,444	243.42%			
Residential	**(Building Acquired)**	**23**	12	Houston/Harris(IH10w)	SF Res	Whole	$271,784	$191,510	41.92%	**28.33%**	**27.87%**	
		24	12	Houston/Harris(IH10w)	SF Res	Whole	$269,645	$220,807	22.12%			
		25	12	Houston/Harris(IH10w)	SF Res	Whole	$274,695	$231,062	18.88%			
		26	12	Houston/Harris(IH10w)	SF Res	whole	$205,819	$166,456	23.65%			
		27	12	Houston/Harris(IH10w)	SF Res	whole	$253,694	$187,780	35.10%			
Commercial	**(Austin)**	**28**	14	Austin/Williamson US 183	Comm. Land	whole	$543,846	$454,860	19.56%	**26.42%**	**28.37%**	
		29	14	Austin/Travis, NW,US183	Con. Store	whole	$396,162	$393,900	0.57%			
		30	14	Austin/Travis, SW,US183	Con. Store	whole	$223,279	$156,899	42.31%			
		31	14	Austin/Travis, NW,US183	Comm. Land	whole	$1,228,535	$857,604	43.25%			

Commercial	**(San Antonio)**	**32**	15	San Antonio/Bexar	Retail	Partial	$624,627	$361,440	72.82%	**46.77%**	**48.82%**	[redacted]
		33	15	San Antonio/Bexar	Comm. Land	Partial	$46,281	$73,079	36.67%			
		34	15	San Antonio/Comal	Comm. Land	Whole	$565,866	$432,567	30.82%			
Commercial	**(Dallas)**	**35**	18	Dallas/Ellis, US380	Retail	Partial	$14,878	$15,483	3.91%	**311.29%**	**367.27%**	
		36	18	Dallas/Denton, US380	Retail	Partial	$13,929	$61,000	77.17%			
		37	18	Dallas/Denton, US380	Retail	Partial	$25,010	$85,230	70.66%			
		38	18	Dallas/Dallas, US 80	Comm. Land	Whole	$585,398	$137,800	324.82%			
		39	18	Dallas/Dallas, Sh 161	Day Care	Whole	$797,787	$116,000	587.75%			
		40	18	Dallas/Ellis, US 77	Retail	Whole	$598,095	$66,200	803.47%			
Commercial	**(Houston)**	**41**	12	Houston/Harris IH 10	Restaurant	Whole	$1,122,932	$1,417,018	20.75%	**30.81%**	**21.54%**	
		42	12	Houston/Harris IH 10	Special Use	Partial	$259,458	$323,270	19.74%			
		43	12	Houston/Harris IH 10	Retail	Partial	$50,885	$266,788	80.93%			
		44	12	Houston/Harris IH 10	Retail	Partial	$14,754	$84,222	82.48%			
		45	12	Houston/Harris IH 10	Comm. Land	Partial	$566,994	$735,620	22.92%			
		46	12	Houston/Harris IH 10	Office	Whole	$6,014,695	$6,110,589	1.57%			
		47	12	Houston/Harris IH 10	Retail	Whole	$1,339,024	$1,075,676	24.48%			
		48	12	Houston/Harris IH 10	Con. Store	Partial	$27,799	$36,156	23.11%			
		49	12	Houston/Harris IH 10	Retail	Partial	$3,927,387	$2,896,345	35.60%			
		50	12	Houston/Harris IH 10	Office	Whole	$3,499,324	$3,236,797	8.11%			
		51	12	Houston/Harris IH 10	Retail	Partial	$3,559,058	$2,962,940	20.12%			
		52	12	Houston/Harris(IH10w)	Comm. Land	partial	$7,935	$14,467	45.15%			
		53	12	Houston/Harris(IH10w)	Restaurant	partial	$366,601	$485,188	24.44%			
		54	12	Houston/Harris(IH10w)	Restaurant	partial	$2,198,710	$2,689,931	18.26%			
		55	12	Houston/Harris(IH10w)	Industrial	partial	$308,613	$370,517	16.71%			
		56	12	Houston/Harris(IH10w)	Hotel	whole	$3,504,746	$5,650,000	37.97%			
		57	12	Houston/Harris(IH10w)	Comm. Land	partial	$636,234	$1,086,445	41.44%			

7. Influential Laws for State Condemnation Rates

7.1 Influential Amendments to State ROW Laws

The U.S. Constitution and almost all state constitutions regulate the power of government to acquire and restrict private property rights. Typically, property taking or acquisition results in one of two legal actions. The first is condemnation proceedings, where the government admits it is taking a property and agrees to pay the owner "just compensation". The second is when the government encroaches upon a private property interest but denies any taking. Hence, it falls to the property owner to file suit against the government an "inverse condemnation" action, seeking compensation for an unacknowledged exercise of eminent domain (Meltz, 1999).

States usually determine compensable items through ROW statutes or previous court cases (Meltz, 1999). The extent of state law flexibility on compensable items varies across the U.S. states and reveals the value each state places on the rights of individual ownership. Detailed state laws on compensable items are used by ROW staff and their consultants in the property appraisal process. When these laws are properly applied, inverse condemnation cases and condemnation rates are reduced.

According to the Uniform Act, if the owner of a property is left with an uneconomic remnant as a result of partial acquisition, the head of the involved Federal agency must offer to acquire that remnant (FHWA, 2004). Each state's definition and determination of uneconomic remnants is unique. Furthermore, state law may differ from federal law in allowing use of eminent domain power for acquisition of such remnants. State provision of law that allows this technique through negotiation or condemnation reduces condemnation rates and enhances the acquisition process. As an example, after the 1956 passage of the Interstate Act, the state of Illinois could acquire only the land actually needed for construction of its interstate highways (Levin, 1963). In 1957, its state legislature decided to permit *purchase* of uneconomic remnants (rather than application of eminent domain) if severance damages were estimated to exceed purchase costs. This new law facilitated ROW acquisition for that state in development of its Interstate highways (Levin, 1963). Allowing the governmental agencies to acquire the uneconomic remnants (through negotiations or power of eminent domain) and providing them with sufficient funding to do so can significantly reduce the possibility for litigations and thus condemnation rates.

New York State's Division of Highways struggled with a provision in its state constitution that prohibited the taking of private property for public use until final just compensation had been ascertained and paid (Levin, 1963). The 1957 session of the State's legislature authorized a "quick taking" procedure, when urgent circumstances for a highway's construction could be shown (Levin, 1963). New York has made use of this law in many instances, expediting the delivery of required ROW (Levin, 1963). Judicious use of this technique is advised, however, to avoid its abuse, and any adverse effect on the nature of acquisitions – and consequent condemnation rates.

Another option involves the early acquisition of land for expected, future public use, to avoid interim development and minimize later acquisition costs. Meltz (1999) finds that such acquisition is justified 5 to 10 years in advance. However, state highway authority approval and state revolving funds are needed; and the agency must be assured of Federal reimbursement, if a Federal-aid highway is involved. Early land taking laws significantly vary across the United States and help reduce condemnation rates.

The nature of early negotiations can be a key issue in condemnation proceedings (Netherton, 1963). Some states require that there be an attempt to negotiate in good faith, others require only a failure to agree, and some require no negotiations at all. Whatever the rule, it is best in all cases that the agency's ROW administrators/negotiators be in a position to make an offer to owners and be familiar with the elements of that offer in early negotiations (Netherton, 1963). A negotiator's preliminary visits and interactions with owners influence owner attitudes throughout the subsequent acquisition proceedings (Netherton, 1963). A statutory emphasis on informed and proactive negotiations can significantly reduce condemnation rates.

Another key acquisition technique is land consolidation, where remainder lands are purchased on either side of a new highway and property consolidations are facilitated for owners (AASHTO, 2003). Irregularly shaped and isolated remainders are not so useful to property owners. Most owners prefer to have all property on one side of a facility, for purposes of property management, including farming. Land consolidation requires more agency intervention and owner coordination, but reduces damages and property owner dissatisfaction. It tends to be most useful when acquiring rural lands and when there are a number of remainders belonging to multiple owners. (Lindas, 1963).

Land exchange is another technique, where properties outside the required acquisition area are purchased, and then exchanged for lands needed for the project. This requires explicit agency authority, and is relatively rare. If well regulated and not abused, land exchange can relieve many acquisition issues (Lindas, 1963).

As discussed above, state ROW statutes on compensable items, determination and acquisition of uneconomical remnants (through offer or eminent domain), quick takings, early takings, land consolidation, and land exchange vary across states and their transportation agencies. These are all expected to impact condemnation rates. These laws are compared among states later in the paper.

7.2 The Uniform Act: Its Provisions and Impacts on Condemnation Rates

This section reviews federal laws for ROW acquisition, as outlined in the Uniform Act. It emphasizes issues that are flexible and thus determined more by state laws. These include early public involvement, sharing of appraisal information, coverage of litigation expenses, negotiations, and quick taking.

7.2.1 Project Development

Public involvement, an essential part of the project development process, is intended to inform the public of the potential impacts of the project and each of its alignment. This helps agencies ascertain support for a project and, more specifically, each alignment.(FHWA, 2004). Depending on state provisions for the use of public hearings in selecting design alignments, this function can noticeably assist in minimizing cost, expediting the process, and satisfying the public's need for input, since hearings allow the agency to become acquainted with public concerns (NCHRP, 2000). And, ideally, public opinion plays an important role in final alignment selection.

7.2.2 Property Appraisal and the Determination of Just Compensation

Private property appraisal, and its review and approval by the acquiring agency, are cornerstones for provision of just compensation (FHWA, 2004). Before an agency can begin negotiations with property owners, the Uniform Act requires formal appraisal and its approval as the basis for any offer of just compensation. The Act waives the appraisal requirements in cases of low-value, straightforward acquisitions, up to $2,500, and permits state agencies to raise this limit further, to $10,000 (FHWA, 2004). Higher limits result in lower condemnation rates (NCHRP, 2000).

The level of appraisal details included in the report and shared with property owners also can assist in avoiding litigation/condemnation proceedings. Some state laws do not require the acquiring agency to share their detailed appraisal reports with owners, though this may lead to owners to distrust the agency's determination of just compensation.

7.2.3 Negotiation versus Condemnation

The next step of the acquisition process is negotiation. After an agency delivers the written offer of just compensation for property purchase and begins negotiations with the owner (or his/her representative), it must provide the owner a reasonable amount of time to reject or accept the offer (FHWA, 2004). The time that is given to the property owner to consider the offer impacts condemnation rates: Higher time spans result in higher condemnation rates (NCHRP, 2000). This is probably due to the fact that (1) more time allows owners to investigate other offers and acquire legal representation and (2) in cases where project timelines are tight, more time for owners may result in a need for more "quick takings" (if allowed).

Almost 80% of all ROW acquisitions are settled without initiating condemnation proceedings (FHWA, 2004). Ideally, all ROW should be acquired via negotiation, rather than condemnation and litigation. This approach reflects the Uniform Act's requirement that agencies "…make every reasonable effort to acquire expeditiously real property by negotiation." The time and cost[9] expended in acquiring property through litigation is substantial, for the agency and property owners. It also results in adversarial interactions between the agency and property owners and further burdens an already overloaded court system (FHWA, 2004).

However, the appraisal process is imperfect. While structured and professional, appraisal of land and improvements is by nature subjective and imprecise. Moreover, property owners may expect compensation offers to be biased low. Given these factors, it can be helpful to allow for different, non-litigious acquisition strategies if agreement cannot be reached through the normal negotiation process (FHWA, 2004).

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[9] Property owners shall be reimbursed for attorney, appraisal, and engineering fees incurred for condemnation proceedings if the final judgment is that the Federal agency cannot acquire the property by condemnation, or the proceeding is abandoned by the United States. In some states, litigation expenses are paid by the acquiring authorities under specific circumstances (FHWA, 2004).

One of these strategies is the administrative settlement and occurs prior to the agency's initiation of its condemnation authority. It typically is more than the agency's approved offer of just compensation but not excessively so; its value may implicitly recognize the expected cost of litigation and the potential cost of project delays. Administrative settlements generally are considered when reasonable efforts to negotiate an agreed acquisition price have failed but there appears to be the potential for agreement. Alternative dispute resolution (ADR) techniques, such as mediation, are another approach, that allows property owners and agencies to turn to a third party for resolution of their disagreement. The use of administrative settlements and ADR techniques can significantly reduce condemnation rates. Another option is the legal settlement, a resolution of the dispute after condemnation has been filed but prior to a court award (FHWA, 2004). Nearly 30% of all ROW acquisition cases filed for eminent domain proceedings are legally settled prior to the court award (FHWA, 2004).

The FHWA (2004) recommends that administrative settlements and ADR be considered prior to initiation of a legal settlement or condemnation. The importance that state statutes place on alternative negotiations and the flexibility a state provides in employing such strategies can impact condemnation rates.

8. Condemnation Rates

8.1 Data Assembly

As described above, existing literature regarding ROW acquisition does not analyze variations in condemnation rates across states nor compare and contrast state laws. The data acquired and analyzed here intends to address these significant gaps in the literature.

State characteristics for the year 2000 and ROW acquisition data for the years 1996 through 2002 were obtained from the U.S. Census and FHWA websites. The state characteristics include variables like income per capita, rural and urban populations, number of registered republicans, rural and urban highway mileages, educational levels, and percentage of land owned by the Federal Government. The 7 years of condemnation rates were averaged, to produce more stable, longer-term state-based condemnation rates. These data are shown in Table 8.1.

Table 8.1 State Condemnation Rates and Key Explanatory Variables

	Condem. Rate (1996)	Condem. Rate (1997)	Condem. Rate (1998)	Condem. Rate (1999)	Condem. Rate (2000)	Condem. Rate (2001)	Condem. Rate (2002)	Ave. Condem. Rate	% Pop in Urban Areas	%Pop with College degree or Higher	%land owned by the Federal Gov.	%population registered to vote as republicans	Rural highway mileage per capita
AK	6.21%	11.11%	3.93%	8.79%	6.98%	4.42%	4.98%	6.63%	65.71%	28.10%	60.40%	58.60%	0.018
AL	19.82%	18.17%	16.76%	20.62%	24.19%	25.29%	17.46%	20.33%	55.44%	20.40%	4.10%	56.50%	0.017
AR	6.26%	11.17%	7.06%	15.36%	9.21%	10.49%	6.85%	9.49%	52.44%	18.40%	10.10%	51.30%	0.033
AZ	15.96%	21.55%	8.22%	21.38%	25.28%	20.46%	26.92%	19.97%	88.17%	24.60%	44.50%	51.00%	0.007
CA	3.34%	3.18%	6.28%	6.67%	3.73%	6.58%	12.90%	6.10%	94.46%	27.50%	47.80%	41.70%	0.002
CO	1.18%	0.46%	0.15%	0.66%	0.19%	0.29%	0.99%	0.56%	84.50%	34.60%	36.30%	50.80%	0.016
CT	15.88%	18.69%	20.16%	21.29%	22.49%	34.25%	36.12%	24.12%	87.70%	31.60%	0.50%	38.40%	0.003
DE	3.10%	10.45%	0.66%	1.38%	0.00%	5.46%	2.46%	3.36%	80.02%	24.00%	1.20%	41.90%	0.005
FL	33.44%	39.23%	46.02%	46.85%	38.00%	34.51%	46.30%	40.62%	89.31%	22.80%	13.20%	48.80%	0.004
GA	4.63%	2.10%	4.61%	6.75%	8.34%	8.59%	4.78%	5.69%	71.66%	23.10%	5.40%	54.70%	0.011
HI	0.00%	13.04%	36.00%	0.00%	0.00%	0.00%	29.63%	11.24%	91.55%	26.30%	15.60%	37.50%	0.002
IA	10.07%	8.32%	6.95%	6.72%	4.32%	5.44%	3.50%	6.47%	61.06%	25.50%	0.60%	48.20%	0.035
ID	1.81%	7.69%	3.85%	15.63%	11.76%	0.00%	0.00%	5.82%	66.39%	20.00%	62.50%	67.20%	0.033
IL	10.63%	15.62%	10.62%	7.45%	14.45%	14.31%	11.58%	12.09%	87.85%	27.10%	1.60%	42.60%	0.008
IN	7.62%	6.93%	5.32%	5.65%	6.56%	6.66%	4.88%	6.23%	70.77%	17.10%	2.20%	56.60%	0.012
KS	6.64%	10.14%	7.25%	8.80%	9.64%	8.87%	7.34%	8.38%	71.42%	27.30%	1.30%	58.00%	0.046
KY	30.57%	34.34%	16.01%	18.82%	29.56%	19.94%	20.56%	24.26%	55.72%	20.50%	5.70%	56.50%	0.017
LA	5.87%	8.78%	12.55%	11.09%	32.14%	11.11%	18.76%	14.33%	72.66%	22.50%	4.20%	52.60%	0.011
MA	4.75%	7.16%	3.25%	0.60%	0.12%	0.17%	0.58%	2.38%	91.41%	32.70%	1.40%	32.50%	0.002
MD	11.42%	25.32%	2.74%	33.42%	23.93%	21.89%	66.17%	26.41%	86.07%	32.30%	2.60%	40.30%	0.003
ME	7.29%	2.64%	3.12%	2.19%	0.15%	0.12%	100.00%	16.50%	40.21%	24.10%	0.90%	44.00%	0.016

