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16. Abstract

TxDOT manages over one million acres of right-of-way, which is used by a variety of third parties to install facilities such as utilities, saltwater pipelines, and small cell nodes. Third parties include common carriers, who install facilities for public use, and private parties, who install facilities for private use. Common carriers access the right-of-way via permit, for which TxDOT does not have the authority to charge a fee. Private parties lease the right-of-way, and the associated fees are intended to cover administrative costs and the value of the right-of-way. This project developed a valuation methodology and framework to assess the value of the right-of-way for leases of various longitudinal distances and durations and assessed whether common carriers are violating their permits by installing additional facilities and leasing them to private parties. The framework is available as a spreadsheet tool for use within Microsoft Excel and an interactive GeoJSON mapping tool for use in a web implementation.

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DISCLAIMER

This research was sponsored by the Texas Department of Transportation (TxDOT) and the Federal Highway Administration (FHWA). The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of FHWA or TxDOT. This report does not constitute a standard, specification, or regulation.

This report is not intended for construction, bidding, or permit purposes. The engineer in charge of the project was Edgar Kraus, P.E. (Texas Registration #96727).

The United States Government and the State of Texas do not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the object of this report.

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LIST OF ACRONYMS AND ABBREVIATIONS

2D	Two-dimensional
3D	Three-dimensional
AADT	Annual average daily traffic
APWA	American Public Works Association
ATF	Across-the-fence
BU	Business United States Highway
Caltrans	California Department of Transportation
CFR	Code of Federal Regulations
CSV	Comma Separated Values
FHWA	Federal Highway Administration
FM	Farm-to-market road
FTA	Federal Transit Administration
GeoJSON	Geographic JavaScript Object Notation
GIS	Geographic information system
ID	Identifier
IH	Interstate Highway
IRWA	International Right of Way Association
KMZ	Compressed keyhole markup language (file)
PCS	Personal Communication Service
PDF	Portable Data Format
QGIS	Open-source GIS, formerly known as Quantum-GIS
RHiNo	Roadway-Highway Inventory Network
RM	Ranch-to-market road
ROW	Right of way
SH	State Highway
SL	State Loop
SS	State Highway Spur
TAC	Texas Administrative Code
TL	Toll road
TTC	Texas Transportation Code
UA	United States Highway Alternate Highway
US	United States Highway
USC	United States Code
ZIP	Zone Improvement Plane

LIST OF TERMS

Absolute positional accuracy: Degree to which a point or feature in a map or 3D reconstructed model corresponds to its true position in a fixed coordinate system in the real world.

CHAPTER 1. INTRODUCTION

The Texas Department of Transportation (TxDOT) is responsible for managing over 1 million acres of right-of-way, which is associated with over 80,000 centerline miles of roadway (*1, 2*). This extensive highway network and associated right-of-way present a vital asset to TxDOT and the citizens of Texas. Aside from serving highway purposes, the right-of-way is used by various third parties, including public and private uses. Examples of uses of the right-of-way by third parties include the installation of utility facilities, renewable energy production, and parking facilities, among other uses. When third parties access the right-of-way, they either need a permit or lease that stipulates the requirements for the use of the right-of-way.

The goal of this research was twofold. The first goal was to develop a valuation framework for the right-of-way that could be used to assess fees for leases with private parties. The fees should consider different types, lengths, durations, and locations of installations by third parties. The second goal was to determine the prevalence of third parties violating the terms of their permits by leasing facilities to private parties.

To meet the goals of the research, the research team conducted a literature review, met with stakeholders to gather information related to the TxDOT leasing process, reviewed a sample of TxDOT permits and leases, and met with industry stakeholders to discuss lease practices and potential process improvements. The researchers then developed a preliminary valuation framework and valuation methodology that was presented for discussion at regional workshops throughout Texas. Researchers further reviewed a sample of TxDOT appraisal data to make recommendations for improvements to TxDOT Connect. This report summarizes the work completed throughout the research. Subsequent chapters cover the following topics:

- Chapter 2 includes a literature review of terms, applicable laws and regulations, valuation methodologies, and practices at other public agencies. This chapter also discusses details, rights, and requirements of different types of right-of-way uses.
- Chapter 3 summarizes information gathered from TxDOT stakeholders responsible for the right-of-way leasing process and describes the assessment of available TxDOT data, based on a sample of permits and leases the research team received from TxDOT.
- Chapter 4 summarizes industry stakeholder feedback that researchers collected from stakeholders that lease TxDOT right-of-way for various purposes.
- Chapter 5 describes preliminary valuation frameworks the researchers developed and the valuation methodology to assess lease rates on TxDOT property.
- Chapter 6 summarizes feedback that researchers received on the preliminary valuation frameworks and valuation methodology that researchers presented at regional workshops throughout Texas.
- Chapter 7 summarizes the assessment of TxDOT appraisal data and recommendations of the research team for improvements to TxDOT Connect.
- Chapter 8 discusses research findings, including conclusions and recommendations.

Separate, standalone deliverables of the research project include the following:

- Right-of-way valuation framework: the framework provides specific values of the right-of-way for different types, lengths, durations, and locations of installations by third

parties. Characteristics of the right-of-way, such as geographic location and type of highway facility, are factors of the valuation framework. The framework exists as a spreadsheet tool for use with Microsoft Excel and as an interactive mapping tool for implementation in a web-based system.

CHAPTER 2. LITERATURE REVIEW

INTRODUCTION

This chapter documents and summarizes the literature review, which focused on the uses of the right-of-way, pertinent laws and regulations, right-of-way valuation practices, and other uses of the right-of-way. Literature searches were conducted to identify research projects, journal articles, Texas and federal laws, and informal information gathered through personal conversations. The first portion of the literature review focused on the laws and regulations related to accessing the right-of-way and charging for that access. Much of the literature review focused on valuation methodologies and understanding the fees that other agencies charge for access to the right-of-way for various installations. Fee structures for various types of installations were documented.

TXDOT RIGHT-OF-WAY USES

Third parties regularly access the TxDOT right-of-way to install facilities such as utilities, saltwater pipelines, and small cell nodes. TxDOT distinguishes between right-of-way uses based on whether the use by a third party is public or private. Public uses require a permit to access the right-of-way, while private uses require a lease. For both public and private uses, there are requirements for application, installation, maintenance, and removal of facilities in the Texas Administrative Code (TAC), Texas Transportation Code (TTC), and various TxDOT manuals. These requirements are described in more detail in the section covering laws and regulations.

Public Use

Third parties that wish to access the right-of-way for a public use or a use that is deemed to benefit the public are granted access by permit. TxDOT does not charge fees associated with administering permits or for the value of land being used. Most commonly, permits are used by public utility companies (e.g., municipal water, electric, and gas) or private utility companies that serve the public (e.g., telecommunication companies). TxDOT reviews permits and the associated documentation about the utility facility, location, and material prior to granting access. TxDOT reserves the right to deny public parties access to the right-of-way.

Private Use

Private uses of the right-of-way require a lease to access TxDOT property. The most common types of leases that TxDOT has entered include parking, bridges, landscaping and maintenance, overhead conveyors, saltwater pipelines, and a wide range of commercial activities. An emerging use of the TxDOT right-of-way is by private companies seeking to install small cell communication devices. Any lease must be for at least fair market rental value.

LAWS AND REGULATIONS

This section describes applicable laws and regulations for leasing the right-of-way and the right to occupy the right-of-way. Federal laws and regulations are described first, followed by Texas laws and regulations. In addition, TxDOT manuals are described as well as TxDOT's experience with lease programs.

Federal

There are a variety of federal laws and regulations concerning the use of the right-of-way and leasing. Title 23 of the United States Code (USC) Section 111 prohibits states from commercializing the right-of-way of the interstate system but does allow states to use or permit for the use of the airspace above and below ground for purposes that do not impair the full use and safety of the highway (*3*). 23 USC 156 requires states to charge, at a minimum, fair market value for the sale, use, lease, or lease renewal of real property acquired with federal assistance, except for utility use and occupancy (*4*).

At the federal level, several statutes and regulations govern the use and management of the highway right-of-way. The use of real property is limited by 49 Code of Federal Regulations (CFR) Section 18.31(b): "Except as otherwise provided by Federal statutes, real property will be used for the originally authorized purposes as long as needed for that purposes, and the grantee or subgrantee shall not dispose of or encumber its title or other interests" (*5*).

Furthermore, 23 CFR 645 Subpart B—Accommodation of Utilities allows departments of transportation (DOTs) to accommodate public and private utility facilities within the right-of-way when such facilities serve the public interest under their approved utility accommodation policy manual or plan (*6*).

Accommodating private or proprietary interests in the right-of-way using a lease is allowed if they are approved under the airspace leasing requirements in 23 CFR 710 Subpart D—Real Property Management (*7*). The right to use the right-of-way for interim non-highway use may be granted in airspace leases as long as such uses will not interfere with the construction, operation, or maintenance of the facility; anticipated future transportation needs; or the safety and security of the facility for both highway and non-highway users. The DOT must charge current fair market value or rent for the use of the land. Federal regulations provide an exception to charging fair market rent if the DOT shows and the Federal Highway Administration (FHWA) approves that such an exception is in the overall public interest for social, environmental, or economic purposes.

When part of a property is taken from a larger property, the "before and after" methodology is used for determining the valuation of the partial acquisition. This methodology is known as the federal rule because it is accepted by federal courts. In addition, many states have adopted this rule into their state code. Essentially, the methodology determines total compensation by subtracting the value of the property after the partial acquisition from the value of the property before the partial acquisition (*8*). This is a straightforward methodology but may not be directly applicable to the leasing of state right-of-way to private parties. In addition, private parties do not gain property interest from leases.

Texas

There are various Texas laws and regulations pertaining to right-of-way practices, including stipulations for TxDOT's requirements and limitations. Some laws are enacted by the state legislature and are then adopted into various TxDOT manuals. Some laws and regulations list requirements for third parties that wish to access the right-of-way, including for public and

private uses. The sections below describe the pertinent laws and regulations in Texas as they pertain to right-of-way leasing practices.

Texas Transportation Code and Texas Administrative Code

The TTC is a topic-by-topic document of laws covering aviation, navigation, railroads, roadways, vehicles, and traffic. Title 6 TTC Subtitle A contains laws pertaining to TxDOT. One of the most applicable sections of the TTC is 202.052, which describes TxDOT's lease authority (*9*):

- The department may lease a highway asset, part of a right-of-way, or airspace above or underground space below a highway that is a part of the state highway system if the department determines that the interest to be leased will not be needed for a highway purpose during the term of the lease.
- The lease may be for any purpose that is not inconsistent with applicable highway use.
- The department shall not charge less than fair market value for the highway asset, payable in cash, services, tangible or intangible property, or any combination of cash, services, or property.
- The department may authorize exceptions to the charges for:
    - The lease of a highway asset to a public utility provider.
    - A lease for a social, environmental, or economic mitigation purpose.
    - A lease to an institution of higher education for a purpose of the institution.

The TAC contains language pertaining to lease agreements, requirements, and requests for leases in 43 TAC 21.600 and following (*10*). This subchapter also includes language that requires TxDOT to not charge less than fair market value for leases (*11*). 43 TAC 21.606 states that anyone wishing to lease a highway asset shall submit the request through TxDOT's website (*12*). The rule stipulates the information that must be provided, such as name, address, description of the asset to be leased, drawings, proposed improvements, and information to support findings to authorize the leasing of the asset. The request is reviewed by the district engineer, the Right-of-Way (ROW) Division, and when appropriate, the executive director and FHWA.

Rules for the accommodation of utilities in Texas are codified in 43 TAC 21.31 and following (*13*). 43 TAC 21.36 details the rights of utilities, which are summarized as follows (*14*):

- Public utilities have a right to operate, construct, and maintain their facilities over, under, across, on, or along the highway. This includes entities authorized to transport or distribute natural gas, water, electric power, telephone, or cable television and common carriers authorized to construct and operate petroleum product and saltwater pipelines.
- A private utility may place a utility facility over, under, or across a highway but is not permitted to place a facility longitudinally on a highway right-of-way.
- A saltwater pipeline operator may place a saltwater pipeline over, under, or across a highway. A saltwater pipeline operator may place a saltwater pipeline longitudinally with a highway right-of-way by lease only.

Certain areas of right-of-way not used for highway purposes, for example areas beneath elevated structures, can be made available for other public purposes such as parking or public parks.

TxDOT uses multiple use agreements that specify the responsibilities of the parties to the agreement, typically TxDOT and local governmental agencies. TxDOT is usually responsible for site work, access, paving, traffic control, lighting, and basic landscaping, and the local agency is responsible for maintenance and operation of the facility. Rules for multiple use agreements are defined in 43 TAC 11.21 (*15*).

The TAC stipulates design requirements for utilities accommodated in the right-of-way in 43 TAC 21.37 (*16*). The same requirements apply to facilities that are installed by lease and by permit. Information contained in the TAC related to utility design includes the following:

- Location. The facility shall be located to avoid future adjustments, have a uniform longitudinal alignment, and have crossings installed at 90 degrees to the centerline.
- Plans. Utility facilities shall be of durable materials, not require routine maintenance, and not disturb drainage. Plans shall include design, location, elevations, and horizontal alignment. As-built plans shall depict the location, elevation, and alignment of the installed facility.
- The utility is responsible for design, installation, adjustment, or relocation of a utility facility.

The Texas Utilities Code (TUC) specifies certain rights and requirements related to leases (*17*). Specifically, 2 TUC 54.2025 relates to the right of municipalities and municipal electric systems to lease excess capacity of its fiber optic cable facilities (*18*). The TUC allows for municipal power agencies, electric cooperatives, telephone corporations, and telephone cooperatives to lease their property and assets.

TxDOT Manuals

In addition to the laws and regulations concerning the lease of the right-of-way and associated requirements, TxDOT has several manuals with relevant information. TxDOT's *Use of Right of Way by Others Manual* provides the rights of third parties and policies to standardize access to the right-of-way (*19*). This manual describes the utility policy, long-term uses of the right-of-way, and short-term uses of the right-of-way. The utility policy was developed for the safety, protection, use, and future development of the highways by stipulating the location, materials, and methods for the installation and adjustment of utility lines. The manual stipulates that new utility installation requests should be made using Form 1082 with attached drawings and that adjusted or relocated utility facilities should use Utility Joint Use Agreement forms. The manual includes a section covering leasing the right-of-way, which describes that a person wishing to lease the right-of-way should submit a request in writing to the district engineer.

TxDOT's *Right of Way Property Management Manual* covers practices related to disposing of real property sites no longer needed for highway purposes, acquiring real property sites, and leasing (*20*). TxDOT has the authority to lease any real property asset including the right-of-way. TxDOT developed two forms for right-of-way leases—a standard lease agreement (form ROW-L-2) and a telecommunication lease agreement (form ROW-L-2T). TxDOT also has lease agreements for leasebacks, state agencies, licenses, and oil and gas leases. TxDOT includes certain requirements in lease agreements including the term, appraisals, rent, construction, plans, inspection, insurance, transfers, defaults, etc.

TxDOT Leasing Programs

TxDOT has a leasing program for saltwater pipelines installed in the right-of-way. A saltwater pipeline is a pipeline facility that conducts water that contains salt and other substances and is intended to be used in drilling or operating a well used in the exploration for or production of oil or gas, including an injection well used for enhanced recovery operations or that is produced during drilling or operating an oil, gas, or other type of well. This includes a pipeline facility that conducts flowback and produces water from an oil or gas well on which hydraulic fracturing treatment has been performed to an oil and gas waste disposal well (*21*). TxDOT allows 90-day surface leases for saltwater pipelines carrying water to wells and subsurface leases for saltwater pipelines carrying produced or flowback water. TxDOT uses form ROW-SW-APP for saltwater pipeline leases and requires applicants to provide contact information, company information, location of the facility, commencement date, and size of pipeline. Currently, TxDOT charges $2,500 for up to 7 miles of pipeline per lease for above ground saltwater pipelines.

TxDOT has a separate leasing program for small cell (i.e., 5G) communication nodes. Applicants are required to request a lease from TxDOT, which includes submitting engineering drawings of the installation request. TxDOT began the leasing program in the Houston District and has since expanded into other locations where demand is present. After TxDOT began implementing their leasing program for small cell communication nodes, the Texas Legislature passed legislation related to these facilities (*22*). Texas Senate Bill 1004 set the maximum annual amount that can be charged per permit at $250 per small cell node. The rate may increase annually by one half of the consumer price index. The legislation also covers the maximum size and placement requirements of communication equipment.

TxDOT has executed airspace leases for parking facilities underneath highways and on vacant state right-of-way. In Austin, the city manages and collects parking revenue from parking lots beneath I-35. In 2004, $150,000 in revenue was generated from a parking lot under I-35 between E 6th and E 8th Streets (*23*). The exact details of this agreement were not readily available, but this may have been executed as a joint use agreement rather than a lease. As reported in a previous TxDOT research study, TxDOT has leased airspace for parking below highways, but these do not provide any financial payment or monetary benefit to TxDOT (*24*).

RIGHT-OF-WAY VALUATION, COST, AND REVENUE

Researchers reviewed literature related to valuing the right-of-way and corridors for applicability to valuing leases at TxDOT. Much of the existing research centers around valuing easements and corridors for longitudinal installations, such as pipelines, telecommunication lines, electricity transmission, and railroads. However, some of the proposed valuation methodologies may have applicability to different right-of-way uses at TxDOT. The sections below summarize research related to valuation methodologies and associated administrative costs.

