Tennessee Remainder Sales Study-2022

Tennessee Department of Transportation Right-of-Way Appraisal Damages Study

Research Final Report from the University of Tennessee | Asad J. Khattak, Iman Mahdinia, A. Latif Patwary, Thomas Boehm, Antora Haque, and Melany Noltenius | May 1, 2022

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15. Supplementary Notes

1) Indexed case reports for easy search by users (PDF files). 2) Coded and structured data (in Excel file), 3) Created Right-of-Way Damage Assessment (ROWDA) Excel-based tool for early estimates of remainder damages, 4) comparison of appraisal damages to remainders with actual sales of remainders.

16. Abstract

The Tennessee Department of Transportation (TDOT) acquires private and commercial properties in conjunction with transportation projects. Many acquisitions are partial takings, i.e., only a portion of the total property is acquired. For such takings, damage amounts are included for the remainders in reports. However, the value of damages, determined from appraisals, is often questioned by owners of the damaged properties. Consequently, evaluating the accuracy and fairness of those appraisals is of paramount importance to both TDOT and affected property owners. In this regard, recent Tennessee appraisal data are used to identify the conditions affecting damages from right-of-way acquisitions. Specifically, the parcel attributes that have the most significant impact on the percent of damages were identified. Next, a prediction tool named ROWDA was developed based on appraisal data to obtain consistent and accurate damage estimates. Case studies of specific takings were identified and reviewed to assist in the transparency of the right-of-way taking process. For properties that had remainder sales data, damage appraisals were compared with the market data to calculate sales-based damages. They help to determine whether the model developed accurately predicted damages. While the small sample size limits definitive conclusions, the analysis suggests that the model predictions are reasonably accurate. Results show that the median sales-based percent-damages were -37%, close to appraisers' estimated percent-damages (-35%) and ROWDA predicted percent-damages (-34%). Overall, the ROWDA tool can make the appraisal process more transparent by identifying appraisals that appear to be out of line with the model's projections.

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Executive Summary

Background

Each year the Tennessee Department of Transportation (TDOT) acquires parcels of land from private and commercial properties in conjunction with transportation projects. Many of these acquisitions are partial takings, meaning that only a portion of a total property is acquired. For such partial takings, assessing damage to the remainder parcel area is a complex issue investigated in this study. Specifically, this research identified the parcel attributes that have the most significant impact on the percentage of damages, which is then calculated as the difference between the property's fair market value before the taking and the fair market value of the remainder after the taking. The Tennessee Department of Transportation Right-of-Way and Utilities Division staff provided more than 509 appraisal reports having damages greater than $25,000. All appraisal reports had damages assessed to the remainder property. After coding the data and doing descriptive analysis, a regression model was developed to determine the correlations of various factors on property damages. The model was embedded in a tool that can predict damage percentage under several different scenarios. A series of appraisal case studies were identified using these attributes to highlight specific details involved in calculating damage percentages in the right-of-way (ROW) taking process. Actual sales data for the remainders were collected and analyzed for 98 properties allowing the research team to compare them with the damage appraisals of the remainder properties. Overall, the study helps with a clearer appraisal process, enhances consistency in the acquisition activities of TDOT projects, and provides supporting information for appraisers to assign a monetary value to remainder damages.

Appraisal Report Information

The appraisal data utilized in this study were provided by the Tennessee Department of Transportation Right-of-Way and Utilities Division staff. This consisted of appraisal reports for TDOT Regions 1 to 4. In total, 546 appraisal reports from recent years were collected, coded, and harnessed. The appraisal reports are based on TDOT's standard appraisal forms. They pertain to a variety of case examples involving variations in land use, types of improvements, and damage percentages. Using the information in the case studies, several attributes (variables) were extracted and quantified. After cleaning the data, removing outliers, and missing values, 509 case studies constituted the final usable database. Additionally, actual sales data for the remainders were collected from various sources, including the Courthouse Retrieval System (CRS). The study analyzed a useable set of 98 properties after removing and cleaning data from 115 properties that had sales data.

Key Findings

The study has provided well-defined conditions affecting the calculation of damages based on appraisal reports. After coding the appraisal data, the existing land use in the data was categorized as 36% Residential, 8% Agricultural, 38% Commercial, 3% Industrial, 9% Vacant/ Woodland, 3% Mixed, and 3% Other. Hedonic regression modeling results indicate statistically significant relationships between the percentage of remainder damages and various land

attributes. Specifically, for 509 observations (those having damages greater than $25,000) located in all TDOT Regions 1, 2, 3, and 4, the factors associated with higher damages are:

- A ratio of acquired land area to original parcel area closer to 1:1,
- Parcels with one front side (i.e., not a corner lot),
- Acquisitions that involve the taking of more than 50 percent of landscaping value,
- Adverse changes in tract utility, such as a reduction in parking, after the acquisition,
- Reductions in tract proximity after the acquisition,
- Damages to parcel access after the acquisition,
- Damages to residential parcels compared to other land uses,
- Changes to frontage elevation after the acquisition,
- Any adverse change in highest and best use after the acquisition,
- Smaller-sized parcels when comparing differently-sized parcels with similar attributes and acquisition size, and.
- Change in use after acquisition.

It is notable that no statistically significant (or substantial) regional differences ($p < 0.05$) in remainder damage appraisals were found, indicating that damages were assessed relatively uniformly by assessors across the four TDOT regions of Tennessee.

Structuring Remainder Damage Case Reports

While structuring, coding, and analyzing the data, the research team uncovered key variables associated with remainder damages. These variables were used to index the case reports for easy access and search. Specifically, the ROW appraisal reports (i.e., cases) for the 4 TDOT Regions are now part of the 2022 Remainder Sales Study and available to users interested in reviewing them. The case studies are categorized based on TDOT regions. They include the 509 appraisal reports distributed among regions as follows: Region 1 - 107 case studies, Region 2 - 80 case studies, Region 3 - 177 case studies, and Region 4 - 145 case studies. The case studies for each region are organized alphabetically by county and in increasing values by PIN and Tract Numbers. Navigation by users is made more accessible by indexing the case studies by the most significant attributes (variables) identified by the research team and relating to right-of-way remainder damage percentage. The users can quickly review detailed information contained in the 509 appraisal reports. Separately, the case studies are also coded in an MS Excel spreadsheet, which can be used by TDOT staff for further analysis and searching for information to assign monetary values to the remainder damages.

ROWDA: A Damage Assessment Tool

A vital aspect of the project is developing a predictive tool that will allow TDOT to anticipate right-of-way costs under varying economic and demographic conditions. To this end, the hedonic regression model for remainder damages (based on the appraiser predictions of remainder damages) was embedded in a Right-of-Way Damage Assessment (ROWDA) tool. This tool provides a platform for establishing a more standardized approach in future appraisals. ROWDA is designed to process various inputs to predict the remainder damage percentage. This Microsoft Excel-based tool is an interface between a set of attributes and resulting damages. The tool can be installed and used on a personal computer. ROWDA allows the user to input various parcel attributes to calculate a prediction of percent-damage. Additionally, the tool can predict

the total cost to the land and improvements in dollars by multiplying the damage percentage with the dollar value of the remainder or undamaged parcel area. All user input is stored in the worksheet.

The tool has several future uses, which include 1) encouraging and maintaining uniformity of remainder damage appraisals across regions, 2) estimating damages before proceeding with a project (and before having complete appraisals done), as well as clarifying changes in scenarios and opinions about how the project is to be implemented, and 3) identifying damages calculated by appraisers that appear to be inconsistent with similar appraisals and providing more profound understanding into why these differences may exist.

The ROWDA tool is developed to estimate percent-damages for TDOT appraisal projects. The tool requires an accurate input for each variable to estimate the damage percentage. To use the tool, Macros must be enabled. The following output measures are calculated based on data in the appraisal reports:

- Value of Land Acquired by TDOT ($).
- Remainder Land Value after Acquisition without Damages ($).
- Estimated Percent-damage to property (%).
- Remainder Land Value after Acquisition including Damages ($).
- Loss in Remainder Land Value after Acquisition due to Damages ($).
- Value of Improvements Acquired by TDOT ($):
- Value of Owner's Improvements after Acquisition without Damages ($).
- Value of Owner's Improvements after Acquisition with Damages ($).
- Loss in Value of Owner's Improvements due to Damages ($).
- Total Market Value of the Property before Acquisition ($).
- Total Loss in Property Value due to Damages ($).
- Remainder value with Damage (Land and Improvements) ($).
- Total Acquisition and Damage Costs (Land and Improvements) ($).

Comparison of Actual Sales with Remainder Damage Appraisals

A key aspect of the study is collecting and analyzing data for remainders' market transactions. Given the objectives of this study, the analysis provided is consistent with the 1995 remainder sales study. The actual sale of a remainder provides the market value for a comparison with the appraiser's assessment of the remainder property's value and thereby the damages due to a TDOT project. Following the 1995 study, this study first calculates the "sales-based" percent-damage or benefit by using the remainder value *before* damages in the appraisal report and the actual sales value and then compares it with the "appraisers-based" estimated percent-damage. For the 509 appraisal cases, the research team explored the actual sales data (a critical part of the information needed) from TDOT-provided CRS reports. The research team explored other sources that have emerged recently and are based on the Multiple Listing Service (MLS) and tax assessors' data to find additional cases. Specifically, Zillow.com and Realtor.com provide information about actual past sales of the property as well as an estimate of home value over time. Using property addresses, 115 cases were matched with 60 cases from CRS, 47 from Zillow.com, and 8 from Realtor.com. To analyze these data, sales within 10-years after the appraisal date are considered, which leads to 98 field-verified cases remaining for analysis.

Notably, 59% (N=58) of the cases are residential, 30% (N=29) were commercial, and the remaining 11% include agricultural, vacant, industrial, and mixed-use cases. The analysis performed shows that:

- When analyzing the "sales-based" percent-damage/benefit, the results showed that in 64% of the cases (N = 63), properties sold below the remainder value before damages, and in 36% (N = 35), the properties showed benefits, i.e., they sold above the remainder value before damages. The sales all occurred within 10 years of the appraisal, with the majority occurring within two years of the appraisal. Also, note that in the "appraisers-based" values for these properties, all 98 cases (100%) had damages only, given the criteria used to select the appraisal reports.
- The median percent-damage (-25%) for the "sales-based" estimation of damages/benefits is almost similar to the appraisers-based estimation (-32%). Notably, in 14% of the cases (N=14 out of 98), the difference between "appraisers-based" estimated percent-damage and "sales-based" percent-damage is within ±10%.
- When appraisal and sales occurred within two years, in 59 such cases, the median sales-based percent-damages becomes -37%, which is within the close range of appraisers' percent-damage (-35%).

Notably, if the duration between appraisal and sale is short, then one would expect minimal changes in the economy (real-estate market, inflation, disruptions) between the appraisal date and the actual sale date. In addition, it is less likely that there will be any dramatic changes (e.g., improvements) made in those properties in a short time. Nevertheless, the presence of "sales-based" benefits cases (27%) in the two years analysis still warrants further investigation and collection of more detailed information. That is, more detailed investigations can help confirm whether the appraisers' estimation matches the actual sales for different types of properties. Importantly, this analysis of remainder market transactions supports the effectiveness of ROWDA predictions of remainder damages.

Key Recommendations

The Right-of-Way remainder sales project has accomplished its goals with new findings from damage appraisal reports and analysis of actual sales. The recommendations for TDOT include the following:

- *Use the uniformly formatted databases to obtain information about properties acquired recently by TDOT to assist with assigning monetary value to remainder damage(s).* The study provides properly indexed 509 case reports for obtaining needed information about remainder damage appraisals in Tennessee. The damage appraisal report information can be easily accessed in the indexed Microsoft Word files created for reviewing case reports. The reports are also available in a Microsoft Excel database for further analysis if desired by the user. Furthermore, the databases allow for easy continuous updating of the appraisal information.
- *Use the remainder sales study field verification forms to assist with assigning monetary values.* Consistent with the 1995 remainder sales study, for the (field-verified) 98 cases, the actual sale of remainders is compared with the appraiser's assessment of the remainder property's value before damages. The associated percent-damage is calculated

accordingly, quantifying the "sales-based" damages. These can also be compared with the "appraiser-based" damages to assist with assigning monetary value to the remainder damages in new cases.

- *Adopt predictive analytics for estimating remainder damages by using the Right-of-Way Damage Assessment (ROWDA) tool.* The ROWDA tool is based on the hedonic regression approach. It provides a quick way to evaluate the financial viability of a right-of-way project at its inception by considering all ROW costs and awards associated with that project. In some instances, users could compare alternative ways to accomplish the same goal that could have different costs. Thus, the ROWDA tool allows future ROW-related transactions and awards to be evaluated against anticipated ROW costs. This tool was validated using sales data.
- *Update the remainder sales study periodically.* Given the increasing rate of change in real-estate markets, there is a need to update the cases regularly and encourage assessors to use state-of-the-art prediction techniques for remainder damage assessments.
- *Future research.* These efforts can explore the best ways of comparing sale and appraisal information, given the time differences (gaps) that need to be considered. Further, experimentation with new data sources and potential methodological ways of improving the effectiveness of appraisals for remainder damages can be explored. . This strategy will include refinements in the hedonic approach used in the ROWDA tool, particularly as more data are incorporated into the database. Consideration should be given to new prediction techniques that are increasingly becoming available, e.g., using big data and models that consider comparable homes, assessed taxes, and property characteristics (e.g., square footage and the number of bathrooms), as well as emerging artificial intelligence techniques. Furthermore, addressing heterogeneity in the appraisal data can improve damage appraisal predictions. This can be done by developing Finite Mixture models—a state-of-the-art technique for estimating sub-populations in the data. This may result in accomplishing better appraisal predictions for future studies.

The above recommendations:

- Provide a way to achieve and maintain uniformity in the process of remainder appraisal damages across the state.
- Provide a way to assess the consistency of a new appraisal with past appraisals of comparable right-of-way damages.
- Support the use of a tool by TDOT appraisers to objectively determine remainder damage (loss of value) while reducing the time and cost of acquisition.
- Lead to increased property owner confidence in assessing damages to their property when TDOT acquires their property for right-of-way projects.

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Chapter 1 Introduction

Compensation is often provided to property owners for damages to any remaining property using appraisals in eminent domain situations. The laws in the United States require that a property owner be paid just compensation when the government, either federal, state, or local, acquires a private property. The "Uniform Act" requires that an "approved appraisal" be used to develop an amount believed to be just compensation [1]. The amount is based on the property's fair market value, as determined by a professionally prepared, reviewed, and approved appraisal.

For TDOT's right-of-way acquisitions, damages to remainder parcels are analyzed using appraisal reports. A new tool (ROWDA) was developed to help assess remainder parcel damages.

The Tennessee Department of Transportation (TDOT) acquires parcels of land from private and commercial properties in conjunction with transportation projects every year. Many of these acquisitions are partial takings referring to a portion of an acquired property, leaving a remainder of the land behind. The acquisition of Right-of-Way is one of the most significant reasons state departments of transportation acquire land. This is a highly complicated process requiring multiple stages, various participants, and large amounts of data and information. It is assumed that the remainder property has suffered economic changes in terms of percentage damages or benefits due to the undertaken portion of the property. The Tennessee Department of Transportation ensures that the property owner is fully compensated for the loss of land and resulting damages incurred due to the acquisition of land and improvements. This involves a valuation or appraisal of the property being acquired. Typically, an independent fee appraiser is hired by TDOT to determine the compensation that must be paid to the property owner. At times, there is a divergence in values of the appraised properties that are similar in nature by two different fee appraisers or a difference between the value calculated by the appraiser and the value calculated by the property owner. A variety of factors are responsible for any inconsistencies.

1.1 Research Significance

The ability of TDOT to acquire right-of-way for transportation projects can be difficult. While a price can be agreed on in many cases, there are cases where assessments by the state and the landowner differ substantially. In some cases, these disputes are relatively easily settled for a higher price, but expensive legal action may result in other cases. One of the reasons behind this discrepancy is that the appraised land value may seem vague and nonspecific. As a result, TDOT may appear to be unintentionally underestimating the value of certain types of land acquisitions, leading to costly and time-consuming dispute resolution, or TDOT may appear to be paying too much for some parcels because TDOT has limited research to back up the appraisal report calculations. Generally, the Tennessee Department of Transportation will not acquire property that is not needed specifically for state right-of-way [2]. This includes acquiring a portion of a parcel of property, which would leave the property owner a remainder of that parcel. A remainder parcel is appraised apart from the whole parcel and is appraised separately.

Research is needed to increase property owner confidence in the eminent domain process and strategies that help shorten the acquisition portion of TDOT projects, resulting in the timely completion of projects involving partial takings.

1.2 Research Problem & Objectives

The issues involved in right-of-way acquisitions and assessing the value of remainders are complex. This 2022 Remainder Sales Study aims to provide an up-to-date remainder sales study and damages study that can help TDOT appraisers make complete and accurate appraisals in cases involving partial takings. The overall purpose of investigating the case histories of previous remainder appraisals is to determine better predictability or expectancy for individual remainders and thus deal with uncertainty. To accomplish these purposes, remainder studies have been conducted in all regions of the state (TDOT Regions 1-4).

Notably, this 2022 Reminder Sales Study uses TDOT's standard appraisal forms and uniform methodology to highlight unique case examples involving variations in land use, types of improvements, and damage percentages. This supports TDOT in its current analytically sound method for making remainder sales valuations. By obtaining and analyzing appraisal reports and actual remainder sales data, this study identifies the parcel attributes that have the most significant impact on the percentage of damages, which is the amount of the fair market value of the property before the taking and the fair market value of the remainder after the taking. This study does not include remainder appraisals that result in benefits; rather, it includes only appraisals resulting in damages.

1.3 Report Organization

This 2022 Remainder Sales Study is organized into the following sections:

- The **Introduction** provides the context of the ROW acquisition process, the significance of the research, the research problem, and the purpose of this remainder sales study.
- The **Literature Review** provides an overview of the remainder sales study topics and sources that contribute to understanding research and identifying gaps. The TDOT 1995 remainder sales study is out-of-date in terms of remainder damage calculations and needs updating with new data and analytical methods.
- The **Methodology** discusses the coding and analysis of data and the development of hedonic models.
- The **Results and Discussion** provide details about the appraisal and sales data and the relationships uncovered when harnessing the data.
- The **Comparison of Actual Sales with Appraisals** compares damages to remainders by the assessors and the damages based on sales of remainder parcels.
- The **Conclusion and recommendations** summarize the results, provide new insights about remainder damage estimation, and recommendations for TDOT and future research directions.

Chapter 2 Literature Review

Recent literature about right-of-way acquisitions varies in terms of methods to ascertain the damages to remainder properties. Empirical evidence related to the amount of damage incurred from partial takings is generally lacking, and appraisals are used to estimate the amount of severance damage. The property is typically appraised before and after the acquisition. The difference between these two values provides the values for the acquired parcel and the depreciation of the remaining property. However, such appraisals have been completed with little or no proof to support the damage amounts [3].

There is a lack of consensus about which land attributes correlate with property damages. Damages in the context of takings are a reduction in the value of a partially taken remainder property. These damages are typically associated with a loss of utility, changes in land use, particularly for vacant and commercial zoning, and changes in access [4]. In addition, damages may be associated with other factors, including a lack of accessible on-site frontage parking, loss of building setback due to utility or zoning regulations, and change of ingress or egress, which cause traffic flow disruption on and near the site [4]. The improvement type, road proximity, parcel's location at key network points such as corner parcels, construction timing, and construction completion also impact appraisal values [5]. Kockelman and Heiner found that loss of on-site parking, loss of access, and property location heavily impact the remainder damage. However, evidence for the size of taking as a correlate of damage was not found in the study [6]. Also, gross land area, gross living area, property value [7], and damaged access (owners blocked from accessing their property) [8] are significantly associated with damages.

Firmly establishing relationships for estimating damages can be difficult due to significant errors in the data and estimation [6]. Despite the difficulty in identifying significant attributes associated with remainder property damage, accurate and clear property damage assessments are needed for budgeting, timely project completion, and reducing the chances of costly litigation.

Regression models have been used to identify attribute factors impacting damage calculations. These models are particularly useful in examining correlates or attribute bundles. Hedonic price functions have been used for decades to estimate the value of a property. The initial models were used to calculate price adjustments based on characteristics related to the various attributes of a product, e.g., in the original study, the quality of vegetables [9]. Subsequently, they were used to predict the value of a property, given its' attributes. More recently, hedonic models have identified attributes relevant to damages in partial takings. Common procedures for modeling include identifying or selecting the variables to be valued based on property sale price.

To understand the association of variables on the acquisition costs of partial takings, Buffington et al. [10] developed a hedonic regression model by incorporating relevant remainder characteristics identified from surveys of public and private experts into the model. Buffington et al. found that land use, change in land use, and the remainder shape impact the damage percentage calculation [10]. For example, the model showed that if the land is for commercial use, the total acquisition cost is higher by $24000 per acre, and if the remainder is rectangular-shaped, the cost is $12000 less than remainders of other shapes.

New econometric and artificial intelligence-based methods are emerging in property valuation, providing more accurate predictions. These new techniques may also be relevant to damage estimations. For example, Rosato et al. modified the Hedonic pricing models used for property valuation (not damages) by developing a mixed hedonic multi-attribute model [11] that can incorporate a broader set of variables in the model. New artificial intelligence techniques are also emerging that can examine large-scale real-estate data efficiently and use algorithms to predict property values accurately. Such techniques can be considered for damage evaluations.