MI	3.58%	2.00%	0.84%	0.72%	3.07%	3.12%	0.43%	1.97%	74.65%	23.00%	11.20%	46.10%	0.009
MN	10.72%	11.36%	13.45%	20.06%	23.40%	15.53%	10.82%	15.05%	70.93%	31.20%	8.20%	45.50%	0.024
MO	11.30%	7.93%	5.50%	13.26%	12.32%	13.25%	5.19%	9.82%	69.37%	26.20%	10.80%	50.40%	0.019
MS	11.72%	16.82%	1.94%	6.10%	19.62%	20.30%	15.44%	13.13%	48.81%	18.70%	5.50%	57.60%	0.023
MT	1.86%	1.39%	1.87%	0.89%	1.98%	2.23%	2.21%	1.78%	54.03%	23.80%	29.40%	58.40%	0.074
NC	10.20%	9.99%	12.97%	8.13%	12.52%	14.82%	14.01%	11.81%	60.22%	23.20%	6.30%	56.00%	0.009
ND	1.10%	4.47%	0.00%	0.00%	0.00%	0.78%	1.02%	1.05%	55.81%	22.60%	5.20%	60.70%	0.132
NE	8.42%	3.79%	7.08%	7.94%	3.40%	6.36%	4.26%	5.89%	69.70%	24.60%	1.30%	62.20%	0.051
NH	11.11%	10.10%	15.02%	9.27%	10.50%	10.94%	10.72%	11.09%	59.18%	30.10%	13.20%	48.10%	0.010
NJ	30.28%	20.83%	31.36%	31.64%	44.80%	35.49%	39.00%	33.34%	94.35%	30.10%	2.60%	40.30%	0.001
NM	0.00%	0.00%	1.49%	0.00%	0.00%	0.00%	0.35%	0.26%	75.03%	23.60%	34.20%	47.80%	0.030
NV	12.21%	9.88%	12.95%	10.90%	16.67%	5.00%	1.57%	9.88%	91.57%	19.30%	83.00%	49.50%	0.016
NY	2.49%	3.99%	3.09%	1.56%	1.66%	2.43%	4.74%	2.85%	87.48%	28.70%	0.70%	35.20%	0.004
OH	20.68%	9.94%	5.19%	0.00%	12.06%	5.77%	15.77%	9.92%	77.34%	24.60%	1.70%	50.00%	0.007
OK	14.14%	7.13%	10.08%	10.13%	6.39%	10.90%	6.73%	9.36%	65.34%	22.50%	3.80%	60.30%	0.029
OR	5.05%	4.80%	9.35%	3.68%	7.69%	3.33%	6.33%	5.75%	78.70%	27.20%	52.50%	46.50%	0.016
PA	21.78%	27.08%	21.24%	23.98%	18.89%	19.48%	22.64%	22.16%	77.04%	24.30%	2.50%	46.40%	0.007
RI	20.39%	12.80%	8.84%	19.19%	96.25%	98.71%	93.57%	49.96%	90.94%	26.40%	0.50%	31.90%	0.001
SC	27.12%	16.56%	21.96%	19.70%	15.80%	18.27%	11.71%	18.73%	60.49%	19.00%	5.70%	56.80%	0.014
SD	0.67%	2.74%	3.30%	1.56%	0.00%	0.88%	0.00%	1.31%	51.92%	25.70%	6.40%	60.30%	0.108
TN	15.51%	19.08%	16.17%	10.63%	23.88%	22.78%	21.62%	18.52%	63.61%	22.00%	7.90%	51.10%	0.012
TX	16.22%	12.39%	13.31%	8.41%	11.47%	14.77%	18.32%	13.56%	82.51%	23.90%	1.40%	59.30%	0.010
UT	9.49%	50.89%	18.25%	17.76%	11.98%	2.65%	2.62%	16.23%	88.26%	26.40%	64.50%	66.80%	0.015
VA	30.36%	11.55%	26.43%	17.48%	17.98%	9.03%	10.98%	17.69%	72.99%	31.90%	8.90%	52.50%	0.007
VT	46.15%	7.50%	16.00%	18.97%	18.92%	21.09%	50.00%	25.52%	38.20%	28.80%	6.30%	40.70%	0.021
WA	0.97%	6.68%	4.09%	3.43%	14.45%	5.80%	6.23%	5.95%	81.99%	31.90%	28.50%	44.60%	0.011
WI	5.86%	5.91%	3.36%	5.52%	7.30%	7.70%	10.82%	6.64%	68.33%	23.80%	5.20%	47.60%	0.018
WV	25.65%	23.57%	0.00%	0.00%	25.22%	20.14%	27.20%	17.40%	46.09%	15.30%	7.90%	51.90%	0.019
WY	0.00%	1.02%	0.00%	2.63%	0.00%	1.63%	0.33%	0.80%	65.23%	20.60%	49.80%	67.80%	0.051

State ROW statutes in each state's general laws or constitution were accessed on the "www.findlaw.com" website, which provides all current federal and state laws and regulations. The LexisNexis database facilitated more narrow searches, on specific ROW issues addressed in each state's constitution, general body of laws, and court cases. In addition, a survey of states ROW administrators conducted by Kockelman et al. (2003) was and used as an additional source of ROW-related statutes.

8.2 Comparison of State Laws

As discussed previously, condemnation rates can indicate both the quality of state acquisition practices and the nature of state ROW statutes. State condemnation rates were plotted for years 1996 to 2002 to examine each state's condemnation rate stability over these years. The graph is displayed in Figure 8.1. The stability apparent in most states' condemnation rates suggests that something relatively constant and fundamental is at work. While different project corridors are acquired every year, laws tend to evolve rather slowly. These laws constrain acquisition practices. It seems plausible that legal statutes are largely responsible for the condemnation rate stability.

For purposes of analysis, the 6-year average condemnation rates were divided into five categories: very low (0%-5%), low (5%-8%), moderate (8%-14%), high (14%-20%), and very high (20%-50%). State ROW rules were compared across states in different categories, in order to ascertain any general trends or patterns. As mentioned earlier, key acquisition rules were ascertained through a review of the ROW literature, state laws, and federal rules. These sets of rules were subjected to the following set of questions:

Do state ROW laws do the following?

1. … allow the acquiring agency take uneconomic remnants through negotiation and/or condemnation?
2. … allow "quick taking"?
3. … require the state to pay owner a portion of litigation costs ?(if the court awards an amount higher than the "Just Compensation" previously determined by the agency).
4. … allow an appraisal waiver up to $10,000?
5. ... require proof of efforts to reach agreement through negotiation?
6. …allow land consolidation?
7. … provide comprehensive and detailed laws on compensable items?
8. … mandate early public involvement?
9. … require the sharing of appraisal and appraisal details with the property owners?
10. … encourage meditation and provide reasonable freedom (e.g., administrative settlements and alternative dispute resolution) in using this technique?
11. … give property owners more than 30 days to petition against the just compensation offer?
12. …. allow early taking?
13. … allow land exchange?

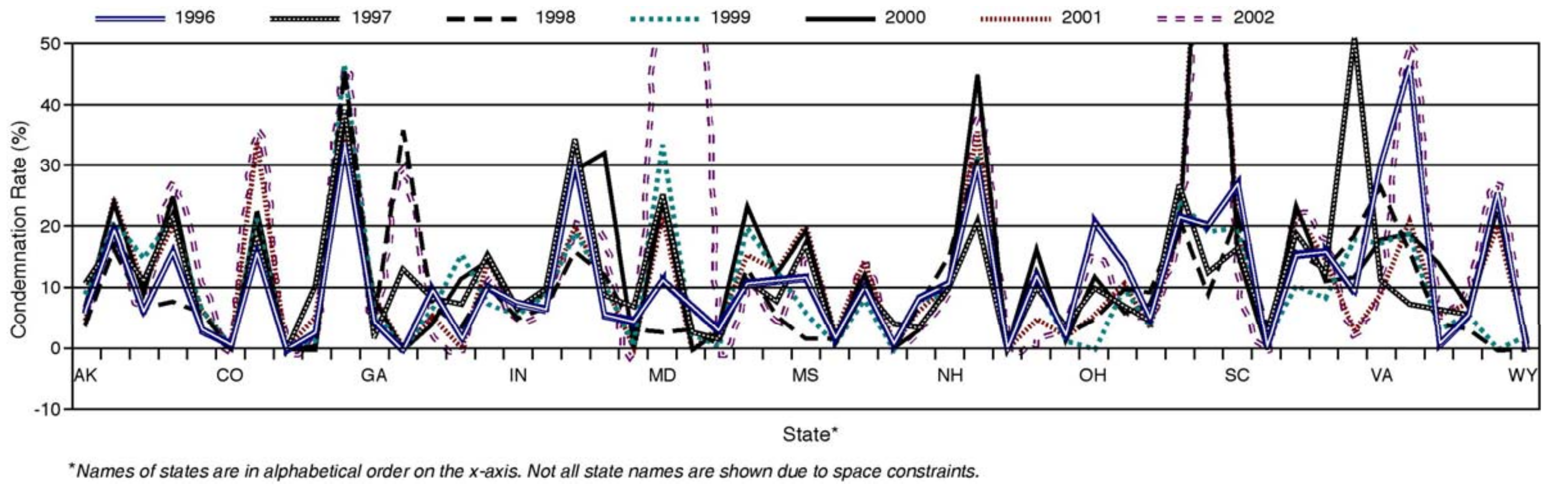

Figure 8.1   Condemnation Rates Variations across U. S. States

Notes: Names of states are in alphabetical order on the x-axis. Not all state names can be shown, due to space constraints.

The percentage of states offering “Yes” responses to each question (see Table 8.2) by each condemnation rate category was calculated. The final results are shown in Table 8.3. These percentages were then studied to ascertain any patterns between state condemnation rates and the key laws suggested by the 13 questions.

Table 8.2 Yes Responses to Key ROW Laws by State

State	Questions with Yes Responses
AK	1,2,9,10,12
AL	1,4,6,10,12
AR	1,5,8,10
AZ	1,5,6,9,11
CA	1,2,4,7,8,9,10,12
CO	4,6,7,9,10,12
CT	2,3,4,5,9,10,11
DE	1,5,7,9,12
FL	1,3,4,5,7,8,9,12
GA	4,5,6,7,9,11
HI	1,5,8,9,10
IA	1,5,6,7,8,9
ID	1,2,4,7,9,10,11
IL	2,4,5,7,8,10,12
IN	1,6,7,8,9,10,13
KS	1,6,8,9,10,11,13
KY	1,5,6,7,8,9
LA	2,4,5,7,8,10,12
MA	2,3,4,5,7,12
MD	1,2,4,7,8,9,10,12
ME	2,4,5,9
MI	1,2,4,7,8,9,10
MN	2,3,4,5,7,12
MO	1,4,5,6,8,9,13
MS	1,4,5,6,8,9,12
MT	2,3,4,5,7,9,10
NC	1,2,4,5,8,9,10,11
ND	1,2,4,7,8,9,10,12
NE	4,5,7,9,11
NH	2,4,5,9
NJ	2,3,4,5,7,12
NM	1,2,4,6,8,9
NV	1,6,8,9,10,11,13
NY	2,3,4,5,7,12
OH	1,4,5,7,8,9,10
OK	1,2,4,5,6,9,10,13

Table 8.2 Yes Responses to Key ROW Laws by State (continued)

OR	1,4,5,6,8,9,10,11
PA	2,4,5,7,8,10,12
RI	1,2,4,7,8,9,10
SC	1,2,3,4,5,6,9,10
SD	4,6,7,9,10,12
TN	1,5,6,7,8,9
TX	1,2,4,5,6,9,10,12
UT	1,4,5,7,8,9,10
VA	1,5,7,9,12
VT	2,3,4,5,9,10,11
WA	1,4,5,6,8,9,10,11
WI	4,5,7,9,11
WV	1,2,4,7,8,9,10
WY	1,4,5,7,8,9,10

Table 8.3 Percentage of Yes Responses to Key ROW Laws

Question #	Very High Condem. Rate 20%-50% Rate	High Condem. Rate 14%-20% Rate	Moderate Condem. Rate 8%-14% Rate	Low Condem. Rate 5%-8% Rate	Very Low Condem. Rate 0%-5% Rate
1	**85%**	75%	50%	67%	12%
2	**50%**	23%	32%	12%	81%
3	15%	**21%**	6%	18%	9%
4	10%	2%	**12%**	8%	11%
5	18%	25%	26%	51%	**76%**
6	34%	37%	45%	52%	**70%**
7	10%	15%	24%	36%	**51%**
8	25%	31%	35%	40%	**46%**
9	23%	27%	37%	43%	**54%**
10	30%	41%	47%	54%	**74%**
11	22%	4%	32%	40%	**44%**
12	4%	16%	25%	20%	**31%**
13	2%	6%	9%	10%	**12%**

Notes: Highest percentage of yes responses to each question are shown in bold. The numbers of states with very high, high, moderate, low, and very low condemnation rates are: 18%, 18%, 23%, 20%, and 21%, respectively.

The results of this exercise indicate that states that allow quick takings and taking of uneconomic remnants tend to suffer from the highest condemnation rates. Although permission of "quick taking" techniques can be useful in expediting the ROW delivery when project timelines are tight, it may be abused by ROW administrators. The power of eminent domain in taking remnants also is open to agency abuse. These opportunities for abuse may explain the higher condemnation rates witnessed in those states.

In contrast, states that mandate early public involvement; require sharing of appraisal details; allow early takings, land consolidation, and land exchange; emphasize negotiation; encourage flexible methods of mediation; and provide detailed and comprehensive laws on compensable items tend to enjoy the lowest rates of condemnation. Early public involvement allows an agency to predict what design alignments are likely to be problematic when acquiring ROW, thus helping avoid later litigation. The sharing of appraisal details makes the process more transparent, thus enhancing owners trust in agency actions. Early taking of land, if the project plans are known in advance, prevents interim developments and thus reducing cause for later disagreements. Land consolidation and exchange help make properties “whole”, thus reducing owner dissatisfaction. Finally, mechanisms for mediation and clear laws on compensation also smooth the acquisition process.

Those states that require payment of litigation costs and give property owners more than 30 days tend to fare somewhere in between, in terms of condemnation rates. These 2 provisions tend to put more power in the hands of the property owners, perhaps allowing for more demands and ability to contest acquisitions.
Legal statutes are one way to evaluate state acquisition processes. Another is a statistical evaluation of other factors at play, including demographics and land development, as described in the following section.

8.3 Condemnation Rate Model

A binary logistic model of state condemnation rates was developed using FHWA and Census data.

$$P_i = \frac{\exp(\beta x_i)}{1 + \exp(\beta x_i)}$$

where P_i, represents the percentage of the parcels taken to condemnation in state *i*, the β is a vector of parameters to be estimated (via the method of maximum likelihood), and x_i is the vector of explanatory variables for state *i*.

A stepwise procedure of adding and removing variables was employed to reach the final model, based on statistically significant explanatory variables. As shown in Table 8.4, the final model controls for the following statistically significant state characteristics: percentage of population in urban areas, percentage of land owned by the federal government, percentage of registered republicans, percentage of population with a college degree or higher, and total rural highway mileage per capita.

Table 8.4 Results of binary logistic model of average condemnation rates

	Coeff.	t-Statistics	p-value
Constant	-2.244	-3.932	0.000
%land owned by the federal government	-0.01258	-3.145	0.0255
%population registered to vote as republicans	0.01961	2.345	0.066
%population with a college degree or higher	0.3294	1.978	0.1048
%population residing in urban areas	0.5611	3.234	0.0231
Rural highway mileage per capita	-0.2315	-3.725	0.0136

Notes: The District of Columbia was excluded from this analysis due its constant 0% condemnation rate.
$N_{obs} = 50$
LRI = .066 (pseudo-R^2)

The parameter signs on the variables are in the expected directions. The coefficient on the percentage of population in urban areas is positive, which indicates that condemnation rates are higher in more urbanized states. This is as expected, because urbanization usually means more concentrated residential and commercial properties, which are usually more difficult to acquire (when compared to less developed/more rural parcels). The coefficient of the percentage of registered republicans also is positive. One might conjecture that registered republicans are less accepting of government "intrusion" in their lives, via activities like ROW acquisition. The percentage of population with (at least) a college degree also has a positive coefficient, perhaps because such persons are more aware of their legal rights, and are more financially capable of protesting appraisal values and government offers of compensation.

The coefficient of the percentage of land owned by the federal government is negative, as expected. The federal government does not need to deal with private property owners in order to acquire its own land. The coefficient of total rural highway mileage per capita also is negative, which is probably due to this variable's positive correlation with rural land, thus complementing the urbanized population variable discussed above.