Valuation Methodologies

Many sources agree that an assembled corridor has value greater than the sum of its parts (*25*). Assembled corridors can be used for both transportation (e.g., roads, rail, recreational trails) and non-transportation (e.g., transmission lines, pipelines, water, sewer, cable, etc.) purposes. Several

sources also hold that joint use of a corridor (e.g., rail plus utility) adds value because there are efficiency gains from sharing the right-of-way and little interference between uses after the initial installation (*25*).

Sales comparison is the benchmark for assessors determining property values, which bases the value of a property on recent sale and rental transactions of similar properties. The main difficulty in applying this method to corridor valuation is a lack of comparable sales (*26*, *27*). Complete corridors are not bought and sold very often. Corridor leases are signed/renewed with higher frequency, but the terms of these contracts are often not revealed to the public (28). When comparable sales are available, they are often expressed as a price per unit length. Corridor users, such as railroads and telecommunication companies, are typically indifferent to corridor area as long as the minimum width is sufficient for the proposed use. Sales comparison is also complicated by many transactions taking place at non-market prices. Railroads sometimes have existing business or informal arrangements with secondary users, for example offering free or discounted corridor access for a transmission line to a power plant that ships coal by rail (*25*). Sellers may not know the market value of their property (*28*). Buyers sometimes overpay to speed up a project timeline, for example telecom companies in the surge of the 1990s (*28*). Several common approaches to valuing corridors are the across the fence (ATF) method, cost avoidance analysis, alternate use, income approach, and volume. These are described in more detail below.

Across the Fence Valuation Method

The ATF method is the most commonly used in the literature. The basic approach is to first determine the value of the land adjacent to the corridor based on standard assessment practices, such as comparable sales, and then to apply an enhancement factor. The enhancement factor reflects the price premium for having an assembled corridor and the value of the corridor attributes including the importance of the end points, importance of other points along the corridor, density of development, demand for corridor use, availability of substitute corridors, length, width, straightness and curvature, grade, and the difficulty of acquiring substitute parcels (*26*). One article provides formulas for a corridor assemblage factor and a corridor enhancement factor (*29*):

$$Corridor\ assemblage\ factor = \frac{Cost\ of\ new corridor + legal\ and\ administrative\ costs + time}{ATF\ value\ of\ existing\ corridor}$$

$$Corridor\ enhancement\ factor = \frac{Actual\ sale\ of\ existing\ corridor}{ATF\ value\ of\ existing\ corridor}$$

Various enhancement factors have been reported by the literature: 2.0 in an arbitration case (*30*), 2–3 over agricultural land (*26*), 1.1–2.0 with urban areas at the higher end (*31*), and 1.0–6.0 (*32*). For the valuation of easements, a common methodology is the before-and-after rule where a parcel is valued at its highest and best use without and then with the easement in place (*29*). A usage factor can then be calculated by taking the loss to the parcel owner and dividing by the before value. Another article proposed to calculate the usage factor of an easement based on the space directly occupied or constrained by the required buffer zones (*33*). A case example is given of a 16-inch pipeline in a 12-ft. easement. The pipeline constrains the use of the corridor over the

diameter of the pipe plus a 24-inch risk area on either side, for a total of 64 inches. The impact in that area is estimated at 85 percent since future use of the risk area is possible but likely to be expensive and dangerous. The remaining 80 inches (40 inches on either side) are estimated at 42.5 percent impact since they are less impacted and may be useful as an overlap or buffer for other corridor uses. The weighted average across the 12-ft. easement is 61.4 percent. The proposed formula for valuing a corridor within a corridor is:

$$ATF \times enhancement\ factor \times \%\ of\ fee = Value$$

The occupancy factor has often been negotiated between the corridor owner and the easement holder (*32*). Once the ATF value and occupancy factor have been determined, annual rent can be calculated as follows:

$$(ATF\ value \times corridor\ enhancement\ factor \times usage\ or\ occupancy\ factor) \times rate\ of\ return = annual\ rent$$

The use of ATF for valuing corridors has been debated in the literature. An article criticized its use, noting that courts have endorsed nominal compensation for an easement in cases where the owner's use of the property has not been materially affected (*34*, *35*). One article points out that utility easements on rail right-of-way date to the early 1900s and were originally charged only a nominal rent (*32*). Railroads began to demand higher rents in the 1980s as rail revenues dropped and land values increased. Authors have criticized the ATF method for assuming that the highest and best use of right-of-way land is the same as adjacent land uses (*32*). This reference also noted that occupancy factors can be difficult to determine when there are multiple uses, some present only for short segments.

Some have argued that the lease cost for subsurface easements should not be tied to land value since the land is unencumbered except for short construction/maintenance windows (*36*). This reference mentions a court case criticizing ATF valuation and notes that in eminent domain, property owners are entitled to only nominal damages when they cannot show that a taking has caused any loss (*37*, *38*, *39*). In a non-corridor context, courts have held that the damages to a servient estate from the loss of an unneeded easement are minimal even if the value of removal to the dominant estate is high (*40*). In a rebuttal to criticism of the ATF method, authors cite other court cases supporting the ATF methodology (*27*, *41*, *42*). The authors argued that easements do impact land value by constraining future use of the land (e.g., a railroad's ability to add another track) (*27*). Courts have also found that loosely comparable sales are admissible in the absence of other market data (*43*).

Cost Avoidance Valuation Method

Cost avoidance analysis considers what it would cost a prospective user to assemble an alternative corridor. This method essentially calculates an upper bound on value—the maximum that a prospective user would be willing to pay (*26*, *44*). The cost of an alternate route has also been proposed as an upper bound for valuing subordinate interests (*36*). This method has been criticized as a valuation approach since private users would have a higher alternative cost than public users due to their lack of eminent domain power (*45*, *29*). A court decision from the United States' formation of Conrail held that "value to the owner not value to the taker…should determine the basic measure of just compensation," and similar judgments can be found in other

cases (*46*, *47*, *48*, *49*, *50*, *51*). An alternative approach to cost avoidance that avoids the eminent domain power issue is to consider the construction cost savings of co-locating in an existing right-of-way and exclude the avoided cost of acquiring an alternative corridor (*36*).

Alternate Use Valuation Method

Alternate use represents the value of the corridor if it were broken up and sold. In most cases, this method is a lower bound because the value of the property as an assembled corridor is higher (*26*). However, alternative value is relevant for abandoned corridors (rail and pipeline are mentioned in the literature) when there is no local demand for assembled corridors. The ratio of ATF value to sales price has been reported as 0.18–3.73 (*31*) and 0.4–0.6 (*52*) for the sale of abandoned rail right-of-way. Values lower than the adjacent land are common in agricultural areas, where former rail right-of-way is less attractive to farmers because of the need to remove ballast and apply heavy fertilizer use to bring the land into production (*52*). Values equivalent to adjacent land may occur in urban areas where little clearing/grading is required. Sales for more than ATF value are most common when the buyer has parcels on either side of the corridor that can be reconnected or is able to resolve an encroachment issue.

Income Valuation Method

The income approach infers the value of a property by performing a discounted cash flow analysis of rental rates. This method is not commonly used for transportation corridors because it is difficult to assign a value to a single segment in a larger network (*27*). Utility companies sometimes use the approach when they have an option of paying for a perpetual easement vs. leasing access (*28*).

Volumetric Valuation Method

A volumetric approach is relevant for valuing underground space, since a parcel can support multiple underground uses as long as they are vertically separated. Several papers have estimated the burden of pipelines and other underground uses to the landowner based on market transactions (*53*, *54*, *55*, *56*). Hedonic regression was used to estimate the contribution of different underground uses or potential uses to land prices (*57*). It has been suggested that values should vary by depth, since shallow depths are the easiest to access (and therefore the most used), while each occupation implies a negative externality on potential future occupations by making the remaining space more difficult to access (*58*). Rights to underground space are typically given away at zero price, with mineral rights as the main exception. The following formula has been proposed to value underground land (*58*):

$$u = \left[\frac{p}{1+b}\right] - c$$

Where

- u is the underground land value.
- p is the value of the underground building site.
- b is the developer's profit rate.
- c is the construction cost.

An example was given of an underground parking structure where the (known) price of an underground parking space can be used to calculate the underground land value. Underground land value is most accurately expressed in terms of volume.

Valuation of Easements

The International Right of Way Association (IRWA) has published articles related to appraising and valuing of easements. In one such article concerning appraising easements for pipelines and telecommunication facilities, the authors state that the value should be based on the loss of value in the burdened property, not the value of the easement to the user (*59*). The value of the easement acquisition should also be directly related to the market value of the property it burdens. The authors also summarize several alternative valuation methodologies that arose from utility right-of-way acquisitions, including the following (*59*):

- **Easement transaction comparable.** Easements are not economic units and are not traded individually on the open market. Easements are generally purchased to assemble a larger system and may not reflect the market value of the property. Additional data about the easement are needed when using them as comparable transactions for valuations. Information about land value, damages to the remainder, and business decisions (i.e., willingness to pay for meeting deadlines) need to be factored in to determine a unit price.
- **Linear rules of thumb.** Easement purchases are often made based on linear units of value such as per foot or per mile. However, this often does not consider differences between properties. Valuation by linear unit usually represents the value to the buyer and not the market value of the property.
- **Improper use of corridor theory.** Corridors exist when long distances are connected from point to point (e.g., by highways, pipelines, or electric transmission lines). The user of the corridor may own the fee title to the land in the right-of-way, which may be saleable or rentable. The methodology to appraise these corridors depends upon the demand of some entity to use the right-of-way. The lower limit of value is typically the across the fence unit value adjusted down for the property rights retained by the seller. The upper limit of value is typically the across the fence unit value including a multiplier.

Another IRWA publication evaluated the effects of easement types on property values. The results indicated that the more severe impact to the surface use and conveyance of future use had more impact on property value (*60*). Essentially, if the easement resulted in the property being unusable in the future, higher compensation is justified. This may be applicable to leases in the sense that higher lease rates may be justified when the facility installed after a lease is more permanent or restricts the surface uses of the right-of-way.

Valuation of Right-of-Way for Telecommunication Facilities

The American Public Works Association (APWA) published an article concerning the valuation of roadway right-of-way used for telecommunications facilities (*61*). The purpose of the article was to set out a method of determining the value of roadway space occupied by telecommunication facilities based on land value rather than a percent of revenues. APWA noted that the method presented is simple to apply and similar to the concept used by many municipalities in setting commercial lease rates for developments and sidewalk cafes. APWA

recommended that fair market value for longitudinal telecommunication leases be established using the following equation:

$$Value = [Land\ Value\ of\ ROW\ by\ Unit\ Area]\ x\ [Length\ of\ Area\ Occupied]\ x$$

$$[Width\ of\ Area\ Occupied]\ x\ [Rate\ of\ Return]\ x\ [Factor\ to\ Recognize\ Degree\ of\ Alienation\ of\ Area]\ x$$

$$[Use\ Factor]$$

Where

- *Value* is the estimated value of a longitudinal telecommunication lease.
- *Land Value of ROW by Unit Area* is the market value of private lands adjoining the right-of-way.
- *Length of Area Occupied* is the longitudinal length occupied by the facility.
- *Width of Area Occupied* is the width encumbered for other purposes, which is the width of the facility plus half the minimum clearance required on either side.
- *Rate of Return* is the annual rate of return expected on the market value of the property (APWA suggests 10 percent is common).
- *Factor to Recognize Degree of Alienation of Area* is a factor to account for the fact that other utilities likely cannot be placed under the facility being installed (APWA suggests 50 percent is common).
- *Use Factor* is not commonly used for telecommunication installations but could be applied for special conditions such as a sharing factor, essential service factor, exclusive rights factor, depth and disruption factor, and hazard factor.

The *Factor to Recognize the Degree of Alienation of Area* is based in part on a formula to allocate fee value for a fee simple parcel, called the Schmutz formula, and on growing interest in using subsurface areas for utilities. The Schmutz formula is intended for fee simple land value allocation based on elevation above and below ground. This formula is not appropriate for a transportation corridor, but the same concept may be used in a transportation corridor. A transportation corridor may be divided into four zones for value allocation purposes: street level, overpass level, underground utility level, and underground transportation level. APWA found that based on advice from real estate experts, the utility corridor is valued at approximately 25 percent of the land value. However, APWA notes that this allocation does not reflect the value to the user of the right-of-way and the ability of the user to pay for that use. Some easement models use subsurface rates as high as 50 percent of the land value.

The Federal Transit Administration (FTA) published a report in 2018 detailing the valuation of railroad right-of-way (*62*). Occasionally, FTA is required to estimate the value of a property. Since these properties are longitudinal right-of-way corridors with unique property ownership situations, there is no generally accepted method of valuing such property. The definition of fair market value is difficult to apply to a longitudinal right-of-way because these properties are not often sold in the open market. The report breaks the valuations down into unused railroad right-of-way and operational right-of-way. The section covering unused rail right-of-way is more applicable to TxDOT right-of-way. FTA identified four approaches to valuing unused railroad right-of-way:

- **Liquidation Value Approach.** This approach assumes the right-of-way is to be divided and disposed to whoever is willing to purchase the property for the highest price, which is usually the abutting owner. Drawbacks of this approach are that many abutting owners would not value an additional small strip of land.
- **Across the Fence Approach.** This approach assumes the value of the right-of-way is similar to the value of the adjacent land outside the corridor. This is a straightforward approach, and the reliability of values is supportable.
- **Across the Fence Plus Corridor Enhancement Factor Approach.** This approach uses the ATF approach and then multiplies that result by a factor to account for the assemblage value of the corridor. This assumes that all parcels have been assembled into a longitudinal corridor. The premium accounts for the added expenses and convenience compared to assembling a corridor from numerous private landowners.
- **Replacement Cost Approach.** This approach represents an estimate of what it would cost to assemble a new corridor, including costs for land, improvements, property damages due to partial acquisitions, relocation assistance, overhead, and potential obstacles to acquisition. This approach would usually result in the highest valuation of the right-of-way.

The FTA noted that the ATF approach and the ATF plus corridor enhancement factor approach appear to be the most reasonable for their valuation of unused railroad right-of-way. However, they noted that the most reasonable approach for FTA purposes is the ATF value without an enhancement factor because the enhancement factor would be speculative and subject to controversy.

Land Value Information in Texas

The Texas A&M Real Estate Center maintains a database of land values in Texas. These reports include rural land values in 7 regions and 33 smaller land areas of Texas. Figure 1 shows the 33 smaller land areas where rural land values are available (*63*). Data tables include the nominal and real price per acre as well as annual percent change and annual compound 5-year growth rates.

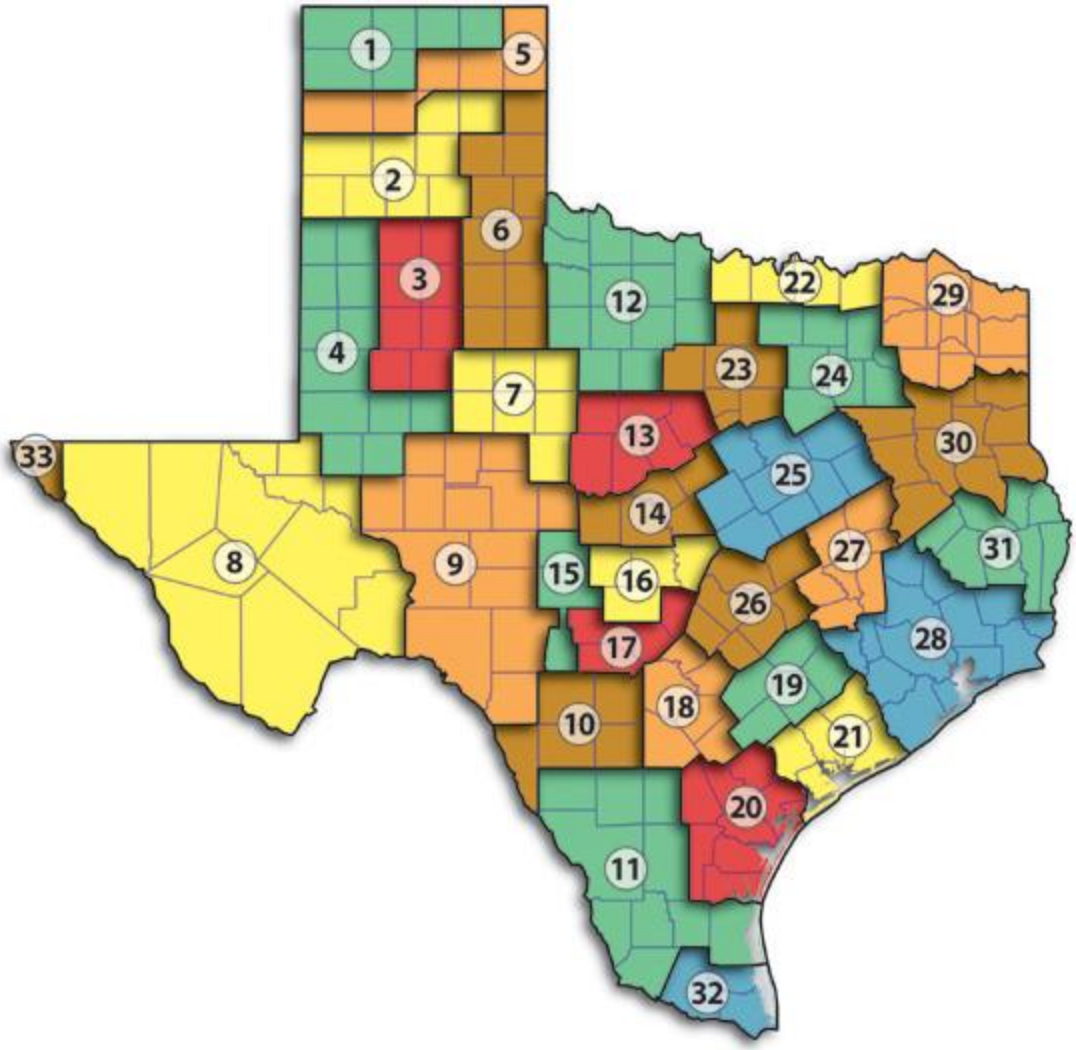

Figure 1. Texas A&M Real Estate Center Rural Land Market Areas (*63*).