This research project was partly motivated by a remainder sales study conducted by the TDOT ROW office and published in May 1995. The study included a remainder sales analysis by county. It contained commercial, residential, agricultural, and special purpose land parcels. Text analysis is performed on that study which identifies the most prevalent words/topics. Some of the important words found are ROW, access, area, dwelling, frontage, shape, proximity, commercial, and tract (Figure 2-1). A series of word connections between pairs of words centered on ROW is also performed, and this is directly linked to the area, acreage, access, and slope (Figure 2-1). The text analysis provides useful insights regarding the general topic areas discussed in this study.

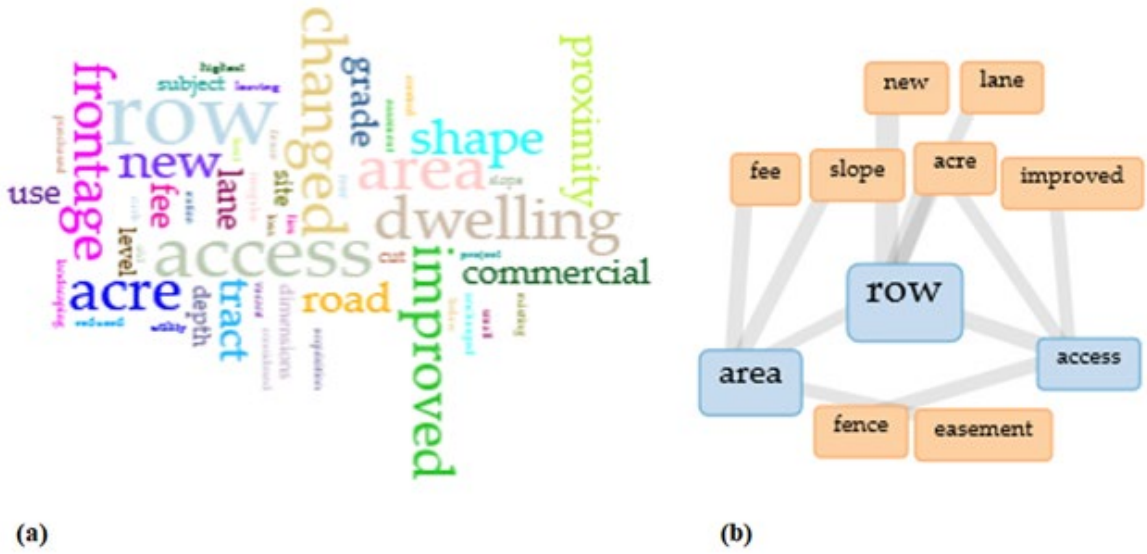

Figure 2-1: Text Analysis (a) prevalent words/topics discussed in the 1995 study (b) word connections

The key variables identified in the 1995 TDOT ROW study of remainder damages are listed as follows:

- Access is damaged after the acquisition
- Land use is changed after the acquisition
- A store/shop is built after the acquisition
- Lot area is damaged after the acquisition
- Required a mobile home
- Area in Acres that is acquired of the rear/front/middle side for a construction
- Remainder area in Acres
- A fraction of the acquired area divided by the remainder
- Percent of damage or benefit

A systematic literature analysis conducted with text analytic tools can enhance understanding of reminder sales and the acquisition process. Consequently, a holistic examination of all the literature discussed in this section is illustrated in Figure 2-2, Figure 2-3, and Figure 2-4 using text analytics. Figure 2-2 demonstrates a word cloud plot of the most frequent words found in the relevant literature. It is based on the frequency statistics of the word list, where frequencies are converted to words with different sizes. The more frequently the word appeared in the studies, the larger the word would be in the plot. For instance, the word cloud emphasizes property, acquisition, remainder, land, and cost, among others, are the most used words in the literature. Similarly, Figure 2-3 presents a phrase cloud plot of the most frequent phrases in the studies. For example, acquisition cost, ROW acquisition, and sale price, among others, are some of the critical phrases found in the previous studies. Finally, Figure 2-4 illustrates the concept map of words across key concepts and topics found in the literature. In this map, words are plotted with a line between each pair of words showing a strong correlation. Each cluster of words with distinct color indicates a topic or concept on right-of-way remainder sales. For example, ROW acquisition, sales data, and remainder damage are among the most important concepts in previous studies.

Figure 2-2: Word Cloud of the Most Frequent Words

Figure 2-3: Phrase Cloud of the Most Frequent Phrases

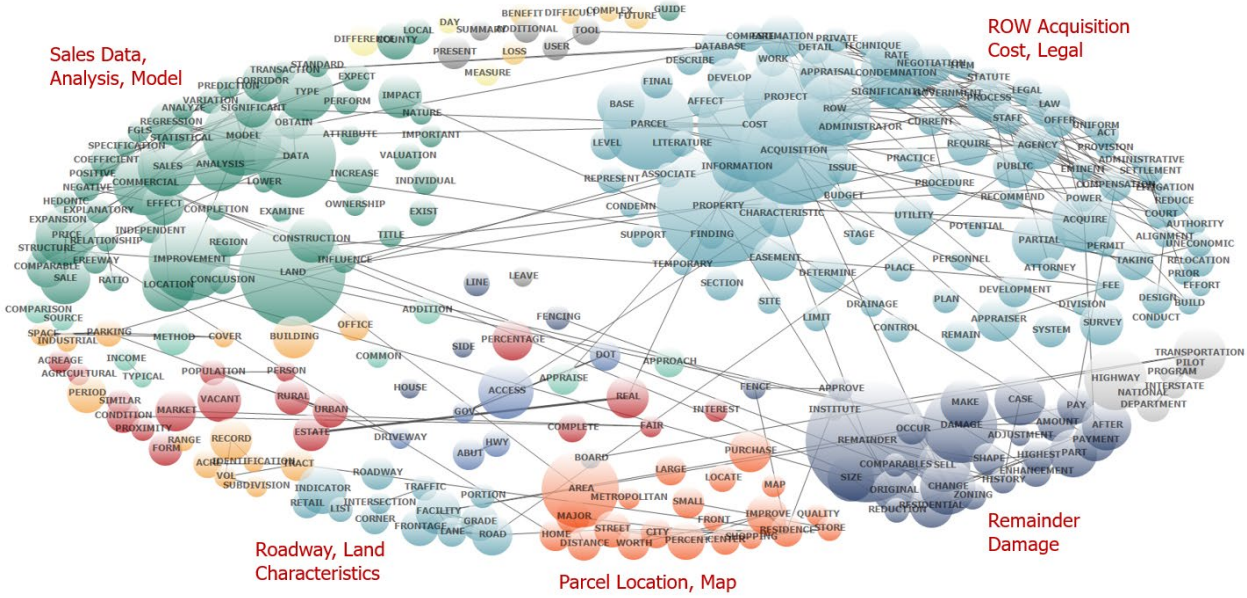

Figure 2-4: Concept Map of Words using Text Mining

Overall, a few studies identify factors affecting the remainder properties' damages and propose robust models to predict damages. Meanwhile, the TDOT 1995 remainder sales study is outdated in damage calculation and data. The research team at the University of Tennessee has conducted this study to fill these gaps. First, the data were collected and coded from more than 500 TDOT appraisal reports. Then, the damage percentage in the appraisal reports is chosen as the variable of interest (dependent variable) for the statistical analysis. Expressing damages in a percentage form eliminates the impact of market forces on the magnitude of a dependent variable expressed

as a difference in property prices at different points in time across different markets. Furthermore, descriptive statistics and regression analyses were used to identify the attributes with the strongest associations with the damage percentage. By adopting a robust regression model, the key variables significantly affecting the percentage of damage to the remainders are identified. Using the regression model's results, a tool named the Right-of-Way Damage Assessment (ROWDA) was developed to evaluate and analyze ROW acquisition inputs to calculate estimates of damage percentage. Importantly, updated field verification of the appraisals with the actual sales values is provided.

Chapter 3 Methodology

To understand the correlates of remainder damage, data on appraisal reports and actual sales were collected. The data were analyzed using descriptive statistics and multi-variate hedonic modeling techniques to predict remainder damages. Such techniques are commonly used to predict the values of real estate properties. The details about the appraisal data provided by TDOT are mentioned below.

3.1 Data Sources

The data utilized in this study are collected from the Tennessee Department of Transportation appraisal reports for TDOT Regions 1-4. In total, 546 appraisal reports conducted by TDOT in recent years have been collected and perused attentively. The appraisal reports are based on TDOT's standard appraisal forms and uniform methodology to highlight unique case examples involving variations in land use, types of improvements, and damage percentages. Instructions to read the appraisal reports are presented in Appendix A. Using the information in the case studies, several attributes were extracted and quantified. The glossary of key terms, acronyms, and attributes is presented in Appendix B. The research team coded the appraisal reports as 155 columns of data (e.g., variables or attributes) in Microsoft Excel spreadsheets. After cleaning the data and removing outliers and missing values, 509 case studies (having damages greater than $25,000) were utilized (As shown in Figure 3-1 directly below).

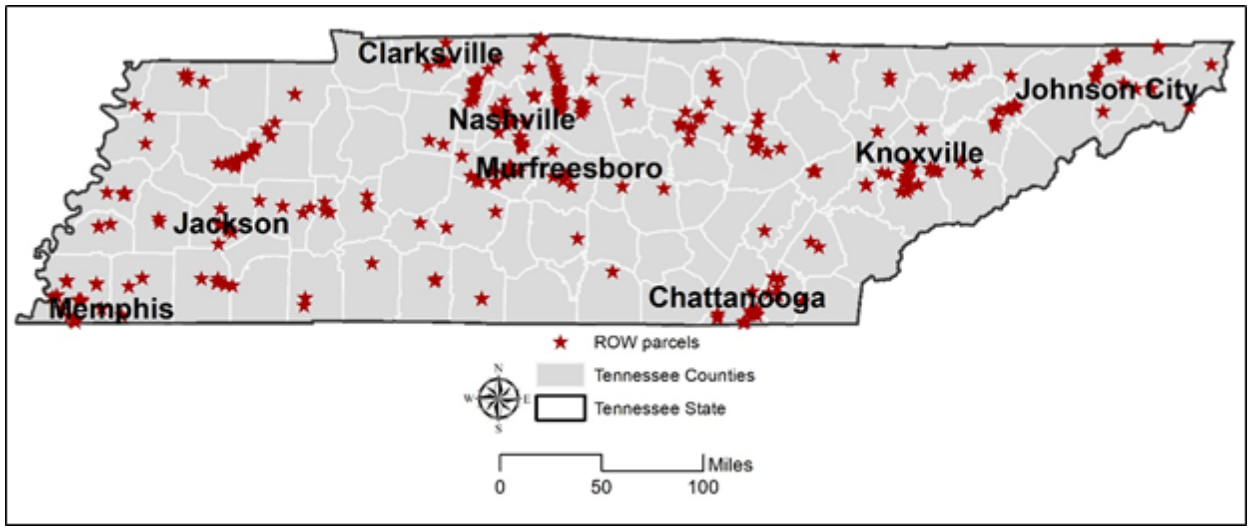

Figure 3-1: Location of parcels affected by ROW projects in Tennessee

The variable of interest in this study is the percentage of damage to the remainder value. For the appraisal report case studies, percentages of damage are calculated. In a partial taking, the damages are measured by valuing the property as a whole before the taking and then determining the value of what remains after the taking. The difference is considered to be the damages. The dependent variable is damage assessed as a percentage of before and after appraised value. The percent damages are equal to the total for damages to the remainder divided by the remainder value. This variable was calculated for each appraisal report. To

demonstrate the calculation, an example of an appraisal report for Anderson County in TDOT Region 1 is provided as follows. It is worth noting that the items discussed here were consistent in all studied appraisal reports.

Example: The research team has created this example based on the method used by TDOT appraisers. Items 20-24 in the appraisal reports explain why damages or benefits were attributed. Item 20 presents the appraiser's reconciled Total Before Value for the entire tract (e.g., $550,000). Before the start of the project, TDOT needs to own the property. The values of the ownership of those items for TDOT to buy are listed in the report's Items 20-A and B. The total for TDOT purchasing the physical ownership of the property owner's items is 20-C. The item 20-D is Total Damages.

The Before Value minus Item 20-C (Physical Ownership Acquisitions including Easements, if any) (e.g., $82.335) equals the Remainder Value of the whole tract without Damages/Benefits as shown below.

$550,000 - $82,335 = $467,665

Percent-damages can be calculated using the following equation:
Percent-damages = Item 20-D (Total for Damages to Remainder) divided by Remainder Value (w/o Damages)

For example:
Percent-damages = $46,567/$467,665 = 9.96%
Based on the calculations, the percent damages were calculated for the rest of the appraisal reports.

3.2 Remainder Sales Case Studies

The Appraisal Case Studies are categorized by TDOT Region (1-4) and then by current land use (i.e., Residential (R), Commercial and/or Business (C), Agricultural and Vacant (A), and Special Use (SU)). The attributes for each region's case study include county, PIN ID and Tract Number, current land use and the highest and best use as if vacant and as if improved, number and type of improvements, and percent of damages.

The highest and best use needs further explanation, given that this method is used in TDOT reports to calculate the appraised value. This idea is used in real estate appraisals to indicate the highest assessed value for a property. To appraise the market value of a property, one way is to imagine its highest and best use, i.e., the use of the property that will provide the highest value for a property, regardless of its actual current use. The highest and best use variable would be the use of the land "As Vacant" without any improvement, compared with the use of the land if it was "Improved," resulting in the highest value. Notably, "As Vacant" assumes the site does not have a structure and addresses the issue of what use should be made of the site. The "improved" designation addresses the use that should be made of the property as it exists in its current form. The highest and best use as improved may differ from the existing or vacant use.

The highest and best use analysis considers the subject property's legal, physical, and financial feasibility and alternative uses to estimate the maximally productive use as if vacant and as if improved. Four tests are applied to identify the highest and best use. These include the following:

1. Legally permissible – factors include zoning, regulations, restrictions, local building codes, environmental regulations, and historic district regulations.
2. Physically Possible – these uses are shaped by the size, area, topography, flood possibilities, shape, and physical capacities. Also, accessibility, frontage, depth, and availability of public utilities.
3. Financially Feasible – any potential use must be comparable with surrounding development patterns and must yield a reasonable profit to be considered financially feasible. If the net revenue capable of being generated from a use is sufficient to satisfy the required rate of return on the investment and provide a requisite return on the land, the use is considered financially feasible.
4. Maximally Productive/Profitable – which of the use alternatives is maximally productive. Of the financially feasible uses, the one which provides the highest residual land value consistent with the market rate of return for that use is the highest and best use.

As mentioned before, the percent of damages is based on the remainder value. For example, the before value minus physical ownership acquisitions, including easements, equals the remainder value of the whole tract without damages. The percent of damages calculated in this report is equal to the total value of damages to the remainder divided by the remainder value before damages.

The types of current land use are residential, agricultural, commercial, industrial, vacant, mixed-use, and others (Greenspace, Office, and Private/Public Institutions) (as shown in Figure 3-2). Additional information includes a list of improvements and the percent of damages. The project and tract identifiers can direct a user to the complete appraisal report.

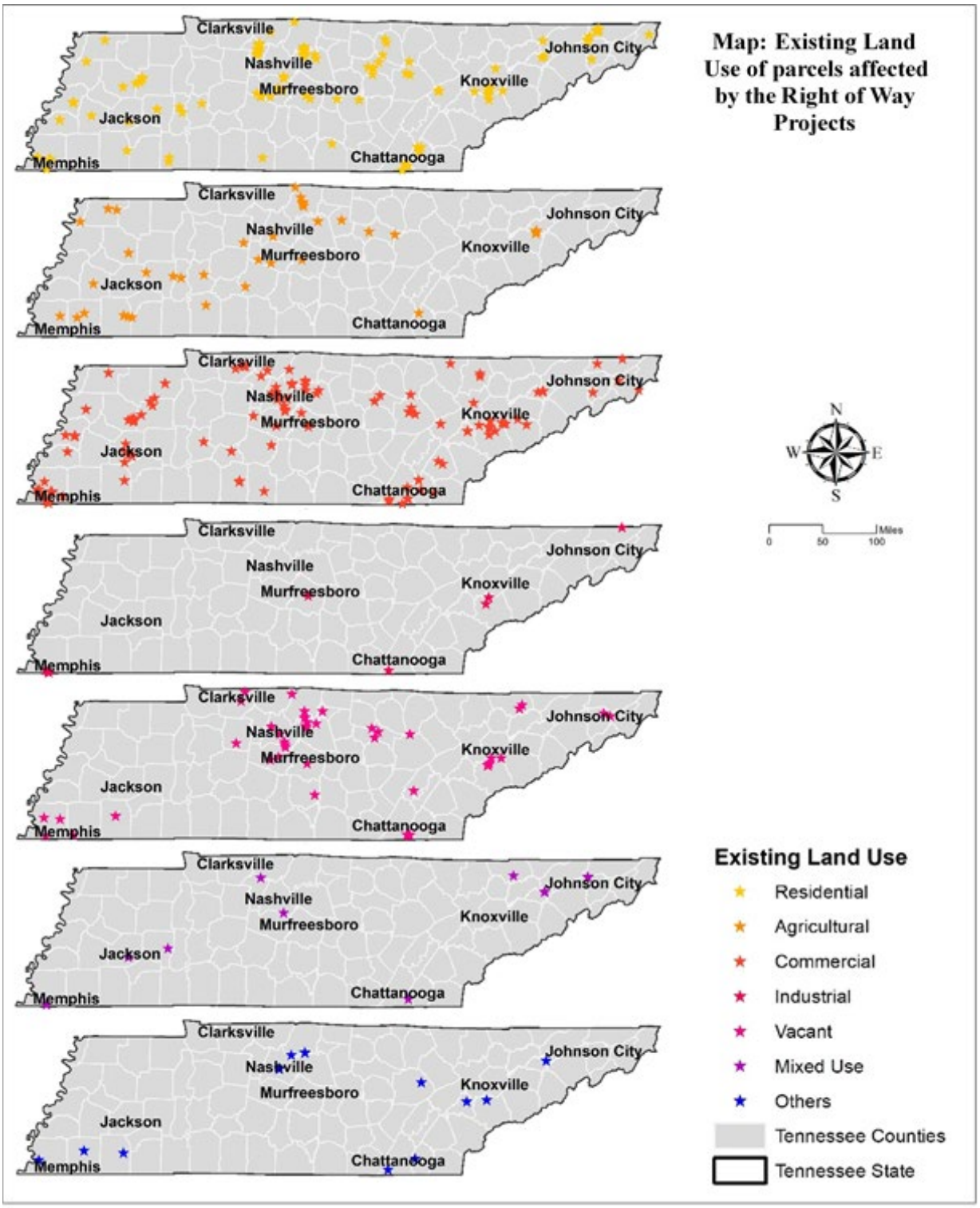

Figure 3-2: Illustration of existing land use of all parcels affected by the ROW project

3.2.1 Region 1 Cast Studies

TDOT Region 1 includes the following counties: Anderson, Blount, Campbell, Carter, Claiborne, Cocke, Grainger, Hamblen, Hancock, Hawkins, Jefferson, Johnson, Knox, Loudon, Monroe, Morgan, Roane, Scott, Sevier, Sullivan, Unicoi, Union, and Washington. Figure 3-3 illustrates the various current land uses identified by appraisal reports. The following land uses are named: Agricultural (Green Circle); Commercial/Retail (Blue Triangle); Green Space (Green Square); Industrial (Red Circle); Mixed-Use (Orchid Triangle); Office (Coral Square); Public/Private Institution (Gold Circle); Residential (Red Triangle), and Vacant (Gray Square). Region 1 contains 107 case studies.