8.4 Summary

In recent years, much emphasis has been placed on research in connection with the ROW acquisition process for transportation projects (see, e.g., FHWA, NCHRP, AASHTO, and TRB). There is strong emphasis on recognizing best acquisition practices in the U.S. While these various studies contain invaluable information and recommendations, they do not consider the unique legal, environmental, social, political, and economic characteristics of individual states. These qualities are reflected in the state's jurisdictional statutes and constitution, which restrict ROW staff in applying the recommended "best" practices.

This work compared state statutes for ROW acquisition, noting their associated weaknesses and strengths. It recommended modifications to current laws in order to expedite the acquisition

process, minimize cost, and build property owners' trust in government actions. Additionally, it estimates how various state characteristics impact property condemnation rates.
The results suggest that states should permit their ROW divisions to employ early taking, land consolidation, and land exchange techniques in the acquisition process. In addition, states should not only encourage, but require, their acquiring agencies to engage the public early and report appraisal details to property owners. Finally, more comprehensive and detailed state provisions and laws on compensable items should be sought, as these can significantly smooth the acquisition process.

The statistical model results suggest that more urbanized states face a higher rate of condemnation, due no doubt to the presence of more complex and costly properties. Rather interestingly, educational attainment and political party affiliation also were found to play statistically significant roles: condemnation rates rise with education and republican party affiliation.

Condemnation rates are on the rise, nationwide. This work provides some valuable indications as to how legal changes can reduce condemnation rates, and how other factors, not under legislators' control, also play a role.

9. Conclusions

This paper has presented research and models for the estimation of ROW costs and commercial property value, and compared state statutes and practices for ROW acquisition, noting their associated weaknesses and strengths.

The literature surveyed addressed the formal processes required of ROW acquisition, property appraisal methods, and the effects of transportation improvements on property values. Real estate journals were also searched for relevant property value studies. Models of home prices are plentiful, but few examples of commercial property value models were found in the literature.

Interviews with real estate professionals and a survey of ROW administrators in Texas and a number of other states identified key challenges to accurate ROW cost estimation and valuation issues. Real estate professionals identified a number of challenges to accurate ROW estimation. These include lack of information on commercial properties, lack of plan detail, time lapse between estimation and actual appraisal/purchase, and uncertainties associated with damages and court awards.

In order to study acquisition costs, actual ROW purchase data were collected from the TxDOT for projects in metropolitan areas. A total cost model was calibrated, which interacted property attributes with parcel and improvement areas. The model also attempted to control for damages through their effect on the value of any remainder parcel. The ROW purchase data were analyzed using least squares regression. A log-log model specification was chosen, because it explained the highest variation and exhibited the best fit.

Analysis of the ROW purchase data revealed significant regional differences in land values, and suggested that retail properties have higher acquisition costs, compared to other land uses. In addition to these, models of full-parcel commercial properties were calibrated. Commercial sales data for the central Austin area were obtained from Travis Central Appraisal District, and sales data for Texas' major metropolitan areas were purchased from CoStar Group. The sales data were again analyzed using least squares regression. Variance models were estimated in each case, and the method of FGLS was used to correct the standard error terms for heteroskedasticity. In the final analysis, the TCAD model explained more variation in the data, but the CoStar data set is more extensive in geographic coverage and in the number and type of variables.

The commercial property value models again revealed regional differences in land value, and provide predictions of value for a variety of land uses. The CoStar data set is perhaps more useful, since it has greater geographic coverage and controls for a larger number of variables. Modelers should identify possible sources of bias in hedonic price models. The method of FGLS was successfully used in this study to correct the standard errors for heteroskedasticity, and provide more efficient estimates.

The models presented here add considerably to the literature and research in this area and should prove valuable to ROW professionals, transportation planners, developers, appraisers, and others involved in ROW cost estimation and commercial property valuation. Commercial properties are particularly troublesome for ROW estimators and professional appraisers, since comparable sales data are often lacking or unavailable. Therefore, the models of commercial sales data should prove helpful, in the absence of more accurate information.

The commercial property models should also be useful as part of a larger framework to estimate the total costs of ROW acquisition in early project development. A case in point, the cost estimation model developed for the Virginia Department of Transportation provides estimates of value for different categories of residential dwellings, but it does not provide values for commercial properties (VTRC, 2003). Predictions such as those provided here address this inadequacy, and could be used to develop early estimates of value.

The models do have their limitations and weaknesses. The models only provide predictions of land and improvement values, and limited treatment of damages. The likelihood and monetary impact of court awards was not captured in the ROW cost model. Some transportation agencies maintain a separate database for administrative settlements and court awards, which they use to predict future costs and prepare estimates. The acquisition of these data sets can be very costly and time-consuming, particularly for ROW purchase data. State DOTs should seek to establish and maintain databases of actual ROW purchase data, which will allow them to track condemnation rates and damage awards, and facilitate better ROW cost prediction.

Further, data outside of Texas and results based on more generic (less region-specific) variables would be helpful. These might include variables characterizing population, wages, climate, accessibility, or economic factors. Whereas the TCAD database only included observations of improved properties, the CoStar data included sales of both raw land and improved properties. One might therefore consider separate models of land and property values in future work, as done by ten Siethoff and Kockelman (2002). Repeat sales (instances where the same property sold at a later date) were observed in both data sets. Future research might consider the inclusion of lagged variables or repeat sales regression techniques to correct for such autocorrelation (Gatzlaff and Geltner, 2000). One might also consider removing properties with extreme sales prices or unusually high variance.

The property cost models estimated here were incorporated into a user-friendly Excel spreadsheet, which serves as the key product of this work, for use by TxDOT ROW administrators and their staff. This product is described in Chapter 6, and complete instructions for its use are provided in Appendix G. Chapter 6 also details the application of this product in the estimation of acquisition costs for 57 distinct parcels in a variety of Texas settings. These 57 parcels were not used in the original model calibration. Few clear biases were found, suggesting that the tool will work well when applied at the corridor level, which is its intended use. This is because underpredicted values (per parcel) will tend to offset those that are overpredicted, resulting in overall budget estimates that may be quite close to the actual acquisition costs. While it is helpful to be able to predict individual parcel acquisition costs, this tool is intended for overall ROW cost budgeting and is not to be used as an appraisal tool. Furthermore, the tool can serve as a standard starting point for all TxDOT ROW budgets, providing consistency in cost estimation procedures across districts and corridors. Modifications to the standard cost estimates can be then made explicit, and total budget values adjusted as needed.

This work also compared state statutes for ROW acquisition, noting their associated weaknesses and strengths. Chapter 7 recommends modifications to current laws in order to expedite the acquisition process, minimize cost, and build property owners' trust in government actions. Additionally, this work estimated how various state characteristics impact property condemnation rates, and these results are described in Chapter 8.

The results of the comparisons suggest that states should permit their ROW divisions to employ early taking, land consolidation, and land exchange techniques in the acquisition process. In addition, states should not only encourage, but require, their acquiring agencies to engage the public early and report appraisal details to property owners. Finally, more comprehensive and detailed state provisions and laws on compensable items should be sought, as these can significantly smooth the acquisition process.

The statistical model results suggest that more urbanized states face a higher rate of condemnation, due no doubt to the presence of more complex and costly properties. Rather interestingly, condemnation rates also were found to rise with education levels and Republican party affiliation of a state's population.

Condemnation rates are on the rise, nationwide. This work provides some valuable indications as to how legal changes can reduce condemnation rates, and how other factors, not under legislators' control, also play a role. Of course, the heart of this effort is the cost estimation tool, for corridor ROW acquisition budgeting purposes. It is hoped that application of this product at the district level will permit greater budgeting accuracy, produce more informed assessments of project costs, and facilitate consistency in budgeting practices across TxDOT districts.

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Appendix A: Out-of-State Email Survey Instrument

Dear Mr. /Ms. (State Official),

The Texas Department of Transportation is seeking information, which might be adapted to future ROW in Texas. We'd like to learn about (state)'s ROW methods and procedures, which you feel are doing a good job in <u>any</u> of the following:

1. Overall Costs--Minimizing the total cost of ROW acquisition

2. Accuracy of Cost Estimates--Improving the accuracy of budget estimates and forecasting costs of ROW parcels for entire projects
   a. Improving cost estimates of partial takings of improved commercial parcels in metropolitan and urban areas;
   b. Predicting more precisely the size or amounts of damages as a result of legal proceedings;
   c. Is your department using any software or databases to predict more accurately predict ROW costs? If so, please describe very briefly:

      Also, do the databases rely on historical ROW costs, current economic and market indicators, or both?
3. Quicker Acquisition--Acquiring parcels quicker and more efficiently;

4. Innovations of Other Types-Adopting or testing <u>new</u> methods of any kind to minimize ROW acquisition costs or speed parcel acquisition such as:
   i. alternative dispute resolution,
   ii. feasible corridor preservation strategies,
   iii. revolving funds and very early purchase of critical parcels
   iv. revenue enhancements through temporary leasing of ROW property etc.

If (state name) has anything in the above areas, please return this email with a couple sentences and the name of the person with whom I can follow up by phone or email. If you have heard of any other states, which may be doing a particularly good job in any of the areas, please direct me to that state. Even if you have no programs or procedures to share, please respond so that we do not bother you with further emails in the future.

We will be pleased to share with you all the information we are provided by your colleagues, if you tell us you would like to receive such information.

Thank you.

James Jarrett
Senior Research Scientist
University of Texas at Austin
Austin, TX
512-475-8922/471-6990

Appendix B: Detailed Findings of Survey from Other States' ROW Administrators

Detailed Findings

A sampling of responses is given below. Items with an "*" are described more fully in a second section of this document. States are arranged alphabetically within each category.

Quantitative Approaches and Models

Alaska — Currently developing a project estimate function within the state's ROWDyS (Right of Way Delivery System) initiative. ROWDyS is an Oracle database system that includes permit functions, inventory, financial management, document management and various reporting features. The project estimate function is scheduled to come on line August 31.

***Connecticut —**The state "completed a review of our cost estimates in an effort to increase accuracy. As a result adjustments have been made to the per parcel cost assigned in the estimate. In addition market costs are included for items such as building demolition and relocation costs. A contingency for potential court awards is a standard part of all cost estimates."

***Idaho —**A former senior ROW staff person has developed a system that could be adapted for developing budget estimates. This is a comprehensive MIS, however, for all procedures in ROW and was not designed for estimation purposes per se.

Iowa —Project estimates are based on historical data "involving % of increase overall from the appraisal to what the owner signs for, and a % goes to condemnation. This process has given us a product that is a lot closer to the final project cost." The average increase is 40% over appraisal amount for everything that is condemned.

***Massachusetts —**Currently developing a software package that will help in forecasting total cost estimates for budgeting purposes. They also use a Massachusetts database service for appraisal work.

Michigan — MDOT real estate utilizes a spreadsheet that lists specific historical overhead costs for certain types of parcel acquisitions such as urban, rural, with or without relocation, and other information.

***Oklahoma —**Two databases are utilized regularly. One database is used for tracking historical costs of projects, maintaining data on the functional classification of the highway and the final right-of-way costs associated with the acquisition. As projects proceed toward a more developed stage, Oklahoma updates the cost estimates at pre-determined intervals. A second database covers administrative settlements, commissioner's awards, legal settlements, and jury verdicts. Staff use the statistical percentages derived from this when computing cost estimates, e.g. projected condemnation costs by county.

***Virginia—**State officials have developed an improved estimating system, which includes all aspects of scoping, design, and construction. The system was drawn from one of the state's districts, and the key to its predictive capabilities is its thoroughness. There are different modules to this Cost Estimating System, including ROW and utility relocations. The modules started with excel software already being used within the department, system modules have been through several iterations to date, including several years of usage in one district office, and have been beta tested throughout the State. Full implementation is scheduled for late 2003.

***Washington—**Cost estimates for eight large and complex transportation corridor projects have been validated through a Cost Estimating Validation Orocess (CEVP). CEVP recognizes that every project cost estimate will be a mix of the very likely, the probable, and the maybe. On the eight large projects, in each case, cost estimates were revised based on specific risks associated with the project. While the success of CEVP has led to substantial demand for validation of project estimates, the process is too intensive and too expensive for smaller projects. Therefore, WSDOT developed a scaled version of the CEVP called CRA.

***Wisconsin—**State has developed a staffing matrix, which provides workload estimates for different tasks in different types of appraisals. The tasks are: management and oversight, relocation assistance, signs, appraisal, review, negotiation, site clearance, and acquisitions without appraisals. The workday estimates are based on an analysis of recent historical acquisition data, and are reviewed and updated every few years by a committee of district and central office management staff. The matrix is a guide that can be used by district management to estimate personnel time requirements on a given project. A second component in the estimation process entails compensation and overhead costs for DOT employees. The accounting section specifies those costs. Combining the workload estimates and the personnel compensation estimates yields total labor cost estimates for specific projects.

Corridor Preservation

Illinois' DOT enjoys statutory authority to establish highway corridors.

Iowa's planning office within Iowa's DOT has a process to determine purchasing procedures for parcels in designated corridors. The planning office "makes a decision as to whether it is critical to acquire at this time or to let them build and acquire with the normal right of way process. At the present time, there is an account set up with $2,000,000 for this type of request."

Kansas has a corridor management section that works with District and ROW personnel to identify critical corridor preservation locations. Some corridor preservation acquisitions involve the purchase of land while others pertain to access control only. One project, for instance is closing highway access openings in an area of the state that is growing rapidly. Other corridor preservation acquisitions are the result of an "opportunity purchase" where a property comes on the market and is vacant

Michigan has a $7 million advanced acquisition fund for opportunity purchases in corridors that appear in the DOT's five-year plan.

Minnesota has several years of experience with expedited land acquisition. According to the state official who responded, the success has been mixed. They are looking currently at corridor investment strategies.

ROW Cost Minimization Techniques

Alabama—"We have found the accuracy and cost estimates to be proportional to the time and expense of making the estimates. This being the case we make project by project judgments on how much time and money to expend on estimates depending mostly upon the complexity of the development along the corridor."

Alaska — State ROW office is allowing the attorney general's office to negotiate with owners as a kind of disinterested third party before they file a condemnation action. Also, the Design group is sponsoring open houses, which educate owners about the appraisal and damage estimation process, show sensitivity, and generate goodwill.

Colorado—Procedures that CDOT uses for time, cost and resource savings include: use appraisal waiver for time and costs savings; administer a master contract with appraisers and acquisition/relocation consultants; negotiate by mail on non-complex acquisitions which saves in time and travel cost savings; adopt a minimum payment for very low value acquisitions; and pay protective rent to minimize subsequent occupant costs—in this procedure CDOT pays rent to prevent another party from occupying a parcel. Protective rent enables CDOT to avoid paying relocation expenses to a subsequent party.

Florida— FDOT has undertaken a pilot project with FHWA approval to add incentive amounts to approved compensation when making an initial purchase offer to property owners. The amount of the incentive is based on the approved compensation: the larger the compensation the larger the incentive. This pilot project is being tested under an experimental control methodology. The new procedure is being used in three FDOT districts on three separate projects, while a similar project, using the department's current and usual procedures, is operating in a different district. The test is being evaluated on cost savings by reducing administrative settlements, overhead, and reducing property owner fees and costs, that are reimbursed by the condemning authority under Florida law. Other expected benefits are increased negotiation rates and reduced acquisition time for the pilot projects. Early indications have been promising.

Florida has also adopted the implementation of the appraisal/conflict of interest waivers for non-complex acquisitions. Through coordination with FHWA, FDOT has established a $25,000 value ceiling for parcels not requiring an appraisal. In a state averaging negotiated settlement rates between 55% and 60%, the negotiation rate for parcels handled through the appraisal waiver average between 85% and 95%. The time and cost savings have been considerable.

Georgia—As a cost reduction technique, the state is leasing vacant buildings prior to acquisition to prevent displacements and related relocation costs.

Maryland—The state is doing more staff appraisals. They also implemented a policy for properties under $10,000 where the state does not obtain titles and does not obtain releases from lien holders. The most recent title deed is examined and the owner on record is paid. If another owner comes forward and proves ownership or partial ownership, that person is paid also. While there is some risk involved in this approach, it reduces delays in title work, and the procedure is used only on properties under the $10,000 threshold.

The State of Maryland also has a database of historic information on parcels that is used in identifying contingencies more precisely. The database includes all jury awards which allows the ROW staff to identify trends in these awards.

Massachusetts—The DOT conducted a work simplification project to reduce unessential steps in processing ROW acquisition. They also have used early environmental assessments and are changing the size of temporary parcels from standard width to actual size needed in design phase.

Minnesota—The state is studying proposals from engineering firms to conduct ROW acquisition as part of Design/Build submissions.

Missouri—They have been using mediation, per a requirement from the state legislature. The state DOT believes it has been achieving more rapid acquisition of parcels since their change to the single agent concept (the landowner is provided the acquisition offer and relocation benefits by the same agent) and by conducting mail offers.