The University of Texas, University Lands developed a rate and damage schedule for various uses of property (*64*). Most uses are related to oil and gas development and operation, but some uses are applicable to potential highway right-of-way uses. Pipeline easements are for a maximum of 10-year terms and have the following minimum fees, which are negotiable, depending on nominal pipeline size. Fees are provided by "rod," a unit that equals 16.5 feet. The fees include:

- $28 per rod for pipelines less than 6 inches.
- $48 per rod for pipelines 6 inches to less than 12 inches.
- $72 per rod for pipelines 12 inches to less than 24 inches.
- $120 per rod for pipelines 24 inches or greater.

Utility line easements are negotiable with the following minimum fees, as shown in Table 1 (*64*):

Table 1. University Lands Rates Schedule for Utility Line Easements (*64*).

Utility Description	Minimum Fee (Per Rod)
Less than 30,000 volts line capacity (maximum width 30 feet)	$20
30,000 volts line capacity but less than 69,000 volts line capacity (maximum width 30 feet)	$24
69,000 volts line capacity but less than 38,000 volts line capacity (maximum width 60 feet)	$80
138,000 volts line capacity but less than 300,000 volts line capacity (maximum width 80 feet)	$112
300,000 volts line capacity but less than 345,000 volts line capacity (maximum width 145 feet)	$166
345,000 volts line capacity and above volts line capacity (maximum width 180 feet)	$204
Fiber optic or telephone line (line serving fewer than 100 end users)	$2
Fiber optic or telephone line (line serving 100 or more end users)	$4

Additional land value information is available at the parcel level from county appraisal offices. When developing the land valuation methodology, valuations covering various regions of Texas will be required.

Administrative Costs

Previous research conducted for TxDOT in 2014 evaluated the time and costs associated with reviewing and processing utility and driveway permits (*65*). During this project, researchers collected data from TxDOT's Utility Installation Review system, interviewed officials from TxDOT and local agencies, collected data from a web-based utility and driveway permit activity logger, and gathered data from financial data systems at TxDOT. At the time, administrative costs of reviewing and processing permits averaged $312 to $318 per utility permit, $357 to $366 per non-residential driveway permit, and $180 per residential driveway permit. In total, the report an estimated administrative cost to TxDOT of approximately $7.7 million per year for utility and driveway permits.

Practices at Other Agencies

Point Based Installations—Macrocells

Many states generate revenue from macrocells, or cell towers, installed on state right-of-way. The California Department of Transportation (Caltrans) allows leasing for macrocell installations and has a standard lease rate based on whether the location is in a prime urban area, urban area, or rural area. Prime urban areas are census designated urbanized areas with populations greater than 50,000. Lease rates that started in July 2019 are $62,288 for prime urban areas, $40,032 for urban areas, and $25,572 for rural areas. The rates increase by 3.5 percent per year (*66*).

In Maryland, the rates for macro site cell towers are determined by the amount of traffic and the type of equipment being installed (*67*). Four types of equipment are described, including:

- Paging, community repeater, etc.
- Specialized mobile radio, narrowband personal communication service (PCS), etc.
- Enhanced specialized mobile radio, broadband PCS, cellular, etc.
- 6–9 inch satellite uplink, FM broadcast, LOS microwave, etc.

Annual rates range from $15,600 for small equipment in areas with low traffic volumes to $57,600 for large equipment in areas with higher traffic volumes. Rates escalate at 3 percent per year and terms are set for 5 to 10 years.

The Code of Virginia established an annual wireless support structure use fee for public right-of-way (*68*). The annual amounts are:

- $1,000 for any wireless support structure at or below 50 feet in height.
- $3,000 for any wireless support structure above 50 feet and at or below 120 feet in height.
- $5,000 for any wireless support structure above 120 feet in height.
- $1 per square foot for any other equipment, shelter, or associated facilities constructed on the ground.

Point Based Installations—Microcells

States also generate revenue by executing leases for microcell, or small cell nodes, sites. Caltrans allows leasing for minicell, microcell, and distribute antenna systems installations and has a standard lease rate based on whether the location is in a prime urban area, urban area, or rural area. Prime urban areas are census designated urbanized areas with populations greater than 50,000. The current lease rates that began in July 2019 are shown in Table 2. The rates increase by 3.5 percent per year (*66*).

Maryland developed a standard pricing schedule for small cell nodes that includes one-time and recurring annual charges (*69*). The one-time fees include a $500 application fee that covers up to five antenna attachments on an existing pole, where additional antenna attachments are $100. Application fees for new poles are $1,000 and include any number of antennas or attachments to that pole. Annual fees are $270 per antenna per year.

The Code of Virginia stipulates the requirements for access to state right-of-way for the installation and maintenance of small cell facilities on existing structures (*70*). The code states that Virginia DOT may not charge a fee for the use of the right-of-way, but they may charge a fee not to exceed $750 for processing an application for a districtwide permit or $150 for processing an application for a single use permit to install small cell node facilities.

Table 2. Caltrans Lease Rates for Minicell, Microcell, and Distributed Antenna Systems.

Installation Type	Location	Annual Lease Price Starting July 2019
Minicell	Prime Urban	$53,772
	Urban	$37,068
	Rural	$25,572
Microcell	Prime Urban	$44,796
	Urban	$29,652
	Rural	$21,840
Distributed Antenna Systems	Prime Urban	$11,868
	Urban	$1,176
	Rural	$612

Longitudinal Installations

Many states have lease programs for longitudinal installations in state right-of-way. The Alaska Department of Transportation and Public Facilities requires permits for utility installations that include an application and footage fee (*71*). The footage fee applies to major permits, which includes underground utilities in the roadway right-of-way, aerial or underground distribution and transmission lines, underground duct systems and utility tunnels, structures or appurtenances, crossings, and aerial service lines over 200 linear feet. The fees for major utility permits include a $600 fee plus $1 per linear foot for footage over 200 feet. The total linear footage fee is capped to not exceed $10,000.

The Iowa Administrative Code allows Iowa DOT to charge an annual occupancy fee for longitudinal installations in the freeway right-of-way (*72*). The fees charged by Iowa DOT include:

- For multi-duct systems, a flat fee of $14,500 per cable or $7,250 per mile of cable, whichever is greater.
- For all other installations, a flat fee of $12,000 per cable or $2,500 per mile of cable, whichever is greater.

The fee increases by 3 percent per year after the base year of 2004.

Maryland established lease rates for longitudinal fiber installations and longitudinal empty conduit installations (*73*). The equation below is used to calculate the rate for installing fiber in Maryland DOT right-of-way:

$$Fiber\ Rate = \left(Annual\ Rate\ x\ \frac{Number\ of\ Strands}{200}\right) x\ Linear\ Feet\ of\ Installation$$

The annual rate is equal to $3.75 for all areas except tunnels and bridges, which have an annual rate of $7.50. The following equation is used to calculate the rate for empty conduit placed in Maryland DOT right-of-way:

$$Empty\ Conduit\ Rate = Annual\ Rate\ x\ Number\ of\ Conduits\ x\ Linear\ Feet\ of\ Installation$$

The annual rate is equal to $3.50 for all areas except tunnels and bridges, which have an annual rate of $7.00.

In Michigan, longitudinal installations in limited access highway right-of-way are permissible for a fee (*74*). The installation must be underground and not increase maintenance costs for Michigan DOT. The fee is a one-time installation fee that does not exceed $1,000 per mile with a minimum fee of $5,000 per permit. If the one-time fee does not cover the reasonable and actual costs to issue the permit, the DOT may assess the remaining balance to the applicant.

North Dakota DOT developed a permit fee schedule that includes a fee of $200 per mile for longitudinal installations, which is included in the DOT's utility accommodation policy (*75*). The mileage is rounded up to the nearest whole mile. For example, if the installation is 2.1 miles, the fee will be based on 3 miles.

In Tennessee, the fees for fiber optic installations on freeways are stipulated in the *Rules and Regulations for Accommodating Utilities within Highway Rights-of-Way* (*76*). When applying for a use and occupancy agreement, a base fee of $200 is required plus $10 for each mile of proposed installation. These fees are for processing the application, reviewing plans, and other administrative costs. Rates for the access to install fiber facilities on state highway right-of-way include $4,000 per mile of trench and a per mile rate of $1,500 for urban areas, $1,000 for suburban areas, and $500 for rural areas. Fees for paying upfront are also provided, which are calculated from the above rates with inflation of 3 percent and a discount of 5 percent.

The Code of Virginia established a requirement for a public right-of-way use fee to cover the use of highway and street right-of-way by certificated providers of telecommunication services (*77*). Virginia DOT is responsible for calculating the fees on an annual basis, which cannot be less than $0.50 per access line per month. The determination of the annual rate is calculated using the following equation:

$$Annual\ Rate = \frac{(Miles\ of\ Public\ Highway\ x\ Highway\ Mileage\ Rate) + \left(Feet\ of\ New\ Installations\ x\ \frac{\$1}{foot}\right)}{\sum Number\ of\ Total\ Access\ Lines}$$

The highway mileage rate is $425 per mile. The monthly rate is determined by dividing the annual rate by 12. All telecommunications providers are required to submit annual data indicating the feet of new installations and the total number of access lines, which are auditable by localities where the installations are placed.

Wisconsin has the authority to charge fees or receive communication services in exchange for longitudinal occupation of controlled-access highway right-of-way. The Wisconsin DOT Highway Maintenance Manual contains the rates for leasing highway right-of-way (*78*). Rates

cover a 20-year period and depend on the length of the installation and average daily traffic (ADT). Installation lengths less than 0.5 miles are prorated but start at $5,000 when ADT is less than 100,000 and $6,000 when ADT is greater than 100,000. Installation lengths over 0.5 miles start are charged $10,000 per mile when ADT is less than 100,000 and $12,000 per mile when ADT is greater than 100,000. Attachments to bridges start at $25,000 on interstates and $10,000 on non-interstates. Certain bridges have different rates that are documented in the maintenance manual.

Reeves County, Texas, developed policies and regulations for the accommodation of utility facilities within their right-of-way that details the requirements for various types of utility facilities (*79*). Reeves County also instituted a saltwater pipeline leasing program in response to the amount of oil and gas activity in the region (*80*). These leases are executed for a period of up to six months and apply to temporary pipelines placed on the surface. Reeves County charges a fee of $14 per rod plus a $500 application fee. Reeves County charges for administrative fees (i.e., $500 application fee) and for the value of the right-of-way being encumbered by the temporary pipeline (i.e., $14 per rod). The policies and regulations state that the maximum size of temporary pipelines is limited to 4 inches.

Area-based Leases

Many DOTs enter into lease agreements for parking spaces and structures. Some of these are for flat lots below bridges or elevated roadways and some are for parking garages. Details of these leases are sparse; however, anecdotal evidence suggests that many agreements may not be leases but may be joint use agreements between DOTs and local governments. In these situations, the DOT allows the local government to construct, maintain, and operate parking facilities.

Florida DOT has the authority to lease land below roadways or bridges for parking to any governmental agency (*81*). The rent must be based on the market value of the area leased or a percentage of parking revenues, including fines or tickets. No information was provided as to how market value is assessed or if there is a standard percentage of revenues collected by Florida DOT.

Recently, California enacted a requirement for Caltrans to offer any airspace under a freeway in the city and county of San Francisco for lease to the city and county for an emergency shelter, feeding program, park, recreational, or open space (*82*). The lease amount for emergency shelter or feeding programs is $1 per month. For up to 10 parcels, the lease amount for park, recreational, or open space is required to be for 30 percent of the fair market lease value of the parcel. Leases require the payment of an administrative fee of no more than $500 per year, unless Caltrans determines a higher amount is necessary for the cost of administering the lease. Caltrans extensively uses airspace leases for parking and in 2012 had around 400 parking lot lease agreements that generated a reasonable amount of revenue (*24*).

The Travis County Healthcare District, which is a political subdivision of the State of Texas, entered into a lease agreement with the Seton Family of Hospitals to lease an eight-story parking garage for a term of six years and nine months with the option to extend the lease for up to seven terms of 120 months (up to 70 years). The aggregate rental rates are comprised of contingent rent and fixed rent. The contingent rent is calculated as 8.881245 percent of the net patient service

revenue. The fixed rent is a predetermined amount of $509,375 per year (prorated for the shortened first year). If renewal options are exercised, the aggregate rent will be negotiated for each renewal term (*83*).

In addition to parking leases, DOTs have been exploring leasing the right-of-way for solar power generation sites. Massachusetts DOT has executed leases for solar power generation sites in the right-of-way. The lease included a site lease fee of $17,500 per megawatt of installed capacity of solar generation. The lease site is seven acres, equaling a rate of $2,500 per acre (*84*). Massachusetts furthered expanded their partnerships for solar power generation and as of August 2018, had eight sites. The power produced at these sites has resulted in a savings to Massachusetts DOT of over $1 million in addition to the $75,000 in annual lease payments. The savings come from energy cost savings through a power purchase agreement with the developer who leased the land and built the solar sites (*85*). Other agencies have leased additional land at safety rest areas for the installation of solar power generation facilities (*86*).

OTHER USES OF RIGHT-OF-WAY

In addition to the uses of the right-of-way discussed above, both through permit and lease instruments, several emerging uses of the right-of-way have been identified. Some of these uses include renewable energy facilities, one type of which (i.e., solar) was discussed previously. Other less used types are discussed in this section.

Wind Power

Wind can be used to generate electricity using wind turbines. The size of wind turbines varies from small applications for individual uses to utility scale turbines connected to a utility grid. For use in the right-of-way, small scale wind turbines are the most applicable. Wind turbines can operate with naturally occurring wind and wind from passing vehicles. Some advances have been made in converting the wind produced by passing vehicles to electricity by using small-scale wind turbines placed on the roadside, inside jersey barriers, and on utility poles (*87*). The use of wind turbines by DOTs is significantly less widespread than solar installations. Massachusetts, Missouri, and Ohio have installed wind turbines for renewable energy production, mostly on vacant land at rest areas (*86*).

Texas has ample wind resources that could be used for generating electricity for wind. Private developers have realized this as Texas leads the nation in wind-powered electricity generation, providing one-fourth of the U.S. total in 2018 (*88*). The National Renewable Energy Laboratory (NREL) developed wind resource maps to assist with visualizing available resources (*89*). Figure 2 shows the U.S. wind resources at 80 meters. West Texas and the Texas Panhandle have the highest resource potential. These areas may present opportunities to install wind turbines on excess state property. In addition, these regions in Texas have some of the greatest wind resources in the United States.

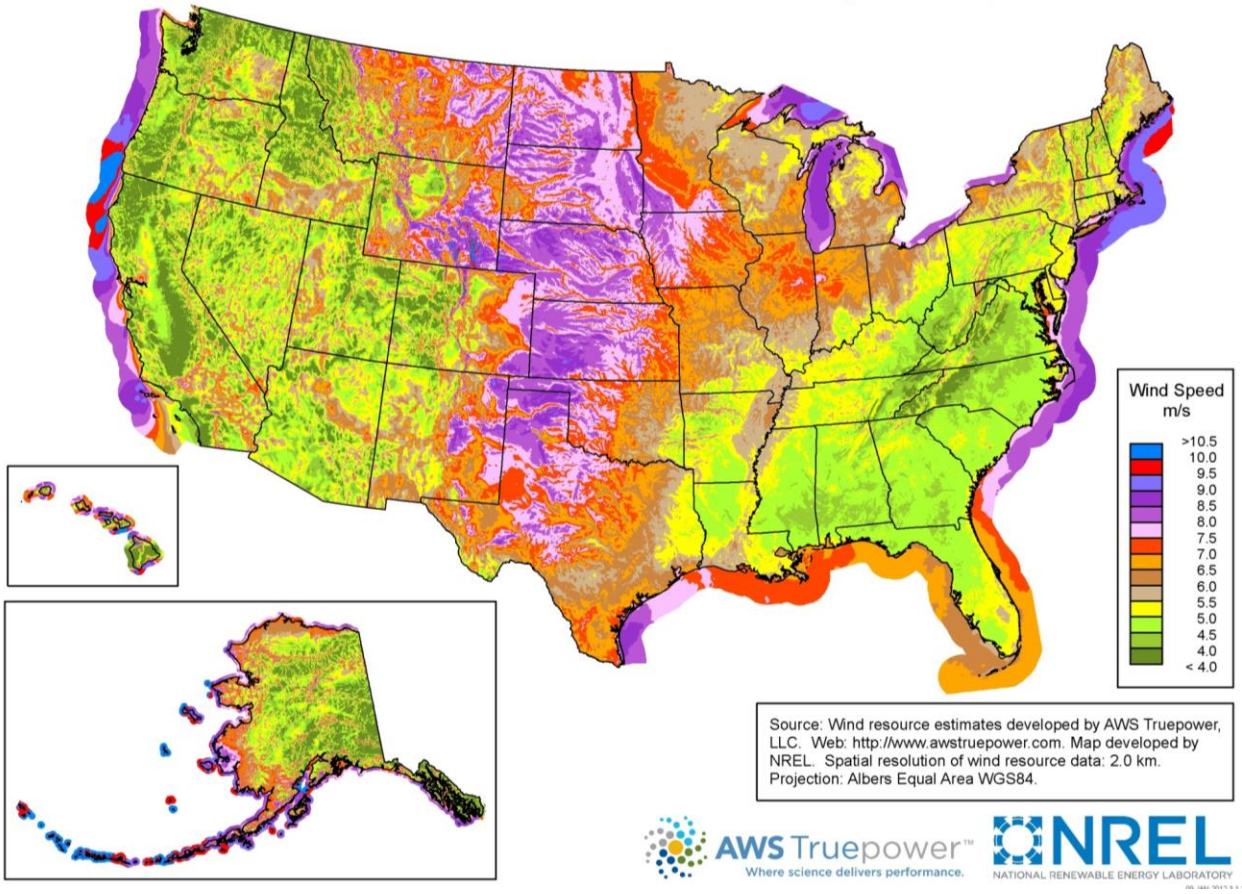

Figure 2. NREL United States Wind Resources at 80 Meters (*89*).