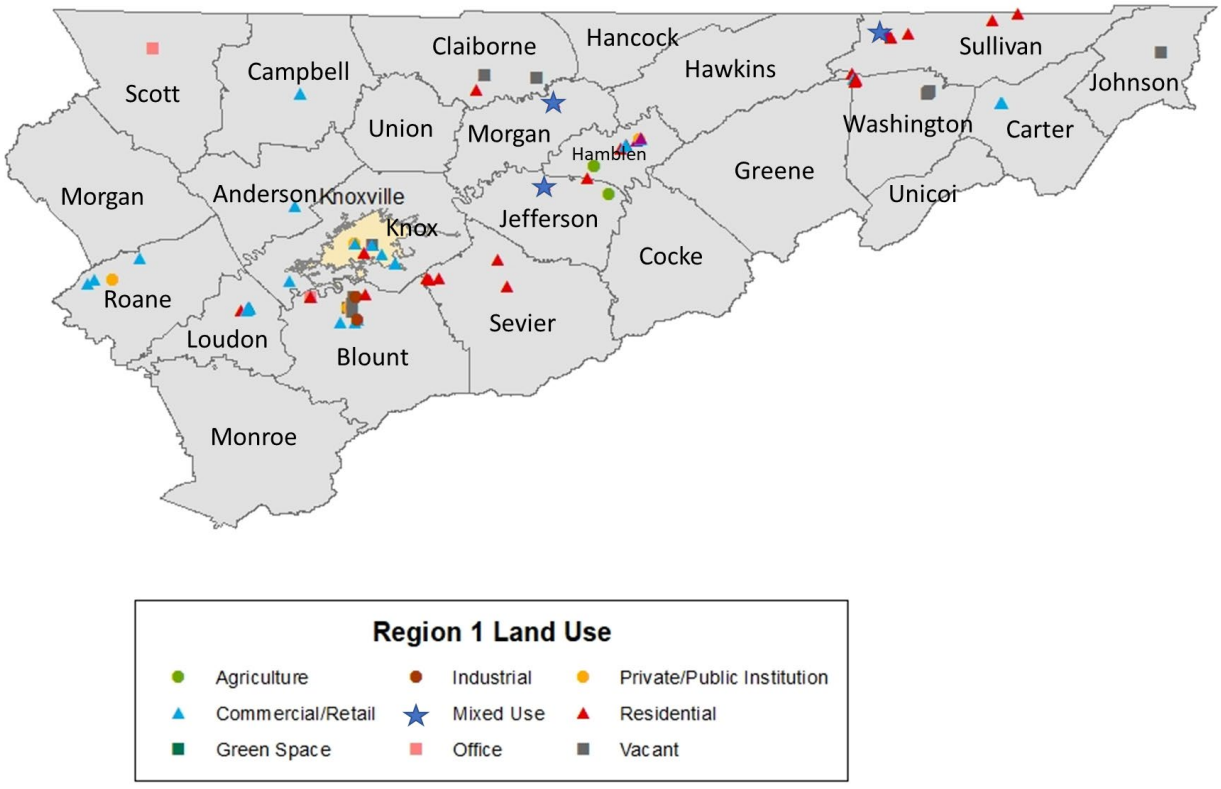

Figure 3-3: Region 1 Current Land Use

The values listed below are descriptive amounts for the 107 observations in TDOT Region 1 and do not represent relationships between specific parcels. Thus, a common numeric value that appears as parcel count for more than one criterion is a coincidence and does not indicate any relationship between the parcels.

- 40 parcels had a change in current land use to the land use "as vacant" and/or "improved";
- 54 parcels had a ratio of remainder land to the original area of 85 percent or higher; in nine cases, 100 percent of the land was acquired;
- 39 parcels had 3 or more damaged improvements;
- 41 Parcels had 3 or more acquired improvements;
- 46 Parcels had some type of access damage; 12 were landlocked after acquisition;

- 21 parcels had some type of proximity damage;
- 31 Parcels had a change in tract utility;
- 21 Parcels had a change in frontage elevation after acquisition;
- 53 Parcels had an area of 1.33 acres or more; one parcel was at least 100 acres;
- 45 Parcels had landscape damage of 50 percent or more;
- 47 Parcels had more than one frontage side (or a corner lot);

3.2.2 Region 2 Case Studies

TDOT Region 2 includes the following counties: Bledsoe, Bradley, Cannon, Clay, Coffee, Cumberland, DeKalb, Fentress, Franklin, Grundy, Hamilton, Jackson, Marion, McMinn, Meigs, Overton, Pickett, Polk, Pulaski, Putnam, Rhea, Sequatchie, Van Buren, Warren, and White. Figure 3-4 illustrates the various current land uses identified by appraisal reports. The following land uses are named: Agricultural (Green Circle); Commercial/Retail (Blue Triangle); Green Space (Green Square); Industrial (Red Circle); Mixed-Use (Orchid Triangle); Office (Coral Square); Public/Private Institution (Gold Circle); Residential (Red Triangle), and Vacant (Gray Square). Region 2 contains 80 case studies.

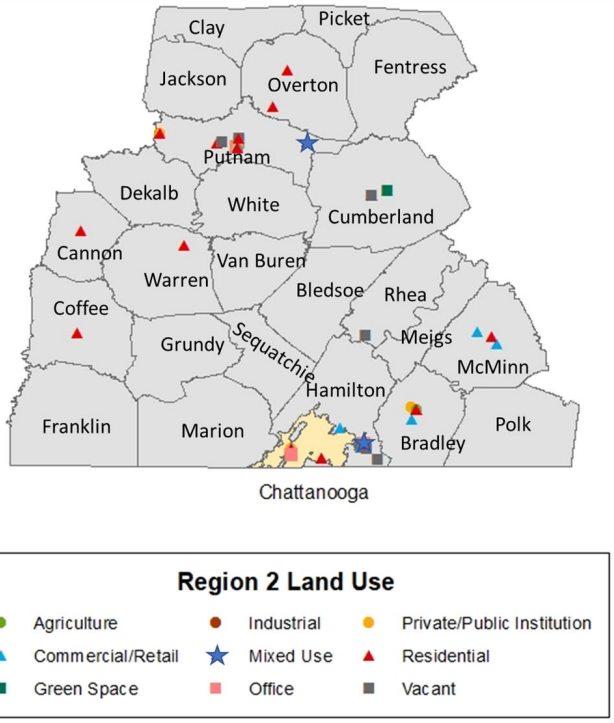

Figure 3-4: Region 2 Current Land Use

The values listed below are descriptive amounts for the 80 observations in TDOT Region 2 and do not represent relationships between specific parcels. Thus, a common numeric value that appears as parcel count for more than one criterion is a coincidence and does not indicate any relationship between the parcels.

- 27 parcels had a change in current land use to the land use "as vacant" and/or "improved;"
- 40 parcels had a ratio of remainder land to the original area of 91 percent or higher; in 17 cases, 100 percent of the land was acquired;

- 28 parcels had 3 or more damaged improvements;
- 30 Parcels had 3 or more acquired improvements;
- 18 Parcels had some type of access damage; 3 were landlocked after acquisition;
- 26 parcels had some type of proximity damage;
- 46 Parcels had a change in tract utility;
- 8 Parcels had a change in frontage elevation after acquisition;
- 40 Parcels had an area of 0.99 acres or more; 1 parcel was at least 100 acres;
- 47 Parcels had landscape damage of 50 percent or more;
- 34 Parcels had more than one front side or a corner lot;

3.2.3 Region 3 Case Studies

TDOT Region 3 includes the following counties: Bedford, Cheatham, Davidson, Dickson, Giles, Hickman, Houston, Humphreys, Lawrence, Lewis, Lincoln, Macon, Marshall, Maury, Montgomery, Moore, Perry, Robertson, Rutherford, Smith, Stewart, Sumner, Trousdale, Wayne, Williamson, and Wilson. Figure 3-5 illustrates the various current land uses identified by appraisal reports. The following land uses are named: Agricultural (Green Circle); Commercial/Retail (Blue Triangle); Green Space (Green Square); Industrial (Red Circle); Mixed-Use (Orchid Triangle); Office (Coral Square); Public/Private Institution (Gold Circle); Residential (Red Triangle), and Vacant (Gray Square). Region 3 contains 177 case studies.

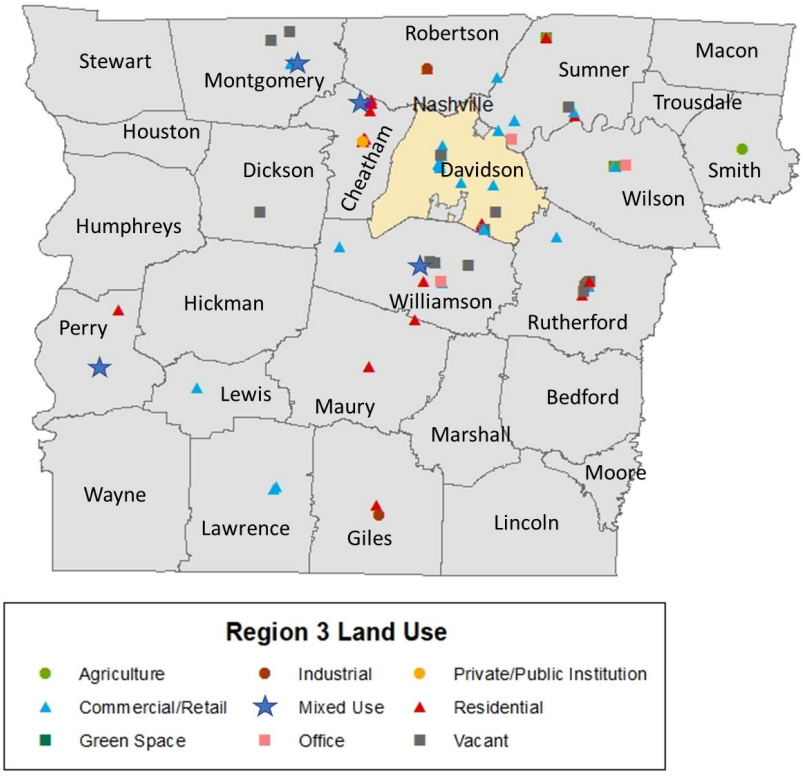

Figure 3-5: Region 3 Current Land Use

The values listed below are descriptive amounts for the 177 observations in TDOT Region 3 and do not represent relationships between specific parcels. Thus, a common numeric value that

appears as parcel count for more than one criterion is a coincidence and does not indicate any relationship between the parcels.

- 49 parcels had a change in current land use to the land use “as vacant” and/or “improved”;
- 89 parcels had a ratio of remainder land to the original area of 86 percent or higher; in 8 cases, 100 percent of the land was acquired;
- 72 parcels had 3 or more damaged improvements;
- 63 Parcels had 3 or more acquired improvements;
- 38 Parcels had some type of access damage; 3 were landlocked after acquisition;
- 58 parcels had some type of proximity damage;
- 48 Parcels had a change in tract utility;
- 10 Parcels had a change in frontage elevation after acquisition;
- 89 Parcels had an area of 1.3 acres or more; 4 parcels were at least 100 acres;
- 60 Parcels had landscape damage of 50 percent or more;
- 67 Parcels had more than one front side or a corner lot;

3.2.4 Region 4 Case Studies

TDOT Region 4 includes the following counties: Benton, Carroll, Chester, Crockett, Decatur, Dyer, Fayette, Gibson, Hardeman, Hardin, Haywood, Henderson, Henry, Lake, Lauderdale, Madison, McNairy, Obion, Shelby, Tipton, and Weakley. Figure 3-6 illustrates the various current land uses identified by appraisal reports. The following land uses are named: Agricultural (Green Circle); Commercial/Retail (Blue Triangle); Green Space (Green Square); Industrial (Red Circle); Mixed-Use (Orchid Triangle); Office (Coral Square); Public/Private Institution (Gold Circle); Residential (Red Triangle), and Vacant (Gray Square). Region 4 contained 145 case studies.

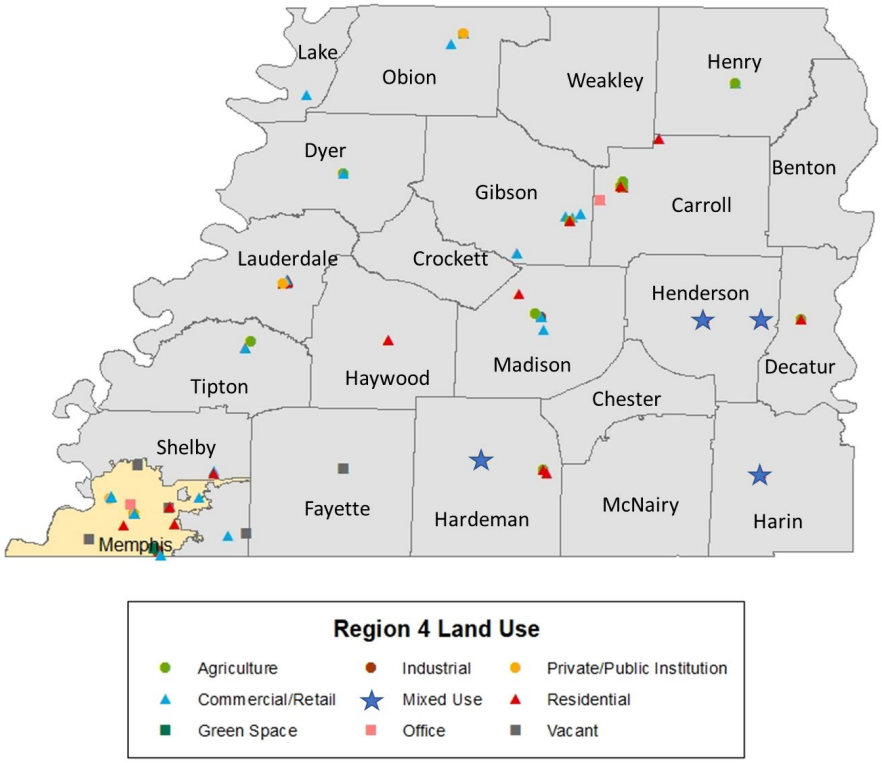

Figure 3-6: Region 4 Current Land Use

The values listed below are descriptive amounts for the 145 observations in Region 4 and do not represent relationships between specific parcels. Thus, a common numeric value that appears as parcel count for more than one criteria is a coincidence and does not indicate any relationship between the parcels.

- 24 parcels had a change in current land use to the land use "as vacant" and/or "improved;"
- 79 parcels had a ratio of remainder land to the original area of 89 percent or higher; in 11 cases, 100 percent of the land was acquired.
- 57 parcels had 4 or more damaged improvements.
- 45 Parcels had 4 or more acquired improvements.
- 62 Parcels had some type of access damage; 12 were landlocked after acquisition.
- 57 parcels had some type of proximity damage.
- 32 Parcels had a change in tract utility.
- 12 Parcels had a change in frontage elevation after acquisition.
- 74 Parcels with areas of 2.0 acres or more; 7 parcels were at least 100 acres.
- 56 Parcels had landscape damage of 50 percent or more.
- 48 Parcels had more than one front side or a corner lot.

3.3 Data Limitations

The analysis of appraisal data only cannot provide a better appraisal method for analysis. That is, using appraisal data to correlate the dependent variable with independent variables cannot provide a better appraisal method or prediction. The statistical analysis simply provides

predictions based on the data used for estimation. Nevertheless, appraisal data can be used to identify the conditions that correlate with (appraised) damages. However, the actual market sales data are needed for better damage predictions. Using appraisal and actual sales data together results in more robust predictions.

TDOT provided appraisal data for 500 plus cases. However, the sales data provided from the Courthouse Retrieval System (CRS) for damaged properties was restricted to only a few cases. That is, the CRS data did not have a sufficient number of cases where the sales dates of damaged properties were after the appraisal dates. Another issue was that the gap between appraisal and sales dates was very large in some cases, e.g., 15 years or more.

3.4 Methodology

This section discusses the methods utilized in this project. To achieve the objectives of this study, an Ordinary Least Squares (OLS) regression model is estimated. Statistical analysis can reveal the relationship or association between several factors (independent variables) and a variable that requires prediction (dependent variable). The OLS model assumes a linear relationship between the input variables (X) and a single output variable (Y). The model can be written using Equation 1 below. An overview of regression analysis is shown in Figure 3-7:

$$Y_i = \beta_0 + \Sigma\beta_i X_i + e_i \qquad (1)$$

where, X represents a set of independent variables, Y is the dependent variable, β_0 is the intercept, β_i is the slope for the i^{th} independent variable, Σ represents the sum of $\beta_i X_i$ across all independent variables included in the regression, and e_i is the error term.

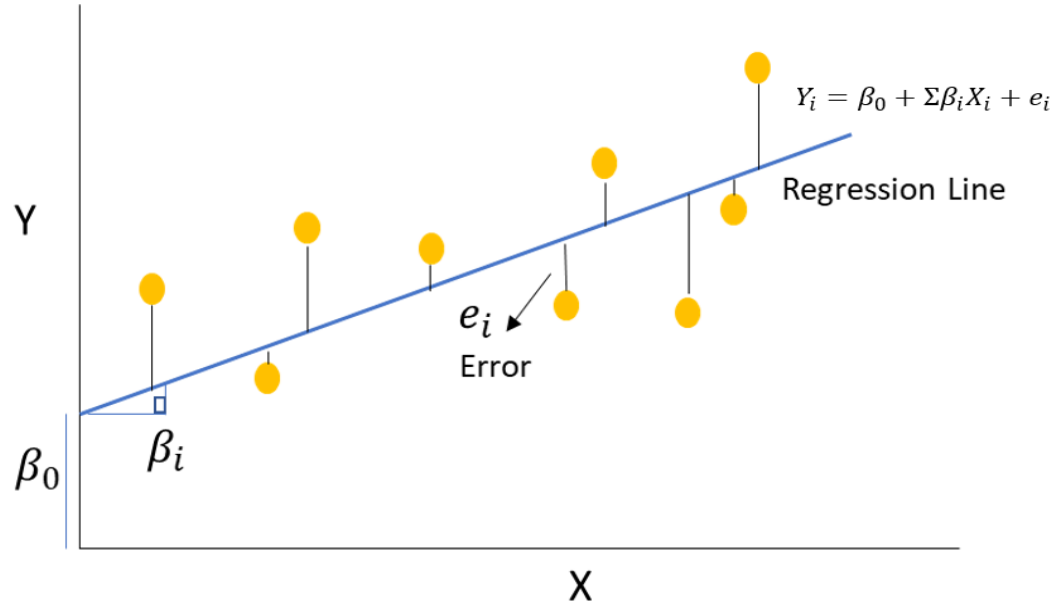

Figure 3-7: Regression Analysis Overview

Linear regression assumes a linear relationship between X variables and the dependent variable Y, the same variance for residuals, independent observations, and a normal distribution of the error terms.

The t-value and p-value are used to check whether the variables used in a model are statistically significant. The t-value is calculated by dividing the coefficient by its standard error. The standard error is an estimate of the deviation of a coefficient. The amount of standard error varies across cases. It can be thought of as a measure of the precision with which the regression coefficient is measured. The p-value for each term tests the null hypothesis that the coefficient equals zero (no correlation). A low p-value (< 0.05) indicates that the null hypothesis can be rejected (indicating significant correlation). Statistical significance indicates that changes in the independent variables correlate with shifts in the dependent variable.

For the model as a whole, R-squared is a goodness-of-fit measure that represents the proportion of the variance for *Y* that Xs explain in a regression model. If a regression model contains independent variables that are theoretically plausible and statistically significant, a reasonably high R-squared value (varies between 0 and 1) can be expected. R-squared can be calculated using Equation 2.

$$R^2 = 1 - \frac{RSS}{TSS} \qquad (2)$$

where, RSS is the sum of squares of residuals and TSS is the total sum of squares. The residuals are the fitted values minus the actual observed values of Y.

Adjusted R-squared is similar to the R-squared goodness of fit measure. However, it adjusts for the number of variables in a model. If uncorrelated variables are in a model, adjusted R-squared can decrease.

$$R^2_{adj} = 1 - \left[\frac{(1-R^2)(n-1)}{n-k-1}\right] \qquad (3)$$

Where *N* is the number of observations and *K* is the number of independent variables.

The F-test for a regression model is used to check the overall significance of the model. It tests the hypothesis that all parameters for independent variables are together equal to zero. The F-test statistic can be calculated using Equation 4.

$$F - test = \frac{RSS/k}{(TSS-RSS)/(n-k-1)} \qquad (4)$$

A statistically significant F-test rejects the null hypothesis that all the parameters in a full model are zero. In other words, a significant F-test indicates that the regression model explains a good portion of the variance in data.

Chapter 4 Results and Discussion

This chapter describes the data and the deliverables, including the analysis of appraisal data, access to structured appraisal data, and the ROWDA tool. The potential for implementation comes from using the data and applying the ROWDA tool.

4.1 Descriptive Statistics Results

Descriptive statistics are used to present the basic features of the data, including the minimum, the maximum, the mean, and the standard deviation. Descriptive statistics merely present the data characteristics without any inferential assumptions about their relationship to a variable (dependent) which is the primary focus of the analysis.

The total number of appraisal report case studies (N) equals 546 (Table 4-1). These case studies were then error-checked and cleaned, meaning the data has been prepared for analysis by removing or modifying incomplete, irrelevant, duplicated, or improperly formatted data. For example, though Region 1 includes 117 raw observations, 107 observations are used for data analysis and the remaining 10 cases have missing values. The table below represents the number of raw or uncleaned observations and the number of useful observations for each region. Of the total number of useful observations, Region 1 accounts for 21 percent, Region 2 accounts for 16 percent, Region 3 accounts for 35 percent, and Region 4 accounts for 28 percent.

Table 4-1: TOTAL NUMBER OF CASES

TDOT Region	*Total Number of Cases*	*Cases with Missing Values*	*Cleaned Data*	*Percentage of Total Cleaned Cases*
Region 1	117	10	107	21%
Region 2	93	13	80	16%
Region 3	184	7	177	35%
Region 4	152	7	145	28%
Total	546	37	509	100%

For the appraisal report case studies, percent damages are calculated. In a partial taking, the damages are measured by valuing the property, as a whole, prior to the taking; and then determining the value of what remains after the taking. The difference is considered to be the damages. For the 509 case studies analyzed, the percent of damage has a mean of 35.50 percent and a standard deviation of 28.03 percent (Table 4-2). The damage ranges from 0 to 100 percent. The histogram in Figure 4-1 indicates that approximately 107 of the 509 case studies (about 21 percent) have damages between 0 to 10 percent. About 376 of the case studies, or approximately 74 percent, have damages of 50 percent or less.