Nevada—The ROW division works closely with design engineers to avoid costly or complicated acquisitions by snaking ROW corridors around problematic or expensive properties. An evaluation is made between constructing retaining walls or acquiring the parcel. Also the state is: (1) using sketch maps to start the appraisal process earlier; (2) acquiring properties prior to environmental clearance on some smaller projects, with state funds; (3) making more acquisitions through administrative settlement, because of delegation of authority to middle management and greater discretion to increase original offers; and (4) taking advantage of a state law that allows for exchanges of properties, without Transportation Board approval, provided the exchange is within the same project.

New Hampshire—They are placing an emphasis on settlement to avoid going through the court process. Also, relocation costs have proven to be troublesome to estimate. Many properties are purchased early, which allows maximum time for relocation of former owners. In some cases, “former” owners are permitted to remain in a building rent-free. This approach provides an incentive to settle and also can facilitate their relocation. The state, when requested by owners, will purchase a complete early acquisition and then sell the remainder after the project is completed.

State officials sometimes use a global settlement approach with businesses. This involves combining relocation benefits and appraised value to provide a lump sum to owners, although the relocation portion is not paid until the premises are vacated. In turn, the business is responsible for their entire relocation by a specified date.

North Carolina—They have been conducting pilot projects on raising threshold levels (without appraisals) in rural areas.

Oklahoma—Improving the efficiency of service providers is one of the three primary approaches for reducing ROW costs in the state. (The other two approaches are reducing condemnations through administrative settlements, and working with design personnel to minimize takings relative to critical properties.)

Service provider fees are significant, as about 90% of ROW work is contracted out. In-house staff work on administrative issues, emergency projects and a few small projects. Service provider fees are paid to consultants and contractors for preparation of right-of-way maps and deeds, appraisal and appraisal review services, negotiation services, relocation assistance, utility coordination, commissioner's fees and legal counsel fees. These fees represent approximately 5%, plus or minus, on an average project. On smaller projects the percentage of costs attributable to fees is higher and on larger projects, the percentage is smaller. There are many factors influencing the fee percentage on each project: the number of parcels, location and zoning, the size of the parcels, number and type of improvements, relocation issues, and so forth. (Another way of comparing costs would be to compare average fee costs per function: mapping, appraisal (residential, commercial, industrial), negotiation, relocation (residential, commercial, industrial), utility coordination, and so forth

Pennsylvania —$25,000 appraisal waiver limit.

South Carolina—They are beginning a mediation program prior to filing a condemnation action. A second internal review, involving a "fresh look at the facts" is required prior to going to condemnation and is credited with reducing slightly the condemnation rate over the past two years. They also have had a pilot project in which the state allows parcel owners to obtain their own appraisals using state funds, with certain conditions. Further, they have raised the limit to $20,000 for parcels which do not require an outside appraisal unless an agreement is not accepted. Also, they have also examined the differences between staff estimates and outside appraisals and determined that staff estimates usually are at the higher end of the range but that settlement at the higher end reduces the number of condemnation cases and associated costs.

Other Procedures (Revenue Generation, Pilot Projects, Procedures Being Studied for Possible Implementation)

Alaska—The ROW office is considering allowing local donations as part of the match from local governments.

Connecticut —All properties acquired for projects are available for lease to the previous tenant until the project moves forward to construction. Leases are based on market conditions.

Florida —has undertaken a pilot project using an alternative appraisal review process in an effort to speed up the production of a good-faith offer for the negotiator. Although still in the very early stages of development, an internally developed software application is being utilized that assists the appraiser and reviewer in the report preparation and review process by comparing critical data with pre-set quality standards or thresholds. This statistical process control application has been successful in reducing review time, although its impact on quality is still being reviewed.

Georgia—State is now offering owners an administrative appeal hearing of Fair Market Value following failed negotiations but prior to filing condemnation. A certified general appraiser conducts the administrative appeal hearing.

Illinois—has extensive experience with leasing, according to two state DOT officials. "In practice this enables us to re-coup some revenue prior to construction and build goodwill with neighbors adjacent to the right-of-way, such as agricultural interests. Since there is often considerable time between purchase and construction, this has proven to be a cost effective practice. Temporary rentals of housing helps to maintain the neighborhoods, continues to provide local tax dollars, as well as reducing our maintenance costs by eliminating the resultant empty structures and the problems that come with them. …. Leasing has primarily utilized the spaces under the roadways as major portions of these routes are constructed on elevated structures. Revenues from these leases in the last fiscal year resulted in approximately $1,000,000.00…. The department is striving to initiate more of these leases and should see a increase in the next few years as more spaces are leased and developed."

Kansas—Established a three-person section to acquire the more basic ROW acquisition projects. This group, Value & Acquire, uses the same appraiser to establish a value for each tract to be acquired and to negotiate the "offer of just compensation." This group handles projects that involve 10 or fewer tracts, are uncomplicated, and for which compensation is less than $10,000/tract.

Maryland—The state is acquiring total take improved properties prior to the receipt or acquisition drawings to speed up the process. All improved advanced purchases are leased until such time as the project is funded for construction. The state charges less then market rent because when the project is funded for construction the lease is canceled. Revenues are not significant but sufficient to make it worth the effort.

Missouri—leases excess ROW until they decide to dispose of it. They also mentioned that Iowa had been involved in leasing many houses during a major urban project several years ago.

Nevada—On a couple of projects, the state has experimented with advanced acquisition. There have been mixed results. The Advanced Acquisition Program began around hardship acquisitions and identifying vacant properties that were prime for development--the idea being to acquire parcels as raw land rather than improved properties. However, there have been some difficulties in estimating damages and also the state paid some damages as a result of inverse condemnation actions. Many of the properties acquired through advanced acquisition were rented or leased until needed for construction. While leasing, the state has encountered a range of property management issues.

New Hampshire—Because of the state's concentration on early acquisitions and settlement with property owners to avoid court proceedings, New Hampshire ends up with many buildings requiring maintenance. The property maintenance staff actively leases some properties and sells any surplus land or buildings not needed for the construction project.

Oklahoma—(1) "We tested an advance contact program recently, i.e. having an agent make early contact, pre-appraisal, with affected property owners just to provide an introduction, provide schedules, and inquire of concerns. It may have assisted with a better relationship later in the appraisal and acquisition stages as the first contact was not an immediate valuation contact or negotiation contact." (2) Some property, including minerals rights in years past, is under lease. However, it is a by-product of the acquisition and disposal process and is not a significant revenue source.

Tennessee—State has in place four continuing contracts for acquisition and relocation services and 40 contracts for appraisal services, which allows ROW to negotiate and issue a work order very quickly.

Washington—(1) The leasing program generates about $1.5 million per year with costs estimated at approximately half of that amount. The state has become more selective than in previous years because of maintenance costs on improved properties and political pressures when renting vacant land—some elected officials believe rents are too high while others criticize the department for rents being too low. (2) "State has been using an advance acquisition revolving fund for about 12 years. It has proven to be an effective tool."

Supplemental Information on Quantitative Approaches and Models

Connecticut—The State of Connecticut provided an excel spreadsheet used by their estimators to develop project estimates. The spreadsheet contains a number of items of interest. For instance, condemnation values are adjusted by 75%, based on prior experience with court awards. Court awards on one project represented 38% of the total cost, and this was a project involving primarily vacant land. Fees for appraisal, title, closing costs, and so forth vary little by parcel complexity, although there was substantial variation in the expenditures for acquisition, relocation and demolition costs.

Idaho—This is a comprehensive MIS that began 15-20 years ago and has developed incrementally since then. It was originally devised to reduce redundant tasks in the ROW acquisition process, identify bottlenecks and delays in processing, and evaluate different sections and districts. There are 55-60 data entry elements in the complete system, starting with the title section and eventually proceeding through the necessary district steps. Parcel identification numbers are used to track all parcels, and all steps and procedures in the critical path must be accomplished before subsequent tasks can be started. While the system does not contain parcel estimation or budget estimation modules per se, the developer believes they have all the necessary data elements in their system already. Authorization has been sought to share some of the data screens with us. The information has yet to be received.

Massachusetts—The ROW section has a consulting firm under contract to produce a new MIS system. Funding was provided by FHWA. The new system will join several discrete existing databases and create a couple new ones. For our purposes, the database initiative will make it easier and faster for ROW staff to compile and refine estimates. In Massachusetts, however, all project estimates are developed within the headquarters rather than in their five districts, and the budget estimation goal is quite different than in Texas. In Texas, this key issue has been better accuracy of estimates whereas in Massachusetts, accuracy is less important than budget expenditures. More precisely, Massachusetts frequently adjusts the pace of parcel acquisition to meet annual budget expenditure limits through mechanisms such as directing district staff to slow down offers, working with the Attorney General's office on the pace of court cases and so forth. Other differences between Texas and Massachusetts: utility relocation costs are unimportant and most parcel acquisition results from widening of existing roadways rather than new alignments in Massachusetts. Nonetheless, the budget estimation module may be of interest and the state contact promised to send materials via email in the near future. The state contact said he didn't know exactly when the new system would become operational although it should be within a couple months.

Oklahoma—Two databases are utilized regularly. One database is used for tracking historical costs of projects, maintaining data on the functional classification of the highway and the final right-of-way costs associated with the acquisition. Accuracy of the data in the historical database is considered sufficiently accurate to provide ballpark figures for scoping or preliminary planning activities, especially in the absence of functional plans or any delineated right-of-way. As projects proceed toward a more developed stage, Oklahoma updates the cost estimates at pre-determined intervals:

Scoping or preliminary planning -- usually by aerial
30% completed-- usually with functional plans
70% completed-- usually with substantially complete construction plans
Final -- after condemnation costs.

The state's level of confidence with the project dictates the efforts to update at certain milestones. The fluctuation in right-of-way cost estimates is generally greater than the fluctuation in construction cost estimates just due to the nature of the activities

A second database covers the increased amounts for administrative settlements, commissioner's awards, legal settlements, and jury verdicts. This database is arranged by county and is updated every time a settlement, award, or verdict is finalized. Staff use the statistical percentages derived from this data to anticipate the additional amount of monies needed to cover these inevitable project related costs when computing cost estimates, e.g. projected condemnation costs by county. Service provider fees, demolition costs, NESHAP inspections, hazardous waste cleanup costs, review costs, and inflation adjustments are included in cost estimates.

Virginia—Because of perceived poor cost estimates in the past, Virginia's DOT set up a task force in May 2002 to develop an improved estimating system. The system is comprehensive, including all aspects of scoping, design, and construction. The system was drawn from one of the state's districts, and the key to its predictive capabilities is its thoroughness. According to articles and materials sent by state officials, previously inaccurate estimates often occurred because items were overlooked or omitted, whereas the new system requires all project elements to be considered. The other important feature of the system is that it requires improved communications among various VDOT divisions to develop certain cost estimates.

There are different modules to this Cost Estimating System, and two are of primary interest to us: ROW and utility relocations. The system in intranet-based and variations in costs across the districts are possible. The modules started with excel software already being used within the department, system modules have been through several iterations to date, including several years of usage in one district office, and have been beta tested throughout the State. Full implementation is scheduled for late 2003.

Improvements in accuracy are expected immediately. As the system becomes more refined and robust, further improvements in accuracy are expected. The goals for the system are to achieve the following:

Individual project estimates (plus or minus 20%)
District wide projects (presumably in the aggregate—plus or minus 10%)
Statewide estimates (plus or minus 5%)

Further detail on the ROW and utility relocation modules has been requested from Virginia officials, and the operating modules have been received. A request for the documentation and for the underlying formulas behind the spreadsheets has been made. It is unknown if this request will be approved or whether a request from TxDOT will be needed to obtain these items.

Washington—Cost Estimating Validation Process (CEVP). The CEVP assigns risk to all of the various project elements, not just right of way, to determine an anticipated future cost. WSDOT developed CEVP to validate cost estimates for large and complex corridor projects. Eight of WSDOT's largest projects have undergone this validation process, and in each case, cost estimates were revised based on specific risks associated with the project. CEVP is an intense workshop process, somewhat resembling value engineering. Each project is examined by a team of top engineers from private firms, public agencies from around the country, risk managers, and WSDOT engineers. The CEVP workshop uses systematic project review and risk assessment methods, including statistics and probability theory, to evaluate the quality of the information at hand and to identify and describe cost and schedule risks. At the core of the CEVP is recognition that every project cost estimate will be a mix of the very likely, the probable, and the maybe. Meeting the estimate of the number of yards and the cost of concrete to be poured for a roadway is pretty likely. It’s probable that if the project is built five years from now, inflation will add 15-20% to “today’s” project costs – but it is less likely what the cost would be three years after that. And a big “maybe” is whether contaminated soil would be encountered during construction requiring expensive cleanup costs. Besides incorporating probabilistic variables, CEVP examines, from the very beginning, how risks can be lowered and cost vulnerabilities managed or reduced--CEVP promotes the activities that will improve end-of-project cost and schedule results.

Each project’s CEVP summary reflects the unique features of a separate project. But all of the summaries share the following points:

Project cost estimates are stated in dollar ranges, not as single numbers.

This reflects the limits of estimating precision at the planning stage when crucial decisions are yet to be made and the specific risks cannot be quantified with great precision.

Risk considerations specific to each project are identified and described.

This is done so that specific risk issues can be foreseen, discussed, and evaluated by the public as the project moves forward.

Project construction schedules are assessed with probabilities.

Schedule-based adjustments made to cost estimates to reflect the smaller purchasing power of dollars that could be spent on construction several years in the future.

CEVP is still being refined, and CEVP cannot change the fact that many unknowns exist at the early stages of project estimation. Moreover, at least in the public information available on CEVP, there is limited information on right-of-way. (See: http://www.wsdot.wa.gov/projects/cevp/sr509.pdf)

The success of the CEVP process for major projects has led to a high demand for validation of estimates for smaller projects. However, the CEVP process is very intensive and too expensive for smaller projects, and because of that, WSDOT has developed a scaled version of the CEVP called Cost Risk Assessment (CRA). A majority of the WSDOT projects, and a number of the local projects, have undergone cost evaluation by CRA.

Wisconsin—The state has developed a real estate staffing matrix that provides workload estimates by type of parcel. The main types of parcels and the total number of workdays, including staff appraisal time, are:

Nominal--Non-complex acquisitions with a value of $5,000 or less which may be acquired without an appraisal if the property owner agrees or with a short format appraisal. (2.85 workdays)

Intermediate--A relatively simple acquisition where highest and best use is obvious and land value is readily determined from comparable sales. (9.0)

Major--Acquisitions where land values are difficult to establish because the highest and best use is not readily ascertained. Land is in transition from an existing use to a higher and better use or comparable sales are not readily available. (14.6)

Complex--Complicated acquisitions from farm, business, manufacturing, or unique special purpose properties where the acquisition severely affects the site and/or improvements, requiring a detailed before and after analysis. Examples include loss of substantial parking from a shopping center/commercial property, loss of adequate access to a motel, loss of pumps and a pump island from a gas station, and other similar situations. (20.6)

Complex Improved-- Same as above except that improvements are included in the acquisition. Examples include a farm, church, school, motel supper club, major retail operations, manufacturing plant etc. Difficult relocation and site clearance are required. (31.5)

The workload estimates are used for internal purposes only and are not used to determine fees for consultants. (If consultants are used, district personnel are directed to deduct any time devoted to the project by consultants.) Once the types of parcels for a new project are sorted into the various categories, district personnel can begin estimating the time needed for the entire project. Then, the aggregate time estimates are multiplied by the workday rate for real estate personnel. That rate, which is comprised of an average hourly rate, fringe benefit rate, and several additional overhead items, was $297 per day in the current fiscal year.