Bioenergy

Bioenergy is energy made from any organic material, including agricultural and forestry residues, municipal solid wastes, industrial wastes, and crops grown solely for energy purposes (*86*). Utah DOT began using the right-of-way to produce bioenergy to reduce maintenance costs in 2006. The experiment found that growing crops in Utah had several challenges including arid conditions and heavily compacted soils. However, other states may not face these challenges, and other states have experimented with growing bioenergy crops. North Carolina and Tennessee have successfully planted bioenergy crops within their rights-of-way. Figure 3 shows bioenergy crops planted in the right-of-way in North Carolina (*86*).

Figure 3. Bioenergy Crops in North Carolina (*86*).

Energy Harvesting

Several energy harvesting technologies are being developed that can convert ambient energy into electrical energy. Forms of ambient energy include stress, strain, mechanical, vibrations, and noise. Efforts include placing generators beneath the upper layer of asphalt to harvest the electrical charge created by the vibrations of moving vehicles, installing mats in roads where vehicles brake to capture the energy lost during braking, and using piezoelectric materials to harvest energy from the vibrations in bridges created by passing vehicles (*86*).

Alternative Fuel Facilities

With the increase and expected continued increase in electric vehicles and plug-in hybrid electric vehicles, there may be a need for additional charging infrastructure. Opportunities exist to use rest stops, visitor centers, recreational areas, and scenic overlooks for electric vehicle charging stations. The Florida Turnpike Enterprise is pilot testing six high-current rapid charging stations in south Florida (*86*).

CHAPTER 3. ASSESSMENT OF AVAILABLE TXDOT DATA

INTRODUCTION

This chapter documents the information gathered from TxDOT stakeholders responsible for administering the leasing process at the district and division level. TxDOT stakeholders of interest included real estate analysts, asset managers, permit coordinators, and maintenance personnel. The goal of these discussions was to gather information pertaining to lease processes, valuation procedures, violations of permits/leases, and right-of-way management practices. Holding the discussions with TxDOT after the discussions with external stakeholders revealed differences in practices and perceptions that may be useful in improving the leasing process at TxDOT. A discussion of differences between TxDOT and the external stakeholders is included at the end of this chapter.

IDENTIFICATION OF STAKEHOLDERS

To gain the most insight possible from districts, researchers identified individuals with extensive experience executing leases. The focus was to find districts with broad experience across all types of leases and with a high number of leases of a certain type. In addition, districts covering rural, suburban, and urban areas were selected to understand differences in practices. Several districts were mentioned by external stakeholders as having unique or good practices for leasing; these districts were included to better understand their processes and practices. The districts of interest for the discussions are shown in Table 3 and in Figure 4.

Table 3. Districts Selected for Discussions Based on Experience Executing Leases.

Rural	Suburban	Urban
Abilene	Corpus Christi	Austin
Amarillo	El Paso	Dallas
Tyler	Odessa	Houston
Yoakum	Pharr	San Antonio

Amarillo, Corpus Christi, Odessa, and Yoakum were selected for their extensive experience with surface saltwater pipeline leases. Abilene was selected to gather insights into their experiences with subsurface saltwater pipeline leases. Austin and San Antonio were selected because they have experience with surface saltwater pipeline, small cell node, and property leases. Dallas, Houston, El Paso, and Pharr were selected due to their experience with small cell and property leases. Finally, Tyler was selected for its experiences with surface saltwater pipeline and property leases. All selected districts have experience with property leases. However, these are mostly handled by the ROW Division. As such, the research team conducted additional discussions with division personnel.

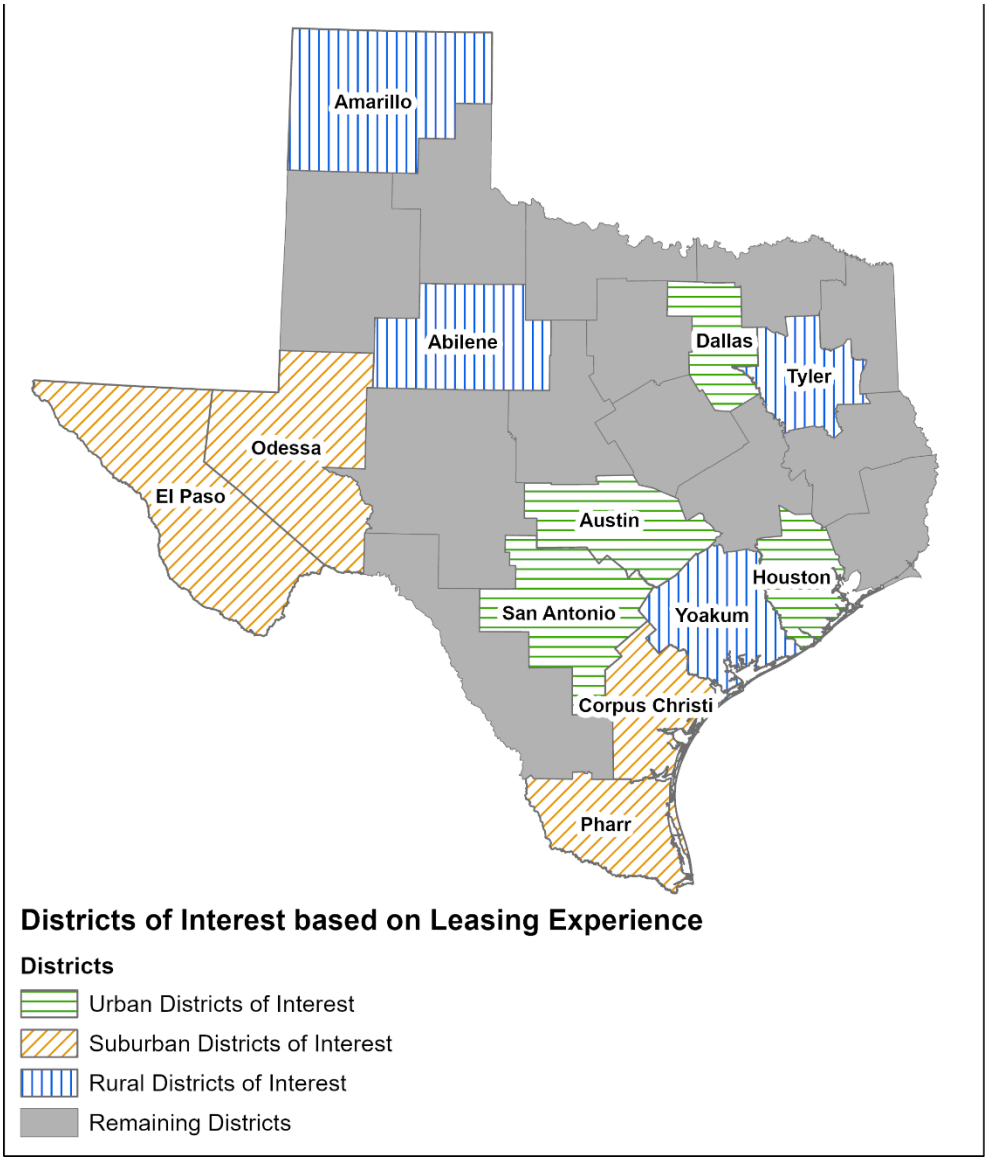

Figure 4. Districts of Interest Based on Leasing Experience.

TXDOT STAKEHOLDER DISCUSSIONS

Once the districts of interest were identified, an email invitation was sent to the leasing contact at each district. The email described the project, outlined the discussion topics, and requested to set up a time to discuss. In most cases a response was sent with availability and an interest in discussing practices. Follow up emails and telephone calls were used as necessary to attempt to hold as many discussions as possible.

Discussion Topics

The discussions with TxDOT focused on several topics including the lease process, valuation information, lease violations, and right-of-way maintenance. Focus was given to understanding differences in information from the external stakeholder discussions and the TxDOT discussions.

Specifically, conversations focused on the information provided to applicants during the lease process and any assistance that was requested or offered. The procedures for reviews of lease applications were discussed, understanding that for some leases, valuation information is already set. For leases where valuations vary, researchers discussed details about the process to determine valuations and lease rents.

One focus of the discussions was lease violations. This includes the types of leases and types of companies that commit the violations. Discussions included how violations are discovered by districts. When discussing violations, the resolution process and outcomes were ascertained from the districts. The final topic for the discussions was right-of-way maintenance and management as they pertain to leases, including maintenance inspections and frequency of issues encountered.

Discussion Findings

The sections below present the findings from the discussions with TxDOT stakeholders. The sections are created based on discussion topics and include lease process, valuation information, lease violations, right-of-way maintenance and management, and miscellaneous findings that did not fit under any of the other categories.

Some of the district stakeholders only handle certain types of leases at the district (e.g., surface saltwater pipelines) and refer the remaining leases to the ROW Division for execution. This appears to be a district-by-district practice as some districts indicated they handle other types of leases. For some leases, districts are involved in the application and review process, but final execution of the lease is done by the ROW Division. Districts indicated they are involved in approval and negotiations but only to the point where they are ready for execution, which is done by the ROW Division.

Lease Process

The general lease process is similar at all districts for surface and subsurface saltwater pipeline leases. In general, companies submit an application that includes the beginning and ending locations of the pipeline, the entry and exit points in the right-of-way, and a map showing the route. For subsurface saltwater pipelines, some districts allow companies to submit a .kmz file showing the proposed route and an application with the intended use. The district reviews the route to see if there are any obvious reasons why they would not lease the area. This allows the company to get a preliminary confirmation prior to committing significant resources to developing plans and a lease.

Once a saltwater pipeline lease application is submitted, it is reviewed for conflicts with construction and maintenance projects as well as conflicts with other existing leases. Many districts will send the application to the area and/or maintenance office for review. When conflicts with projects are identified, the district contacts the applicant and informs them of the conflict. Resolution strategies for surface saltwater pipelines are provided to applicants.

Resolution strategies include working with the contractor to determine if the pipeline can be installed, rerouting the pipeline, or denying the application. For subsurface pipelines, the resolution is often to wait on installation of the line, phase construction around road construction, or deny the request. Depending on the urgency of need for the company to install the subsurface

pipeline, they may not move forward with the lease and find another option, such as private property.

The specific details that districts request with surface saltwater pipeline leases vary. For example, some districts request that applicants submit details of any culverts they are using for crossings, evidence that they contacted landowners whose driveways will have crossings, and information about the materials they are using for pipelines.

Subsurface saltwater pipeline leases require a plan set that is signed and sealed by a professional engineer. The types of plans received vary widely at districts. Some districts indicated receiving hand drawn plans on engineering paper that were signed and sealed by a professional engineer. In general, the plans are required to show pipeline details, engineering calculations, installation location, offsets from right-of-way line, and other right-of-way occupants.

One district mentioned they execute many pipeline leases with business owners along TxDOT roadways. The businesses want city utilities and the city informs them it will take several years before they can install them. The businesses want temporary service for the time being, so they get a lease from TxDOT to install services. Usually these leases are for only a couple of feet of right-of-way. The district mentioned that the costs to appraise the property and engineer the pipeline cost more than the lease.

Small cell leases are being executed in eight districts currently, with several more starting to accept leases soon. The lease process varies by district. Some districts conduct field meetings to assist in determining lease locations that would be acceptable to the district. The district reviews lease applications to ensure compliance with utility accommodation rules and lease requirements. Districts will involve design and construction groups if the lease application is in an area where construction is occurring or will start. Sometimes the district denies the location but provides a nearby alternative. Some districts indicated a portion of their review is for construction practices (e.g., traffic control, notification, and returning the right-of-way to its original condition) and safety of the devices. Once local approval is obtained from the district, the ROW Division will execute a lease. Payments are handled by the ROW Division and valuations are predetermined based on the type of installation.

One district developed a review process flowchart to track small cell lease requests and ensure they are reviewed by the stipulated times. Small cell leases have three installation options including using an existing pole, installing a new pole, and attaching to an existing TxDOT structure. However, several districts indicated it is highly unlikely they would approve a lease to install on an existing TxDOT structure.

Some districts indicated they use digital signatures to help speed up the lease process. Some districts indicated that they are only using it during remote work operations due to Covid-19 but see the advantages of using it moving forward.

Valuation Information

Regarding above ground saltwater pipelines, several districts noted they are unsure of how the $2,500 fee for up to 7 miles of pipeline was established. It was mentioned that this is considered

fair market value for these types of leases but were unsure whether this should vary depending on where the lease is located and the length of the installation.

Subsurface pipeline lease rates are based on the size, length, and location of the pipeline. The districts with subsurface pipeline leases indicated that they are almost always executed in rural locations. There is no appraisal or gathering of land value information needed for these leases. Table 4 shows the subsurface pipeline lease schedule based on the size and location of the installation. The lease rates are negotiable, but the minimum values are presented in the table.

Table 4. TxDOT Subsurface Saltwater Pipeline Lease Rate Schedule.

Pipeline Size	Rural	Urban	Metropolitan
Less than 4"	Minimum $50/rod	Minimum $60/rod	Minimum $70/rod
4" to less than 6"	Minimum $55/rod	Minimum $65/rod	Minimum $80/rod
6" to less than 12"	Minimum $60/rod	Minimum $70/rod	Minimum $100/rod
12" to less than 24"	Minimum $70/rod	Minimum $80/rod	Minimum $120/rod

Several districts indicated that both surface and subsurface pipeline leases are significantly less expensive than leasing from private landowners adjacent to the right-of-way. In addition, companies only need to work with TxDOT rather than multiple landowners. There is some trade-off with subsurface pipelines because TxDOT has higher construction standards than private landowners.

Small cell lease fees are pre-established by the ROW Division. Districts indicated that the values are considered fair market value. However, according to a forth coming study conducted for TxDOT, most small cell leases incur more cost to process than what TxDOT recovers in lease fees.

The TxDOT ROW Division executes property leases and has developed several standard practices. When executing a lease, the ROW Division requires an appraisal, which serves as the base value for leasing. On occasion, the ROW Division leases property directly to an interested party that inquired about a lease. In addition, the ROW Division will offer property for lease through a bid if they believe multiple parties might have interest in the property. TxDOT has been approached by a party to lease a property and then bid that property to anyone interested.

The TxDOT ROW Division targets a 10 percent rate of return per year. This mimics guidance from the General Land Office regarding leasing property. Also, the division includes a 3 percent annual escalation factor for lease rents. The division accepts payment in full or as agreed to in the lease, including monthly, quarterly, or annually.

Lease Violations

Districts noted that when a company executes a lease, enforcing the requirements is easy because they are spelled out in the lease. Sometimes companies act slowly to correct the issues TxDOT raises; however, they must correct them eventually. Districts take safety concerns seriously and will act immediately to address potential safety issues when observed.

Violations for surface saltwater pipelines are somewhat common. Some districts indicated finding very few issues, while others indicated having issues with around half of their leases. Common issues noted included pipelines installed without a lease, pipelines installed improperly, and companies not placing signage with installations.

On occasion, districts find surface pipelines installed without a lease. These are usually discovered by maintenance inspectors. When discovered, staff will attempt to determine the company that operates the line to have it removed until they can execute a lease. Districts noted that sometimes it appears the company did not know they were required to have a lease.

A common issue with surface pipeline leases is that the lines will snake in the right-of-way when pumping is started. When maintenance inspectors find lines not installed against the right-of-way line, they notify the district of the location, and the district notifies the operator. On occasion, companies will use a new contractor to install lines and they will place them anywhere in the right-of-way. Districts notify the operator to have them moved to the right-of-way line.

Several districts mentioned that companies do not place signs showing who operates the pipeline and has responsibility for it. One district said this might be due to the competitive nature of the business. Operators do not want their competitors to know where they are working and the oil and gas companies with which they are working.

One district noted that surface pipeline operators will try to install lines through driveway culverts when landowners object to a driveway crossing. TxDOT informs them they need to work with the landowners on a resolution because they cannot install in driveway culverts.