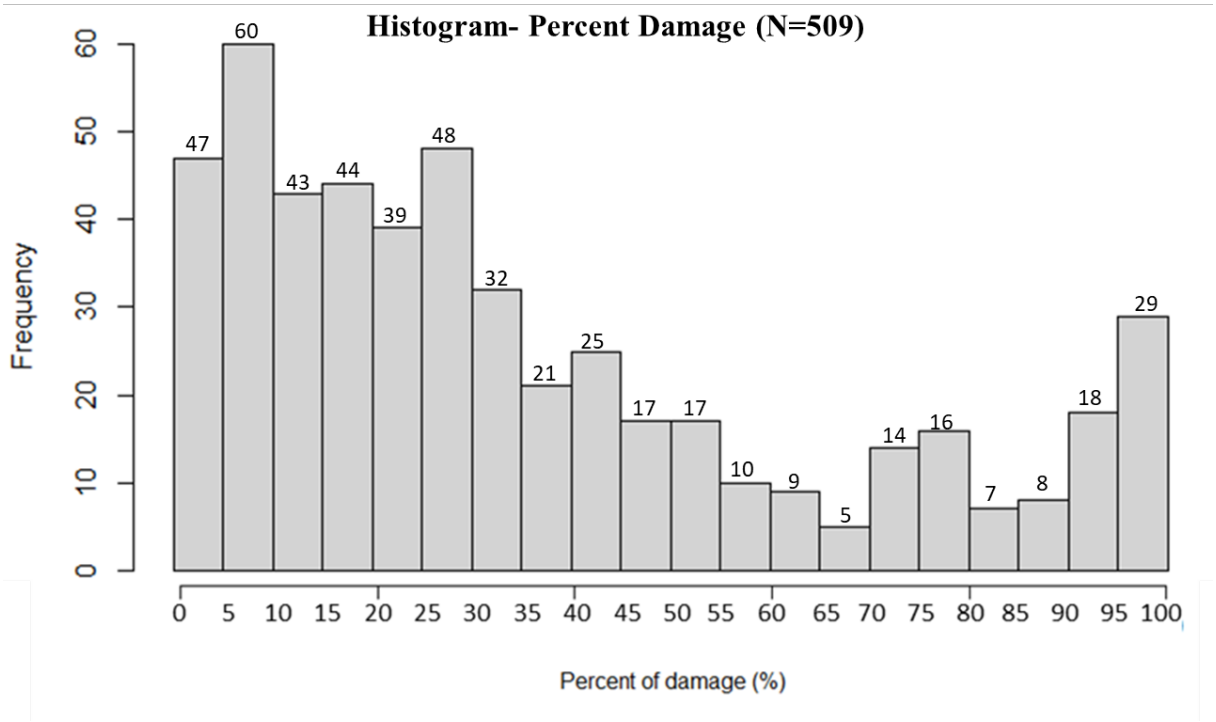

Figure 4-1: Percent of Damage to Remainder Histogram

Appraisal report case studies are categorized based on existing land use. Of the 509 case studies analyzed, the top three current land uses before acquisition include commercial (38%), residential (36%), and vacant (9%), with the remaining land uses representing 17 percent of case studies.

Additional analysis includes calculating the average ratio of acquired land to the original parcel area, which is about 16 percent (Table 4-2). This means that, on average, about 16 percent of the entire land is taken for right-of-way acquisition. The average number of acquired improvements is 2.65, and the average number of damaged improvements is 2.82 after acquisition. In this case, improvements are considered anything done to the land before the acquisition that increases land value, such as building a structure, landscaping, and drainage. Damaged improvements are those that are impacted by the right-of-way acquisition resulting in a loss of value to the remainder property; whereas acquired improvements are those taken in the right-of-way process (Table 4-2). For this dataset, the number of acquired improvements is slightly lower than that of damaged improvements.

Table 4-2: DESCRIPTIVE STATISTICS OF DAMAGE AND ACQUISITION MEASURES

Variable	*Minimum*	*Maximum*	*Mean*	*Standard Deviation*
Percentage Damage (%)	0.000	100.00	35.50	28.03
Tract Acres	0.144	1401.647	14.947	73.20
Fee Acquisition Acres	0.000	49.03	1.467	4.630
Ratio of Acquired to Original Tract Area	0.000	0.961	0.159	0.167

Variable	Minimum	Maximum	Mean	Standard Deviation
Number of Acquired Improvements	0.000	26.000	2.652	3.071
Number of Damaged Improvements	0.000	13.000	2.823	3.049

As each property must be appraised in terms of its highest and best use by TDOT, the definition of the highest and best use is as follows: "The reasonable, probable and legal use of vacant land or an improved property, which is physically possible, appropriately supported, financially feasible, and that result in the highest value [12]. The values in Table 4-3 are based on the highest and best use of the case studies. They show the results for if the land is vacant as if the land is improved before acquisition. For example, the highest and best use of 46 percent of the parcels would be for commercial use if the parcels are considered vacant. Additionally, the highest and best use of 44 percent of the parcels would be for commercial use if the parcels are considered improved.

Table 4-3: TRACT EXISTING USE, HIGHEST AND BEST USE AS VACANT AND AS IMPROVED BEFORE ACQUISITION

Land Use	Existing Use	Highest and best use as vacant	Highest and best use as improved
Residential	36% (184)	36% (186)	38% (195)
Agricultural	8% (40)	7% (34)	6% (33)
Commercial	38% (196)	46% (235)	44% (222)
Industrial	3% (12)	4% (18)	4% (18)
Vacant/ Woodland	9% (49)	1% (4)	1% (5)
Mixed-use	3% (13)	5% (29)	6% (28)
Specific use	3% (16)	1% (3)	1% (8)
Total	100% (509)	100% (509)	100% (509)

Table 4-4 highlights the frequencies of critical improvements that are acquired and damaged. Acquired improvements are part of the right-of-way not retained by the track owner, and damaged improvements are part of the right-of-way that is impaired due to construction but retained by the owner. Improvement types are not categorized based on land use (e.g., residential, commercial, and agricultural), though some improvements may be more closely associated with commercial use, such as fuel station canopy or storage tank.

In addition to categorizing improvements as acquired or damaged, the table divides the frequencies into those that are equal to or less than fifty percent and those that are greater than fifty percent based on the units of measurement, such as value (in $), square feet (sqft), linear feet (Linear Ft) or the number of items (#). For example, in 23 case studies, TDOT acquired less than or equal to 50 percent of each tract's primary building, and in 181 case studies, TDOT damaged less than or equal to 50 percent of each tract's primary building.

Table 4-4: FREQUENCIES OF KEY ACQUIRED IMPROVEMENTS

Type of Acquisition	*Minor (Acquisition ≤ 50% of the improvement value before acquisition)*	*Major (Acquisition > 50% of the improvement value before acquisition)*	*No Acquisition*	*Total*
Improvements	**% (No. of Cases)**	**% (No. of Cases)**	**% (No. of Cases)**	**% (No. of Cases)**
Primary Building (sqft)	5% (23)	14% (71)	81% (415)	100% (509)
Storage/Shed (sqft)	1% (6)	3% (15)	96% (488)	100% (509)
Barn (sqft)	1% (4)	0% (2)	99% (503)	100% (509)
Carport (sqft)	0% (1)	1% (5)	99% (503)	100% (509)
Garage (sqft)	0% (1)	1% (5)	99% (503)	100% (509)
Industrial Liquid or Gas Storage Tank (#)	0% (1)	2% (8)	98% (500)	100% (509)
Fuel Station Canopy or Shelter (sqft)	1% (7)	2% (8)	97% (494)	100% (509)
Septic System (#)	1% (7)	5% (27)	94% (475)	100% (509)
Asphalt/Concrete Pavement (sqft)	34% (177)	17% (86)	49% (246)	100% (509)
Gravel Pavement (Sqft)	13% (68)	5% (26)	82% (415)	100% (509)
Fence (Linear ft)	12% (64)	9% (47)	79% (398)	100% (509)
Business Sign (#)	2% (12)	8% (40)	90% (457)	100% (509)
Landscape (sqft)	24% (123)	22% (112)	54% (274)	100% (509)

Finally, descriptive frequencies of some of the key variables identified in the appraisal report case studies are presented in Table 4-5. The first four variables address tract topography, shape and location. The analysis indicates that 99 percent of tract topography is either level or rolling/sloping. Slightly more than half of all tracts are irregular in shape, and 39 percent are corner tracts. More than 17 percent of the tracts are located in a flood hazard area. The next four variables address easements and indicate that slightly more than 62 percent of all tracts require an easement of some type. Of these, 16 percent require a drainage easement, 59 percent require a construction easement, and 40 percent require a slope easement. About half of the tracts require cut and fill remediation to establish optimal terrain for construction or use.

The final variables address changes in tract use, proximity, access, and utility. Results indicate that 12 percent of tracts are left with inadequate remainder land to develop after acquisition. Seventy-eight percent of tracts have no change in highest and best use after acquisition; whereas, whereas 15 percent have a change in highest and best use to assemblage. Proximity damage represents whether the primary structure (usually the principal home) has incurred a decrease in proximity to the nearest thoroughfare (not necessarily most accessible). In this instance, 32 percent of case studies indicated damage

regarding proximity; 31 percent of case studies suffered from utility damage such as parking space reduction. Access damage is divided into three groups – no damage; minor damage, which represents a reduction in the ease of existing adequate access; and landlocked, which means the parcel no longer has adequate access. Six percent of the tracts are identified as landlocked after acquisition for the case studies under review. Finally, changes in land value after acquisition are analyzed. Results include no change; partial change, which indicates a portion of the land's value is reduced; and entirely changed, which indicates a negative change in the value of the entire tract. For the case studies under review, 43 percent have no change; 8 percent have a partial change; and 49 percent have a negative change in parcel value for the remainder parcel.

Table 4-5: FREQUENCIES OF KEY VARIABLES

Variable	***Attribute***	***Frequency***	***Percentage***
Tract Topography	Level	244	48%
	Rolling or Sloping	257	51%
	Steep	8	1%
Tract Shape	Regular Shape	216	42%
	Irregular Shape	293	58%
Corner Tract	No	313	61%
	Yes	196	39%
Flood Hazard Area	No	422	83%
	Yes	87	17%
Required Easement (All Types)	No	194	38%
	Yes	315	62%
Drainage Easement	No	426	84%
	Yes	83	16%
Construction Easement	No	207	41%
	Yes	302	59%
Slope Easement	No	302	60%
	Yes	207	40%
Inadequate Area of Remainders to Develop	No	450	88%
	Yes	59	12%
Required Cuts/Fills	No	289	57%
	Yes	220	43%

CONTINUED TABLE 4-5: FREQUENCIES OF KEY VARIABLES

Variable	***Attribute***	***Frequency***	***Percentage***
Change in Highest and Best Use after Acquisition	No Change	395	78%
	Same Use but Limited	29	6%
	Changed to Assemblage	77	15%
	Changed from Commercial to Residential/Agricultural/Industrial	7	1%
	Changed from Residential to Agricultural/Vacant/Woodland	1	0%
Proximity Damaged	No	346	68%
	Yes	163	32%
Utility Damaged/Parking Space Reduction	No	351	69%
	Yes	158	31%
Access Damaged	No	344	68%
	Minor Damage	136	26%
	Landlocked	29	6%
Change in Land Value After Acquisition	No change	221	43%
	Partially changed	36	8%
	Entirely changed	252	49%
Change in Frontage Elevation	No change	455	89%
	Yes	54	11%
Original Parcel Area (Acre)	Area ≤1	203	40%
	1<Area ≤2	95	19%
	2<Area ≤5	82	16%
	5<Area ≤10	39	8%
	10<Area ≤30	42	8%
	Area >30	48	9%

4.2 Linear Regression Model Results

In this study, an ordinary least-squares regression model is estimated to predict the variable of interest (dependant variable). In this model, the damage percentage is the dependent variable. The damage percentage is chosen as it eliminates the impact of market forces and supply-demand impacts on the dependent variable that property prices would include. The modeling results are presented in Table 4-6. For regression modeling, the intercept is the expected mean or average value of Y (dependent variable). The coefficient value signifies the strength of a relationship, i.e., how much the mean of the dependent variable changes given a one-unit shift in an independent variable while holding other variables in the model constant. A negative coefficient suggests that the dependent variable decreases as the independent variable increases. The p-value represents the strength of association between damage percentage (dependent variable) and the various independent variables. A p-value of 0.05 or less is statistically significant in identifying a meaningful relationship. A p-value of 0.01 or less is considered highly statistically significant. The model's multiple R-squared value is 0.780 and the adjusted R-squared value is 0.770, indicating that the model explains about 77 percent of the variation in the dependent variable. This can be observed in Figure 4-2, where the similarity between the distributions of the predicted percent damages by the model and observed appraisers' estimation of percent damages is illustrated.

Given that the dependent variable values are derived from appraisal estimates and not market sale price data, this model provides insights on how to improve appraisals to fully reflect the market value of a parcel before and after damages—this issue will be addressed later in this report. However, it will allow the identification of new appraisals whose estimates of value before and after a TDOT project are not in line with what is expected, given the predicted damages from the model based on past appraisals. In addition, the proposed model could provide predictions of damages for a proposed project before going forward with that project and prior to having detailed appraisals done. This can allow reconsideration of a costly project before its undertaking. Specifically, decision-makers can determine whether or not to proceed and what changes should be made to reduce its impact on the remainder property if the project is undertaken.

Results indicate a very strong relationship between the percentage of damages and the following variables. For N=509 observations in Regions 1, 2, 3, and 4, higher percent damages are associated with:

- The ratio of acquired land area to original parcel area is closer to 1 to 1,
- Parcels with one front side (i.e., not a corner lot),
- Acquisitions that involve the taking of more than 50 percent of landscaping value,
- Adverse changes in tract utility, such as a reduction in parking, after the acquisition,
- Reductions in tract proximity after the acquisition,
- Damages to parcel access after the acquisition,
- Damages to residential parcels compared to other land uses,
- Changes to frontage elevation after the acquisition,
- Any adverse change in highest and best use after the acquisition,

- Smaller-sized parcels when comparing differently-sized parcels with similar attributes and acquisition size.

Table 4-6: MODELING RESULTS

Variable (N=509) **Y: Percent-damage**	***Coefficient***	***P-value***
Constant	20.907	0.000***
Ratio of Acquired to Original Tract Area	28.675	0.000***
Tract Area (acre), (base: Area ≤1 acre)		
1< Area ≤2	-3.19	0.070*
2< Area ≤5	-5.034	0.009***
5< Area ≤10	-6.416	0.011**
10< Area ≤30	-8.099	0.003***
Area >30	-14.941	0.000***
Existing use before the acquisition (Base: Residential)		
Agricultural	-0.732	0.830
Commercial	-7.946	0.000***
Industrial	-9.337	0.041**
Vacant/Woodland	-0.236	0.933
Mixed-use	-10.51	0.013**
Specific uses	-4.222	0.285
Change in highest and best use after acquisition (Base: No Change)		
Same Use but Limited	26.954	0.000***
Changed to Assemblage	44.327	0.000***
Changed from Commercial to Other Land Uses	44.885	0.000***
Changed from Residential to Agricultural/Vacant/Woodland	26.624	0.066*
More than one front side (corner) – Original Tract	-2.862	0.036**
Landscape Acquired Majorly (>50% of the area)	5.430	0.001***
Change in Frontage Elevation After Acquisition	6.892	0.001***
Proximity Damaged after Acquisition	5.280	0.003***
Utility Damaged/Parking Space Reduction	12.059	0.000***
Access Damaged after Acquisition (Base: No Damage)		
Minor or moderate	5.014	0.001***
Major-Landlocked	22.667	0.000***

N = 509; F-test = 74.86; R-squared = 0.780; Adj. R-squared = 0.770; RMSE = 13.927
*** p<0.01, ** p<0.05, * p<0.1

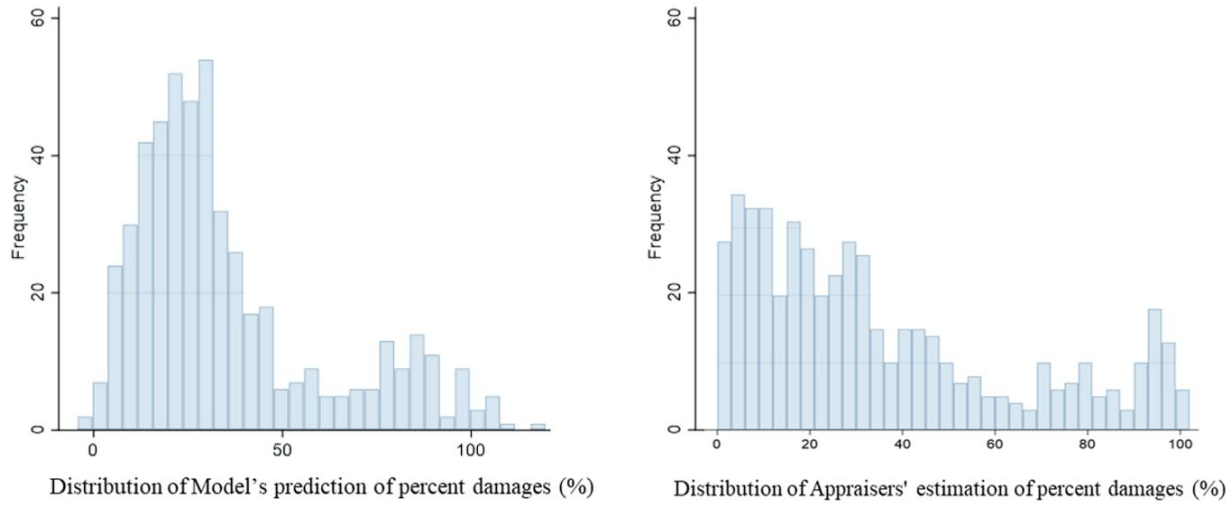

Figure 4-2: Comparison between the distribution of the model's prediction and observed appraisers' estimation of Percent of Damage to Remainder

The variable "Major Landscaping Acquired" describes what proportion of the landscaping value was acquired. Landscape acquisition is included in the model because it could impact the extent of damages to the remainder's value. Basically, a higher percentage of landscape acquisition could harm other improvements such as a home and/or swimming pool because a major loss of landscaping could reduce privacy. In addition, landscape acquisition could adversely impact the view, increase a home's exposure, proximity to surrounding roads (reduction of the distance between the primary buildings and surrounding roadways), and thereby, the overall aesthetic quality of the remainder property.

In the model, the categorical variables representing case studies in TDOT Regions 1-4 were not statistically significant (5% level) and hence removed from the model. No statistically significant regional difference indicates that damages are fairly uniform across the 4 TDOT regions. Of note, damages are larger in residential land use than in other land use categories. This result is observed because residential acquisitions are typically smaller parcels to begin with, and their use as residential could be more likely to be negatively affected (e.g., traffic noise closer to the residence) than would be for commercial or industrial properties. In addition, closer proximity to any damage may be why the impact of such damages is more intense in residential cases.

4.3 Right-of-Way Damage Assessment Tool

A key aspect (and deliverable) of the project is developing a predictive tool that will allow TDOT to anticipate right-of-way costs under varying conditions. To this end, the regression model was embedded in a Right-of-Way Damage Assessment (ROWDA) tool. This tool is designed to evaluate and analyze ROW acquisition inputs to calculate estimates of damage percentage. The ROWDA tool is shown in Figure 4-3. This Microsoft Excel-based tool is an interface between a set of attributes and regression equations. It allows the user to input a variety of parcel attributes and calculate a prediction of the percentage of damage to be expected. Additionally, the tool presents total damage in terms of dollars. (This is done by multiplying the percentage of damage with the

remainder (undamaged) value). All user input is stored in the worksheet within the workbook in which the tool is based. The tool has several future uses, which can include:

- Monitoring consistency across TDOT regions by comparing appraisals across regions.
- Estimating damages before going forward with a project (even before having full appraisals done). This will help assess project viability and potential modifications in how the project is to be done.
- Identifying damage estimates from actual appraisals that appear to be out of line compared to past appraisals used to generate the model's predictions.