Appendix C: Contact Information of States' Respondents

Georgia
Terry McCollister
Assistant RW Administrator
Georgia

Don Brown

Kentucky
Ralph Divine
Director
Division of Right of Way and Utilities

Maine
Ray Quimby

Idaho
Jesse (Bill) W. Smith, Jr.
Right-of-Way Supervisor
Idaho Transportation Department

South Carolina
Oscar Rucker

Connecticut
Richard Allen
Rights of Way Division Chief - Administration
Connecticut Department of Transportation

Minnesota
Karl Rasmussen
Ass't Director - Real Estate and Policy Development
Office of Land Management
Minnesota Department of Transportation

New Jersey
Nick Monahan
Robert Cunningham

Mississippi
Lockett Peyton
Right of Way
Assistant Division Administrator

Florida
Ken Towcimak
Thomas Shields

North Carolina
John Williamson

Iowa
Colleen Chapa
ROW Relocation & Design

James S. Olson
Right of Way Supervisor

Nebraska
Randy Needham
Right of Way Manager
Nebraska Department of Roads

Missouri
John Martin
State of Missouri

Massachusetts
Gerry Solomon
Commonwealth of Massachusetts

Russell McGilvray
Commonwealth of Massachusetts

Michigan
Matt DeLong
William Swagler
Anthony Stoker

Illinois
Dennis Hollahan

Zachary Taylor
Property Manager / Bureau of Land Acquisition
Illinois Dept. of Transportation

New Hampshire
James A. Moore, P.E.
Asst. Director Of Project Development
N.H.Dept. of Transportation

Bill Janelle

Tennessee
Mike Phillips, Director
Right-of-Way Division

Washington
Gary Gallinger
State of Washington

Jennifer Brown
State of Washington

Oklahoma
Kurt Harms
Chief of ROW
State of Oklahoma

Alabama
Deborah Speigner
Alabama

Pennsylvania
Gary C. Fawver, PE
Chief of
Utilities and Right of Way Section

Kansas
Rob Storck

Alaska
G. E. Rick Kauzlarich, State Right of Way Chief
State of Alaska DOT & PF

Wyoming
John Sherman

Wisconsin
Becky Krugman

Maryland
Christian Larson

Indiana
Ken McClure

Nevada
Paul A. Saucedo
Asst Chief R/W Agent
Nevada Department of Transportation

Colorado
Pat Bergman
Colorado

Virginia
Michael Perfater
Stephen Haynes
Cheryl Kyte

Appendix D: Email Survey Instrument for Texas Districts' ROW Administrators

We've begun an applied research project to develop an estimation model (technique, rule of thumb etc.), which can be used by TxDOT for internal budgeting purposes. *This is not an appraisal model for individual properties*, and will not take the place (or bias in any way) professional appraisers' work, which is required of all State ROW processes. Nor will the estimation model be used by appraisers or used in any legal proceedings. The estimation model may be used by TxDOT district and HQ personnel for initial project budgeting and annual departmental budgeting cycles.

Your Name: ____
District: ____
Date: ____

I. Current Procedures in Your District

1. Budget Estimates—

How do you prepare budget estimates for future ROW projects?
What are the procedures used?
Are they informal "guess estimates" or is there a fairly precise methodology used?
Are the estimates made primarily on individual parcels (micro) or on the entire project or major sections of a project (macro)?

Please be specific and if it applies to your district, please describe the procedures for the schematic stage, multiple alignment stage, preferred alignment stage, and when your district has the final ROW maps.

2. Accuracy of Estimates—

How well has your district done in terms of accuracy?

When the estimate is "off", is it generally low or high?
(Please quantify in percentages your past accuracy.)

Why?

3. What types of parcels, if any, are the most difficult to estimate without using outside appraisers?

4. What is the timing of the estimation/appraisal link—are estimates needed months (years?) in advance of any appraisal data?

5. How common are "partial takings" and "uneconomic remainders?"

Do they differ by project/corridor type (e.g., upgrades vs. expansions vs. new-location freeways)?

6. In your district, do the planned alignments consider ROW costs to the extent they should (e.g., via access issues, creation of uneconomic remainders, generation of lawsuits)?

7. Are you satisfied with current budget estimation procedures?   If not, why not?

8. Do you use the ROWIS information database in performing estimates or is it helpful in any way during the estimation process?

II. Ideal Procedures and Improved Process

9. What would be the ideal, practical estimation procedure for you at the district-level?

10. What are the biggest impediments, if any, to developing this ideal estimation procedure, or at least an improvement over what is done now?

11. Are there any promising or innovative procedures you've heard about or are working with to improve the current estimation process?

12. What, if anything, could be done now and at minimal cost to improve the process or procedure in your district?

13. Are the district engineers/planners finding ways to ***proactively*** save land, time, or money? (Examples might be by purchasing easements for impacted parcel owners through their neighbors' parcels, by building back roads, by warning developers and builders many years in advance of later corridor needs, and so forth.)

If that is occurring, please identify what has been the most successful

III. People

14. Who at the local level do you deal with mostly on ROW issues—county, city, metro—and what kinds of questions do they ask you regarding ROW cost estimates?
Are there any individuals (locally, anywhere in Texas, or elsewhere) whom we should contact regarding the estimation of ROW costs?

If so, please list their name, their phone number, why we should call them, and if we should, or should not, mention your referral.

15. Is there anything else you wish to mention about any aspect of this topic? Our project team will be starting to generate a data set which details specifics of parcels, date when they were acquired, corridor details, condemnation issues, and other relevant information for which we can control statistically and/or describe more qualitatively. The ROWIS database will be the first source but if necessary, can a member of our project team (Jared Heiner, email: jheiner@mail.utexas.edu) contact you regarding data from your district?

Appendix E: Detailed Findings of Survey from Texas Districts' ROW Administrators

I. Current Procedures In Your District

1. Budget Estimates—

How do you prepare budget estimates for future ROW projects?
What are the procedures used?
Are they informal "guess estimates" or is there a fairly precise methodology used?
Are the estimates made primarily on individual parcels (micro) or on the entire project or major sections of a project (macro)?

Please be specific and if it applies to your district, please describe the procedures for the schematic stage, multiple alignment stage, preferred alignment stage, and when your district has the final ROW maps.

While there is great variation in how the districts describe their estimation procedures, and several districts do not believe there is much consistency across the districts, there may be more comparability than thought. All districts proceed from a general or macro approach in the early stages to a more refined micro (parcel by parcel) procedure as ROW choices are made. Much variation across the districts probably is due to differences in project sizes, the stage at which projects are first estimated, and information availability. There does appear to be differences across districts on parcel types, project types, condemnation rates, and a host of other factors. However, it seems that a parcel involving strip shopping center parking would be estimated similarly (procedure, not the value) in most metro areas. Likewise, partial takings of rural farmland would be estimated similarly.

The procedures used by four districts are provided below. They show both the diversity and the similarity in general approaches.

The first comes from one of the major metro districts (Dallas).

"The estimation process is viewed in successive, distinct stages.

a. **Schematic stage—This is a very general regional estimate at the earliest stages of a potential project. At this point they usually only have a centerline and a 300 foot corridor to go on. ROW develops an estimate, based on the area and type of project (rural, metro, widening-new etc.), using a "cost per mile" calculation. Successive estimates become much more refined for the following stages.**
b. **Multiple alignments—usually 3-4 although sometimes as high as 5.**
c. **Preferred Alignment**
d. **ROW Maps—parcel by parcel.**

Once estimates, however rough, are developed at stages b, c, or d, a district may add a certain contingency percentage for expected damages, unknowns, past experiences, and other contingencies."

The second example comes from an urban area district (Waco).

"The procedures are very similar to other district offices. In a nutshell, if they (ROW staff) have a ROW map, they estimate how many square feet of property will be needed, multiply that by a price per square foot for the different types of parcels, and then add the parcel amounts for an aggregate number. If they have only schematics, they look at each property and develop a very gross estimate."

The third comes from a mostly rural district (Brownwood).

"Visually inspect project
Calculate land area
Categorize property types
Discuss land values by category with local appraisers and realtors
Value improvements
Estimate damages to any remainders (fencing etc.)
Calculate utility adjustments
Estimate relocation cost
Estimate closing cost

A fairly precise methodology is utilized. Estimates are normally made on a per-parcel basis. Each parcel is visually inspected and an estimate is applied to known cost of similar land and improvements along with other known cost of acquiring real property."

And the fourth example comes from a small urban area district (Tyler).

"If the estimate is just for programming and a best guess is needed quickly-- We talk to the project manager and may drive the project. We also contact local real estate agents and call utility companies to get a rough estimate. We may only have a county map with the limits shown and maybe need estimates for taking ROW off one or both sides.

If we need a more detailed estimate, we use whatever information we have available at the time. We use approved schematics, preferred alignment or approved row map. Drive the project and look at each parcel for damages to the remainder, improvements in the taking, utility lines on public and private row."

2. Accuracy of Estimates—

How well has your district done in terms of accuracy?

When the estimate is "off", is it generally low or high?
(Please quantify in percentages your past accuracy.)

Why?

On the general question (how well has your district done), the responses were fairly evenly divided between positive and neutral, with almost no one saying they were doing a poor job. At least one-third of the districts said they have never looked at the accuracy of their estimates.

In looking at the districts that provided a numerical estimate of their accuracy, the most common range was 15%-30% off. Twenty-five percent was cited by a number of districts and might serve as the point estimate.

Of those who provided a response, the majority of districts, probably two-thirds, said their estimates were too low, compared to the eventual ROW costs. Some districts cited specific reasons for the differences (e.g. rate of condemnation proceedings, the likelihood of an unpredictable judgment for damages and so forth). Some districts said estimates are really nothing more than "guess-estimates", and others did not cite any reasons.

Several districts are now regularly adding contingency percentages on top of their best estimates. One district is adding 20% for its rural parcels and 33% for its urban parcels. Other districts are in the 30%-40% range. One said it has gone as high as 50%.

One metro district stated that even adding a "fudge factor" was less than adequate because they see considerable variation by project within the district. The estimates depend to some extent on characteristics of the projects themselves (widening from 2 lanes to 4, widening from 2 lanes to 6, as opposed to new alignments etc.). The estimates also depend to some extent on each project's condemnation rates (as high as 40-50% on some projects), donations (on one recent project, more than 60% of parcels were donated), close-by-deed rates (proportion accepting TxDOT's offer), and jury awards. Another metro district believes a good measure of how well they are estimating is the proportion of trials that terminate early. In their view, when more owners decide after a day or two that they will not receive large awards, that vindicates the accuracy of their original parcel estimate.

3. What types of parcels, if any, are the most difficult to estimate without using outside appraisers?

- ***Parking for commercial properties (strip shopping, stand alone retail, office buildings, and display (auto lots) businesses) all were mentioned. Depletion of strip shopping parking can mean the property is limited in its choice of possible tenants and also that its income potential and long-term value is diminished.***
- ***Billboards—Dallas and Houston, although for different reasons***
- ***Utilities in rural areas—availability of information, timeliness of information, discrepancies between expected and actual locations;***
- ***Utilities in metro areas (problem is obtaining information on "what is where" although once they have that information, the estimation process is straightforward)***

- ***Chain and franchise stores because of parking considerations and expertise of property owners in negotiating with departments of transportation on ROW;***
- ***Contaminated parcels--Houston***
- ***Industrial parcels—A higher proportion go to condemnation;***
- ***Churches—Parking is very important and they rarely accept TxDOT's offer;***
- ***Mixed-use parcels—More complex than single-use parcels and more difficult to find comparable properties;***
- ***Large irrigation systems—Several rural districts***
- ***Obtaining information on commercial properties was cited as a problem for most metro districts.***

4. What is the timing of the estimation/appraisal link—are estimates needed months (years?) in advance of any appraisal data?

The typical timeframe for large projects was estimated to be three years, with some stretching out to five and seven years. Small projects usually required less than a year, and sometimes only six months.

One district noted the irony of the tradeoff between amount of information and available time. For TxDOT estimation purposes, the district usually has sufficient time to prepare estimates but not much information, whereas in providing estimates to local government officials, the district generally has sufficient information but not much time.

The ROW administrator of one metro district argued that it is very difficult to forecast property values several years into the future. Not only is it difficult to forecast the national and state economic conditions and how property values in the aggregate will change over that period of time, but their estimates also must take into account projections about values for different areas and different classes of property within the metro region, and then incorporate the specific factors for each parcel.

5. How common are "partial takings" and "uneconomic remainders?"

85%-95% are partial takings. Uneconomic remainders are either non-existent (rural districts) or a maximum of 5% in several districts. Perhaps half of the districts with uneconomic remainders expressed displeasure about the cumbersome nature of current TxDOT procedures on uneconomic remainders.

Do they differ by project/corridor type (e.g., upgrades vs. expansions vs. new-location freeways)?

Generally, partial takings are associated with upgrades and expansions vs. new locations. Partial takings are more common in rural than in metro and urban districts. Whole takings are most common with city parcels, especially when new locations are involved. Uneconomic remainders are equally common on upgrades and new locations.

In terms of expense, partial takings are more expensive on upgrades and expansions than on new locations. When uneconomic remainders occur with new locations, at least one district tries to acquire entire parcels rather than deal with denial of access, bisected properties, and control of access problems.

6. In your district, do the planned alignments consider ROW costs to the extent they should (e.g., via access issues, creation of uneconomic remainders, generation of lawsuits)?

Most districts said yes, although several expressly indicated more could be done. A number of districts indicated coordination between the design and ROW staffs had improved noticeably from the past. In the past, ROW staffs were sometimes not consulted about possible costs until late in the process. Now many of the districts appear to view ROW staffs as part of the decision-making process and their advice is used in determining if small alignment changes could affect cost significantly. No district mentioned, however, any rules of thumb about when an alignment would be changed based on a cost-tradeoff.

7. Are you satisfied with current budget estimation procedures? If not, why not?

The majority of districts said yes. If there was a pattern, it seemed that the rural districts are more satisfied. Others said the process is as accurate as it can be because of the nature of the process (lead time involved, uncertainty of alignment, lack of information, unpredictability of condemnation awards, unforeseen utility costs, uniqueness of each project and set of parcels, and so forth) precludes much improvement. However, a number of districts identified potential improvements from a database or more systematic information. (See below the section on Specific Comments on Databases and Models, on page 11.)

8. Do you use the ROWIS information database in performing estimates or is it helpful in any way during the estimation process?

Most districts do not consider ROWIS to be useful, several indicated ROWIS was a negative in fact, and ROWIS is being used in estimates only by a couple districts. There, it did not seem to have a central role. Comments about ROWIS ranged from its non-historical data, to non-comparability across regions, and its lack of utility information, which two districts indicated comprised up to 50% of ROW costs for them.

Several districts also noted they use current market data from appraiser files or the local tax district, rather than ROWIS data, to produce estimates. One district said ROWIS is not at all beneficial in generating estimates or in calculating values for parcels because (a) there is no narrative on the parcels, (b) no information about curative measures, and (3) nothing which would provide an appraiser with information about why a parcel may or may not be unique.

II. Ideal Procedures and Improved Process

9. What would be the ideal, practical estimation procedure for you at the district-level?

10. What are the biggest impediments, if any, to developing this ideal estimation procedure, or at least an improvement over what is done now?

11. Are there any promising or innovative procedures you've heard about or are working with to improve the current estimation process?

12. What, if anything, could be done now and at minimal cost to improve the process or procedure in your district?

Few districts thought anything could be done. As noted in the answer for item 7 above, the majority of districts believe the current estimation process is satisfactory. Several districts said more information and more staff would improve valuation and budget estimates. Others said the existing framework and its constraints prevented improvement. Suggestions were mostly items such as obtaining ROW requirements and good maps earlier. For some rural districts, and at least one urban district, in particular, utility costs are a problem. Usually the problem relates to either obtaining information in a timely fashion about the location of utilities or to discrepancies between what utilities are expected and what are actually found on site. Another district suggested advanced surveying would help them determine if there were likely to be any major impacts on a parcel. (Staking the ROW alignment.) This district also suggested greater utilization of "distance finders" which would enable TxDOT personnel to gauge more accurately where they are located and how much ROW they would be taking from a parcel. At the estimate stage, they are unable to "walk the land."

Other impediments: securing information from tax appraisal districts which had provided information in the past without a charge but which now requires a fee; obtaining information about commercial sales; and finding sufficient staff time to prepare detailed estimates as most of their staff's time needs to be devoted to reviewing appraisals (because of the limited staff time, one district recently hired for the first time an appraiser to develop an estimate.)

Obtaining information on commercial properties was cited by most of the metro districts as being a problem. None has a solution, however.

One district suggested a Louisiana procedure "Quick Take" as being worthy of further consideration by TxDOT. The Texas Turnpike Authority has the authority for a "quick take" procedure, although it has yet to be used.

13. Are the district engineers/planners finding ways to *proactively* save land, time, or money? (Examples might be by purchasing easements for impacted parcel owners through their neighbors' parcels, by building back roads, by warning developers and builders many years in advance of later corridor needs, and so forth.)

If that is occurring, please identify what has been the most successful

This produced a wide range of specific responses, mostly from metro and urban districts. The predominant answer was that their district was involved with one or more of the examples or had considered them but found they did not apply. (Note that this question was not asked of all districts.) One of the metro districts provided a lengthy response on this, which is included beginning on page 14.

Another metro district no longer provides information to developers and builders about longer term ROW corridor needs as the district is convinced it has worked against, rather than benefited, TxDOT interests. The district ROW director provided examples of how information was used by property owners and condemnation attorneys to increase their eventual revenues from TxDOT.

III. People

14. Who at the local level do you deal with mostly on ROW issues—county, city, metro—and what kinds of questions do they ask you regarding ROW cost estimates?

For the most part, city and county officials ask TxDOT districts what their contributions will need to be and when they will need to budget for them, rather than questioning the amount of the estimates or the methods used to generate the estimates. Several districts said they knowingly estimate high so that the local officials are not caught off guard, but several others noted that high estimates had caused problems when local officials reserved more funds than needed or when local officials had trouble meeting the requirements. Another noted that because his estimates are not based on a strong methodology, he believes the local officials are relying on him because of personal trust more than anything else.