Another lease violation mentioned by several districts is that companies will try to work with expired permits. Contractors keep expired permits in their vehicles to provide to TxDOT if they are asked about it in the field. This is not a common practice but has happened in multiple districts.

In one instance, a pipeline company submitted a lease application which was approved. TxDOT provided the lease documents for execution, but the applicant did not pay the lease dues, so TxDOT did not fully execute the lease. The pipeline company proceeded with installing the pipeline. TxDOT attorneys were involved to get payment from the company when it was discovered they were installing without a fully executed lease.

A common lease violation mentioned by several districts is that companies do not provide 48-hour notice of upcoming work. This presents problems when inspections are required for installations. One district mentioned that even a 48-hour notification is often not adequate because of the number of inspections they conduct. Another district mentioned that companies will notify them of work and then begin immediately, rather than 48 hours after notifying the district. Companies executing all types of right-of-way leases do not notify TxDOT prior to beginning work—this is not specific to one type of lease.

Right of Way Maintenance and Management

Districts require surface pipeline operators to mow a strip of the right-of-way where lines are going to be installed so that mowers can see the lines. This also helps maintenance supervisors

see the lines. Operators are responsible for maintaining vegetation throughout their lease. Districts mentioned that they require operators to clear culverts prior to installing crossings if there is debris in the bottom of the culvert.

One concern with subsurface pipeline leases is that the contractors are used to working on private easements where they clear and flatten the grade after construction. Districts noted that the contractors do not grade the right-of-way properly to TxDOT's specifications. Districts remind the contractors of this during construction and inspections. One district noted that many of the plans they receive do not show much detail about existing or final grade of the right-of-way.

Districts will inspect subsurface pipeline construction to ensure contractors are installing in the correct location and depth. On occasion, one district has required companies to remove pipelines because they were not deep enough. They noted these pipelines were installed before the lease was executed but after they submitted the application. These leases were for shorter lines providing service to businesses.

Districts noted concerns regarding small cell leases because there are several companies involved in the process. For small cell leases, one company applies for the lease, a second company installs the devices, a third company provides power to the devices, and a fourth company connects the power to the devices. These are all separate companies, so it is easy for information that is conveyed to the applicant company to not be passed along to the other companies. This concern applies to a lesser degree to saltwater pipeline leases, since usually one company submits the lease and hires a contractor to construct the facility.

Leases include a clause to repair damage to the right-of-way and return it to its original condition. This can be difficult when companies are in a hurry to install facilities. Many contractors damage sidewalks and roadside features when installing small cell nodes. Oftentimes it takes several phone calls and emails to resolve the issues.

Miscellaneous Findings

Several districts discussed practices or findings that do not easily fit in the categories above. These miscellaneous findings cover all types of leases, including saltwater pipelines, small cell nodes, and property leases. Some of the findings appear to be incorrect practices at districts, which were addressed during the discussions.

Some districts noted that electric companies get permits from TxDOT to install utility poles at the edge of the right-of-way and then lease space on the poles to telecommunication companies. If a pole is damaged, TxDOT contacts the electric company. However, the electric company can only move the lines they own, not the telecommunication lines. TxDOT is limited in their ability to work with the telecommunication companies because they may not know who owns the lines.

One district mentioned that when utility poles are relocated on a construction project, the telecommunication companies that have leases with the electric company will seek reimbursement from TxDOT. They claim that they have a property interest because they have a lease, even though the electric company does not have an easement and installed the poles

through a permit. The district does not pay the telecommunication companies for their relocations unless the electric company had an easement.

Several districts mentioned there are instances where private companies claim to be a public company because they have a certificate from the Public Utility Commission of Texas. Most districts indicated that they review the intended use of the installation and determine whether it can be installed by lease, permit, or not at all. However, some districts mentioned that there are no issues with private companies installing facilities by permit because it is easy to check whether they are registered with the Public Utility Commission of Texas. This indicated that in the district's opinion, having a certificate from the commission makes companies' installations public use. Some districts indicated that they denied a permit request from a company because they needed a lease for the proposed installation. The company's argument was that they have executed the same installation using a permit in other districts. In general, it appears to be telecommunication companies that are attempting to get permits rather than leases for private uses.

One district mentioned an upcoming issue where a pipeline company that executed a lease declared bankruptcy. The lease expired in 2021, and TxDOT was unable to collect payment from the company to remove the pipeline on their behalf. The district was unsure how this will be resolved at this time.

The issue of the quality of plans was raised by several districts regarding subsurface pipelines and telecommunication leases. The districts indicated that most plans only show the alignment of the proposed installation and are not surveyed using TxDOT monuments. In addition, TxDOT does not provide them with as-built plans or documents showing the existing right-of-way grade. The applicants do not include the final grade or existing grade in their plans, which creates problems with returning the right-of-way to its original condition after construction.

Several districts mentioned there would be benefits to developing a web-based mapping system for surface saltwater pipelines. The districts mentioned the system could handle applications, mapping of leases, and notifications for removal dates. One district mentioned TxDOT was in the process of developing a system but did not finalize it.

One issue mentioned regarding surface pipelines was that the TAC stipulates a maximum operating pressure of 60 psi, while most pipelines are operated in the 70 to 100 psi range.

INFORMATION FROM LEASES

Additional information from leases was provided during the discussions with TxDOT district personnel. This includes information that districts provide applicants to assist them with the process. Districts have developed guidance for surface pipelines and subsurface pipelines. One district indicated they are developing information packets for small cell nodes.

Several districts ask surface saltwater pipeline lease applicants for information needed to execute the lease up front, in addition to the lease application. Districts request a cover letter with the intention of the lease, including the location, roadway, and information about the use. Districts ask for a map of the route but prefer a .kmz file, if possible. If culvert crossings are involved, some districts will request pictures of the culverts to be used. Districts request a certificate of

insurance showing TxDOT as the insured party. Companies that execute a high number of leases will often send their certificate of insurance when they renew their policy so that TxDOT has it on file.

One district requests that applicants include certain statements in the cover letter for surface saltwater pipeline leases. This includes a statement about the type of water being transported, that no pumps will be placed in the right-of-way, that pipelines shall remain within three feet of the right-of-way line, whether there are other pipelines in the right-of-way, that the applicant will maintain the right-of-way, and that they will use markers identifying the company and a contact person.

One district developed a similar information packet for subsurface saltwater pipeline leases. The information provided to applicants includes a sample of design plans showing the proposed installation, depth of cover, and relation to other features in the right-of-way. In addition, certain portions of the lease are included in the information packet, including references to construction plans, as-built plans, construction standards, and insurance and liability statements.

COMPARISON OF TXDOT VERSUS EXTERNAL STAKEHOLDER RESPONSES

Similar discussions were held with external stakeholders as well as with TxDOT district and division personnel. A common theme that appeared was that both TxDOT and external stakeholders are in favor of modernizing the lease process and digitizing it as much as possible. This was most prevalent for surface saltwater pipeline leases. External stakeholders would like to reduce their workload with compiling lease information. TxDOT stakeholders would like a tracking and inventory component to review lease installations and be notified when they are due to be removed.

One major difference with surface saltwater pipeline leases is that external stakeholders would like to initiate leases for pumps and using driveway culverts, which TxDOT is unlikely to approve for safety reasons. External stakeholders noted that the leasing requirements vary in terms of the information each district requires. This was apparent from the discussions with TxDOT as well. While the overall requirements are the same, some districts require additional details or information.

Subsurface pipeline operators noted that they like that TxDOT does not require detailed design plans and surveys when submitting applications. This makes the costs to develop plans lower and speeds up the development process. However, TxDOT indicated that usually their plans are inadequate and would like additional details included.

A common theme that emerged regarding both surface and subsurface saltwater pipeline leases is the advantages of using TxDOT right-of-way compared to private property. External stakeholders and TxDOT acknowledge the significant cost savings in lease values for TxDOT right-of-way. In addition, there are benefits to companies only having to negotiate with TxDOT rather than multiple landowners.

There is a difference in perception about the adherence to lease procedures. External stakeholders claim to always follow the procedures and rules in their lease but acknowledged

that other companies violate the terms on occasion. TxDOT indicated that lease violations are common, especially for surface pipelines.

Companies executing property leases prefer to negotiate directly with TxDOT for leases. However, TxDOT would rather bid the property leases to generate interest from multiple parties. External stakeholders acknowledge that this is better for TxDOT in terms of the lease rents they will receive.

CHAPTER 4. SUMMARY OF INDUSTRY STAKEHOLDER FEEDBACK

INTRODUCTION

This chapter documents the information gathered from external stakeholders that lease TxDOT right-of-way for various purposes. External stakeholders in the oil and gas, pipeline, telecommunications, and property management industries were identified from existing leases. Requests for discussions were sent to a sample of stakeholders from each industry, focusing on those with the most experience leasing TxDOT right-of-way. Discussions with stakeholders were held to gather information about lease practices, valuation information, potential process improvements, and details about specific installations. This chapter details the process to identify stakeholders, a summary of findings from lease data reviewed, and the findings from discussions with stakeholders.

IDENTIFICATION OF STAKEHOLDERS

Researchers identified potential stakeholders to solicit feedback about leasing TxDOT right-of-way by reviewing TxDOT's lease information. Requests were placed with TxDOT's ROW Division to access lease information and lease holders. Lists of leases for saltwater pipelines, property, and small cell nodes were received. An analysis of these leases was conducted to better understand companies that commonly lease the right-of-way and the types of leases they execute. This analysis not only provided information about the types of leases, but also information about the costs, which will be useful in later phases of the research.

Saltwater Pipeline Leases

Saltwater pipeline leases are most commonly surface leases for 90 days with a 90-day renewal option. Surface saltwater pipeline leases are handled at district offices, where district staff review and execute leases. In addition, TxDOT executes subsurface saltwater pipeline leases, albeit much less frequently. Subsurface saltwater pipeline leases are handled by the ROW Division in conjunction with the district offices.

Saltwater pipeline leases use the ROW-SW-APP form to execute leases. This form contains much information pertinent to this project. Some of the applicable information includes applicant information such as company, name, and contact. Additional information about the pipeline facility includes beginning and ending locations, origin and destination source, and size of pipeline.

Summaries of surface saltwater pipeline leases were received from the Abilene, Amarillo, Austin, Corpus Christi, Laredo, Lufkin, San Antonio, Tyler, and Yoakum districts. The leases ranged from June 2016 to February 2020. From these leases, researchers identified attributes such as locations, sizes, and operators. Table 5 shows the 10 most common companies executing surface saltwater pipeline leases and the number of leases they executed in this timeframe.

Table 5. Ten Most Common Companies Executing Above Ground Saltwater Pipeline Leases.

Operator	Number of Leases
Breakwater Energy Services	171
Select Energy Services	120
EOG Resources	74
Burlington Resources Oil and Gas	43
Enersol Group (was Price Petro Services)	43
Qwik Pipe	30
Legacy Energy Services	29
Ginger's Oilfield Services	12
GeoSouthern Energy Partners	11
Encana Oil and Gas	7

Subsurface saltwater pipeline leases are handled by the ROW Division. Leases have been executed in the Abilene, Odessa, San Angelo, and Yoakum districts. Table 6 shows the companies that have executed leases for subsurface saltwater pipeline leases.

Table 6. Companies Executing Subsurface Saltwater Pipeline Leases.

Operator	Number of Leases
NGL Water Solutions Permian	4
Surge Operating	4
Permian Basin H2O	4
Quiroga Trucking	1
Diamondback E&P	1
Solaris Water Midstream	1
XRI Holdings	1
Platform Water Services	1
Breitburn Operating	1
Permian Resources	1

Property Leases

Property leases are handled by the TxDOT ROW Division. Leases are executed in two ways, through direct negotiations with a party interested in leasing a specific site or through an advertisement for bids. Direct negotiations generally occur when an interested party approaches TxDOT about using land for a specific purpose with little interest to other parties. TxDOT will request bids for leases in locations that are likely to draw interest from multiple parties.

Researchers analyzed the current and expired property leases that TxDOT executed with private parties. The uses of property vary widely and as such, few companies have multiple leases. The companies with multiple leases are using the property for parking. Table 7 shows the companies with multiple parking leases in TxDOT right-of-way.

Table 7. Companies Executing Multiple Leases for Parking in the Right-of-Way.

Company	Number of Leases
Rio Perla Properties	4
GrayStreet Parking	3
UTSA	2
ASNDSATX	2
Queen Shiva	2

Some private utility leases are included with right-of-way property leases. The companies leasing TxDOT right-of-way for private utilities are shown in Table 8.

Table 8. Companies Executing Leases for Private Utilities in the Right-of-Way.

Company	Number of Leases
Magnolia Beach RV Park	1
Agilon Energy II	1
Town and Country Food Stores	1
Quiroga Trucking	1
Faskin Oil and Ranch	1

A more detailed view of the various types of property leases and the attributes of those leases is provided below.

Small Cell Leases

TxDOT executes small cell leases in several districts as part of a pilot program. The districts with small cell leases include Amarillo, Austin, Dallas, El Paso, Fort Worth, Houston, Pharr, and San Antonio. TxDOT provided leases from the beginning of the small cell leasing program in the

Houston District in December 2019 through March 2020. There are nine companies that have executed leases for small cell nodes in TxDOT right-of-way in that timeframe, as shown in Table 9.

Table 9. Companies Executing Small Cell Leases in the Right-of-Way.

Company	Number of Leases
Verizon Wireless	189
New Cingular Wireless	144
ExteNet Systems	127
Crown Castle	84
AT&T	40
Mobilitie	38
Zayo Group	30
Windstream Communications	3
MCImetro Access Transmission Services	2

INFORMATION FROM LEASES

In addition to determining which companies are applying for leases, researchers analyzed information about the attributes of leases and the installed facilities from the permit documentation. The sections below describe the analysis of lease information for saltwater pipeline leases, property leases, and small cell leases.

Saltwater Pipeline Leases

Saltwater pipeline leases are either for temporary surface pipelines or subsurface pipelines. The base lease form for each type is the same, but there are significant differences in the lease terms, information provided, and engineering requirements for the two types of saltwater pipeline leases. This section is divided into two categories to discuss each type separately.

Temporary Surface Saltwater Pipelines

TxDOT uses a standard lease for saltwater pipelines as mentioned previously. However, the information reported by districts remains inconsistent. This may be a factor of different information provided by operators to each district or because each district reports different information to the ROW Division. Even with differences in details, all districts report the company executing the lease, their contact information, and the beginning and ending dates of the lease. Some districts provide the road where the lease is located, the coordinates of the beginning and ending locations in the right-of-way, and the origin and disposition source of the water.

To better understand where surface saltwater pipeline leases are executed, researchers analyzed which districts execute leases. Table 10 shows the number of leases executed within each district that provided lease information to the ROW Division for this analysis. The leases cover the time period from June 2016 to February 2020. Researchers expected that the Odessa District has a significant number of leases, but no information was provided. Unsurprisingly, the districts that have significant oil and gas developments in major producing zones have the highest number of leases. Specifically, the Corpus Christi and Yoakum districts account for 82 percent of the surface saltwater pipeline leases reviewed.

Table 10. Surface Temporary Pipeline Leases per District.

District	Number of Leases
Abilene	20
Amarillo	27
Austin	18
Corpus Christi	370
Corpus Christi and Yoakum	1
Laredo	12
Lufkin	5
San Antonio	20
Tyler	15
Yoakum	170
Total	**658**

The standard surface saltwater pipeline lease is for 90 days with an option to renew for an additional 90 days. Analyzing the beginning and ending dates of leases reveals that most leases are for 90 days. However, many leases have one or two days added or subtracted to the lease period. This is likely caused by districts adding three months from the lease beginning date regardless of the number of days in those months. Table 11 shows the distribution of lease lengths. The leases with lengths less than 89 days and greater than 92 may be the result of mistyped dates when entering lease information into the reports sent to the ROW Division. These leases make up a small proportion of the total leases (i.e., 7 percent).

Table 11. Distribution of Surface Saltwater Pipeline Lease Lengths.

Length of Lease (days)	Number of Leases
0	15
1–88	9
89	51
90	264
91	102
92	195
> 92	20

The size of surface saltwater pipelines depends on the amount of water required, rate at which it is needed, and the distance between the water source and disposal destination. Commonly, operators use 3, 4, 8, 10, and 12-inch pipelines. Table 12 shows the distribution of pipeline diameters. The oil and gas industry is constantly evolving, and one emerging aspect is companies drilling longer and deeper wells. As such, more water is required to drill and complete wells. Table 13 compares the diameter of surface saltwater pipelines over time. It appears the diameter of surface pipelines is increasing over time.

Table 12. Distribution of Surface Saltwater Pipeline Diameters.

Diameter of Surface Pipelines (inches)	Number of Leases
3	27
4	34
8	83
10	204
12	40

Table 13. Diameter of Surface Saltwater Pipelines over Time.

Diameter of Surface Pipelines (inches)	Number of Leases in 2016	Number of Leases in 2017	Number of Leases in 2018	Number of Leases in 2019	Number of Leases in 2020
3	6	6	1	13	1
4	0	12	4	15	3
8	14	33	23	12	0
10	21	43	50	79	9
12	0	4	3	21	12

Since the number of surface saltwater pipeline leases varies from year to year, comparing the sizes based on annual percentages of total leases executed in that year provides a clearer picture, as shown in Table 14. The darker the color, the higher that pipeline's diameter share of leases of all the leases approved in that year. The table shows that over the last few years, the use of 8-inch diameter pipelines has declined dramatically, use of 10-inch pipelines has decreased, and use of 12-inch pipeline has increased dramatically.