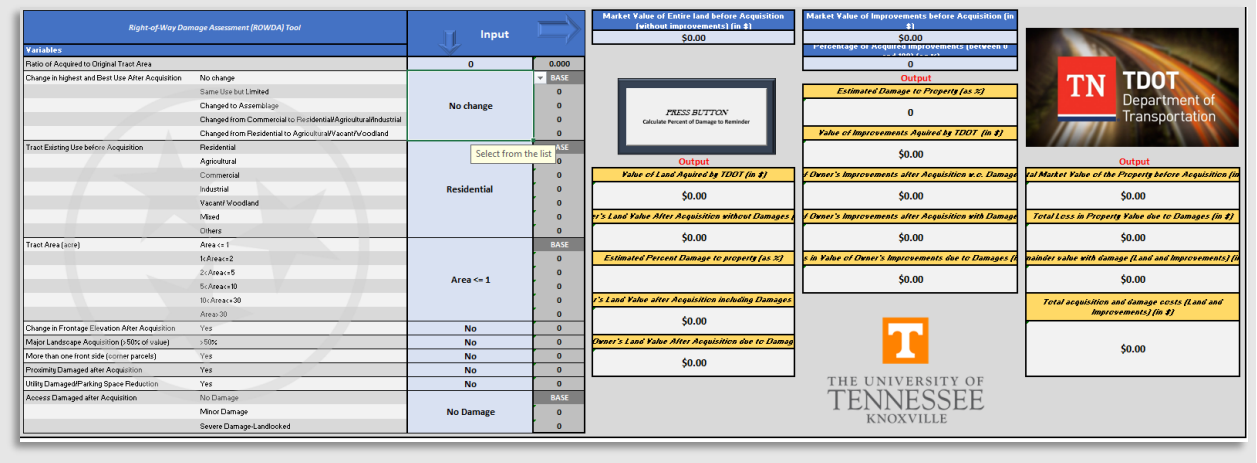

Figure 4-3: Demonstration of ROWDA Tool

The input variables to estimate percent-damages include (based on the modeling results):

- The ratio of the acquired area to the original area (value between zero and one)
- Existing use before the acquisition (Residential, Agricultural, Commercial, Industrial, Vacant, Mixed, Others)
- Change in highest and best use after acquisition (No change, Same use but limited, changed to assemblage, changed from commercial to other land uses, changed from residential to agricultural/vacant/woodland – envisioned by TDOT appraisers)
- Tract Area measured as less than or equal to one acre, between 1 and 2 acres, between 2 and 5 acres, between 5 and 10 acres, between 10 and 30 acres, and larger than 30 acres.
- Change in frontage elevation after acquisition (No or Yes)
- Landscape acquired majorly (>50% of the area) (No or Yes)
- More than one front side, corner parcels – original parcel (No or Yes)
- Proximity damaged after acquisition (No or Yes)
- Utility damage/parking space reduction (No or Yes)
- Access damaged after acquisition (No damage, Minor or moderate, Major-Landlocked)

The input variables to estimate severance costs include:

- The market value of the entire land before the acquisition (without improvements)
- The market value of improvements before acquisition
- Percentage of acquired improvements

The tool calculates and reports the following:

- Value of Land Acquired by TDOT ($)
- Owner's Land Value After Acquisition without Damages ($)
- Estimated Percent-damage to property (%)
- Owner's Land Value after Acquisition, including Damages ($)
- Loss in Owner's Land Value After Acquisition due to Damages ($)
- Value of Improvements Acquired by TDOT ($)
- Value of Owner's Improvements after Acquisition without Damages ($)
- Value of Owner's Improvements after Acquisition with Damages ($)
- Loss in Value of Owner's Improvements due to Damages ($)
- Total Market Value of the Property before Acquisition ($)
- Total Loss in Property Value due to Damages ($)
- Remainder Value with Damage (Land and Improvements) ($)
- Total Acquisition and Damage Costs (Land and Improvements) ($)

Chapter 5 Comparison of Actual Sales with Appraisals

This chapter provides details about market transactions for remainders, specifically, information about sales data collection and comparison between sales-based percent-damages/benefits and appraiser-based damages. The research team provides field-verified forms (98 in total) showing sales-based damages/benefits, which are consistent with the TDOT 1995 remainder sales study [14]. These forms can be used directly to assist appraisers in assigning monetary value to remainder damages. Additionally, comparing sales-based estimates of damages to appraisal-based estimates of damages is the only way to evaluate the efficacy of appraisal estimates and, as such, a way to consider the accuracy of the ROWDA model.

5.1 Collection and Analysis of Sales Data

A vital aspect of this remainder sales study is collecting data for the remainders' market transactions. Based on input from TDOT, the method used to analyze the data should be consistent with the 1995 remainder sales study [14]. The actual sale of a remainder provides the market value for comparison with the appraiser's prediction of the property's value and associated damage. Following the 1995 study, this study first calculates the "sales-based" percent-damages/benefits by using the remainder value *before* damages in the appraisal report and the actual sales value. These values are then compared with the "appraisers-based" estimated percent damages.

The research team has obtained actual sales data (a critical piece of information) from several sources. The 509 appraisal reports were first matched with the TDOT-provided CRS (Courthouse Retrieval System) reports. This data source is considered valid and reliable as CRS directly collects the data from the local counties instead of collecting the data from any third parties [14]. The data are available online. Initially, the project team matched properties by the parcel identification number (PIN) and verified the county and tract number in the appraisal and CRS reports. The parcel map ID and the property's physical address were matched as a final check. As a result, matching cases where sales have occurred after the appraisal report are identified. The cases where actual sales were made before the appraisers' assessments were ignored. This issue was found in several CRS reports. The 60 matched cases from CRS are distributed across all four TDOT regions. Specifically, they include 15 cases from TDOT's Region 1, 4 cases from Region 2, 16 cases from Region 3, and 25 cases from Region 4.

In order to retain as many properties as possible in the analysis, other sources of sales data were considered. Since the 1995 remainder sales study, several new sources of property sales data have emerged. These relatively new sources include *Zillow.com* and *Realtor.com*. Notably, Zillow.com is linked to the Multiple Listing Service (MLS), and it provides information about actual past sales of the property as well as an estimate of home value over time. The estimated home value over time is typically based on a set of models that consider comparable homes, assessed taxes, and home characteristics (e.g., based on square footage, number of bedrooms, and bathrooms). While Zillow provides sale information only about residential properties, Realtor.com additionally provides the transaction history and value for commercial properties.

Using property addresses, 47 cases were matched from Zillow and 8 from the Realtor.com service. Overall, sales information about 115 (60 + 47 + 8) matching cases was collected. A critical factor in comparing the sale and the appraised value is the time elapsed between the two events. To begin with, the new data for this study was compared to the 1995 remainder sales study data. This comparison of the distributions of the time from the appraisal date to the sale date for both studies is shown in Figure 5-1. In the 1995 study, 129 cases were available and the time differences between appraisal and sales date of all the cases were within six years (0 to 6 years). The two distributions are quite similar. It can be observed from the left chart in Figure 5-1 that there are also several cases where sales occurred more than 6 years after the appraisal date for the 2022 remainder sales data.

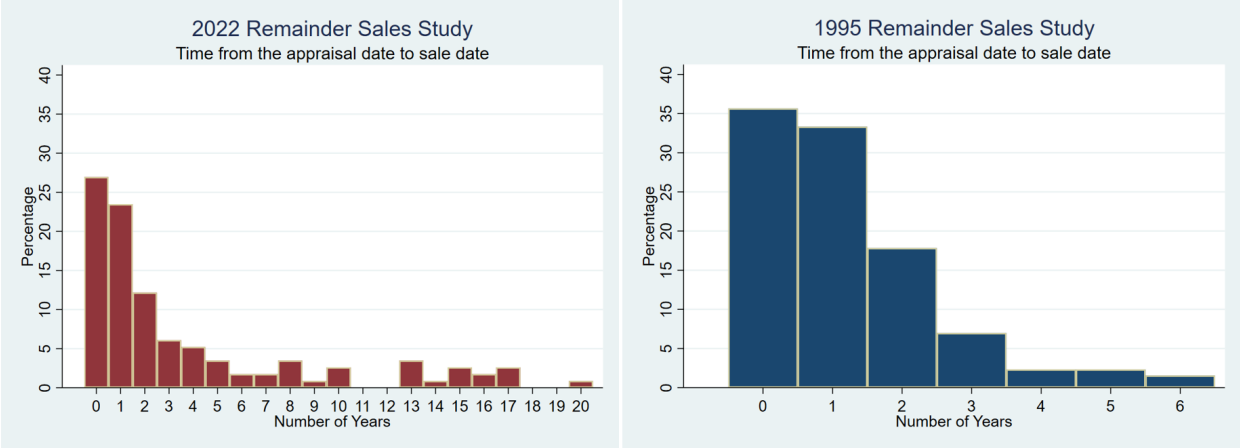

Figure 5-1: Duration between appraisal date and sale date in 2022 and 1995 remainder sales studies

To analyze the 2022 sales data, sales cases within 10-years were considered after the appraisal date. This threshold of 10 years was agreed upon by TDOT ROW experts, leading to 98 cases remaining for analysis in this 2022 study. The distribution of the cases analyzed is shown in Figure 5-2 and Table 5-1. Notably, the difference between appraisal date and sale date for 60% of the cases is within 0-1 years. Figure 5-3 shows the breakdown of the 98 cases by land use, and Table 5-2 shows the percentages in which the appraisers' value estimate was either greater than or less than the actual sale price.

Figure 5-2: Percentage Distribution of the 0-10 Years Cases

Table 5-1: DISTRIBUTION OF THE 0-10 YEARS CASES (N=98)

Year	*Frequency*	*Percent*
0	31	31.63
1	28	28.57
2	13	13.27
3	7	7.14
4	6	6.12
5	4	4.08
6	2	2.04
7	1	1.02
8	3	3.06
9	1	1.02
10	2	2.04
Total	**98**	**100**

Further analysis of the data indicates that 59% (N=58) of the cases are residential, 30% (N=29) are commercial, and the remaining 11% include agricultural, vacant, industrial, and mixed-use cases, as shown in Figure 5-3.

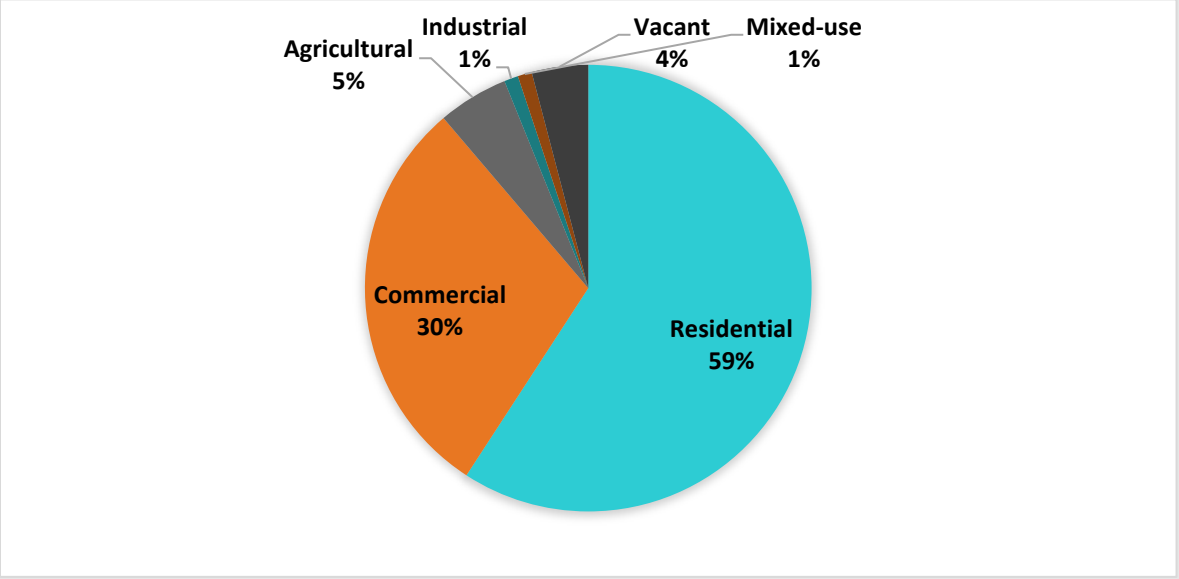

Figure 5-3: Land Use Distribution of the Matching Cases (N = 98)

Table 5-2: FREQUENCY OF CASES WHERE SALES VALUES ARE GREATER OR LESS THAN THE REMAINDER APPRAISAL VALUE AFTER DAMAGES

Year	*Number of cases*	*Percentage*
Sales value > Remainder appraisal value after damage	60	61%
Remainder appraisal value after damage > Sales value	38	39%

While comparing the remainder sale value with the remainder appraisal value after damages, it was observed that in 61% (N = 60) of the cases, the remainder sales value was above the remainder appraisal value after damages. In 39% (N = 38) of the cases, it was lower, as shown in Table 5-2. Analyzing the remainder appraisal value after damages and sales data together is complicated primarily due to the time difference and changes in property characteristics (e.g., structural improvements) that may have occurred between the remainder's appraisal and actual sale. Therefore, comparing sale and appraisal information needs to be done carefully, accounting for the time gap that should be considered. Furthermore, the sales information can determine (and validate) the estimated model's prediction ability. Adjustments can be made to account for differences in appraisal and sales values as well as time differences, i.e., the gap between the appraisal report and actual sale.

Aside from these issues, comparing the sales and appraisal data provided helpful information. As shown in Table 5-3, the median for the remainder of sale values is $124,950 (N=98 cases). This median is 23% higher than the median appraised value for the remainder land and improvements, which is $96,188. Therefore, the data shows that the remainder properties sold for higher prices than their appraised values. This could be partly attributed to the length of time

gaps, economic changes, land-use changes, and changes in property attributes. The research team performed these corrections in some cases using the available adjustment methods shown in the "field verification of the matching cases" section.

Table 5-3: DESCRIPTIVE STATISTICS OF APPRAISED VALUE& SALES VALUES (N=98)

Appraised & Sales Values	***Median***	***Min***	***Max***
Appraisal Value, $	$96,188	$907	$19,923,876
Sale Value, $	$124,950	$12,300	$31,375,000
Difference of Medians (Sale $-Appr. $)	$28,762	n/a	n/a
% Difference in Median values (above)	+23.00%	n/a	n/a
Difference between Sales and Appraisal values (Sale $- Appraisal $)	-	-$479,226	$11,451,124

The mean for sales values is relatively high at $779,762 due to a few very high valuations of commercial and industrial properties; these extreme cases, along with other unusual cases, are explored further. Three commercial or industrial land use cases were deemed extreme upon further examination, as shown in Table 5-4 below.

Table 5-4: SPECIAL CASES FOUND IN CRS DATA

County	*Tract No*	*Type*	*Appr. Date*	*Appr. Value*	*Sale Date*	*Sale Value*	*Sale Minus Appraisal*
Shelby	32	Industrial	05/11/18	$19,923,876	09/26/19	$31,375,000	$11,451,124
Shelby	1	Commercial	09/14/16	$7,611,339	03/19/19	$12,084,000	$4,472,661
Williamson	4	Commercial	07/27/12	$3,213,626	01/23/19	$14,340,000	$11,126,374

Other individual unusual cases were also explored. Three examples of unusual cases are illustrated in Figure 5-4, Figure 5-5, & Figure 5-6 below. In Figure 5-4, the appraised value of the remainder land and improvements was only $907. However, according to the appraiser's report, the fair market value was $195,000 before the acquisition. After the acquisition, the tract had lost almost all utility. The appraisal report showed nearly 100% damages to improvements and 95% to the underlying land. Therefore, the tract could not be put to its highest and best use as residential development, and it was shown as an assemblage to an adjacent property owner. When the market sales data was examined, the property was shown as sold at a substantially higher price ($214,500). The sale date of the tract is after the appraisal date, i.e., the appraisal date was January 2020, and the sale date was December 2020. It is entirely possible that the dates have an error and the sale occurred before the appraisal. That is, the new owner may well have bought the property *before* the appraisal, given that the photographs of the appraisal report are very similar to the recent photographs from Zillow. Such cases need further investigation.

In another tract shown in Figure 5-5, the appraised value of the remainder land and improvements is shown as $2,000. However, based on sales data, the fair market value was $200,000. In this case, the appraisers estimated the damages to be 90% for the remainder land, and 100% for the improvements after the acquisition. They put the property as an assemblage with an adjoining property that has access. However, the property was subsequently sold for $40,000 at a later date after the appraisal report. Again, this may well be due to coding errors in terms of dates of appraisal and sales.

In Figure 5-6, the COVID-19 shock and subsequent lowering of interest rates can be observed in the sale price that is initially reduced and then increases after a few months. There are other unusual cases observed in some of the matching cases. For instance, a residential property was acquired 100%, but the same residence is available for sale on Zillow. Moreover, due to proximity damage, some properties received a substantial loss in value, but apparently, this did not have a noticeable impact on the sale value in most cases (assuming that the dates are coded correctly). However, further investigation into these mentioned cases is warranted.

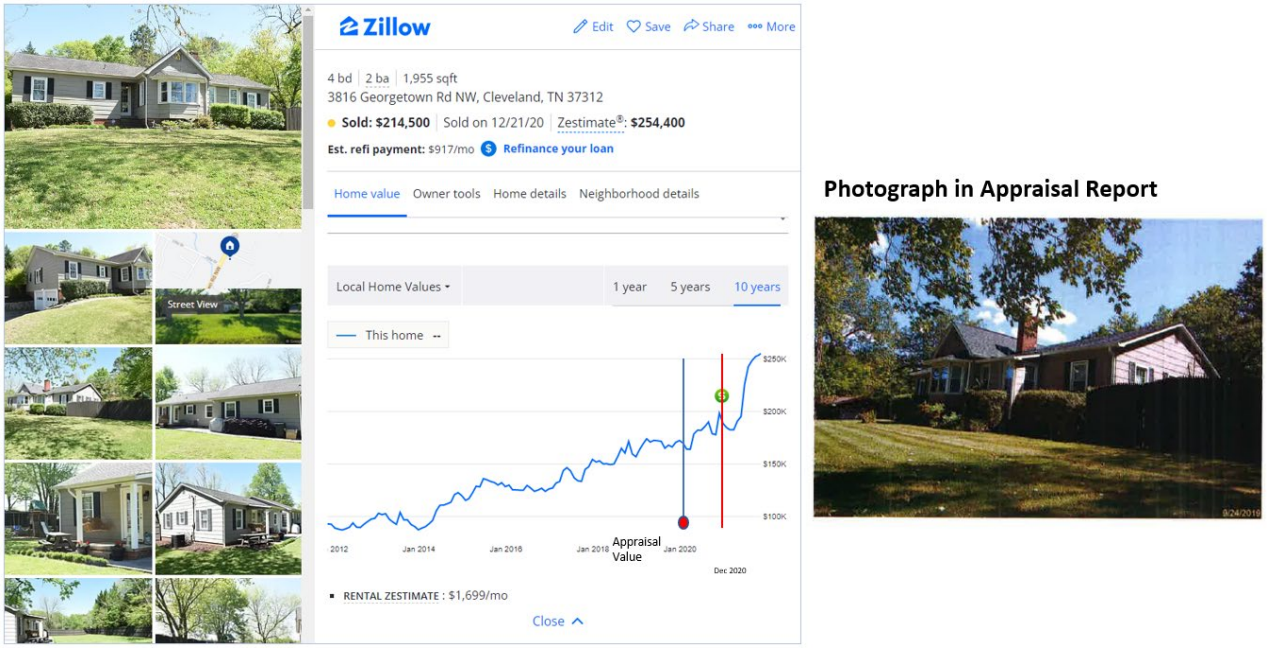

Figure 5-4: Unusual Case 1 - Tract 53, Bradley County (Source: Zillow.com and TDOT Appraisal Reports)

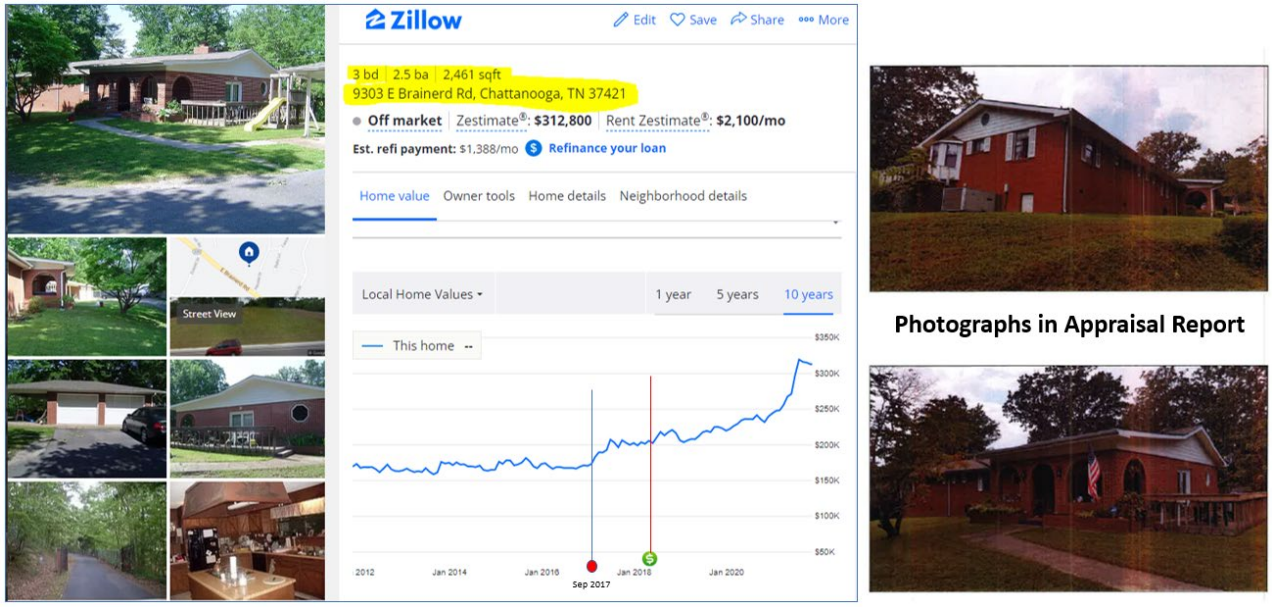

Figure 5-5: Unusual Case 2 - Tract 163-S, Hamilton County (Source: Zillow.com and TDOT Appraisal Reports)