Are there any individuals (locally, anywhere in Texas, or elsewhere) whom we should contact regarding the estimation of ROW costs?

If so, please list their name, their phone number, why we should call them, and if we should, or should not, mention your referral.

No one suggested anyone outside of Texas. Several districts named other district personnel. Others suggested were condemnation attorneys, individuals who previously worked for TxDOT, private appraisers, and acquisition consultant companies.

15. Is there anything else you wish to mention about any aspect of this topic?

One district provided considerable information about problems with parcels where there are title difficulties: lack of wills, liens, bankruptcies, divorces, and so forth. Several districts noted that changing some administrative procedures (settlement authority, business reestablishment limitation) would speed up certain types of smaller acquisitions. Several districts also noted

that they would like more frequent sharing among the districts of promising techniques and how others have addressed certain issues. One of the major metro districts provided unique information on condemnation attorneys and the myriad legal, political, and judicial constraints within which TxDOT ROW operates. This district believes the technical aspects of estimation can be handled adequately but that the non-technical (political, legal, and judicial) issues, which affect ROW estimates and costs, are mostly beyond the scope of districts.

Our project team will be starting to generate a data set which details specifics of parcels, date when they were acquired, corridor details, condemnation issues, and other relevant information for which we can control statistically and/or describe more qualitatively. The ROWIS database will be the first source but if necessary, can a member of our project team (Jared Heiner, email: jheiner@mail.utexas.edu) contact you regarding data from your district?

Every district responding to this, which was most districts, was willing to provide data.

Specific Comments on Databases and Models

(Unless otherwise noted, these are verbatim comments from the districts, with minor editorial changes.)

Brownwood

A comprehensive database relating to cost would be helpful, especially in the area of consultants and utility adjustments.

A comprehensive database of right of way costs from around the State (would improve the process).

Bryan

A systematic approach to estimating the costs would be helpful. If the program were offered with a spreadsheet type of analysis this would help compare differing alternatives.

Obviously a model that used a set of variables that anyone could plug into and produce a ROW estimate would be ideal. In this model you could have multiple variables found throughout the general area you are acquiring. It would be nice to have the ability to assign low, moderate, or high values for tracts of land with the necessary attributes giving them this value.

Corpus Christi

An improvement would be to have all the details about the proposed acquisition as early as possible. The ideal would be to plug the specifics such as size, type of property, location, etc., in a database to get an estimate. (This would be the ideal, practical estimation procedure at the district-level.)

We have recently discussed developing a crude table of rural and urban land values by county for use in the early stages of alignment planning. The table, while it may not improve the accuracy, could be used to simplify the process, and could be used by designers not familiar with land values.

Utility adjustments and, often, residential and business relocation costs, can comprise a significant portion of right of way acquisition costs. In this area, utility adjustments often exceed the cost of the land on a project. These costs can be difficult to estimate, because often we do not know the extent of the necessary adjustments. We try to estimate these costs based on our prior experience. It would be helpful if there were some statistical data compiled on these as well.

Lubbock

Are there any promising or innovative procedures you've heard about or are working with to improve the current estimation process?

Use of statewide averages of relocation assistance cost, cost estimate services on the Internet for improvement estimations- Marshall & Swift, http://www.CMDFirstSource.com/index.asp

Tyler
Do more SUE work on projects and have a common database to access actual costs for utilities on current projects (would improve the current estimation process).

Yoakum
Are there any promising or innovative procedures you've heard about or are working with to improve the current estimation process?

The Yoakum District uses an Access database to aggregate the estimates. This allows flexibility in answering budget questions.

Amarillo
Are there any promising or innovative procedures you've heard about or are working with to improve the current process?

What would be nice is a vast database of regionally-based data which could be drawn upon by administrators and their staffs. The existing databases focus on property information which doesn't help ROW administrators that much (replacement cost guide for buildings) or they are very laborious and cumbersome to use, such as appraisal district information. A "good database" should contain detailed regional data so that an estimator in Amarillo can find that a three-phase power line of 10 miles should cost such and such, i.e. the data elements should be priced in unit costs appropriate for them. Other types of utility infrastructure data elements should be included also.

Databases that might be utilized for the new database: Marshall and Swift (replacement cost of buildings) and the Handy-Whitman Index of Public Construction Costs.

Waco
Researcher note: This district is at the very beginning stages of creating an access database for parcels, but they have nothing to share currently, as it is in the preliminary design stage.

Austin

Researcher note: The process is about as good as it can be right now. District ROW staff believe (1) every parcel is unique; (2) every situation is unique; (3) regional variations would be too significant to use a database; and (4) staff experience is the primary determinant of estimation accuracy. However, some type of quantitative model might be useful if staff experience could be incorporated into it or if the database could be used to "add experience" for their young, less experienced employees. (They have 18 ROW staff currently, down from 30 several years ago because of a declining workload.)

Abilene
Researcher note: District ROW administrator is interested in some type of model or computer program that would be more standard across districts, have more credibility, and generate more accurate estimates than current techniques.

Beaumont

Researcher note: District ROW administrator needs something to reduce the time his staff spends on the 4-5 optional alignments, which never get built on each project. In his view, if a software package could be developed or is already available which would speed up the estimation process without proving too costly, it would be worthwhile.

Dallas

The Dallas district has some type of database of parcels.

Because of a retirement, the district is looking at the option of having estimates performed by an outside consultant. One of them has a database which he says can verify estimates, based on work that he performed in Austin.

Incidentally, the Dallas district does not use much appraisal district information as they have found it "pretty useless." Valuations used to be too low compared to actual sales, and now they believe appraisal district valuations are too high, compared to market prices. So they use sales information instead, commercial brokers whenever possible, and also the Roddy Report in their estimation work.

<u>Comments by San Antonio District on Proactive Approaches</u>
(Juan Zaragosa, San Antonio ROW administrator, emails from February 6-7, 2003.)

13. Are the district engineers/planners finding ways to proactively save land, time, or money? (Examples might be by purchasing easements for impacted parcel owners through their neighbors' parcels, by building back roads, by warning developers and builders many years in advance of later corridor needs, and so forth.)

The SAT District does a good job usually through the Project Development Process and strives to be proactive. Need to involve the ROW Personnel early in the initial phases of all project development to better utilize the ROW acquisition and appraisal expertise.

The SAT district is doing all of these (Advanced Acquisitions, donations, land exchanges, plat dedications, etc.) and using several combinations of each. If ROW personnel are involved in the early planning process, they may be able to identify problem parcels that will require special handling. In early or advanced acquisitions, it is possible to sequence acquisition work to deal with difficult parcels. This may be due to the complexity of the property or the ownership and previous acquisition history. In a Metro District, most acquisition are repeat business or old transactions handled correctly reap some good and/or bad returns. The ROW staff is in the unique position of having access to this information, if it exists to share with project designers or planners. Parcel donations can also be identified or handled in the early project development phase of planning a project. There are times that a landowner does not wish to sell but they may have some plan that will work with an exchange of property between them and TXDOT. This can also be handled by ROW staff after the parcel needs are developed, the exchange agreement may be an option to allow TXDOT to acquire and the landowner to also acquire some piece of ROW for his use of the remainder property to reach his highest and best use of the site. Because of a past transaction or repeat business, some property owners are willing to donate a tract early into the project and continue there development rather than wait for the project to develop through the planning and then the acquisition process. An announcement that a project will occur can really impact or label a property with a negative image. Ex: TXDOT will destroy the interim development of the tract with its future highway expansion. The payment of acquisition costs and damages does not always compensate a property and/or a new business for the disruption during the life of a project (from initial survey work to final completion of the highway improvements.) Temporary Construction Easements are usually not very effective or useful. They also impacted a property for the life of a project and may result in the same business loss of a partial or full taking and without the benefit of Relocation Assistance Program for displaced owners. If project needs are identified early and a property is to be platted through the Local Public Agency, dedications through the plat process do occur, especially if the required future ROW will be a minor amount of property, the developer will plat the required future ROW need. The voluntary setback by a developer in a proposed development of land needed for a future ROW project is also very helpful in the acquisition phase of a ROW project. It will minimize damages to the remainder property and avoid the cost of purchasing improvements along the required ROW. For the developer, there is the benefit of full disclosure that a project is forthcoming also along the corridor at a later date and some assurance that the highway project will not be destroy the planned use of a property being offered for sale. The

required need for more full disclosure in the real estate market make it helpful for the TXDOT to provide the ROW needs early to the community being impacted by a project. Being able to confirm a sale through a friendly land title company is a tremendous asset to have in any project development and the estimating of ROW costs becomes more accurate based on actual sales in the area of planned projects. This really helps the estimating of planned project costs. Advanced acquisitions and land exchanges are the best tools available once the property owner concedes that a project will occur in the future. A good recent example is the future Kelly Parkway Corridor. People along the proposed corridor are now ready to sell or deal with us. We will need to wait for planning to be complete and funding to allocate before we can proceed to purchasing parcels.

Appendix F: Contact Information of Texas Districts' Respondents

Fort Worth
Bill Wimberley, P. E.
bwimber@dot.state.tx.us
Phone: (817) 370-6550
Fax: (817) 370-6557

Beaumont
Lynwood Walters
lwalter@dot.state.tx.us
Phone: (409) 898-5701
Fax: (409) 896-0265

Abilene
Tommy Jones
tjones@dot.state.tx.us
Phone: (325) 676-6830
Fax: (325) 676-6902

Christopher Medley (Ft. Worth appraiser)

Amarillo
Larry Black
lblack1@dot.state.tx.us
Phone: (806) 356-3380
Fax: (806) 356-3263

Austin
Bob Harwood
rharwoo@dot.state.tx.us
Phone: (512) 832-7219
Fax: (512) 832-7248

Dallas
Travis Henderson
thender@dot.state.tx.us
Phone: (214) 320-6264
Fax: (214) 320-6605

Houston
Frances Willison
fwillis@dot.state.tx.us
Phone: (713) 802-5681
Fax: (713) 802-5700

Lufkin
Steve Evans
jevans@dot.state.tx.us
Phone: (936) 633-4324
Fax: (936) 633-4374

Atlanta
Dan Weathersby
dweath@dot.state.tx.us
Phone: (903) 799-1320
Fax: (903) 799-1229

Yoakum
Bob Clark
fclark@dot.state.tx.us
Phone: (361) 293-4342
Fax: (361) 293-4336

Odessa
Gary Law
glaw@dot.state.tx.us
Phone: (915) 498-4712
Fax: (915) 498-4760

Bryan
Samuel Wilson
swilson@dot.state.tx.us
Phone: (979) 778-9721
Fax: (979) 778-9705

Brownwood
Charles Tyner
crust@dot.state.tx.us
Phone: (325) 643-0451
Fax: (325) 643-0306

Tyler
Dwayne Tyner
dtyner@dot.state.tx.us
Phone: (903) 510-9137
Fax: (903) 510-9122

Corpus Christi
Ron Stuckey
rstuck1@dot.state.tx.us
Phone: (361) 808-2272

San Antonio
Juan Zaragosa
jzarago@dot.state.tx.us
Phone: (210) 615-5910

Waco
Paul Spear
pspear@dot.state.tx.us
Phone: (254) 867-2750

Appendix G: Cost Estimate Tool Instruction Manual

Instructions Document

For

Cost Estimate Worksheet

Developed for the

Texas Department of Transportation

As part of Project 0-4079
August 31, 2004

The Center for Transportation Research
The University of Texas at Austin

WARNING---DO NOT USE FOR APPRAISALS

The cost estimate worksheet presented is a right-of-way acquisition cost estimation tool designed to be used by TxDOT for internal budgeting purposes only. This is not an appraisal tool for individual properties, and will not take the place of (or bias in any way) professional appraisers' work, which is required of all State ROW processes. Nor will the estimation model be used by appraisers or used in any legal proceedings. The estimation tool may be used by TxDOT district and HQ personnel for initial project budgeting and annual departmental budgeting cycles.

WORKSHEET INSTRUCTIONS

Introduction

The Right-of-Way (ROW) cost estimation tool presented herein is designed to estimate acquisition cost at parcel level and thus requires the user to enter parcel information. An additional feature of this tool is a "Summary" worksheet that allows users to record information (including the cost of acquisition) on all parcels acquired for a project. This can be simply done by clicking on the "Record the Parcel Information" button located at the bottom of the "Parcel-level cost" worksheet. The tool will place each record in a row in the "Summary" worksheet and order each by parcel number. The "Summary" worksheet will also calculate total cost of acquisition for a project by summing acquisition costs of all parcels under a project. Comments accompany each entry cell to ease the application of this product. This document is intended to provide additional guidance on different elements of this worksheet.

Worksheet Protection

Currently, the spreadsheet is protected. Users can unprotect the spreadsheet if changes to the elements of this tool are desired. This can be simply done by going to the "Tools" menu, selecting "Protection", and choosing "Unprotect Sheet". The password is "txdotrowcost".

“Applicable”, “Non-Applicable”, “Optional”, and “Applicable If Exist” Cells
Depending on the user’s selections in the “GENERAL ACQUISITION INFORMATION” section and the nature of the acquisition, the applicability of some required information on the worksheet changes, which is indicated by words “Applicable”, “Not Applicable”, “Optional”, and “Applicable If Exist” to the right side of the entry cells. These terms are also defined in comment boxes inserted for these cells. “Applicable” by an entry cell means that users must provide the information required. On the contrary, “Not-Applicable” means that users do not need to provide this information. The term, “Optional”, means that users have both options of entering an estimate for the corresponding variable, or leaving that value at zero. If left at zero, the tool will use its built-in assumptions to accommodate those variables.

Parcel Number
Parcel identification number as defined by TXDOT.

CSJ Number
Project identification number as defined by TXDOT.

Estimated Consumer Price Index (CPI) for the Acquisition Year
Users are allowed to enter their own estimation of CPI for the corresponding acquisition year. If this variable is left at zero, the tool will use its own built-in assumptions to account for escalation. The project team regressed past CPI values on the variable of year in order to predict future CPI values. The procedure used and CPI information can be viewed at http://www.bls.gov/bls/inflation.htm.

Parcel Location
User is asked to select a location with the most similar characteristics to those of the parcel location. The listed districts were randomly selected, and information on projects accomplished in these districts was used to develop the cost models. Adjustments to the worksheet or the final total cost are appropriate, should the selected location be significantly different from the parcel location.

Type of Parcel Acquisition
Three options are provided: Commercial Whole Taking, Non-Commercial Whole Taking, and Partial Taking. Below is a brief discussion of each category.

Commercial Whole Taking: The term “commercial” refers to retail properties, office buildings, shopping centers, hotels, warehouses, manufacturing facilities, apartment complexes – and land that have the potential for development for these types of buildings. “Whole taking” means that the entire parcel is acquired for the project.

Non-Commercial Whole Taking: The term “non-commercial” refers to all other properties that are not mentioned above. “Whole taking” means that the entire parcel is acquired for the project.

Commercial/Non-Commercial Partial Taking: This includes partial acquisitions where only a part of the land is acquired. This category includes both commercial and non-commercial partial takings.

Land Use
User is asked to select the land use that best describes the acquired parcel. Note that this list will change based on the user's selection of type of acquisition and parcel location. Definitions of land use options are provided in the following table.

Definitions of Listed Land Uses

Vacant	Vacant Land
Agricultural	Agricultural Land
Single-Family Residential	Single-Family Residential
Multi-Family Residential	Multi-Family Residential
Retail	Retail Uses (e.g., Shopping and Restaurant)
Service	Auto Repair and Service
Other	Other Uses (e.g., churches, medical and dental offices)
Apartment	Apartment Use
HiRise	Hi-Rise Condominium
Office Larger than 35000 Sf	Office Larger than 35000 Sf
Medium Office (10-35K SF)	Medium Office (10-35K SF)
Small Office Less than 10000 SF	Small Office Less than 10000 SF
Medium Store	Shopping Center, Grocery, or Discount Store
Small Store	Small Store or Strip Center Less than 10000 SF
Restaurant	Restaurant, Night Club, Fast-food
Convenience Store	Convenience Store, Gas Station, Auto Repair or Service
Small Warehouse	Warehouse less than 20000 SF
Large Warehouse	bulk warehouse, flex space, research and development, and manufacturing
Hotel	Hotel or Motel
Rest Home	Rest Home or treatment center
Apartment	Apartment Use
Commercial	Commercial Land
Hotel	Hotel or Motel
Industrial	Industrial Use
Mobile	Mobile Home Park
Office	Office Use
Residential	Residential Land
Retail	Retail Use
Special	Special Use (e.g., church, hospital, or school)

Acquisition Year
User is asked to enter the year in which the parcel will be acquired.

Population Density (persons/square mile)
User is asked to enter the population density of the area where the parcel is located. The following table lists suggested values of population density for parcel locations listed under "Parcel Location" drop-down menu that are applicable in various cases.