Table 14. Diameter of Surface Saltwater Pipelines as Percentage of Annual Leases over Time.

Diameter of Above Ground Pipelines (inches)	Number of Leases in 2016	Number of Leases in 2017	Number of Leases in 2018	Number of Leases in 2019	Number of Leases in 2020
3	15%	6%	1%	9%	4%
4	0%	12%	5%	11%	12%
8	34%	34%	28%	9%	0%
10	51%	44%	62%	56%	36%
12	0%	4%	4%	15%	48%
Total	100%	100%	100%	100%	100%

Some districts keep track of the date that surface saltwater pipelines were removed from the right-of-way to help with asset management and permit review. Of the 658 total leases reviewed, 29 percent included the date the pipeline was removed from the right-of-way.

Subsurface Saltwater Pipelines

Subsurface saltwater pipelines are managed by the ROW Division in conjunction with districts. Subsurface saltwater pipeline leases use the same form as surface saltwater pipelines. However, subsurface leases are for a 5-year period with an option to renew for an additional five years. The minimum rate for subsurface leases is based on the University of Texas Lands Rate and Damage Schedule (*64*). This rate specifies a minimum of $72 per rod (i.e., $4.36 per foot) for pipelines of 12 to 24 inches in diameter.

Similar to surface saltwater pipeline leases, subsurface saltwater pipelines leases are executed in areas with significant oil and gas developments. Table 15 shows the districts and counties with subsurface pipeline leases.

Table 15. Number of Subsurface Saltwater Pipelines in Counties and the Corresponding District.

District	County	Number of Leases
Abilene	Howard	10
	Not Reported	1
Odessa	Reeves	1
	Reeves and Culberson	2
	Reeves and Loving	2
	Winkler	1
San Angelo	Reagan	1
Yoakum	Matagorda	1
	Total	**19**

Subsurface saltwater pipelines leased in TxDOT right-of-way vary in size from 8 inches in diameter to 24 inches. Table 16 shows the breakdown of pipeline diameters.

Table 16. Diameter of Subsurface Saltwater Pipelines.

Diameter of Subsurface Pipelines (inches)	Number of Leases
8	2
10	1
12	9
16	3
24	3
Not Reported	1

The lengths of subsurface saltwater pipelines vary from 0.5 miles to 50 miles. Table 17 shows the number of subsurface pipelines for different groups of lengths.

Table 17. Length of Subsurface Saltwater Pipelines.

Length of Subsurface Pipelines (miles)	Number of Leases
< 1	1
1–3	6
3–5	4
5–10	3
10–20	3
> 20	1
Not Reported	1

Subsurface saltwater pipeline leases are negotiated between the operator and TxDOT using the University of Texas Lands Rate and Damage Schedule as a starting point. As a result, lease costs vary depending on the length of the agreement, length of the pipeline, size of the pipeline, and location. Despite this, the dollar amount of lease agreements can be compared when accounting for these differences. To accomplish this, researchers divide the total lease amount by the diameter of the pipeline, the length of the pipeline, and the length of the lease. This calculation is expressed below:

$$Unit\ Rate = \frac{Total\ Lease\ Amount\ (\$)}{Pipeline\ Diameter\ (feet)\ x\ Pipeline\ Length\ (feet)\ x\ Lease\ Term\ (years)}$$

The unit rate of subsurface saltwater pipeline leases varies from $0.42 to $1.09 measured in dollars per foot diameter, foot length, and years of term. Table 18 shows the average unit rate of subsurface leases by district. Table 19 shows the unit rate of subsurface leases by year. Table 20 shows the unit rate of subsurface leases by district and by year. These values are strictly based on the information in leases and do not account for attributes of the right-of-way, number of leases/utilities in the right-of-way, or physical location of the lease. However, these data provide important information for future work involving valuing the right-of-way, especially when combined with additional information about the physical location and other right-of-way occupants.

Table 18. Average Unit Rate of Subsurface Pipelines Leases per District.

District	Average Unit Rate of Leases
Abilene	$0.80
Odessa	$0.53
San Angelo	$1.09
Yoakum	Not enough data to calculate

Table 19. Average Unit Rate of Subsurface Pipelines Leases per Year.

Year	Average Unit Rate of Leases
2016	$0.81
2017	$0.78
2018	$0.64
2019	$0.42

Table 20. Average Unit Rate of Subsurface Pipelines Leases per District per Year.

District	Year	Average Unit Rate of Leases
Abilene	2016	$0.78
	2017	$0.85
Odessa	2017	$0.64
	2018	$0.64
	2019	$0.42
San Angelo	2016	$1.09
Yoakum	2018	Not enough data to calculate.

Property Leases

Property leases are executed for a variety of purposes by companies for commercial use and by individuals. Common usages range from parking, construction access, utilities, and advertising. Property leases are executed throughout Texas, but with greater frequency in urban areas. Table 21 shows the number of leases executed by district. Table 21 shows the number of leases in counties for districts with at least 10 leases.

Table 21. Number of Property Leases per District.

District	Number of Leases
San Antonio	32
El Paso	18
Dallas	16
Fort Worth	15
Corpus Christi	13
Houston	10
Beaumont	9
Austin	8
Bryan	7
Tyler	7
Odessa	5
San Angelo	4
Wichita Falls	4
Yoakum	4
Abilene	2
Atlanta	2
Pharr	2
Amarillo	1
Brownwood	1
Paris	1
Laredo	1
Lubbock	1
Lufkin	1

Table 22. Number of Leases per County in Districts with 10 or More Leases.

District	County	Number of Leases
San Antonio	Bexar	31
	Kendall	1
El Paso	El Paso	17
	Jeff Davis	1
Dallas	Dallas	14
	Ellis	1
	Denton	1
Fort Worth	Tarrant	8
	Johnson	3
	Wise	2
	Parker	1
	Somervell	1
Corpus Christi	Nueces	8
	Jim Wells	3
	Bee	2
Houston	Harris	8
	Fort Bend	1
	Not Reported	1

Leases are categorized by lease type and by lease usage. Lease types are higher level classifications, while usages are more detailed descriptions of the purpose of the lease. Table 23 shows the number of leases, total payments, and average payments for each lease type. Table 24 shows the number of leases, total payments, and average payments for various lease usages. The lease usage information provides a more detailed view of the actual lease purpose. Many similar lease types are grouped; however, many miscellaneous uses are categorized as other at the end of the table. The most common lease usage is for parking facilities.

Table 23. Number, Total Payments, and Average Payment for Each Lease Type.

Lease Type	Number of Leases	Total Payments	Average Payment
ROW Lease	135	$44,578,917	$332,678
Private Utility	13	$632,297	$52,691
General Land Office Shared Lease	7	$1,495,530	$213,647
Leaseback	3	$1,146,072	$382,024
State Agency	2	$6,228,402	$3,114,201
License	2	$6,420	$3,210
Limited Underground Drilling	2	$90,997	$45,498

Table 24. Number, Total Payments, and Average Payment for Lease Usages.

Lease Type	Number of Leases	Total Payments	Average Payment
Parking	91	$44,528,508	$489,324
Utility	15	$1,816,448	$121,097
Bridge	10	$1,831,942	$183,194
Marina and Bait Stand	7	$1,667,530	$238,219
Overhead Encroachment	6	$516,075	$86,013
Construction Related	5	$536,245	$107,249
Driveway	4	$67,979	$16,995
Conveyor Belt System	4	$595,485	$148,871
Commercial Use	3	$1,072,220	$357,407
Recreational/Park	2	$136,244	$68,122
Transit Facility	2	$225,000	$112,500
Residential Encroachment	1	$18,900	$18,900
Other Uses	15	$1,166,059	$77,737

Analyzing lease uses reveals some trends in leasing practices and rates. The total and average values presented above do not account for the different lease lengths, which vary from 2 years to 60 years. Using an average annual lease rate provides a more standardized comparison between leases. Table 25 shows the number of parking leases, total payments, and average payments of

those leases per year of the lease by district. Parking leases include land under bridges in urban areas, vacant parcels, and leases for business to have parking on TxDOT property adjacent to their business.

Table 25. Number, Total Payments, and Average Annual Payment for Parking Leases.

District	Number of Leases	Total Payments	Average Annual Payment
San Antonio	26	$27,609,162	$53,276
El Paso	16	$1,957,035	$15,245
Fort Worth	12	$1,070,426	$8,743
Dallas	11	$11,033,847	$50,154
Tyler	4	$150,821	$3,734
Bryan	4	$624,354	$7,804
Austin	3	$952,411	$53,200
Wichita Falls	3	$50,004	$4,467
Houston	3	$392,154	$32,409
San Angelo	2	$300,459	$7,511
Lufkin	1	$76,956	$3,848
Abilene	1	$36,000	$3,600
Beaumont	1	$21,175	$1,059
Paris	1	$65,344	$6,534
Yoakum	1	$78,461	$3,923
Lubbock	1	$109,899	$5,495
Corpus Christi*	1	$0	$0

* *The parking lease in Corpus Christi is a General Land Office lease for parking at a boat ramp.*

Table 26 shows the number of utility leases, total payments, and average payments of those leases per year of the lease by district. The utility leases are for different types of pipelines. The leases are executed by oil and gas companies, businesses (e.g., for sewer lines or water lines), and school districts.

Table 26. Number, Total Payments, and Average Annual Payment for Utility Leases.

District	Number of Leases	Total Payments	Average Annual Payment
Odessa	3	$1,226,918	$17,243
Yoakum	3	$3,572	$192
Tyler	3	$16,500	$550
Corpus Christi	2	$42,398	$1,060
Beaumont	2	$525,986	$21,574
Houston*	2	$1,075	$54

** One of the utility leases in Houston does not have adequate information to calculate the average annual payment.*

Small Cell Leases

TxDOT implemented their small cell leasing program as a pilot in the Houston District and have since expanded it to multiple districts. Table 27 shows the number of small cell leases, total fees, and average fee per district.

Table 27. Number, Total Payments, and Average Annual Payment for Small Cell Leases.

District	Number of Leases	Total Payments	Average Payment
Houston	318	$456,092	$1,457
Dallas	115	$122,964	$1,098
Fort Worth	93	$11,852	$1,317
Pharr	69	$79,488	$1,169
San Antonio	28	$19,344	$691
Austin	27	$34,860	$1,291
El Paso	4	$7,344	$1,836
Amarillo	3	$3,672	$1,836

Note: Some leases did not include payment information, many of which were in the Fort Worth District.

Small cell nodes may be installed on existing poles or new poles may be placed in the right-of-way and nodes installed on the new pole. A higher fee is associated with installing a new pole. Table 28 shows the number of leases, number of poles, and percentage of leases where a pole was installed per district. The leases that include installation of a pole range from 4 percent in the Fort Worth District to 100 percent in the El Paso and Amarillo districts.

Table 28. Number of Leases, Number of Leases that Include a Pole, and Percentage of Leasing Installing a Pole for Small Cell Leases.

District	Number of Leases	Number of Leases with Pole	Percentage of Leases with Pole
Houston	318	223	70%
Dallas	115	53	46%
Fort Worth	93	4	4%
Pharr	69	29	42%
San Antonio	28	4	14%
Austin	27	18	67%
El Paso	4	4	100%
Amarillo	3	3	100%

Small cell leases are placed on a variety of TxDOT roadway types. However, there are variations from district to district. Table 29 shows a cross tabulation of the percentage of installations on each roadway type in each district.

Table 29. Comparison of Percentage of Installations on Roadway Types in Districts.

	Amarillo	Austin	Dallas	El Paso	Fort Worth	Houston	Pharr	San Antonio	Total
BU	—	—	—	—	4%	—	1%	—	1%
FM	100%	4%	44%	100%	38%	23%	35%	21%	30%
IH	—	22%	8%	—	14%	36%	19%	29%	25%
RM	—	26%	—	—	—	—	—	—	1%
SH	—	7%	27%	—	27%	11%	45%	4%	19%
SL	—	19%	10%	—	—	1%	—	36%	4%
SS	—	—	3%	—	14%	—	—	7%	3%
TL	—	—	3%	—	—	9%	—	—	5%
UA	—	—	—	—	—	8%	—	—	4%
US	—	22%	6%	—	3%	12%	—	4%	8%

Note: "—" indicates there were no small cell installations on a roadway type in a district.

INDUSTRY STAKEHOLDER DISCUSSIONS

Using the information identified from the leases, researchers identified companies with whom to discuss TxDOT's leasing practices. Emphasis was given to companies that have more experience with the lease process. A sample of companies from each category was selected for the discussions and an invitation was sent to each. The invitation outlined the details of the project, general discussion topics, and a request for a response if interested in participating. A number of companies that have executed leases for surface pipelines, subsurface pipelines, and property leases responded with interest in participating in a discussion.

Discussion Topics

The discussions focused on the lease process, right-of-way valuation information, and right-of-way management. Specifically, inefficiencies or issues in the leasing process were discussed. Topics included limitations that would result in companies seeking a lease on private property in lieu of TxDOT right-of-way or that would result in companies violating terms of their lease. Lease process discussions included the type of lease, the type of installation, and the decision-making process for using TxDOT right-of-way versus private property. Discussions about TxDOT's assistance during the lease process were initiated to understand differences at districts and to find discrepancies in what information TxDOT needs to execute leases compared to the information companies typically provide.

Right-of-way valuation practices were discussed to the extent possible since these practices may be related to private companies' business operations. General discussions included information companies would like to convey to TxDOT about leasing valuations. This included additional types of leases that TxDOT does not currently allow but that companies would like to execute.

Right-of-way management practices were discussed, including access to install and maintain facilities. TxDOT maintenance requirements were discussed as applicable to certain types of leases. Traffic control was discussed with companies that have a construction component to their leases. Discussions about damage to installed facilities were held with companies that install facilities in the right-of-way.

Discussion Findings

Lease Process

Companies reported positive experiences working with TxDOT to execute leases. One consistent theme that emerged is differing practices at districts. Surface pipeline operators noted that each district requests slightly different details, but that the overall information is the same. On occasion, surface pipeline operators have waited too long to hear back from TxDOT about a lease, which resulted in the operator negotiating with landowners to install the surface pipelines on private property. Subsurface operators noted that they are generally more rushed than TxDOT when trying to execute leases. They acknowledged that their desire for faster reviews might not necessarily translate to TxDOT.

Subsurface pipeline operators noted that the information TxDOT expects is consistent with what they need for their designs. Essentially, TxDOT expects them to show the pipeline in relation to

the right-of-way line and other right-of-way occupants. More detailed engineering requirements are needed as attachments to the lease. Some subsurface pipeline operators noted that they cannot find information on what TxDOT requires or information about who to contact, especially when they first start working with TxDOT.

A consistent theme that emerged about the lease process was to digitize the forms as much as possible. Some districts allow digital signatures, while some require hard copies. Specifically for surface pipeline operators, using digital signatures speeds up the lease process, which would be helpful for instances where oil and gas companies do not give the district much lead time about where a well will be drilled. Subsurface pipeline operators noted that their lease requests could be handled through the Utility Inventory Review system. This system could include details and checklists for the information companies need to provide to TxDOT with the lease application.

Surface pipeline operators proposed the idea of TxDOT developing master lease agreements with companies to consolidate the individual lease agreements. The master lease agreement could stipulate the terms and conditions, while the individual agreements could provide specific details on the location and physical installation.

Both surface and subsurface pipeline operators noted few if any issues with the amount of space to install facilities in TxDOT right-of-way. Surface pipeline operators noted they typically drive a route prior to requesting a lease to identify whether other surface pipelines are already on the route and to look for any TxDOT construction or maintenance work. If construction or maintenance activities are occurring nearby, surface pipeline operators will talk with contractors conducting the work to see if they could install their surface pipelines. Subsurface pipeline operators will conduct a One Call to identify other right-of-way occupants. If there is inadequate space, operators will find an alternative route either along another road or on private property.

Subsurface pipeline operators noted that they will submit a .kmz file to TxDOT districts showing a proposed saltwater pipeline alignment to get feedback on whether there is adequate space in the right-of-way. They seek guidance about whether a lease is workable before committing significant resources to designing the pipeline and negotiating a lease.

Surface pipeline operators provided some forward-looking thoughts about their industry, including the potential need for larger diameter pipelines. Operators noted that the size of the pipelines have been increasing as drilling and completing wells requires more water. There may be other limitations on surface pipelines getting much larger because of the weight of larger pipelines and costs for larger pumps. Operators noted that more than two pipelines may be needed as companies change practices to completing nearby wells in tandem. Oil and gas companies are completing four wells on the same pad by continuously switching from one well to the next for each stage of the fracking process.

Companies leasing TxDOT right-of-way for business purposes noted that the direct negotiation process is preferable to bidding. They simply provide TxDOT with the property information, appraisal, and their proposed usage. The process takes longer but is easier and more straightforward for them. Companies noted that this likely benefits them, whereas bids benefit TxDOT in terms of lease rates.

Companies noted that the bidding process could result in them leasing property that they may not otherwise be interested in leasing. A hypothetical example was provided where TxDOT is leasing a parking area adjacent to a development. The developer may feel obliged to submit a bid to avoid another company controlling the parking adjacent to their development.

Companies noted that having the leasing process centralized at the ROW Division is much easier than working with each district. The information required is standardized, and the point of contact changes much less frequently. This is also beneficial when requesting to install improvements, such as attaching lights to bridge columns.