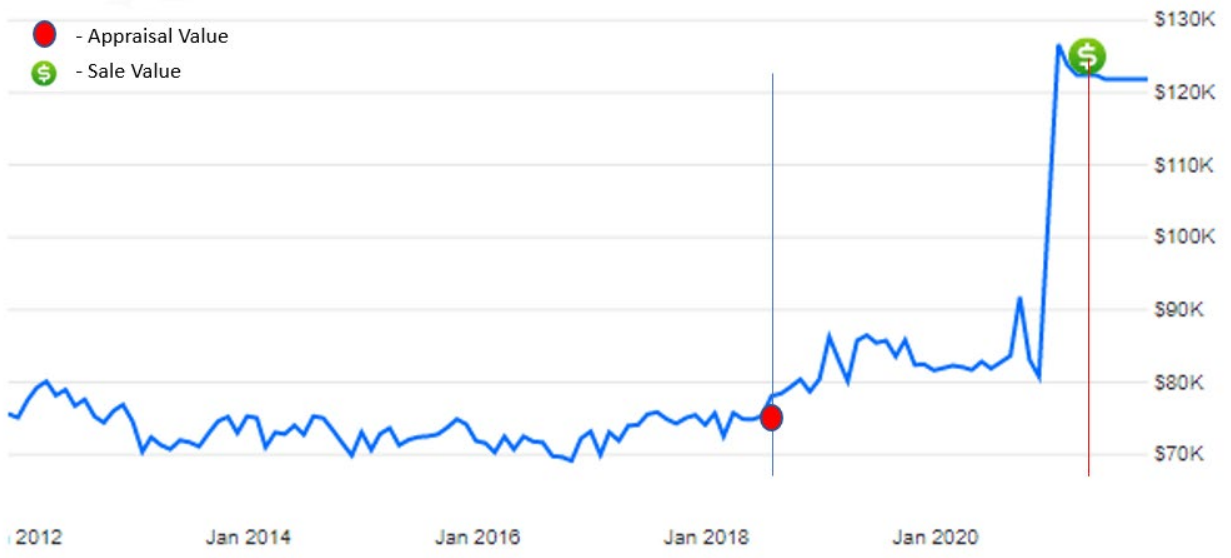

Figure 5-6: Unusual Case 3 - Tract 27, Carroll County (Source: Zillow.com)

5.2 Credibility of Zillow/Realtor

After finding sales in CRS, the research team explored more matching cases through Zillow/Realtor.com. Several tracts were cross-matched between CRS and Zillow. The results show that the actual sales and other information are consistent across these platforms. Zillow is a real estate home sales and rental marketplace information site for consumers, with data and knowledge of more than 110 million homes across the US. The Zillow website uses statistical and machine learning models to examine hundreds of data points for each home to estimate the value. Zillow receives information about property sales from the municipal/county offices responsible for recording real estate transactions. To estimate a home's value, Zillow provides a proprietary home valuation tool, Zestimate, by using neural network-based AI models that incorporate data from the county and tax assessor records and direct feeds from hundreds of multiple listing services and brokerages. The Zestimate also incorporates:

- Home characteristics, e.g., square footage, location, and the number of bathrooms.
- On-market data such as listing price, description, comparable homes in the area, and days on the market
- Off-market data — tax assessments, prior sales, and other publicly available records
- Market trends, including seasonal changes in demand

Zestimate has a nationwide median error rate of 1.9% for on-market homes, while the Zestimate for off-market homes has a median error rate of approximately 7.5% [15]. However, there are some limitations of Zestimate. To begin with, Zestimate is only available for residential properties. In addition, Zestimate can be missing for some residential properties. Alternatively, Realtor.com fulfills the same purposes as Zillow and overcomes some limitations regarding non-residential properties. Realtor.com provides information on all types of land uses. Realtor.com is affiliated with the national association of realtors and is linked to over 580 regional Multiple

Listing Services (MLS). The listings of realtor.com are the closest to the MLS, which is updated regularly by realtors. Therefore, these data sources are usually considered valid and reliable.

5.3 Field Verification of the Matching Cases

Field verification of matching cases is performed by following the 1995 remainder sales report. The verification contains several types of information. To begin with, it includes property location (i.e., address, region, city, county, tax map, parcel number, PIN, Zoning, and Tract number), Parcel and Remainder characteristics (i.e., tract size, frontage, and improvements). In addition, the verification includes approved appraisal information (i.e., appraisal date, before value, acquisition, damage to the remainder, the amount due to owner, remainder value before damages). "Before value" is the summation of the land value and the improvements' value. The acquisition includes acquired land value, the value of all types of easements, and acquired improvements value. The remainder value before damages is calculated by subtracting the summation of acquired land value, easements, and acquired improvements from the before value. Furthermore, it includes the actual sale date and sale value of the remainder tract. Indicated damage/ benefit amount is calculated by subtracting the "remainder value before damage" from the actual sale value. Then, the sales-based percent-damages/benefits are calculated using Equation 5 below. Finally, the verification includes some additional information, i.e., proximity damage (before-after), cuts/fills (before-after), access (before/after), and any additional comments. A field verification sample is illustrated in Figure 5-7. Subsequently, the appraisers-based percent-damages are calculated using Equation 6. Furthermore, the research team analyzed ROWDA-based percent-damages for selected appraisal cases using Equation 7.

$$\text{Sales-based \%-damages or benefits} = \frac{Actual\ \ Sales\ Value - Remainder\ \ Value\ \ Before\ \ Damages}{Remainder\ \ Value\ \ Before\ \ Damages} * 100 \quad (5)$$

$$\text{Appraisers-based \%-damages} = \frac{Remainder\ \ Value\ \ Before\ \ Damages - Remainder\ \ Value\ \ After\ \ Damages}{Remainder\ \ Value\ \ Before\ e\ Damages} * 100 \quad (6)$$

$$\text{ROWDA-based \%-damages} = \sum Regression\ Coefficients\ (\beta) * Input\ Variables(X) \quad (7)$$

Where,

- Remainder Value Before Damages = Before Value – Value of acquired land, easements, & improvements
- Before Value = Land Value + Improvements' Value
- Remainder Value After Damages = Before Value – Value of acquired land, easements, & improvements – Remainder Damages Estimated by the Appraisers
- Details of the "Regression Coefficients" and "Input Variables" are shown in Table 4-6

2021 Remainder Sales Study / Field Verification

Property Location: **163 Cleveland Street, Ripley, TN 38063**

City:	**Ripley**	Zip:	38063	County:	**Lauderdale**	Region#	**4**
Tax Map#:	76P-B	Parcel#:	26.00	PIN#	101211.00	Zoning:	**Residential**
State Project#:		Tract#:	**62**				

Latest Sale Date: **1/10/2012** Sale Amount **$48,525**

From CRS/Zillow/ Realtor

Grantor: Grantee:

Has the property changed since the acquisition by D.O.T? (i.e., Zoning subdivided, highest & best use, remodeled, additional imp.)

Original PCL./Changes: Residential tract, 0.223 acres, rolling, irregular shape, has frontage along Cleveland Street. Improvements are situated one to two feet above roadway elevation. Improvements include a residence with a concrete drive, landscaping, shed, etc.

Description of Rem.: The remainder is an irregular tract of 0.183 acres after the acquisition. The frontage will be the same as before. Highest and best use will also be the same, residential.

APPROVED APPRAISAL

BEFORE VALUE

Land-acre/sq.ft.:	0.223 AC	@$0.50/SFT	**$4,857**
Improvements			**$65,143**
Appr. Date: **1/11/2011**		Total before value $:	**$70,000**

ACQUISITION

land-acre/sq.ft.:	0.04 AC	@$0.50/SFT	**$865.00**
Perm. Drainage esmt.:			
Slope esmt.:			**$56.00**
Cons. esmt.:			**$19.00**
Improvements:			**$1,771.00**
Damages to the remainder:			**$45,638**
		Amount due owner $:	**$48,349**

From Appraisal Report

Sales Amount **$48,525**

Before value - value of acquired land, easements, and improvements

Remainder Value Before Damages (minus-) **$67,289**

Indicated damage/benefit amount **$ (18,764)**

Sale Value - Remainder Value Before Damages

Calculations: (48525-67289) /67289 =-18764/67289 = -27.9%

% of damage: **27.9%** % of benefit:

Percent-damage/Benefit = (Sale Value - Remainder Value Before Damages) * 100 / Remainder Value Before Damages

Proximity Damage (before):	N/A	(After):	Yes
Cuts/Fills (before):	N/A	(After):	Yes
Access (before):	Adequate	(After):	Adequate

Comments: The tract has proximity damage. However, the highest and best use after acquisition will remain unchanged.

Figure 5-7: Field Verification sample

Examples of the field verification cases are shown in Appendix C, which can be used to assist appraisers in assigning monetary value to remainder damages. A supplementary document provides all the field verification cases and this information can be obtained from TDOT (TDOT.Research@tn.gov). Notably, 59% (N=58) of the cases are residential, 30% (N=29) are commercial, and the remaining 11% include agricultural, vacant, industrial, and mixed-use cases. When analyzing the "sales-based" percent-damages/benefits, the results in Table 5-5 show that in 64% of the cases (N = 63), properties sold below the remainder value before damages, and in 36% (N = 35), the properties showed benefits, i.e., they sold above the remainder value before damages. Notably, these sales occurred within 10 years of the appraisal; also note that in the "appraisers-based" values for these properties, all 98 cases (100%) had damages only (not benefits), given the criteria used to select the appraisal reports.

Table 5-5: DESCRIPTIVE STATISTICS OF SALES-BASED PERCENT-DAMAGES/BENEFITS AND APPRAISERS-BASED PERCENT-DAMAGES (DAMAGE VALUES HAVE A NEGATIVE SIGN AND BENEFIT VALUES HAVE A POSITIVE SIGN) (N=98)

Descriptive Statistics	***Sales-based percent-damages/Benefits***	***Appraisers-based percent-damages***
Median	-25%	-32%
Minimum	-94%	-97%
Maximum	683%	0%
Number of benefit cases	*36% (35 cases)*	*0% (0 cases)*
Number of damage cases	*64% (63 cases)*	*100% (98 cases)*

In Table 5-5, the estimated sales-based percent-damages/benefits show a maximum of 683% benefit and a minimum of –94%, which is the percent-damages. The median percent damage (-25%) for the "sales-based" estimation of damages/benefits is almost similar to the appraisers-based estimation (-32%). Figure 5-8 illustrates the histogram of the differences between sales-based percent- damages/benefits and appraisers-based percent-damages for all the cases. Notably, in 14% of the cases (N=14 out of 98), the difference between "appraisers-based" estimated percent-damage and "sales-based" percent-damage is within ±10% and 74% of the cases (N=73), are within ±71% range (note that appraisers do not necessarily use this range, and it is for illustrating the differences between sales-based damages/benefits and appraisers-based damages). Furthermore, Figure 5-9 shows the distribution for residential and commercial cases separately. Most cases are within the -71% to 142% range.

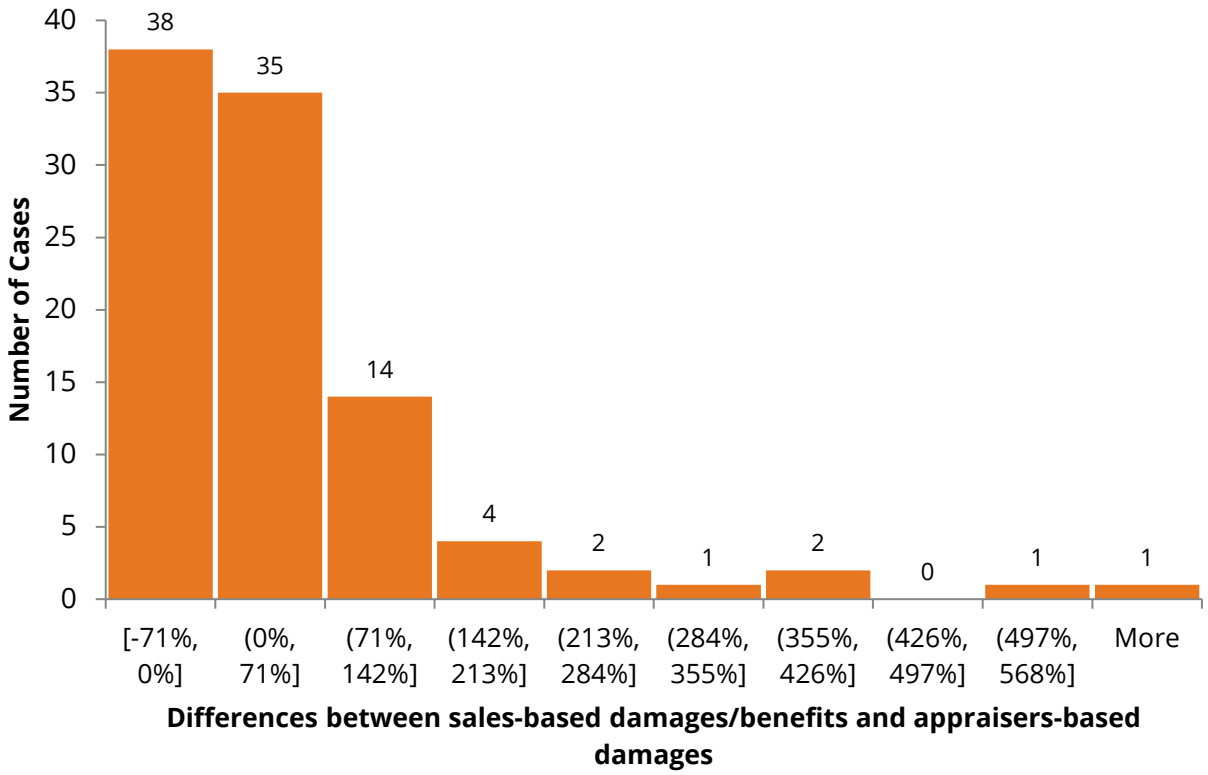

Figure 5-8: Histogram of the differences between sales-based percent-damages/benefits and appraisers-based percent-damages, Damage values have a negative sign, and Benefit values have a positive sign

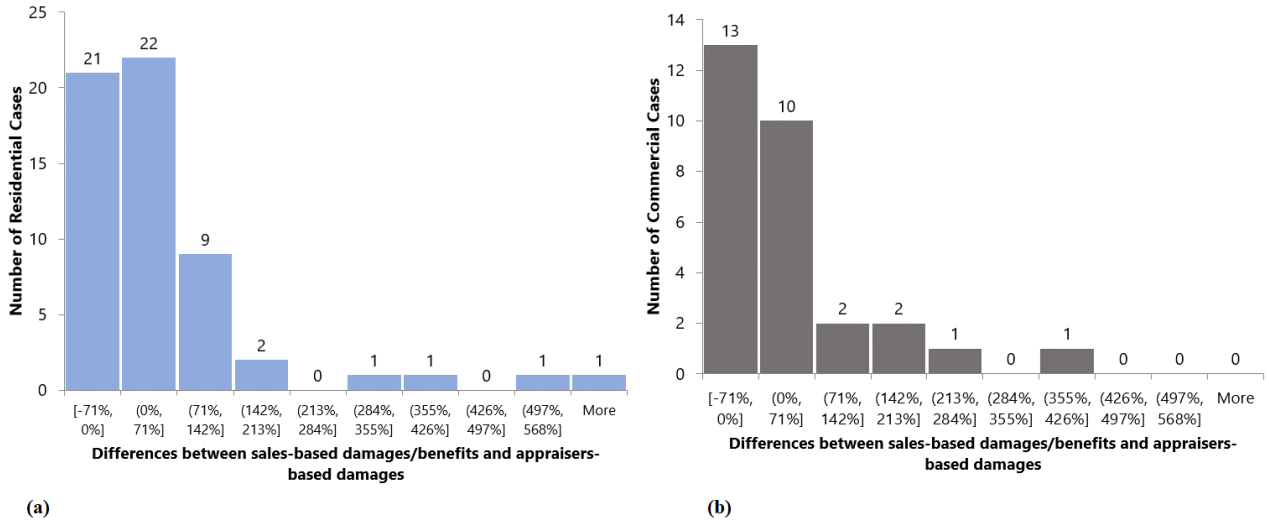

Figure 5-9: Histogram of the differences between sales-based percent-damages/benefits and appraisers-based percent-damages (a) Residential tracts (b) Commercial tracts

Although the median percent-damages are close, there are still 35 benefits cases (36%) in the sales-based approach, whereas the appraisers-based approach does not have any benefits cases. Therefore, further examination is needed by adjusting for the factors that can influence

the actual sales value when comparing it with the appraisers' estimation, e.g., the length of time gap between appraisal and sale, the changes in the economy (real-estate market, inflation, disruptions) and changes in land use and improvements. The research team analyzed some residential cases by exploring the methods available to adjust the actual sales price and compare it to the appraisers' estimation.

Table 5-6: COMPARISON BETWEEN SALES-BASED PERCENT-DAMAGES/BENEFITS AND APPRAISERS-BASED PERCENT-DAMAGES BEFORE AND AFTER Z-ADJUSTMENT (N=34)

	Appraisers-based percent-damages	***Before adjustment: sales-based percent-damages***	***Z-adjustment: sales-based percent-damages/benefits***
Median	-39%	-31%	-36%
Maximum	-2%	683%	605%
Minimum	-97%	-83%	-84%
Number of benefits cases	0	8	10
Number of Damages cases	34	26	24

Zestimate from Zillow.com is one of the available methods to adjust the actual sales price to the appraisal date. More explanation on the available adjustment methods can be found in Appendix D. Specifically, the research team collected Zestimate values in both appraisal date and sales date for 34 available residential cases. Then, the sales-based percent-damages/benefits were calculated and compared with the before adjustment scenarios, as shown in Table 5-6. The results indicate that the median sales-based percent-damages is -36% after adjusting the sales price using the Zestimate (Z-adjustment), whereas this value was -31% before Z-adjustment (the adjustment of the sale price using the Zestimate from Zillow.com is defined as "Z-adjustment"). Notably, appraiser-based percent damages were -39%, which means that, as expected, Z-adjustment brings the sales-based percent-damages closer to appraiser-based percent-damages (within 3%, implying that appraisers, on average, are on target). However, the results did not change substantially for these cases.

Table 5-7: DESCRIPTIVE STATISTICS OF SALES-BASED PERCENT-DAMAGES/BENEFITS, APPRAISERS-BASED PERCENT-DAMAGES, AND ROWDA-BASED PERCENT-DAMAGES, WHERE APPRAISAL AND SALES OCCURRED WITHIN TWO YEARS (N=59)

Descriptive Statistics	***Sales-based percent-damages/benefits***	***Appraisers-based percent-damages***	***ROWDA-based percent-damages***
Median	-37%	-35%	-34%
Minimum	-93%	-97%	-100%
Maximum	683%	0%	-5%
Number of benefit cases	*27% (16 cases)*	*0% (0 cases)*	*0% (0 cases)*
Number of damage cases	*73% (43 cases)*	*100% (59 cases)*	*100% (59 cases)*

The validation with the actual sales values even after adjustment suggests appraisers' estimation somewhat deviates from the actual value of the remainder tract. If the duration between appraisal and sale is relatively long, then the change in economic conditions and the property itself (e.g., improvements) is a possibility of raising the value of the remainder property. Therefore, cases where appraisal and sales occurred within two years (Table 5-7), were examined to minimize such confounding effects. Importantly, this analysis of remainder market transactions supports ROWDA predictions of remainder damages. Among a total of 59 such two-year period cases, 73% cases (N = 43) show sales-based percent damages (previously, it was 64%), and the rest of the 27% cases (N = 16) show sales-based percent benefits. The median sales-based percent-damages now decreased to -37%, which is close to the appraisers' estimated percent damage (-35%). Notably, the ROWDA-based percent damages are calculated using the ROWDA tool with relevant independent variables-see Appendix E. The results show a similar median value (-34%) relative to sales-based and appraisers-based percent damages. However, the presence of "sales-based" benefits cases (27%) warrants further investigation and collection of more detailed information. Also, more data can help confirm whether the appraisers' estimation matches the actual sales for different types of properties.

Chapter 6 Conclusion and Recommendations

The median sales-based %-damages are close to appraiser estimated %-damages—confirming consistency in assigning monetary value to remainder damages.

Each year the Tennessee Department of Transportation conducts partial taking of many private or commercial land parcels for various Right-of-Way projects. These affected parcels face discrepancies in the values appraised for the remainders and their actual sales values, which might cause either benefits or damages to the remainders. This study was initiated to provide up-to-date information about appraisals and sales of the remainders. Two datasets were created for this study, namely the appraisal dataset and the actual sales dataset. The appraisal data on 509 affected parcels (having damages greater than $25,000) across four Tennessee regions were coded by the research group and it was provided in the format of Appraisal Reports by TDOT Right-of-Way and Utilities Division staff. Specifically, the appraisal report data was coded and joined with several other relevant attributes using the information in the existing reports. After removing the outliers and missing values, a unique database of 509 case studies was developed. This constitutes the Appraisal Dataset. These case studies varied in the type of land use, improvements, and damage percentages. Actual sales data for the remainders of these case studies were searched for, using the Courthouse Retrieval System (CRS) reports, Zillow.com, and Realtor.com. Eventually, 98 valid cases were identified and collected to be used in this study as the Actual Sales Dataset.