COUNTY	Population Density (miles/square mile)	COUNTY	Population Density (miles/square mile)	COUNTY	Population Density (miles/square mile)
Anderson	51.5	Gillespie	19.6	Moore	22.4
Andrews	8.7	Glasscock	1.6	Morris	51.3
Angelina	100.0	Goliad	8.1	Motley	1.4
Aransas	89.3	Gonzales	17.4	Nacogdoches	62.5
Archer	9.7	Gray	24.5	Navarro	44.8
Armstrong	2.4	Grayson	118.5	Newton	16.2
Atascosa	31.4	Gregg	406.4	Nolan	17.3
Austin	36.1	Grimes	29.7	Nueces	375.3
Bailey	8.0	Guadalupe	125.2	Ochiltree	9.8
Bandera	22.3	Hale	36.4	Oldham	1.5
Bastrop	65.0	Hall	4.2	Orange	238.4
Baylor	4.7	Hamilton	9.8	Palo Pinto	28.4
Bee	36.8	Hansford	5.8	Panola	28.4
Bell	224.6	Hardeman	6.8	Parker	97.9
Bexar	1117.2	Hardin	53.8	Parmer	11.4
Blanco	11.8	Harris	1967.0	Pecos	3.5
Borden	0.8	Harrison	69.1	Polk	38.9
Bosque	17.4	Hartley	3.8	Potter	124.9
Bowie	100.6	Haskell	6.7	Presidio	1.9
Brazoria	174.4	Hays	144.0	Rains	39.4
Brazos	260.2	Hemphill	3.7	Randall	114.1
Brewster	1.4	Henderson	83.8	Reagan	2.8
Briscoe	2.0	Hidalgo	362.8	Real	4.4
Brooks	8.5	Hill	33.6	Red River	13.6
Brown	39.9	Hockley	25.0	Reeves	5.0
Burleson	24.7	Hood	97.5	Refugio	10.2
Burnet	34.3	Hopkins	40.8	Roberts	1.0
Caldwell	59.0	Houston	18.8	Robertson	18.7
Calhoun	40.3	Howard	37.2	Rockwall	334.5
Callahan	14.4	Hudspeth	0.7	Runnels	10.9
Cameron	370.1	Hunt	91.1	Rusk	51.3
Camp	58.5	Hutchinson	26.9	Sabine	21.4
Carson	7.1	Irion	1.7	San Augustine	16.9
Cass	32.5	Jack	9.6	San Jacinto	39.0
Castro	9.2	Jackson	17.3	San Patricio	97.1
Chambers	43.4	Jasper	38.0	San Saba	5.5
Cherokee	44.3	Jeff Davis	1.0	Schleicher	2.2
Childress	10.8	Jefferson	279.0	Scurry	18.1
Clay	10.0	Jim Hogg	4.6	Shackelford	3.6
Cochran	4.8	Jim Wells	45.5	Shelby	31.8
Coke	4.3	Johnson	173.9	Sherman	3.5

Coleman	7.3	Jones	22.3	Smith	188.2
Collin	580.1	Karnes	20.6	Somervell	36.4
Collingsworth	3.5	Kaufman	90.7	Starr	43.8
Colorado	21.2	Kendall	35.8	Stephens	10.8
Comal	139.0	Kenedy	0.3	Sterling	1.5
Comanche	15.0	Kent	1.0	Stonewall	1.8
Concho	4.0	Kerr	39.5	Sutton	2.8
Cooke	41.6	Kimble	3.6	Swisher	9.3
Coryell	71.3	King	0.4	Tarrant	1675.0
Cottle	2.1	Kinney	2.5	Taylor	138.2
Crane	5.1	Kleberg	36.2	Terrell	0.5
Crockett	1.5	Knox	5.0	Terry	14.3
Crosby	7.9	Lamar	52.9	Throckmorton	2.0
Culberson	0.8	Lamb	14.5	Titus	68.5
Dallam	4.1	Lampasas	24.9	Tom Green	68.3
Dallas	2522.6	La Salle	3.9	Travis	821.1
Dawson	16.6	Lavaca	19.8	Trinity	19.9
Deaf Smith	12.4	Lee	24.9	Tyler	22.6
Delta	19.2	Leon	14.3	Upshur	60.1
Denton	487.3	Liberty	60.5	Upton	2.7
DeWitt	22.0	Limestone	24.3	Uvalde	16.7
Dickens	3.1	Lipscomb	3.3	Val Verde	14.1
Dimmit	7.7	Live Oak	11.9	Van Zandt	56.7
Donley	4.1	Llano	18.2	Victoria	95.3
Duval	7.3	Loving	0.1	Walker	78.4
Eastland	19.8	Lubbock	269.7	Waller	63.6
Ector	134.4	Lynn	7.3	Ward	13.1
Edwards	1.0	McCulloch	7.7	Washington	49.9
Ellis	118.5	McLennan	204.9	Webb	57.5
El Paso	670.8	McMullen	0.8	Wharton	37.8
Erath	30.4	Madison	27.6	Wheeler	5.8
Falls	24.2	Marion	28.7	Wichita	209.8
Fannin	35.0	Martin	5.2	Wilbarger	15.1
Fayette	23.0	Mason	4.0	Willacy	33.7
Fisher	4.8	Matagorda	34.1	Williamson	222.6
Floyd	7.8	Maverick	36.9	Wilson	40.2
Foard	2.3	Medina	29.6	Winkler	8.5
Fort Bend	405.3	Menard	2.6	Wise	53.9
Franklin	33.1	Midland	128.9	Wood	56.5
Freestone	20.4	Milam	23.8	Yoakum	9.2
Frio	14.3	Mills	6.9	Young	19.5
Gaines	9.6	Mitchell	10.7	Zapata	12.2
Galveston	627.8	Montague	20.5	Zavala	8.9
Garza	5.4	Montgomery	281.4		

Source: U.S. Census Bureau, Census 2000

Suggested Population Densities

Land Area of Acquired (SF)
User is asked to enter the area of land to be acquired. The acquisition can be partial or involve the entire parcel.

Length of Parcel Frontage with the Main Road (FT)
User is asked to enter the length of the parcel that borders a public road.

Is this parcel located on a corner (of two public roads)?
User is asked to determine whether the parcel is located at the corner of an intersection.

Acquired Building Area (SF)
User is asked to enter the acquired building area in square feet.

Acquired Building Condition
User is asked to determine the condition of the acquired building based on any available information. Appraised condition is preferable if available.

Age of the Acquired Building (Years)
User is asked to enter the age of the acquired building in years.

Number of Floors in the Acquired Building
User is asked to enter the number of floors of the acquired building.

Number of Structured or Covered Parking Spaces
User is asked to enter number of covered or structured parking spaces that exist for the acquired parcel.

Total Cost of Other Improvements ($)
This worksheet only accommodates the costs of acquiring the two improvements: buildings and parking space.

Costs of acquiring other improvements, such as fencing, signage, driveway, lightning, and others should be added if applicable.

Remainder Area (SF)
User is asked to enter the area of land that is not acquired (this is only required for partial takings).

Is there a Change in Parcel Shape?
User is asked to determine whether shape of the parcel has changed as a result of partial acquisition.

Loss in Parcel Frontage with Public Roadway (FT)
User is asked to enter the frontage length of the parcel that is lost due to partial taking.

Is There a Reduction in Highest and Best Use Value?

User is asked to determine whether highest and best use value of the parcel has changed as a result of partial acquisition.

Other Costs

Users are required to enter estimations of additional costs if applicable. If estimations are not available, users can use suggested values in comment boxes corresponding to each cost. The average of each cost from 1997 to 2003 was calculated using historical acquisition data for Texas posted on the FHWA website and are suggested in comments box for each cost.

Appendix H: Cost Estimate Complete Table of Test Results

Appendix H: Cost Estimate Complete Table of Test Results (page 1A of 8)

Group	Subgroup	Obs. No.	District No.	District/County	Parcel No.	CSJ No.	Acquisition Year	Land use
Vacant and Agricultural Land (No Building Acqu	(Urban and Rural Areas)	1	8	Abilene	1	090822010	2004	Agricultural Land
		2	8	Abilene	2	090822010	2004	Agricultural Land
		3	8	Abilene	14	090822010	2004	Agricultural Land
		4	8	Abilene	5	090822010	2004	Agricultural Land
		5	9	Waco	1	119104019	2003	Agricultural Land
		6	9	Waco	2	119104019	2003	Agricultural Land
		7	9	Waco	3	119104019	2003	Agricultural Land
		8	8	Abilene	3	090822010	2004	Vacant Land
		9	8	Abilene	11	090822010	2004	Vacant Land
		10	8	Abilene	15	090822010	2004	Vacant Land
		11	8	Abilene	20	090822010	2004	Vacant Land
		12	8	Abilene	21	090822010	2004	Vacant Land
		13	8	Abilene	22	090822010	2004	Vacant Land
	Metropolit	14	12	Houston/Harris (IH10)	229	027107261	2003	Vacant Land
		15	12	Houston/Harris(IH10)	202	027107261	2003	Vacant Land
		16	12	Houston/Harris (IH10)	208	027107261	2003	Vacant Land
Residential	(No Building Acquired)	17	9	Waco	6	119104019	2004	Rural Residential
		18	9	Waco	23	119104019	2004	Rural Residential
		19	9	Waco	21	119104019	2004	Rural Residential
		20	9	Waco	20	119104019	2004	Single-Family Residential
		21	14	Austin/Travis (SW, US 183)	16	015106039	2003	Single-Family Residential
		22	15	San Antonio/Bexar	6	800015007	2004	Multi-Family Residential
Residential	(Building Acquired)	23	12	Houston/Harris(IH10w)	21	027107237	2004	Single-Family Residential
		24	12	Houston/Harris(IH10w)	22	027107237	2004	Single-Family Residential
		25	12	Houston/Harris(IH10w)	20	027107237	2004	Single-Family Residential
		26	12	Houston/Harris(IH10w)	25	027107237	2004	Single-Family Residential
		27	12	Houston/Harris(IH10w)	32	027107237	2004	Single-Family Residential

Group	Subgroup	Obs. No.	Taking Type	Change in H&B Use	Original Length of Frontage with the Main Public Road (Ft)	Frontage Loss (Ft)	Change in the Parcel Shape	Corner	Taken Area (Acres)	Taken Area (ft^2)
Vacant and Agricultural Land (No Building Acqu	(Urban and Rural Areas)	1	Partial	No	124	124	Yes	No	0.06	2805.26
		2	Partial	No	145	145	Yes	No	13.88	604778.33
		3	Partial	No	111	111	Yes	Yes	2.71	117943.06
		4	Partial	No	156	60	Yes	No	0.01	574.99
		5	Partial	No	150	150	No	No	1.12	48891.74
		6	Partial	No	310	310	No	No	13.19	574491.06
		7	Partial	No	310	310	No	Yes	0.14	6098.40
		8	Partial	No	400	400	Yes	No	13.44	585537.88
		9	Partial	No	314	314	No	No	6.00	261516.82
		10	Whole	No	200	200	N/A	No	3.43	149510.99
		11	Whole	No	100	100	N/A	No	0.45	19600.00
		12	Whole	No	143	143	N/A	Yes	0.45	19602.00
		13	Whole	No	145	145	N/A	Yes	0.23	9801.00
	Metropolit	14	Whole	No	22	22	N/A	No	0.04	111864.37
		15	Partial	No	1172.58	435	Yes	No	4.08	177607.00
		16	Partial	no	200	20	Yes	Yes	0.07	3205.00
Residential	(No Building Acquired)	17	Partial	no	121	121	No	No	0.62	27042.05
		18	Partial	no	70	70	No	No	0.24	10454.40
		19	Partial	no	None	None	No	No	0.02	892.98
		20	Partial	no	10	10	No	No	0.06	2613.60
		21	Partial	no	None	None	No	No	0.31	13547.16
		22	Partial	no	400	400	Yes	Yes	0.25	10958.00
Residential	(Building Acquired)	23	Whole	N/A	None	74	N/A	No	0.23	10020.00
		24	Whole	N/A	None	None	N/A	No	0.23	10018.80
		25	Whole	N/A	None	None	N/A	No	0.23	10018.80
		26	whole	no	None	None	N/A	No	0.15	6500.00
		27	whole	no	110	70	N/A	No	0.17	7340.00

	1	2	3	4
A	■			
B				

Appendix H: Cost Estimate Complete Table of Test Results (page 1B of 8)

Commercial (Austin)	**34**	14	Austin/Williamson US 183	176A	015105076	2003	Commercial Land	whole	N/A	125,12	125,12	N/A	Yes	0.77	33323.40
	35	14	Austin/Travis, NW,US183	25	015105076	2003	Convenience store (Commercial)	whole	N/A	118.54	118.54	N/A	No	0.33	14200.56
	36	14	Austin/Travis, SW,US183	12	015105076	2003	Convenience store (Commercial)	whole	N/A	None	None	N/A	No	0.09	3920.40
	37	14	Austin/Travis, NW,US183	23	015105076	2003	Commercial Land	whole	N/A	400	400	N/A	Yes	1.34	58239.72
Commercial (San Antonio)	**38**	15	San Antonio/Bexar	89	029110084	2004	Retail (Commercial)	Partial	No	80	21	Yes	Yes	0.22	9459.00
	39	15	San Antonio/Bexar	99	029110084	2004	Commercial Land	Partial	yes	60	60	No	No	0.02	1035.00
	40	15	San Antonio/Comal	4	025303056	2000	Commercial Land	Whole	N/A	None	None	N/A	No	0.61	26528.04
Commercial (Dallas)	**41**	18	Dallas/Ellis, US380	36	004803070	2000	Retail (Commercial)	Partial	No	134	134	No	No	0.04	1738.00
	42	18	Dallas/Denton, US380	23	134090053	2004	Retail (Commercial)	Partial	No	150	150	Yes	Yes	0.04	1553.00
	43	18	Dallas/Denton, US380	24	134090053	2004	Retail (Commercial)	Partial	No	303	167	No	No	0.04	1897.00
	44	18	Dallas/Dallas, US 80	2	091845580	2003	Commercial Land	Whole	N/A	120	120	N/A	Yes	0.45	19689.12
	45	18	Dallas/Dallas, Sh 161	74	296401026	2003	Day Care (Special Use)	Whole	N/A	None	None	N/A	No	0.18	7816.00
	46	18	Dallas/Ellis, US 77	38	004803070	2003	Retail (Commercial)	Whole	N/A	100	100	N/A	No	0.12	5252.00
Commercial (Houston)	**47**	12	Houston/Harris IH 10	217	027107261	2004	Restaurant (Commercial)	Whole	N/A	267	267	N/A	No	1.26	55038.00
	48	12	Houston/Harris IH 10	218	027107261	2004	Special Use	Partial	No	250	250	No	No	0.29	12500.00
	49	12	Houston/Harris IH 10	223	027107261	2004	Retail (Commercial)	Partial	No	195	195	No	Yes	0.02	784.00
	50	12	Houston/Harris IH 10	222	027107261	2004	Retail (Commercial)	Partial	No	103	103	No	Yes	0.01	312.00
	51	12	Houston/Harris IH 10	200	027107261	2004	Commercial Land	Partial	No	314	314	Yes	No	0.47	20467.00
	52	12	Houston/Harris IH 10	26	027107261	2004	Office (Commercial)	Whole	N/A	145	145	N/A	No	1.56	68028.00
	53	12	Houston/Harris IH 10	27	027107261	2004	Retail (Commercial)	Whole	N/A	210	210	N/A	Yes	1.24	54009.00
	54	12	Houston/Harris IH 10	30	027107261	2004	Convenience Store (Commercial)	Partial	Yes	100	30	Yes	No	0.03	1234.00
	55	12	Houston/Harris IH 10	43	027107261	2004	Retail (Commercial)	Partial	No	250	120	No	Yes	1.63	71045.00
	56	12	Houston/Harris IH 10	28	027107261	2004	Office (Commercial)	Whole	N/A	190	190	N/A	No	0.94	41002.00
	57	12	Houston/Harris IH 10	33	027107261	2004	Retail (Commercial)	Partial	No	255	255	Yes	No	2.19	95400.00
	28	12	Houston/Harris(IH10w)	209	027107261	2004	trip Shopping Center (Commercia	partial	no	30	None	Yes	No	0.01	239.58
	29	12	Houston/Harris(IH10w)	212	027107261	2004	Restaurant (Commercial)	partial	NO	175.32	175.32	No	No	0.26	11464.99
	30	12	Houston/Harris(IH10w)	213	027107261	2004	Restaurant (Commercial)	partial	no	None	None	No	No	1.05	45738.00
	31	12	Houston/Harris(IH10w)	214	027107261	2004	Industrial (Commercial)	partial	No	116.36	116.36	No	No	0.20	8681.51
	32	12	Houston/Harris(IH10w)	215	027107261	2004	Hotel (Commercial)	whole	no	498	498	N/A	No	1.17	51139.44
	33	12	Houston/Harris(IH10w)	228	027107261	2004	Commercial	partial	no	117.83	117.83	No	No	0.43	18634.97