Lease Valuations

Surface pipeline operators provided insights into valuation practices and proposed ideas for future TxDOT leases. Operators noted that having one payment for each 7-mile segment is easier and more streamlined than paying based on smaller intervals. Some counties charge operators in 0.1-mile increments, which creates more work for the operators to figure out the exact length of their installations. Operators noted that one strategy could be to charge in 1-mile increments.

Surface pipeline operators noted that they commonly install two pipelines with the leases but only use one. The second pipeline is installed so that if the first is damaged, water can be switched over quickly to the second pipeline to avoid delay in providing water to drilling and fracking crews.

In general, surface and subsurface pipeline operators noted huge advantages to working with TxDOT compared to private landowners. This is because they only need to negotiate or work with TxDOT rather than multiple property owners. Also, the companies know what TxDOT expects from them, and the lease terms are consistent from previous leases. A major advantage noted by surface pipeline operators is that the TxDOT right-of-way is open and clear compared to private property. Both surface pipelines and subsurface pipeline operators indirectly acknowledged that leasing from TxDOT is cheaper than leasing from private property owners. Subsurface pipeline operators noted that if there are a significant number of utilities in the right-of-way it may be easier to work with private property owners.

Surface pipeline operators proposed additional leases that they would be interested in negotiating with TxDOT, including installing pumps in the right-of-way, crossing in culverts under driveways parallel to the roadway, and drilling water wells on TxDOT property. Operators noted that because TxDOT does not allow pumps, they occasionally will use a longer route on a county road that allows pumps and pipelines. This avoids situations where they must negotiate with private landowners adjacent to TxDOT's right-of-way.

Subsurface pipeline operators noted that on occasion they may want to negotiate a lease for a pipeline larger than 24 inches. They suggested this could be negotiated on a case-by-case basis. In addition, subsurface pipeline operators noted that leases for longer time periods would be desirable if TxDOT were willing to negotiate. Operators also noted that their permits have provisions for rent to change with fair market value, but they are unsure how TxDOT determines fair market value. They noted they are not likely to agree to a lease with a private landowner that included fair market value increases, but they have a greater level of trust with TxDOT.

One subsurface pipeline operator noted that they began leasing from TxDOT because they were having difficulties negotiating with private landowners. The landowners were under the impression that TxDOT could not lease the right-of-way and there was no viable alternative to using their property, so they were trying to negotiate higher prices.

Many of the companies executing leases with TxDOT, both for subsurface saltwater pipelines and land-based usages noted a desire for longer leases. Subsurface pipeline operators commented that they were not exactly sure what would happen when their lease expired and were uncertain whether TxDOT would require them to remove the pipelines. Companies leasing TxDOT right-of-way for business purposes noted that longer term leases would be more desirable and create more certainty for them. They also noted that TxDOT can opt out of leases with 24 months' notice and would like that period to be extended.

Right of Way Maintenance and Management

Surface pipeline operators noted that while most companies abide by TxDOT's leasing policies, there are many small operators that do not. These companies will install surface pipelines (and occasionally pumps) for short periods of time and remove them before TxDOT finds them or finds out who is operating the pipeline. In addition, operators noted that some companies may install a line prior to executing a lease with TxDOT if the review process is taking longer than usual.

Surface pipeline operators noted they occasionally will install pipelines through a culvert under a driveway parallel to the roadway. This is rarely done and typically only when a business has a very wide driveway that would be difficult to install crossings on or when a landowner does not allow a driveway crossing. Operators noted instances where landowners do not accept any sum of money for a driveway crossing and threaten legal action if they install one.

Surface pipeline operators noted they are responsible for right-of-way maintenance during their lease. This typically involves mowing and keeping pipelines visible. Operators noted they have never been forced to mow by TxDOT but do it for safety and operational reasons. They will mow to reduce the likelihood of encountering snakes while installing lines and to ensure their lines are visible to avoid damage. Surface pipeline operators did not experience damage to pipelines by tractors in TxDOT right-of-way, but it happens occasionally on private property.

Subsurface pipeline operators noted several issues during construction of their pipelines. These issues included encountering utilities unexpectedly while installing their pipeline. Traffic control was noted as a potential issue, especially for less experienced companies. Subsurface pipeline operators noted that the potential to have to relocate their pipelines creates a lot of unknowns and potential future expenses.

One subsurface pipeline operator noted that TxDOT is executing a lease for another pipeline two feet away from their pipeline. They are worried about the close proximity causing issues during construction and maintenance activities. They noted that one of their pipelines was damaged by another company while boring under a road.

Companies leasing TxDOT property noted that the burden of maintenance is placed on them as part of the lease. This is generally not problematic since they keep the properties maintained for

business reasons. They noted they have never been approached by TxDOT for maintenance purposes.

CHAPTER 5. VALUATION METHODOLOGY AND FRAMEWORK

INTRODUCTION

This chapter describes the data collection and analysis as well as the valuation methodology and frameworks that the research team developed to assess property values and lease rates on TxDOT property. The data analysis included county tax assessor data, TxDOT appraisal data, and Texas A&M Real Estate Center data. The description of the county tax assessor data analysis includes the types and formats received and the processing steps to obtain corridor-specific land values appropriate for across-the-fence valuation.

Researchers developed two valuation methodologies. The first, an across-the-fence approach, ties the value of TxDOT right-of-way to the value of adjacent properties, with some adjustment factors. The second, a categorical approach, scales leases based on local property valuations and the type of lease. Scaling factors are created by comparing the value of land in counties and districts to the statewide average land value. The scaling factors can then be used to adjust lease rates based on local land values. Finally, the research team developed two frameworks for presenting the calculated ROW and lease values: an interactive map and a spreadsheet tool.

DATA COLLECTION

The research team collected valuation datasets from a variety of sources. The goal was to gather land valuation data throughout the state. Data were collected from tax assessors, universities, and public agencies in Texas. Data were formatted into a common template and uploaded to a database. The common fields included in the database include:

- Property ID.
- Acreage.
- Address.
- Latitude and Longitude.
- Land Value.
- Improvement Value.
- Market Value.

Not every data source had the same structure and fields. The list above are the essential elements needed for developing the framework and determining lease valuations.

One of the most readily accessible statewide valuation sources is county tax appraisal datasets. One tradeoff of the accessibility is the accuracy of the valuation assessment. County tax appraisals are applied annually for each property in a county. Because of the frequency of appraisals and the large number of properties, counties do not appraise every property as if a transaction were taking place. As a result, county tax appraisals are not directly comparable to market transaction data and appraisals. However, when comparing tax appraisals across the state, they can provide a baseline and relative difference between values throughout Texas.

The Texas A&M Real Estate Center produces rural land values for 33 regions throughout Texas, as shown in Figure 1 (*63*). The available data only contain rural land values, which can help with

valuing leases in rural areas but not urban areas. The data include nominal and real land values per acre, number of sales, and median acreage per sale from 1971 to 2019. The data are comprised of a sample of private land sales reported to the Real Estate Center. The statistics provide a general trend of size and market price levels rather than the valuation of any particular property. These data were useful for grouping counties to fill-in counties with missing data and scale land valuations from regions.

The research team gathered lease data from TxDOT at the district and division level. TxDOT regularly executes leases for saltwater pipelines, property, and small cell nodes. Summaries of these leases were shared with the research team. Property leases are negotiated with interested parties or selected through a bidding process. In some instances, third party market appraisals are conducted to determine the value of a given property prior to leasing. Saltwater pipeline and small cell node leases are executed with preestablished rates.

In addition, TxDOT acquires property for construction of roadways, drainage easements, and for building facilities. TxDOT appraises each property prior to acquisition. The appraisals are stored internally and are not made publicly available. These appraisals could represent another source of data for property valuation and acquisition data. TxDOT provided a sample of appraisals performed for property acquisitions and associated comparable properties for projects in the Bryan, Corpus Christi, Dallas, Fort Worth, Lufkin, Paris, Tyler, and Waco districts.

The Texas Comptroller of Public Accounts maintains an online eminent domain database that includes data from public and private entities that use eminent domain to acquire property in Texas (*90*). At a minimum, entities are required to submit information annually to the database. However, the data entities are required to submit are limited and mostly focuses on if they used their eminent domain authority in a given year and the type of projects for which eminent domain authority is granted.

ANALYSIS

The data analysis portion varied for each type of data and desired framework for which the data were used. At a minimum, the common data elements described above are desired to include in a valuation database. The property tax data, TxDOT property leases, and small cell leases are easily formatted to extract the desired data fields because they include address information or latitudes and longitudes of the location. Detailed locations are difficult to extract for longitudinal leases because the lease spans for several miles along a roadway or multiple roadways. The rural land data from the Texas A&M Real Estate Center are only available for groups of counties.

After extracting data elements from each type of lease or property valuation, the common fields were added to a database. Due to the varied nature of each type of valuation dataset, the database allows querying specific property valuations in some locations or extracting average valuations throughout the state. The average valuations can be extracted for urban or rural areas in specific towns, counties, or regions of Texas.

County Tax Assessor Data

Tax assessments in Texas are administered at the county level. In the spring of 2020, the research team searched all 254 Texas counties for property valuation data. This section describes the

public availability of valuation data as of tax year 2019, data formats, and the processing steps undertaken in order to develop and present an across-the-fence valuation methodology for TxDOT right-of-way.

Availability of Valuation Data

The research team first searched for the website of every county appraisal district. Nearly every county appraisal district has a website, although most appear to be maintained by third party data management vendors and use one of three standard templates. Many counties release parcel-level valuations on their website, although the availability and format of this data varies significantly from county to county. Broadly speaking, counties can be grouped into three categories: those that release parcel-level valuations in geospatial format, those that provide parcel-level valuations in a tabular format, and those that do not release this data. Figure 5 shows the category for each county.

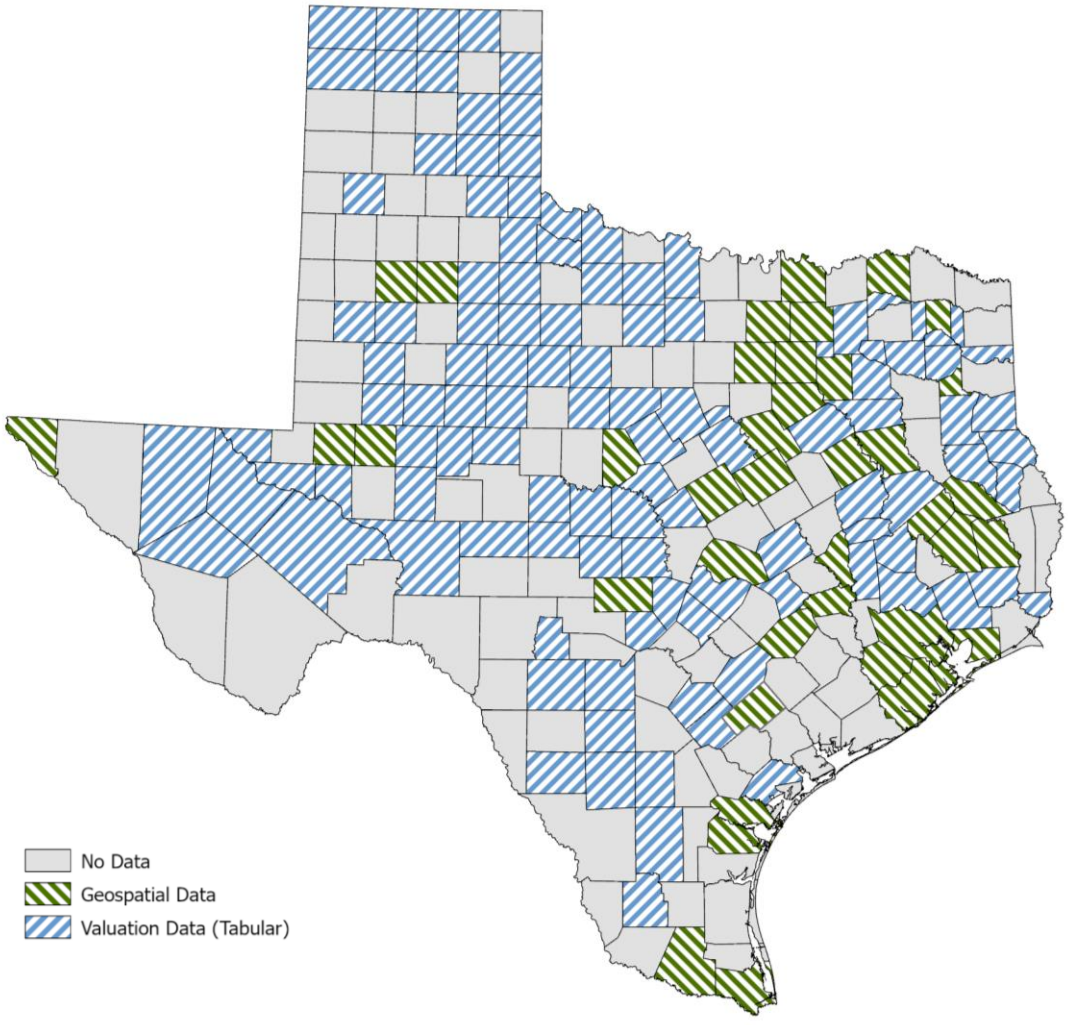

Figure 5. Data Availability by County.

In total, parcel valuations were available in some format for 154 counties. For the 100 counties shaded in red, researchers found datasets listed for purchase by the third-party vendors. The majority of the 100 counties in red have a query tool or interactive map to retrieve values for individual parcels, but the lack of a comprehensive dataset would make it prohibitively time-consuming to apply the across-the-fence methodology in a systematic way.

Data Formats

Counties that released parcel-level data did so in a variety of different formats, including:

- Shapefiles.
- Comma separated values (CSV).
- Mainframe exports (fixed width).
- PDF.

Shapefiles and CSV files did not require any pre-processing and were already in a suitable format to apply the across-the-fence methodology.

Some counties, such as Travis, released what appears to be an export of a mainframe database in fixed width format. The research team wrote a processing script in R to read the fixed width files, extract relevant fields, and save the resulting table in CSV. In the case of Travis County, the export package included good documentation about the different tables, fields, widths, and descriptions. All fields of interest were located in the property table, including the property ID, property address, legal acreage, and value fields (i.e., land, improvement, market).

Other counties, such as Callahan, released data only in PDF. The research team attempted to write a processing script for PDF files but was largely unsuccessful. In the case of Callahan County, the PDF was a tax roll export with a block of text for each parcel. While it is possible to extract the text from the PDF, the text is not structured in a machine-readable tabular or key-value format. As a result, it would be difficult to extract a single countywide table from the PDF without significant manual effort.

A key data processing challenge was the lack of standardization in data structure and field names, which made it difficult to script or automate the processing steps. The main fields of interest for this study were the property ID, address, acreage, and the land, improvement, and market values. Property addresses were sometimes provided as a single address block and sometimes split into multiple fields, with the most specific format including separate fields for street number, prefix, name, suffix, city, state, and zip code. Some county datasets had multiple fields for acreage. Researchers spot-checked values in these cases and generally found the field named “legal_acreage” (or some variation thereof) to be the most accurate. Most counties included fields for land, improvement, and market values. In some cases, these categories were subdivided into homestead and non-homestead fields or into prior year value and change. Some counties also provided agricultural, timber, and mineral value fields. Researchers spot-checked sums for many counties with specific field structures and missing or unclear documentation.

Processing Steps to Apply Across-the-Fence Valuation

The data analysis included extracting land valuation data adjacent to TxDOT's on-system highways. The research team developed two procedures, one for counties with geospatial data and a second for counties with tabular data.

Counties with Geospatial Data

This subsection describes the processing steps for counties with geospatial data (shapefile or equivalent). These steps were performed in QGIS, an open-source geographic information system (GIS) software; function names are described as they appear in QGIS version 3.22. The general procedure is as follows:

1. Select Roadway-Highway Inventory Network (RHiNo) on-system roads for the county.
2. Generate a buffer around the RHiNo on-system roads.
3. Select parcels that intersect RHiNo buffers.
4. Split the selected parcels into rural and urban subsets.
5. Join parcel layers to RHiNo road layers, summarizing value and acreage fields.
6. Aggregate joined road layers by highway number, summarizing value and acreage.
7. Calculate average rural and urban land values per acre for each highway.

These steps are explained in detail below. All counties use the following two base layers:

- **TxDOT_Rhino_OnSys.shp**. A statewide shapefile of on-system roadways, downloaded from TxDOT's Open Data Portal (*95*).
- **tl_2019_us_uac10_TXonly.shp.** A shapefile of urbanized area and urban cluster polygons, as defined by the U.S. Census Bureau (*96*). Urbanized areas have a population of 50,000 or greater, while urban clusters have a population between 2,500 and 50,000.

Step 1: Roads in a particular county were selected from TxDOT_Rhino_OnSys.shp using the Select Features by Value tool and setting field CO equal to the code for the county. Selected features were then saved as a new layer.

Step 2: The Buffer tool was used to generate a buffer around on-system roads. For most on-system roads, a distance of 100 ft was sufficient to select all parcels adjacent to the right-of-way. However, a larger distance was required for some roads with wide rights-of-way (e.g., freeways with frontage roads). Researchers selected RHiNo segments with ROW_MIN > = 300 ft and used a distance of 200 ft for these segments. In many rural counties, this selection was empty and the wide buffer step could be omitted.