The Appraisal Dataset can be used directly by TDOT to access cases in support of new remainder appraisals. The data was used to develop a hedonic regression model, which identified statistically significant relationships between the percentage of remainder damages and various land attributes. Factors associated with greater remainder damages are provided in this report. Some of the critical variables of the model include the type of change in highest and best use after acquisition and the existing use (before acquisition). No statistically significant (or substantial) regional differences in remainder damage appraisals were found. This implies that damages were assessed fairly uniformly by assessors across the four TDOT regions of Tennessee. As an important product of this effort, the case studies are also coded in an MS Excel spreadsheet, which can be used by TDOT staff for further analysis and searching for information to assign monetary values to the remainder damages.

Next, the hedonic regression model results were used to develop a predictive tool called Right-of-Way Damage Assessment (ROWDA). This tool provides a platform for establishing a more standardized approach in future appraisal work. It is a Microsoft Excel-based tool with an interface between a set of attributes and resulting damages. This tool is based on appraisal data, and it will allow TDOT to anticipate right-of-way costs under varying economic and demographic conditions. ROWDA can estimate percent damage to property (%). Additionally, ROWDA also calculates several outputs, including the value of the land acquired by TDOT.

The Actual Sales Dataset (N=98) was used to compare it with the damage appraisal dataset in hand. Maintaining consistency with the 1995's Remainder Sales Study, the "sales-based" percent-damages/benefits are calculated using the remainder value before damages in the appraisal report and the actual sale price. It was found that 64% of the cases (N=63) have damages and 36% (N=35) showed benefits when the sales occurred within 10 years of the appraisal. The median percent damage (-25%) for the sales-based estimation of damages/benefits is almost similar to the "appraisers-based" remainder damage estimation (-32%). In 14% of the cases (N=14 out of 98), the difference between appraisers-based estimated percent-damage and sales-based percent-damage is within ±10%. If sales occurred within two years of the appraisal date, the median sales-based percent-damages becomes -37%, which is within the close range of appraisers' estimated percent-damage (-35%). When the duration between appraisal and sale is short, one would expect minimal changes in the economy (real-estate market, inflation, disruptions) between the appraisal date and the actual sale date. In addition, it is less likely that there would be any dramatic changes (e.g., improvements) made in those properties in that short time. Nevertheless, the presence of "sales-based" benefits cases (27%) in the two years still warrants further investigation and more detailed investigation. Besides, more data can be collected to help in confirming whether the appraisers' estimation matches the actual sales for different types of properties. Additionally, the percent damages calculated using the ROWDA tool were close to sales-based and appraisers-based percent damages. Importantly, this analysis of remainder market transactions provides strong support for the effectiveness of ROWDA predictions of remainder damages.

This study provides several recommendations that TDOT can undertake immediately.

- The staff at TDOT can use the uniformly formatted databases to obtain information about properties acquired recently by TDOT to assist with assigning monetary value to remainder damage(s). Damage appraisal information on 509 cases is reported in Microsoft Word and Excel format, which is easily readable and updatable.
- TDOT can use the remainder of the sales study field-verification forms to assist with assigning monetary values. These field verification forms cover 98 case studies and compare the actual sale of remainders and the appraiser's assessment of the remainder property's value before damages. These forms are similar to the 1995 remainder sales study, and they can also be utilized by appraisers who can compare "sales-based" damages to assist them in assigning monetary value to remainder damages in new cases.
- TDOT may consider adopting predictive analytics for estimating remainder damages by using the Right-of-Way Damage Assessment (ROWDA) tool. The ROWDA tool is based on the hedonic approach, and it provides a quick way to evaluate the financial viability of a right-of-way project at its inception by considering all ROW costs and awards associated with that project. Although there are alternative ways to accomplish the same goal with different costs, ROWDA is a quick assessment tool that allows future ROW-related transactions and awards to be evaluated against anticipated ROW costs. This tool was validated using sales data.
- TDOT can plan to update the remainder sales study periodically. Given the increasing rate of change in real-estate markets, there is a need to update the cases regularly and

encourage assessors to use state-of-the-art prediction techniques for remainder damage assessments.

- Future research can explore the best ways of comparing sale and appraisal information, given the time differences (gaps) that need to be considered. Further, experimentation with new data sources and potential methodological ways of improving the effectiveness of appraisals for remainder damages can be considered. This strategy will include refinements in the hedonic approach used in the ROWDA tool, particularly as more data are incorporated into the database. Consideration should be given to new prediction techniques that are increasingly becoming available, e.g., using big data and models that consider comparable homes, assessed taxes, and property characteristics (e.g., square footage, number of bathrooms) as well as emerging artificial intelligence techniques. Furthermore, heterogeneity in the appraisal data can be addressed to improve damage appraisal predictions using The finite Mixture model as a state-of-the-art technique for segmentation. This may result in accomplishing better appraisal predictions for future studies.

Overall, the recommendations in this study provide a way to achieve and maintain uniformity in the process of remainder appraisal damages across the state. They also provide a way to assess the consistency of a new appraisal with past appraisals of comparable right-of-way damages. These recommendations support the use of a tool (ROWDA) by TDOT appraisers to objectively determine remainder damage (loss of value) while reducing the time and cost of acquisition. Finally, this study can increase property owners' confidence in assessing damages to their property when TDOT acquires their property for right-of-way projects.

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Appendix A: How to Read Appraisal Reports

Appraisal reports are divided into different sections.

I. Name, Address & Telephone Numbers

(A) Owner

(B) Tenant

(C) Address and location of the subject property

2. Detail description of the entire tract, including acreage, shape, frontage and depth length in feet, topography, flood designation, location of water features (e.g., creeks and ponds), and improvements known as structures (e.g., buildings, pavement areas, septic systems, and fencing).

3. Tax information

(A) Tax Map and Parcel Number

(B) Subject's FEMA Flood Hazard Area status, with FEMA Map/Zone identifiers

4. Interest Acquisition, such as Fee, Drainage Easement, Construction Easement, Slope Easement, or Other

5. Acquisition (Total or Partial)

6. Type of Appraisal (Formal or Formal Part Affected), as well as description referencing the Intended Use of Report.

7. Detail Description of Land Acquired, including location; length, width, and size of land area to be acquired; and any structures.

8. Sales of Subject (Show all recorded sales of the subject in the past 5 years; they show the last sale of the subject if not sold in the past 5 years). This includes information on the sale date, grantor, grantee, book page, verified consideration amount, how the sale amount is verified (e.g., deed), existing use, zoning, utilities available (e.g., water, electricity, telephone), off-site improvements (e.g., public road) and the lot size in square feet or acres.

9. Highest and Best Use

The highest and best use is the reasonably probable and legal use of property land as if the land were "vacant" and/or if the property had "Improvements." The highest and best determination is made based on four attributes - physically possible, appropriately supported, financially feasible, and results in the highest value.

10. Description of Residential Improvements (Structures)

(A) General Description, including units, stories, design, construction, manufactured housing, and actual and effective ages.

(B) Exterior Description, including foundation, exterior walls, roof surface, gutter and downspout material, window type, storm sash, and crawl space

(c) Room List identifying square footage and the number of rooms in the basement, main level, and second level of the home for Living, Dining, Kitchen, Family room, Recreation Room, Bedrooms, Bathrooms, Laundry, and Other. Total living area square footage is calculated based on the number of rooms, bedrooms, and bathrooms.

(D) Kitchen build-ins are included, including range/oven, disposal, dishwasher, fan/hood, compactor, and any special features.

(E) Interior Finish includes Floor types (i.e., hardwood, carpet, vinyl, other); walls (i.e., drywall, panel, plaster, and other); Trims/Finish Condition (i.e., excellent, good, average, fair, poor); Bath Floor type (i.e., ceramic, vinyl, carpet, other); Bath wainscot (i.e., ceramic, vinyl, other); Kitchen Floor (i.e., vinyl, tile, other), and any special features, such as fireplaces, ceiling fans, intercom, etc.)

(F) Heating Unit including type, fuel, condition, and Cooling Unit, including Central, and other condition

(G) Insulation including none, floor, ceiling, roof, walls, adequate, energy-efficient insulated windows

(H) Improvement Analysis includes a designation of Good, Average, Fair, or Poor for the following: Quality of Construction, condition of Improvement, Rooms Sizes and Layout, Closets and Storage, Plumbing, Electrical, compatibility to Neighborhood, as well as calculation of Estimated Remaining Economic Life and Estimated Remaining Physical Life

(I) Car Storage includes identification of garage, carport, number of cars, attached, detached, built-in, finished, unfinished, and condition

(J) Porches/Decks/Patios (Describe and show dimensions)

(K) Comment

11. Description of Commercial or Other Improvements

(A) Structure number, Number of stories, age, function, construction, condition, square feet area, reproduction cost, depreciation, and indicated value.

(B) Other Comments and Explanation of Reproduction Costs and Depreciation, including Current Age in years/Expected Life in years = depreciation in percentage

14. SALES COMPARISON APPROACH - LAND VALUE ANALYSIS: PART A

(A) Analysis of Comparability, including inspection date, sale numbers, and cash equivalent sales price, as well as the date of sale, number of periods, percent per period, time adjustment, sales price adjustment for time, proximity to subject parcel, and unit value of land (e.g., square foot, FF, acre, and lot). Other elements are identified by subject, decryption, and plus/minus adjustment. These elements

include (A) location, (B) size, (C) shape, (D) site/view, (E) topography, (F) access, (G) zoning, (H) utilities available, (I) encumbrances easement (J) off-site improvements, (K) off-site improvements and (L-N) other adjustments (specify). Net Adjustment is the net number of items from Location (A) through other (L-N). Adjusted indicated Unit Value indicates the unit value indicated by each comparable in dollars.

(B) Total indicated Value of Subject Land shows the reconciled unit value from comparable properties times the number of units in subject parcel divided by Correlated Unit Value of X Units.

(C) Comments

15. SALES COMPARISON APPROACH – PROPERTY ANALYSIS: RESIDENTIAL & RURAL

16. MISSING

17. EXPLANATION and/or BREAKDOWN OF LAND VALUES

(A) Valuation of Land is calculated by the amount of land in either square feet (Sq. Ft.), Frontage Feet (FF), Acres or Lot times (multiplied by) the reconciled unit value from comparable properties in dollars.

18. APPROACHES TO VALUE CONSIDERED

(A) Indicated Value of (choose one) Entire Tract or Part Affected from SALES COMPARISON Approach, and the value in dollars.

(B) Indicated Value of (choose one) Entire Tract or Part Affected from COST Approach, and the value in dollars.

(C) Indicated Value of (choose one) Entire Tract or Part Affected from INCOME Approach, and the value in dollars.

(D) Reconciliation (Which approaches were given most consideration) (Single-Point conclusion Should be Reasonably Rounded)

19. FAIR MARKET VALUE of (choose one) entire tract or part affected, and value in dollars.

(A) Total Amount Due Owner if (choose one) entire tract or part affected acquired and amount due in dollars.

(B) Amount Attributable to: Land (Value in Dollars) and Improvements (Value in Dollars).

Remarks

20. PARTIAL ACQUISITION

Value of entire tract in dollars

Amount Due Owner if Only part Acquired (Detail Breakdown)

(A) Measurement of Land Acquired (Fee) in Square Feet or Acre (choose one) at value (in dollars) equals total amount due owner for land acquired.

Measurement of Land Acquired for Drainage Easement in Square Feet or Acre (choose one) at value (in dollars) equals total amount due to owner for land acquired for drainage easement.

Measurement of Land Acquired for Slope Easement in Square Feet or Acre (choose one) at value (in dollars) equals total amount due owner for land acquired for slope easement.

Measurement of Land Acquired for Construction Easement in Square Feet or Acre (choose one) at value (in dollars) equals total amount due owner for land acquired for construction easement.

(B) Improvement Acquired (Indicate which improvement by showing structure numbers) describes each structure and the values of improvements acquired.

(C) Value of Part Acquired Land & Improvements (Sub-Total) in dollars

(D) Total Damages in dollars

(E) Sum of A, B, and D in dollars

(F) Benefits (Explain and deduct from D. Amount must not exceed incidental damages) in dollars

(G) TOTAL AMOUNT DUE OWNER (if only part is Acquired) in dollars.

21. VALUE OF REMAINDER

A. Land Remainder

Left: Amount of land in either square feet or acres at the following: Dollar Amount Per Unit both before and after; Damages both percentage and dollar amounts, and Remaining Value.

Right: Amount of land in either square feet or acres at the following: Dollar Amount Per Unit both before and after; Damages both percentage and dollar amounts, and Remaining Value.

Remainder Value of Land in dollars.

Less amount paid for Easement in Item 20A in dollars.

Less Cost to cure (Line 20-D) in dollars.

Total Remainder Value of Land ($).

B. IMPROVEMENTS REMAINDER

Improvement Number, Before Value ($); Damages in % and $; Remaining Value ($).

Remainder Value of Improvements ($)

Less Cost to Cure Items ($)

Total Remainder Value of Land & Improvements ($)

23. HIGHEST AND BEST USE AFTER ACQUISITION: (Summarize the support and rationale for the opinion).

24. DESCRIBE REMAINDER(S):

25. AMOUNT OF DAMAGE ($)

    (A) AMOUNT OF BENEFITS ($)

26. PHOTOGRAPHS

Appendix B: Glossary of Key Terms and Acronyms

A list of definitions pertaining to key variables identified in the appraisal reports and identified in the results of the descriptive statistics are provided.

Appraisal Report Definitions

The following definitions are compiled from "The Dictionary of Real Estate Appraisal," sixth edition, published by the Appraisal Institute. As the dictionary includes more than 5,000 entries, only those terms specifically relating to the remainder sales study and appraisal reports are contained in the list below.

Access is the ingress to and egress from a property that usually abuts an existing street or highway.

Allocation is a method of estimating land value in which the appraiser collects information about the site values of comparable sales and establishes a ratio between the site value and the total value.

An appraisal is the act or process of developing an analysis, recommendation, or opinion of value leading to the assignment of results.

The appraiser is expected to perform valuation services competently and in a manner that is independent, impartial, and objective.

An Appraisal Report is the written or oral communication of an appraisal.

Assemblage is the combining of two or more parcels, usually but not necessarily contiguous, into one ownership or use.

An assignment is a written transfer of the rights of use and occupancy of a property to be held by another legal entity, e.g., assignments of mortgages, sales contracts, and leases.

Comparable is a shortened term for similar property sales, rentals, or operating expenses used for comparison in the valuation process.

Condemnation is the act or process of enforcing the right of eminent domain. In condemnation, the loss in value to the remainder, resulting from a partial taking, is known as damages.

Contributory Value is the change in the value of a property as a whole, whether positive or negative, resulting from the addition or deletion of a property component, structure, or improvement.

The Cost Approach is a set of procedures through which a value indication is derived for the fee simple interest in a property by estimating the current cost to construct a reproduction of (or replacement for) the existing structure, deducting depreciation from the total cost, and adding the estimated land value.

Cost to Cure is the cost to restore an item of deferred maintenance to new or reasonably new conditions.

Damages refer to the statutory procedures and practices in the government's taking of private property for public use upon the payment of compensation; the process of enforcing the right of eminent domain. In condemnation, the loss in value to the remainder, resulting from a partial taking, is known as damages.

Depreciation is the loss in property value from any cause, the difference between the cost of an improvement and the market value of the improvement.

An easement is the right to use another's land for a stated purpose. An easement conveys property use, but not ownership.

Economic Life is a method of estimating depreciation in which the ratio between the effective age of a building and its total economic life is applied to the current cost of the improvements after the costs to cure curable physical and functional items are deducted.

Eminent Domain is the right of the government to take private property for public use upon payment of just compensation. The fifth amendment of the U.S. Constitution guarantees payment of just compensation upon appropriation of private property.

Encroachment is the trespassing on the domain of another or the partial or gradual displacement of an existing use by another use.

Encumbrance is any claim or liability that affects or limits the title to a property, such as a mortgage, other liens, or easement. An encumbrance cannot prevent the transfer of possession, but it does remain after the transfer.

Estate is a right or interest in the property, which defines an owner's degree, quantity, nature, and extent of interest in real property. There are many different types of estates, including fee simple.

Excess or Surplus Land is land that is not needed to support existing improvements. The highest and best use of the excess land may or may not be the same as the highest and best use of the improved parcel. Excess land is valued separately.

Extraction is a method of estimating land value in which the depreciated cost of the improvements on the property is calculated and deducted from the total sale price to arrive at an estimated sale price for the land.

Fair Market Value is similar to market value in general usage; used mainly in condemnation, litigation, and property tax situations; used in an appraisal estimate.

Fee Simple Estate is the absolute ownership unencumbered by any other interest, subject to the limitations imposed by the governmental powers of taxation and eminent domain.

FEMA Map is a Flood zone map created by the Federal Emergency Management Agency (FEMA).

Field Review is an appraisal review for which the scope of appraisal work includes inspection of the exterior and sometimes interior of the subject property and possibly inspection of the comparable properties to confirm the data provided in the appraisal report.

Final Reconciliation is the last phase in the calculation of value in which two or more value indications derived from market data are resolved into a final value.

Forecasting, in appraisals, is the process of estimating value, land use, or other attributes in advance based on past trends.

Functional Utility is the ability of a property or building to be useful and to perform the function for which it is intended according to current market tastes and standards; the efficiency of a building uses in terms of architectural style, design and layout, traffic patterns and size and type of rooms.

A grantee is a person or entity to whom property or property rights are transferred by deed or other documents.

A grantor is a person or entity who transfers property or property rights by deed or other documents.

The highest and best use is the reasonable, probable, and legal use of vacant land or an improved property, which is physically and legally possible, appropriately supported, financially feasible, and that results in the highest value.

The income Approach is a set of procedures through which an appraiser derives a value indication for an income-producing property by converting its anticipated benefits, such as cash flows, into property value.

Ingress a means of entering or an entrance.

Interim Use is the temporary function applied to land or improved property until it can be put to its future highest and best use.

Legally Nonconforming Use is a use that was lawfully established and maintained, but no longer conforms to the regulations of current zoning; also known as a grandfathered use.

Market Share is the estimated percentage of the total potential market for a specific type of property (e.g., office space, retail space, single-family homes) that is currently absorbed by existing facilities or is forecast to be absorbed by proposed facilities.

Market Value is a calculation based on the most probable price that the specified property should sell for in a competitive market after a reasonable time under all conditions requisite to a fair sale.

A neighborhood is a group of complementary land uses; a congruous grouping of inhabitants, buildings, or business enterprises.

Obsolescence is an impairment of desirability and usefulness caused by new inventions, changes in design, improved processes for production, or external factors that make a property less desirable.

Over-improvement is an improvement that does not represent the most profitable use for the site on which it is placed because it is too large or costly and cannot develop the highest possible land value.

Oversupply is an excess of supply over demand, which is indicated by high vacancy rates, sluggish absorption rates, and declining land value.

Paired Sales Analysis is a quantitative technique used to identify and measure adjustments to the sale prices or rents of comparable properties. To apply this technique, sales data on nearly identical properties is analyzed to isolate and estimate a single characteristic's effect on value.

Physical Life is the total period a building lasts or is expected to last as opposed to its economic life.

Riparian Rights are the right of the owner of land bordering a non-navigable lake or stream to the use and enjoyment of the water that flows across their land or is contiguous to it.

The Sales Comparison Approach is the process of deriving a value indication for the subject property by comparing market information for similar properties with the property being appraised, identifying appropriate units of comparison, and making qualitative comparisons with or quantitative adjustments to the sale prices of the comparable properties based on relevant, market-derived elements of comparison.

Special Use Permit is permission granted by a local zoning agency that authorizes a use as a special exception to the applicable zoning. For example, a special use permit in a residentially zoned area might allow for a church.

Swale is a shallow depression, in a flat area of land, that may be artificial and used in a stormwater drainage system.

Under-improvement is an improvement that is inadequate to maximize the return to the site, usually a structure that is of a lower quality or size than typical competitive properties.

The valuation process is a systematic procedure used in the valuation of real property.

Value in Use is the value of a property assuming a specific use, which may or may not be the property's highest and best use on the effective date of the appraisal. Value in use may or may not be equal to market value.

Zoning is a public regulation of the use of private land through the application of police power; accomplished by establishing districts or areas with uniform requirements relating to lot coverage, setbacks, type of improvement, permitted activities, signage, structure height, minimum lot area, density, landscaping, and other aspects of land use and development. Zoning regulations are established by the enactment of a local (city, town, or country) zoning ordinance.

Zoning Variance is a legally authorized modification in the use of the property at a particular location that does not conform to the regulated use set forth in the zoning ordinance for the surrounding area; not an exception or change in the legally applicable zoning.

Definition of Key Variables

This list contains the definition for 16 of the 155 variables found in the excel spreadsheet used in the study. The purpose of the detailed definitions used in this research is to provide a deeper understanding of the values found in the study. For example, the variable Topography represents the topography of the tract; the values include 0 for level topography, 1 for gently sloping topography, and 2 for topography described by the appraiser as steeply sloping.

Land use

- Existing use: The current use of the property before the acquisition.
- Highest and best use as vacant/improved: The reasonably probable and legal use of vacant land or an improved property, which is physically possible, appropriately supported, financially feasible, and that results in the highest value.