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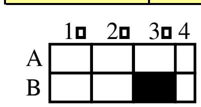
Remaining Area (Acres)	Remaining Area (ft^2)	Total Area (Acres)	Value of Acquired Land ($)	Type of Improvement	Value of Improvements Taken($)	price of the building Taken ($)	Type of Damages	Cost of Damages ($)
95.94	4178954.74	96.00	$763	N/A	N/A	N/A	to secure the property for agricultural use	$729
39.91	1738536.23	53.80	$9,024	N/A	N/A	N/A	to secure the property for agricultural use/Split	$8,080
7.21	314172.14	9.92	$9,206	irrigation system	$431	N/A	to secure the property for agricultural use/Split	$1,040
21.79	949033.01	21.80	$150	N/A	N/A	N/A	fence over the property line	$448
176.95	7707942.00	178.07	$1,235	fence, fence, gate, landscape	$6,188	N/A	replace fence	$1,294
475.15	20697534.00	488.34	$15,467	fencing,fencing, gate	$7,123	N/A	replace fence and gate	$863
64.04	2789582.40	64.18	$1,750	fencing,fencing, gate	$1,650	N/A	replace fence and gate	$570
115.89	5048220.67	129.33	$29,400	N/A	N/A	N/A	to secure the property for agricultural use/Split	$5,600
7.75	337433.18	13.75	$22,450	N/A	N/A	N/A	to secure the property for agricultural use/Split	$1,100
N/A	N/A	3.43	$8,581	N/A	N/A	N/A	None	None
N/A	N/A	0.45	$3,450	N/A	N/A	N/A	None	None
N/A	N/A	0.45	$4,560	N/A	N/A	N/A	None	None
N/A	N/A	0.23	$3,555	N/A	N/A	N/A	None	None
N/A	N/A	0.04	$950,654	N/A	N/A	N/A	None	None
20.58	896552.11	24.66	$2,395,773	drive and drive and fence	$12,442	N/A	None	None
0.54	23410.00	0.61	$58,700	conc apron, curbing, paving, landscaping, fencing, ext lighting	$13,448	N/A	None	None
6.92	301435.20	7.54	$2,024	fencing	$1,536	N/A	replace fence	$354
1.62	70567.20	1.86	$1,480	fencing, fencing, landscaping, cattle guard, driveway	$3,241		replace fencing, loss of parking	$450
0.32	13939.20	0.34	$435	driveway	$65		replace fencing, loss of parking	$670
0.81	35283.60	0.87	$189	slab, driveway	$111		remove an addiutional 100sf of the slab so as tio remove safety issues	$1,500
0.09	3877.00	17424.16	$30,498	Garage Apartment and fencing	$340	N/A	Remianing is limited in size and odd in shape and it will have no direct access to the new facility so damages	$8,600
17.41	758473.00	769431.00	$98,125	Fencing (6529)+landscaping (6428)+parking spaces (3073)+curbing (718)+Jogging Trail (137)	$16,881	N/A	because of the taking, a driveway located near the corner wil have to be relocated further east along Vista Del Norte. Access will be denied at the very corner due to the radius of the intersection. Because of this, the appraiser has included an amount to construct a new driveway and to relocate the trash dumpster	$16,438
N/A	N/A	10020.00	$126,700	Main residence (37207)+Garage (4277)+paving (2632)+fencing (174)+decks (1080)+landscaping (1890)+wall and pool (17550)	$64,810	$37,207	N/A	N/A
N/A	N/A	10018.80	$120,240	Building (74875+749)+Garage (5280+53)+paving (4201)+fence (1036)+landscaping (12001)+fence (481)+retaining wall (1891)	$100,567	$75,624	N/A	N/A
N/A	N/A	10018.80	$102,705	landscaping (15000)+fence(1875)+building (105822)+paving (1)+fence (1)	$128,357	$105,822	N/A	N/A
N/A	N/A	6500.00	$112,456	building	$54,000	$54,000	N/A	$0
N/A	N/A	7340.00	$98,880	building	$88,900	$88,900	N/A	$0

N/A	N/A	33323.40	$454,860	N/A	N/A	N/A	N/A	N/A	
N/A	N/A	14200.56	$267,000	store(114900)+business sign on pole (1650)+Asphalt(11501)	$126,900	$114,900	N/A	N/A
N/A	N/A	3920.40	$100,899	building(17700+1700)+carport(770)+utility(880)+drive/parkin g(2001)+landscaping(4001)+storage 1(2200)+storage2(2451	$56,000	$49,400	N/A	N/A
N/A	N/A	58239.72	$802,600	Garage(1)+Canopy (1)+Paving(1)	$55,004	$55,000	N/A	N/A
1.84	80008.00	89467.00	$149,867	Building (68366, retention 3000)+Canopy (1359, retention 1)+paving (566, retention, 1)+building signage (1496, retention 75)+Pole signage (1690, retention 85)	$83,477	$78,366	Uneconomic remainder and parking and driveway and business	$128,096
0.20	8783.00	9818.00	$16,003	paving (807) and sign (3205)	$4,012	N/A	damage for parking and frontage	$53,064
N/A	N/A	26528.04	$432,567	N/A	N/A	N/A	N/A	N/A
0.58	25308.36	27064.00	$1,964	Driveway and Signs-on Premise	$1,519	No building	Driveway and Reusage of the Remainder	$12,000
27756.67	27752.26	29305.26	$21,750	Patio, Curbs, Signs-on Premise, Post, Landscaping	$1,900	No building	the appraiser estimated that the loss of ingress and egress (Access on a direct access entrance point on a premium corner) would have a negative impact on the value of the site at a $37350	$37,350
0.75	32490.00	34387.00	$14,230	Paving (6402)+Business Sign (6600)+Commercial Building (181000)	$71,000	$58,000	None	$0
N/A	N/A	19689.12	$137,800	None	N/A	N/A	N/A	N/A
N/A	N/A	7816.00	$41,850	building and garage (69900+3500)+paving(601)+fencing and gate (1310)+landscaping (2001)+walk (351)	$74,150	$73,400	N/A	N/A
N/A	N/A	5252.00	$17,100	Paving & Building	$49,100	$48,000	N/A	N/A
N/A	N/A	55038.00	$1,268,583	signs-on-pernium and parking lot and exterior light and landscaping and shed	$148,435	$95,684	N/A	N/A
2.92	127196.92	139696.92	$318,750	Driveway and Landscaping	$3,420	No building	Driveway and Reusage of the Remainder	$1,100
1.01	43848.00	44632.00	$21,168	Sign & Paving	$16,380	No Building	Driveway and Reusage of the Remainder	$229,240
1.26	54669.00	54981.00	$18,360	Asphalt/Driveway	$857	No Building	Parking and Driveway	$65,005
1.22	52970.00	73437.00	$734,370	None	$0	No Building	Irregular Remainder	$1,250
N/A	N/A	68028.00	$3,543,244	Building	$2,567,345	$2,567,345	N/A	N/A
N/A	N/A	54009.00	$699,675	Building and Driveway	$376,001	$350,000	N/A	N/A
0.08	3456.00	4690.00	$24,500	Driveway and Parking	$1,200	No Building	Visibility and Irregularity of the Remaining Building	$10,456
0.26	11500.00	82545.00	$2,222,345	Building & Driveway & Parking	$610,000	$567,987	Visibility and reusage	$64,000
N/A	N/A	41002.00	$2,002,346	Building	$1,234,451	$678,120	N/A	N/A
0.53	23045.00	118445.00	$2,121,340	Building	$554,600	$554,600	Driveway and parkings and irregular remaining	$287,000
0.65	28157.18	0.65	$3,000	signs on premise, drive, exterior light	$4,949		replace sign and exterior lighting	$6,518
0.89	38933.93	1.16	$209,609	signs on premise, pkg lot, landscaping, building, ext lighting	$92,033	$127,467	bisection of building	$183,546
0.38	16470.04	1.43	$1,666,764	building, deck, other	$481,465	$188,358	remainder site improvement, reduction in the land value, site cleanup	$541,702
3.36	146570.69	3.56	$256,276	drive, parking lot	$96,287	N/A	remainder site improvement, reduction in the land value, site cleanup	$17,954
N/A	N/A	1.17	$1,866,550	building, signs on premise, fence, landscaping, swimming pool	$3,783,450	$3,602,089	N/A	N/A
1.67	72780.05	2.10	$372,700	storage building, building, paving, signs-on premise, landscaping, fence, gate	$386,419		the appraiser damaged a portion of the building facility for reconfiguring the building to a useable condition (Building and safety codes)	$327,326

Appendix H: Cost Estimate Complete Table of Test Results (page 3A of 8)

# of Uncovered Parking Spots	# of covered parking spots	# of acquired uncovered parking spots	Age of the Acquired Building	Condition of the Acquired building	The Area of Acquired Building	Number of floors in the Acquired Building	Estimated Cost ($)	Actual Cost ($)	Difference Percentage	Absolute Difference	Under-Estimation ($)	Over-Estimation ($)
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$1,445	$1,492	3.15%	3.15%	$47	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$16,266	$17,104	4.90%	4.90%	$838	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$10,407	$10,677	2.53%	2.53%	$270	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$712	$832	14.42%	14.42%	$120	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$13,275	$8,717	-52.29%	52.29%	N/A	$6,941
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$28,466	$23,453	-21.37%	21.37%	N/A	$6,085
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$4,849	$3,970	-22.14%	22.14%	N/A	$1,074
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$28,932	$35,000	17.34%	17.34%	$6,068	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$24,141	$25,600	5.70%	5.70%	$1,459	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$15,542	$11,542	-34.66%	34.66%	N/A	$5,386
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$5,668	$3,450	-64.29%	64.29%	N/A	$3,644
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$6,979	$4,560	-53.05%	53.05%	N/A	$3,702
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$4,876	$3,555	-37.16%	37.16%	N/A	$1,812
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$645,165	$950,654	32.13%	32.13%	$305,489	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$904,860	$2,408,215	62.43%	62.43%	$1,503,355	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$53,059	$72,148	26.46%	26.46%	$19,089	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$20,472	$3,914	-423.05%	423.05%	N/A	$16,558
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$13,998	$5,171	-170.70%	170.70%	N/A	$8,827
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$3,003	$1,105	-171.76%	171.76%	N/A	$1,898
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$4,924	$1,800	-173.56%	173.56%	N/A	$3,124
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$39,100	$39,438	-0.86%	0.86%	$338	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$451,406	$131,444	243.42%	243.42%	N/A	$319,962
N/A	N/A	N/A	23	good	1639	1	$271,784	$191,510	41.92%	41.92%	N/A	$80,274
N/A	N/A	N/A	25	average	1657	1	$269,645	$220,807	22.12%	22.12%	N/A	$48,838
N/A	N/A	N/A	15	good	1884	1	$274,695	$231,062	18.88%	18.88%	N/A	$43,633
N/A	N/A	N/A	15	good	4300	1	$205,819	$166,456	23.65%	23.65%	N/A	$39,363
N/A	N/A	N/A	24	good	6500	1	$253,694	$187,780	35.10%	35.10%	N/A	$65,914

N/A	N/A	N/A	N/A	N/A	N/A	N/A	$543,846	$454,860	19.56%	19.56%	N/A	$88,986
N/A	N/A	N/A	25	Average	2426	1	$396,162	$393,900	0.57%	0.57%	N/A	$2,262
N/a	N/A	N/A	20	Average	600	1	$223,279	$156,899	42.31%	42.31%	N/A	$66,380
N/A	N/A	N/A	N/A	Poor	4500	N/A	$1,228,535	$857,604	43.25%	43.25%	N/A	$370,931
100	0	100	40	Fair	3507	1	$624,627	$361,440	72.82%	72.82%	N/A	$263,187
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$46,281	$73,079	-36.67%	36.67%	$26,798	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$565,866	$432,567	30.82%	30.82%	N/A	$133,299
300	0	12	N/A	N/A	N/A	N/A	$14,878	$15,483	-3.91%	3.91%	$605	N/A
120	0	45	N/A	N/A	N/A	N/A	$13,929	$61,000	-77.17%	77.17%	$47,071	N/A
30	0	10	25	average	1050	1	$25,010	$85,230	-70.66%	70.66%	$60,220	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$585,398	$137,800	324.82%	324.82%	N/A	$447,598
N/A	N/A	N/A	20	Fair	4000	1	$797,787	$116,000	587.75%	587.75%	N/A	$681,787
N/A	N/A	N/A	25	Poor	2200	1	$598,095	$66,200	803.47%	803.47%	N/A	$531,895
N/A	N/A	N/A	24	average	10000	1	$1,122,932	$1,417,018	-20.75%	20.75%	$294,086	N/A
N/A	N/A	N/A	N/A	N/A	N/A	1	$259,458	$323,270	-19.74%	19.74%	$63,812	N/A
N/A	N/A	N/A	N/A	N/A	N/A	1	$50,885	$266,788	-80.93%	80.93%	$215,903	N/A
500	0	120	N/A	N/A	N/A	1	$14,754	$84,222	-82.48%	82.48%	$69,468	N/A
0	0	0	N/A	N/A	N/A	1	$566,994	$735,620	-22.92%	22.92%	$168,626	N/A
400	0	400	17	average	44500	34	$6,014,695	$6,110,589	-1.57%	1.57%	$95,894	N/A
300	0	300	20	Fair	43500	1	$1,339,024	$1,075,676	24.48%	24.48%	N/A	$263,348
54	0	Not Statistically Significant	N/A	N/A	N/A	N/A	$27,799	$36,156	-23.11%	23.11%	$8,357	N/A
550	0	Not Statistically Significant	23	Good	55000	1	$3,927,387	$2,896,345	35.60%	35.60%	N/A	$1,031,042
250	0	250	30	Fair	34000	26	$3,499,324	$3,236,797	8.11%	8.11%	N/A	$262,527
613	0	Not Statistically Significant	12	Good	67050	3	$3,559,058	$2,962,940	20.12%	20.12%	N/A	$596,118
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$7,935	$14,467	45.15%	45.15%	$6,532	N/A
119	N/A	unknown	7 yrs	average	6637	1	$366,601	$485,188	24.44%	24.44%	$118,587	N/A
128	n/a	?		average	36666	1	$2,198,710	$2,689,931	18.26%	18.26%	$491,221	N/A
67	N/A	N/A		good	5710	1	$308,613	$370,517	16.71%	16.71%	$61,904	N/A
92	N/A	92	9	good	36550	2	$3,504,746	$5,650,000	37.97%	37.97%	$2,145,254	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	$636,234	$1,086,445	41.44%	41.44%	$450,211	N/A



Misprediction ($)	(1M $ and Plus)	Misprediction for (1M $ and Plus) parcels	Un-weighted Average % Misprediction	Weighted Average % Misprediction	Weighted Average % Misprediction (Cost>=1M $)
$47	$0	$0	28.38%	24.97%	
$838	$0	$0			
$270	$0	$0			
$120	$0	$0			
$6,941	$0	$0			
$6,085	$0	$0			
$1,074	$0	$0			
$6,068	$0	$0			
$1,459	$0	$0			
$5,386	$0	$0			
$3,644	$0	$0			
$3,702	$0	$0			
$1,812	$0	$0			
$305,489	$0	$0	40.34%	53.28%	
$1,503,355	$2,408,215	$1,503,355			
$19,089	$0	$0			
$16,558	$0	$0	197.22%	191.78%	
$8,827	$0	$0			
$1,898	$0	$0			
$3,124	$0	$0			
$338	$0	$0			
$319,962	$0	$0			
$80,274	$0	$0	28.33%	27.87%	
$48,838	$0	$0			
$43,633	$0	$0			
$39,363	$0	$0			
$65,914	$0	$0			

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$88,986	$0	$0	26.42%	28.37%	24.15%
$2,262	$0	$0			
$66,380	$0	$0			
$370,931	$0	$0			
$263,187	$0	$0	46.77%	48.82%	
$26,798	$0	$0			
$133,299	$0	$0			
$605	$0	$0	311.29%	367.27%	
$47,071	$0	$0			
$60,220	$0	$0			
$447,598	$0	$0			
$681,787	$0	$0			
$531,895	$0	$0			
$294,086	$1,417,018	$294,086	30.81%	21.54%	
$63,812	$0	$0			
$215,903	$0	$0			
$69,468	$0	$0			
$168,626	$0	$0			
$95,894	$6,110,589	$95,894			
$263,348	$1,075,676	$263,348			
$8,357	$0	$0			
$1,031,042	$2,896,345	$1,031,042			
$262,527	$3,236,797	$262,527			
$596,118	$2,962,940	$596,118			
$6,532	$0	$0			
$118,587	$0	$0			
$491,221	$2,689,931	$491,221			
$61,904	$0	$0			
$2,145,254	$5,650,000	$2,145,254			
$450,211	$1,086,445	$450,211			

	1	2	3	4
A				
B				