The existing use and the highest and best use are categorized as follows:

1. Residential
2. Agricultural
3. Commercial
4. Industrial
5. Vacant/woodland
6. Mixed-use
7. Others (special use)

- Change in highest and best use (binary) – The change in the highest and best use of the tract after the acquisition. Since the appraisal reports only consider the negative impacts, this variable only considers a change that adversely affects the highest and best use (reduction). If there is a change in the highest and best use, it is 1; otherwise, 0.
- Change in highest and best use (categories) – The change in the highest and best use of the tract after the acquisition can be captured based on one of the following categories:

    - Same land use but limited
    - Changed to assemblage
    - Changed from commercial to industrial/residential/agricultural/vacant/woodland
    - Changed from residential to agricultural/vacant/woodland

Improvements

- Number of damaged improvements – The number of improvements that are damaged due to the project (after the acquisition).
- Number of acquired improvements – The number of improvements that are acquired by the project.

Damages/Acquisition improvements

- Damage to the building improvements - If the damage after the acquisition to the building improvements is greater than 50%, it is coded as major (2), less than or equal to 50% is coded as minor (1), and no damage (0).

- Major/minor building improvements acquisition - If the acquisition of the building improvements is greater than 50%, it is coded as major (2), less than or equal to 50% is coded as minor (1), and no acquisition (0).
- Damage to the paved parking/driveway improvements - If the damage after the acquisition to the paved parking/driveway improvements is greater than 50%, it is coded as major (2), and less than or equal to 50% is coded as minor (1), and no damage (0).
- Major/minor paved parking/driveway improvements acquisition - If the acquisition of the paved parking/driveway improvements is greater than 50%, it is coded as major (2), and less than or equal to 50% is coded as minor (1), and no acquisition (0).
- Damage to the gravel parking/driveway improvements - If the damage after the acquisition to the gravel parking/driveway improvements is greater than 50%, it is coded as major (2), and less than or equal to 50% is coded as minor (1), and no damage (0).
- Major/minor gravel parking/driveway improvements acquisition - If the acquisition of the gravel parking/driveway improvements is greater than 50%, it is coded as major (2), and less than or equal to 50% is coded as minor (1), and no acquisition (0).
- Damage to the landscaping improvements - If the damage after the acquisition to the landscaping improvements is greater than 50%, it is coded as major (2), less than or equal to 50% is coded as minor (1), and no damage (0).
- Major/minor landscaping improvements acquisition - If the acquisition of the landscaping improvements is greater than 50%, it is coded as major (2), less than or equal to 50% is coded as minor (1), and no acquisition (0).
- Damage to the fencing improvements - If the damage after the acquisition of the fencing improvements is greater than 50%, it is coded as major (2), less than or equal to 50% is coded as minor (1), and no damage (0).
- Major/minor fencing improvements acquisition - If the acquisition of the fencing improvements is greater than 50%, it is coded as major (2), less than or equal to 50% is coded as minor (1), and no acquisition (0).
- Damage to the barn improvements - If the damage after the acquisition to the barn improvements is greater than 50%, it is coded as major (2), less than or equal to 50% is coded as minor (1), and no damage (0).
- Major/minor barn improvements acquisition - If the acquisition of the barn improvements is greater than 50%, it is coded as major (2), less than or equal to 50% is coded as minor (1), and no acquisition (0).
- Damage to the storage/shed improvements - If the damage after the acquisition to the storage/shed improvements is greater than 50%, it is coded as major (2), and less than or equal to 50% is coded as minor (1), and no damage (0).
- Major/minor storage/shed improvements acquisition - If the acquisition of the storage/shed improvements is greater than 50%, it is coded as major (2), less than or equal to 50% is coded as minor (1), and no acquisition (0).

- Damage to the garage improvements - If the damage after the acquisition to the garage improvements is greater than 50%, it is coded as major (2), less than or equal to 50% is coded as minor (1), and no damage (0).
- Major/minor garage improvements acquisition - If the acquisition of the garage improvements is greater than 50%, it is coded as major (2), less than or equal to 50% is coded as minor (1), and no acquisition (0).
- Damage to the liquid or gas storage tank improvements - If the damage after the acquisition to the liquid or gas storage tank improvements is greater than 50%, it is coded as major (2), and less than or equal to 50% is coded as minor (1), and no damage (0).
- Major/minor liquid or gas storage tank improvements acquisition - If the acquisition of the liquid or gas storage tank improvements is greater than 50%, it is coded as major (2), and less than or equal to 50% is coded as minor (1), and no acquisition (0).
- Damage to the canopy improvements - If the damage after the acquisition of the canopy improvements is greater than 50%, it is coded as major (2), less than or equal to 50% is coded as minor (1), and no damage (0).
- Major/minor canopy improvements acquisition - If the acquisition of the canopy improvements is greater than 50%, it is coded as major (2), less than or equal to 50% is coded as minor (1), and no acquisition (0).
- Damage to the septic system improvements - If the damage after the acquisition to the septic system improvements is greater than 50%, it is coded as major (2), less than or equal to 50% is coded as minor (1), and no damage (0).
- Major/minor septic system improvements acquisition - If the acquisition of the septic system improvements is greater than 50%, it is coded as major (2), less than or equal to 50% is coded as minor (1), and no acquisition (0).
- Damage to the business sign improvements - If the damage after the acquisition to the business sign improvements is greater than 50%, it is coded as major (2), less than or equal to 50% is coded as minor (1), and no damage (0).
- Major/minor business sign improvements acquisition - If the acquisition of the business sign improvements is greater than 50%, it is coded as major (2), less than or equal to 50% is coded as minor (1), and no acquisition (0).

Parcel

- Change in frontage elevation – It is 1 if the land value is damaged after the acquisition due to a noticeable change in the frontage elevation; otherwise, 0.
- Change in parcel shape – It is 1 if the land value is damaged after the acquisition due to a noticeable change in the parcel shape; otherwise, 0.
- Access damaged - Access damaged has three categories. Minor or moderate damage represents the damages that reduce the access of parcel/s, but still, have adequate access to be used after. However, major damage or landlocked means that there is no access at

all, or the access is significantly reduced and is not sufficient, and the highest and best use of the parcel was mostly changed to assemblage.

- Change in land value after acquisition - Assigned as “partially” if the value of a portion of the land is reduced. Likewise, it is coded “entirely” if the value of all parts of the land is affected/damaged.
- Proximity damage - The proximity damage is market derived using the typical setback from the roadway in the neighborhood, the severity of the reduction of the front yard setback, and the impact of the roadway on the residence. If the track's proximity is damaged after the acquisition, it is 1; otherwise, 0.
- Change in tract utility - Captures the damage to the remainders caused by a negative change in utility (e.g., reduction in the number of parking spots). It is 1 if the change is significant; otherwise, 0.
- Inadequate area to develop - When the remainder’s area is inadequate for a development, it is 1; otherwise, 0.
- Ratio of acquired to the original land area - The ratio of acquired land area to the original land area.
- Damages percentage- The percentage of damage to the remainder.
- Topography - The topography of the tract is assigned as 0 if the land is level, 1 if it is rolling or gently sloping, and 2 if it is best described as heavily steep sloping.
- Easements - Three types of easements are found in the reports, i.e., drainage easement, slope easement, and construction easement.
- Cuts/fills required - If the remainder requires cuts/fills, it is assigned as 1, otherwise 0.

Appendix C: Examples of Field Verification Cases

2021 Remainder Sales Study / Field Verification

Property Location:	**1101 E. Broadway Street, Lenoir City, TN**						
City:	**Lenoir**	Zip:	37771	County:	**Loudon**	Region#	**1**
Tax Map#:	20L-C	Parcel#:	14 & 15	PIN#	115209	Zoning:	**Commercial**
State Project#:		Tract#:	**6**				

Latest Sale Date: **11/4/2020** Sale Amount **$115,000**

Grantor: Grantee:

Has the property changed since the acquisition by D.O.T? (i.e., Zoning subdivided, highest & best use, remodeled, additional imp.)

Original PCL./Changes: Residential, contains 0.173 acres and is located at the intersection of US highway 321 and US highway 11. The site has frontage along two highways (which doesn't give access to the site) and two secondary streets.

Description of Rem.: Landscaping or small park, 3001 SF remainder land, no access drive to the land and topography is below grade of highway 321 surrounded by roads, landlocked.

APPROVED APPRAISAL

BEFORE VALUE

Land-acre/sq.ft.:	7536 SF	$20/SF	**$150,700**
Improvements			**$184,300**
Appr. Date:	**2/6/2017**	Total before value $:	**$335,000**

ACQUISITION

land-acre/sq.ft.:	1704 SF	$20/SF	**$34,080.00**
Perm. Drainage esmt.:			**$0.00**
Slope esmt.:			**$45,296.00**
Cons. esmt.:			**$8,532.00**
Improvements:			**$184,300.00**
Damages to the remainder:			**$59,672**
		Amount due owner $:	**$331,900**

Sales Amount **$115,000**

Remainder Value Before Damages (minus-) **$62,792**

Indicated damage/benefit amount **$ 52,208**

Calculations: (115000-62792) /62792 =52208/62792 = 83.1%

% of damage: % of benefit: **83.1%**

Proximity Damage (before):	N/A	(After):	No
Cuts/Fills (before):	N/A	(After):	Yes
Access (before):	Adequate	(After):	Landlocked

Comments: Uneconomic Remnant Parcel- Potentially can be used for landscaping or small park as part of intersection improvements.

Figure C- 1: Field Verification of a Commercial Tract

2021 Remainder Sales Study / Field Verification

Property Location:	**9303 E. Brainerd Road, Chattanooga, TN**						
City:	**Chattanooga**	Zip:	37421	County:	**Hamilton**	Region#	**2**
Tax Map#:	159M-E	Parcel#:	38	PIN#	101431	Zoning:	**Residential**
State Project#:		Tract#:	**163S**				

Latest Sale Date: 5/7/2018 Sale Amount **$40,000**

Grantor: Grantee:

Has the property changed since the acquisition by D.O.T? (i.e., Zoning subdivided, highest & best use, remodeled, additional imp.)

Original PCL./Changes: Residential tract, 2.314 acres, rectangular in shape, slopes above grade and exhibit wooded, rolling topography. Access to the property is from Est Brainerd Road via easement over the adjoining property.

Description of Rem.: Residential, remainder will contain 1.496 acres, slightly irregular in shape, overall topography will be consisten with the subject tract before construction with the exception of a severe cut slope that will be present along its E. Brainerd Road Frontage.

APPROVED APPRAISAL

BEFORE VALUE

Land-acre/sq.ft.:	2.314 AC	$30,000/AC	**$69,420**
Improvements			**$130,580**
Appr. Date:	9/20/2017	Total before value $:	**$200,000**

ACQUISITION

land-acre/sq.ft.:	0.818	$30000/AC	**$24,540.00**
Perm. Drainage esmt.:			**$0.00**
Slope esmt.:			**$0.00**
Cons. esmt.:			**$2,349.00**
Improvements:			**$117,839.00**
Damages to the remainder:			**$53,133**
		Amount due owner $:	**$198,000**

Sales Amount			**$40,000**
Remainder Value Before Damages		(minus-)	**$55,272**
Indicated damage/benefit amount			**$ (15,272)**

Calculations: (40000-55272) /55272 =-15272/55272 = -27.6%

% of damage: **27.6%** % of benefit:

Proximity Damage (before):	N/A	(After):	No
Cuts/Fills (before):	N/A	(After):	Yes
Access (before):	Adequate	(After):	Damaged

Comments: Assemblage with adjoining property that has access

Figure C- 2: Field Verification of a Residential Tract

Appendix D: Exploring Adjustment Factors to Make the Actual Sales and Appraisal more Comparable

The main report states that the comparison between actual sales and appraisal sales needs further investigation. Specifically, the comparison will be more reasonable after adjusting the factors related to the length of time gap between appraisal and sale, accounting for the changes in the economy (real-estate market, inflation, and disruptions) and changes in land use and improvements. If there were no other major modifications to the remainder property between the appraisal date and sale date, the sales could be made more comparable to appraisals by using adjustment factors, especially for longer gaps. The research team considered two methods for making adjustments (i.e., discounting the sale price). The first one is to use the Zestimate from Zillow for residential properties, given that estimates of residential property value are provided over time. The second method uses the Housing Price Index (HPI) from the Federal Housing Finance Agency.

Method 1: Using Z estimate

Zillow publishes Zestimate residential property valuations for 104 million homes across the country and uses statistical and machine learning models that can examine hundreds of data points for each home. To estimate property value, Zillow has created a proprietary home valuation tool, Zestimate, by using neural network-based AI models that incorporate data from the county and tax assessor records and direct feeds from hundreds of multiple listing services and brokerages. The Zestimate also incorporates:

- Home characteristics include square footage, location, and the number of bathrooms.
- On-market data such as listing price, description, comparable homes in the area, and days on the market
- Off-market data — tax assessments, prior sales, and other publicly available records
- Market trends, including seasonal changes in demand

The Zestimate of the property value can be tracked over time for many residential properties. Zestimates for the appraisal date and sale date can be collected from Zillow in this method. Then, the percentage difference between these values can be calculated, which can be used to discount the sale value to the appraisal date. This discounted sale value can be used to re-estimate the sales-based percent-damages/benefits. However, this method has limitations, e.g., Zestimates is only available for residential properties.

Method 2: Using the Housing Price Index (HPI)

The Federal Housing Finance Agency (FHFA) calculates house price appreciation indices across relatively small geographic areas, e.g., counties. The index is known as the House Price Index (HPI). This index provides county-wise yearly adjustment weights (annual percent-change). The weights are different for each county each year, which can be used to discount the sales

value to the appraisal date. When the time gap between appraisal and sales is more than one year, it is required to gradually discount the sale value to the appraisal date based on different HPI weights for each year. For example, if an appraisal year is 2014 and the sale year is 2016, then the discounting process should first adjust the 2016 value to 2015 using the weight for that one-year gap (2015-2016) and subsequently adjust the 2015 discounted value to 2014 discounted value using a different weight (2014-2015). In this way, HPI-discounted sales value can be calculated, which can be used to re-estimate the sales-based percent-damages/benefits. However, the method has some limitations, e.g., the weights are not seasonally adjusted. Moreover, as of the writing of this report, HPI did not have any adjustment factor for 2021.

Comparison of Zestimate with HPI for two sample cases

The research team analyzed two sample cases to explore the outcomes of the mentioned methods meant to adjust the sale prices. As shown in Table D-1, Z-adjusted discounted sale value shows a 22% reduction from the actual sale value in sample case 1 and a 10% reduction in case 2. At the same time, the HPI-adjusted discounted sale value has a 6% reduction in case 1 and an 8% reduction in case 2. Table D-2 displays the percent-damages/benefits estimation from the discounted sales value of Zestimate and HPI methods. In case 1, the sales-based percent-damages from the Z-adjusted sale value show a 79.82% higher percent-change (percent-damages: -39.20%) compared to the before adjusted percent-damages is closer to the appraisers-based percent-damages (-45.24%). Similarly, HPI-adjustment shows a higher percent change in the sales-based percent-damages value. However, Z-adjustment shows estimates that are closer to the appraisers' estimates.

Table D- 1: DISCOUNTED SALES VALUE OF ZESTIMATE AND HPI METHODS

County/Tract	*Appr. Date*	*Sale. Date*	*Sale Value*	*Z-adjusted Discounted Sale Value*	*HPI-adjusted Discounted Sale Value*
Carroll/35	9/16/2018	11/8/2019	$133,000	$103,433.95 (-22%)	$125,223.61 (-6%)
Carroll/40	10/1/2018	11/12/2020	$162,500	$145,760.70 (-10%)	$148,918.41 (-8%)

Table D- 2: PERCENT-DAMAGES/BENEFITS ESTIMATION FROM THE DISCOUNTED SALES VALUE OF ZESTIMATE AND HPI METHODS

County/ Tract	*Appraisers -based percent-damages*	*Sales-based percent-damages/benefits*				
		Before Adjustment	Z-Adjustment	%Change after Z-adjustment	HPI-Adjustment	%Change after HPI-adjustment
Carroll/35	-45.24%	-21.80%	-39.20%	79.82%	-26.40%	21.10%
Carroll/40	-47.80%	-14.50%	-23.30%	60.69%	-21.70%	49.65%

Overall, results from the above sample cases on the comparison between the Z-adjustment and HPI-adjustment indicate that:

- Both methods show improvements in the sales-based percent-damages/benefits after incorporating the adjustment factors.
- The Z-adjustment showed a higher percent change in the sales-based percent-damages/benefits than HPI-adjustment.

Since Zestimate provides reasonable estimates and the data are more easily accessible, the research team attempted to further explore cases by using the Z-adjustment factor in the main report.

Appendix E: ROWDA-based Percent-damages

The Right-of-Way Damage Assessment (ROWDA) tool is based on the hedonic regression approach, which provides a way to evaluate the financial viability of a right-of-way project at its inception by considering all ROW costs and awards associated with that project. In the field verification of the actual sales and appraisers, the ROWDA tool predicts the percent damages of 59 properties (where the sale date and appraisal date are within two years). They are compared with the sales-based percent-damages/benefits and appraisers-based percent-damages. The results for all 59 cases are presented in Table E- 1 below.

Table E- 1: SALES-BASED PERCENT-DAMAGES/BENEFITS, APPRAISERS-BASED PERCENT-DAMAGES, AND ROWDA-BASED PERCENT-DAMAGES, WHERE APPRAISAL AND SALES OCCURRED WITHIN TWO YEARS (N=59)

Region	*Counties*	*PIN#*	*Tract No*	*ROWDA-based %-damages*	*Sales-based %-damages/benefits*	*Appraisers-based %-damages*
1	Blount	101651.03	206	-29%	-60%	-30%
1	Blount	101651.03	249	-17%	396%	0%
1	Carter	43975.01	55	-69%	100%	-71%
1	Jefferson	100248.00	30	-22%	-58%	-19%
1	Knox	100241.03	9	-27%	-79%	-20%
1	Knox	115662.00	17	-56%	-75%	-24%
1	Knox	115662.00	12	-56%	66%	-50%
1	Knox	115662.00	2	-100%	127%	-95%
1	Knox	107777	26	-99%	278%	-87%
1	Knox	100241.03	2	-100%	429%	-91%
1	Roane	101244.02	31	-33%	-29%	-35%
1	Sullivan	112834.02	46	-34%	-74%	-56%
1	Sullivan	105467.01	173	-31%	-72%	-17%
1	Sullivan	105467.01	217	-44%	-47%	-40%
1	Sullivan	105467.01	59	-31%	-37%	-43%
1	Sullivan	105467.01	60	-31%	-33%	-30%
1	Sullivan	105467.01	191	-34%	65%	-25%
1	Washington	112834.01	31	-77%	-81%	-93%
1	Washington	112834.01	15	-88%	0%	-97%
2	Bradley	101430	56	-45%	-41%	-54%
2	Bradley	101430.01	57	-44%	-9%	-80%

Region	*Counties*	*PIN#*	*Tract No*	*ROWDA-based %-damages*	*Sales-based %-damages/benefits*	*Appraisers-based %-damages*
2	Bradley	101430.01	130	-37%	-9%	-53%
2	Bradley	101430.01	53	-82%	683%	-97%
2	Clay	100259.1	33	-13%	74%	-51%
2	Cumberland	100260.01	206A	-23%	-65%	-33%
2	Hamilton	112833	5	-29%	-93%	-31%
2	Hamilton	101431.00	80	-56%	-50%	-67%
2	Hamilton	101431	163-S	-87%	-28%	-96%
2	Overton	107351.01	110	-87%	-83%	-12%
2	Putnam	112538	127	-47%	-67%	-28%
2	White	124864	24	-31%	-75%	-18%
3	Cheatham	109542	24	-29%	-78%	-15%
3	Cheatham	109542	25	-29%	-77%	-16%
3	Cheatham	109542	78	-27%	-74%	-16%
3	Cheatham	109542	146	-32%	-58%	-45%
3	Cheatham	109542	234	-29%	-21%	-58%
3	Davidson	105766.02	142	-30%	7%	-14%
3	Sumner	10766.01	46	-15%	-78%	-17%
3	Sumner	101300.00	8& 10	-97%	-70%	-70%
3	Sumner	100286	35	-35%	-37%	-49%
3	Sumner	107338.98	12	-34%	14%	-34%
3	Sumner	10766.01	56	-23%	97%	-2%
3	Williamson	101435	31	-30%	-34%	-41%
3	Wilson	100281.02	77	-21%	-82%	-15%
3	Wilson	100281.02	45	-36%	-62%	-30%
3	Wilson	100281.03	16	-81%	-52%	-18%
3	Wilson	100281.02	70	-24%	-9%	-17%
3	Wilson	100281.03	36	-100%	4%	-79%
3	Wilson	103203.02	9	-25%	21%	-23%
3	Wilson	100281.02	80	-84%	30%	-96%
4	Carroll	100326.02	35	-41%	-22%	-45%
4	Gibson	100602	1	-25%	-72%	-25%

Region	*Counties*	*PIN#*	*Tract No*	*ROWDA-based %-damages*	*Sales-based %-damages/benefits*	*Appraisers-based %-damages*
4	Gibson	100325.00	22	-18%	-47%	-25%
4	Henderson	100350	44A	-28%	-65%	-28%
4	Lauderdale	101211	62	-37%	-28%	-68%
4	Madison	112752.00	5	-80%	-60%	-50%
4	Shelby	100339.01	32	-5%	32%	-16%
4	Tipton	100639	3	-39%	-51%	-44%
4	Tipton	100639	6	-51%	-5%	-95%