Step 3: The Select by Location tool was used to select features from the parcel layer that intersected the RHiNo buffer layer. Selected features were saved as a new layer. This step was performed twice for counties that had normal (100 ft) and wide (200 ft) buffer layers.

Step 4: The Select by Location tool was used to divide selected parcels into rural and urban subsets. Parcels that intersect an urbanized area or urban cluster polygon from tl_2019_us_uac10_TXonly.shp were considered urban, and the selection was inverted to obtain the set of rural parcels. Rural and urban parcel selections were saved as new layers. This step was performed twice for counties that had normal and wide buffer layers.

Step 5: The Join Attributes by Location (summary) tool was used to join parcels to roads. The input layer was the county RHiNo layer, the join layer was the rural or urban parcel selection, the geometric predicate was "intersects," the fields to summarize were the three value fields (i.e., land, improvement, market) and acreage, and the summary to calculate was "sum." This step was performed four times for counties with normal and wide buffer layers (i.e., normal urban, normal rural, wide urban, wide rural).

Step 6: The Aggregate tool was used to summarize the results. The joined road layers were grouped by the HWY field, which includes both the highway system and number (e.g., "US0287"). Sums were calculated for the three value fields (i.e., land, improvement, market) and acreage. This step was performed up to four times, depending on the number of buffer layers.

Step 7: Average rural and urban land values per acre by highway were calculated by dividing the sum of the land value field by the sum of acreage. In many cases, a highway is only present in rural (or urban) portions of the county, in which case the other value is blank.

Counties with Tabular Data

Several methods were attempted for calculating land values in counties with tabular data. Zone Improvement Plane (ZIP) codes are included with most property addresses in the data. In urban areas, ZIP code boundaries are relatively compact and are sometimes used as a level of aggregation in research studies. However, spot checks by the research team showed that ZIP code boundaries do not line up with city boundaries or urbanized area/urban cluster boundaries, limiting their usefulness for ROW valuation.

City names are also included with most property addresses, but this method of aggregation has similar problems to ZIP codes. The U.S. Postal Service commonly assigns rural addresses to a nearby city based on delivery routes, making it difficult to determine whether a property is rural or urban.

The street name is present as a separate field in many data formats. Researchers wrote an R script to summarize land values and acreage by street name. This appears to be a viable approach, but comes with some limitations:

- On-system roads and rural/urban divisions are identifiable but require some manual post-processing.
- The same highway may appear multiple times due to variations in address coding.
- The research team is not aware of any efficient method for obtaining alternate names for on-system roads used in urban areas.

This approach was tested on Archer County, summarizing the property table based on the "Prop_Street" field. Parcels with an address on SH 25 were easily identified, but appeared in several different variations, including but not limited to "HWY 25," "S HWY 25 E," "SH 25," and "STATE HWY 25." In Archer City, SH 25 is known as Main Street, and "MAIN ST" and "MAIN ST" were found in the summary table. Archer City is not an urban cluster, so Main Street would be considered a rural segment of SH 25. The alternate names of on-system roads, such as Main Street for SH 25 and Center Street for SH 79 in Archer City, are not included in RHiNo but can be identified manually from other mapping sources. The accuracy of this

approach may also suffer in larger towns where an on-system road includes portions of several named streets or in counties where the same street names occur in multiple towns.

Geocoding addresses is another possible approach. This was not tested on any counties, but is known to the research team from past projects. Geocoding is likely to be the most accurate of the approaches described in this section and should correctly identify parcels adjacent to on-system roads as well as their position with respect to rural/urban boundaries. Potential downsides to this method are the speed of computation, which can be slow using the Esri ArcGIS application programming interface, and the omission of parcels with an address that is not machine readable (e.g., “MAIN & HWY 82, HOLLIDAY, TX” from Archer County).

Calculated Land Values

Figure 6 shows the relative per acre value of land assessed in each county with publicly available data. The counties containing northern Houston and Austin have the highest average per acre land value. The counties containing Dallas and Fort Worth have lower assessed land values and are similar to the per acre values in Brazos, Fort Bend, Franklin, Llano, Nueces, and Polk counties. Counties containing mid-sized cities generally have higher per acre land values than rural counties. No data were available for El Paso and Bexar counties. Harris County, which contains Houston, only contains a small portion of the properties.

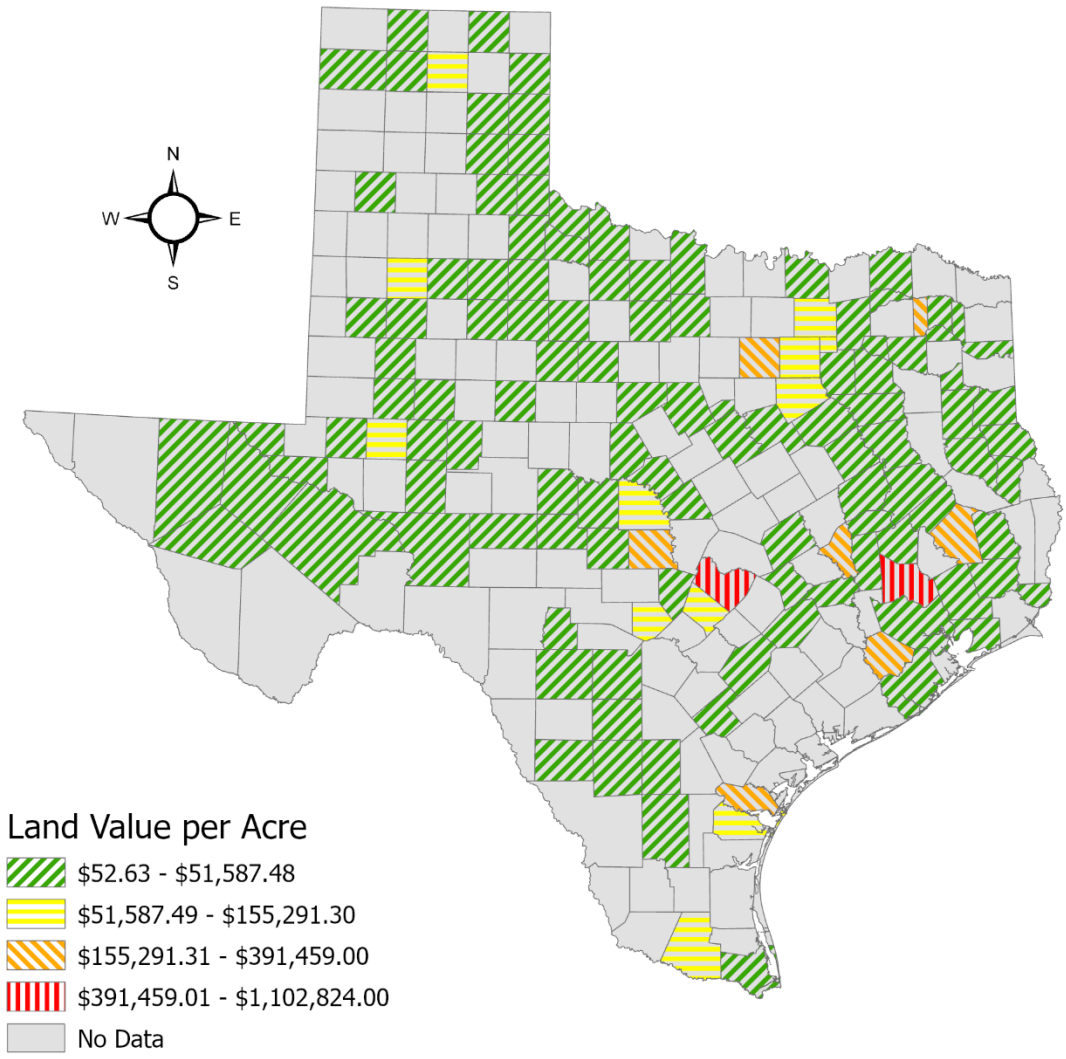

Figure 6. Land Value per Acre from County Tax Assessors.

The per acre land values were averaged for each TxDOT district to compare land values at the district level. Figure 7 shows the average land value per acre for each TxDOT district. Again, the districts with larger urban areas have the highest average land values, excluding the El Paso and San Antonio districts. While there are differences in how counties assess property values, the relative differences in value per acre is useful for valuing leases throughout TxDOT. This is especially useful when land values are combined at the district level, which removes some of the variability in how individual counties value property.

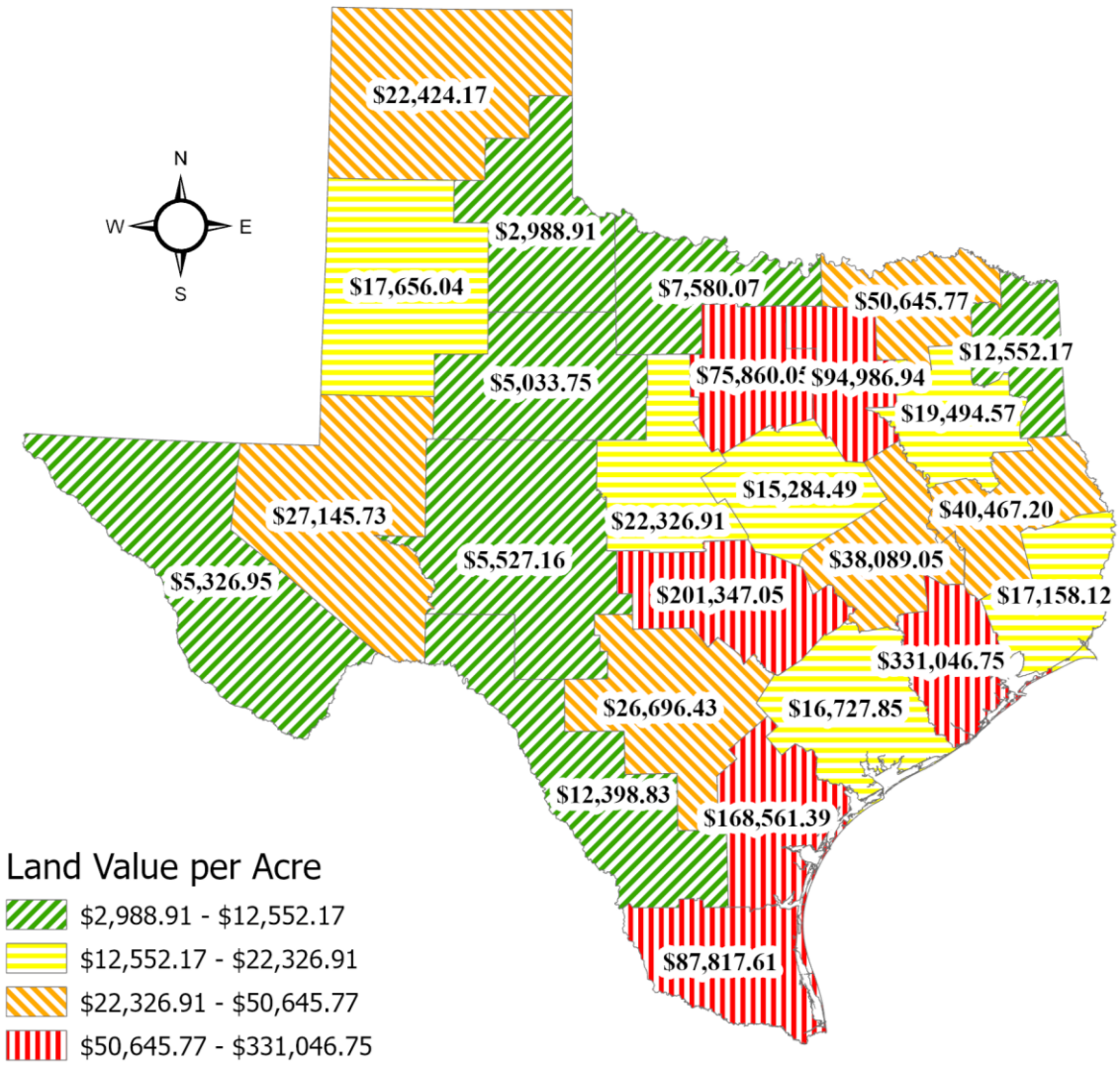

Figure 7. Land Value per Acre for Each TxDOT District.

TxDOT Lease and Property Appraisal Data

The TxDOT lease information was formatted and summarized for several types of leases throughout Texas. The data are summarized to provide general trends for leasing valuations in different regions of Texas. Property leases are executed when people or businesses approach TxDOT about leasing a property or through a competitive bidding process. Many properties are appraised prior to leasing to ensure TxDOT receives fair market value for the lease. Each property lease TxDOT executed was reviewed to understand the value of leases. The research team used satellite imagery to determine the size of the property and whether it was in an urban or rural setting. The value of each property lease was then converted to an average annual per acre payment. This normalized leases that had different lengths and different land areas.

Figure 8 and Figure 9 show the value of leases on a per acre basis in rural and urban areas, respectively. Several districts have executed property leases in rural areas. The valuation of these leases were higher in districts with large urban areas even though the leases themselves were in rural areas. This is likely because some of the rural area leases are in transition areas near urban areas and for business purposes (e.g., a bridge used by a quarry or batch plant to transport material over a TxDOT roadway). The leases in more rural districts are often for parking in front of a business or for private landowners to tie water and sewer lines into a municipal utility line.

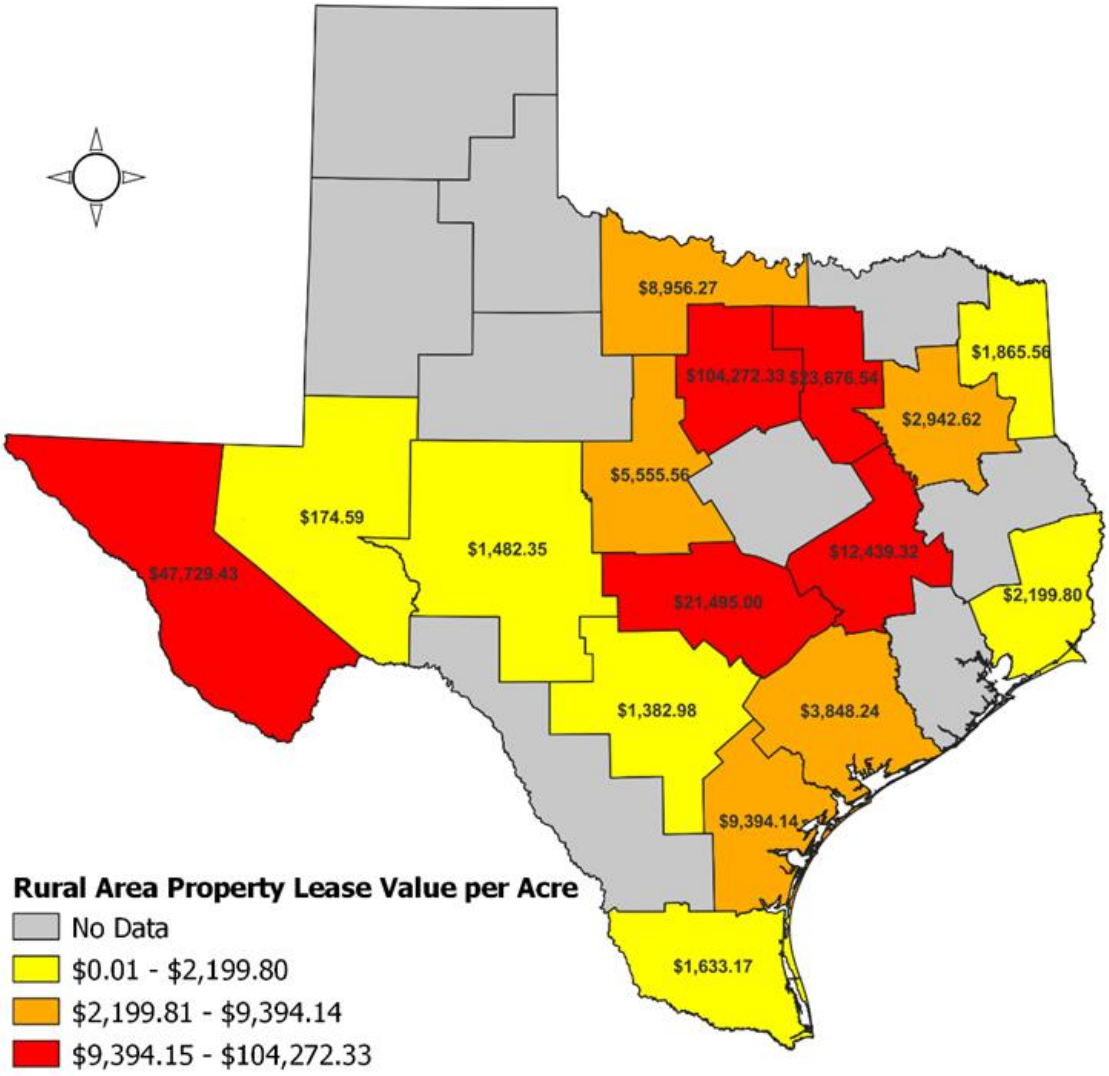

Figure 8. Value of Leases on a per Acre Basis for Rural Areas.

The valuation of leases in urban areas are more varied. Districts with small urban areas have some of the higher per acre lease values in urban areas. Many of the leases in urban areas are for parking under TxDOT bridges. Some of these leases are executed by commercial entities that will then charge customers for parking. In general, the leases in urban areas have higher per acre valuations than in rural areas.

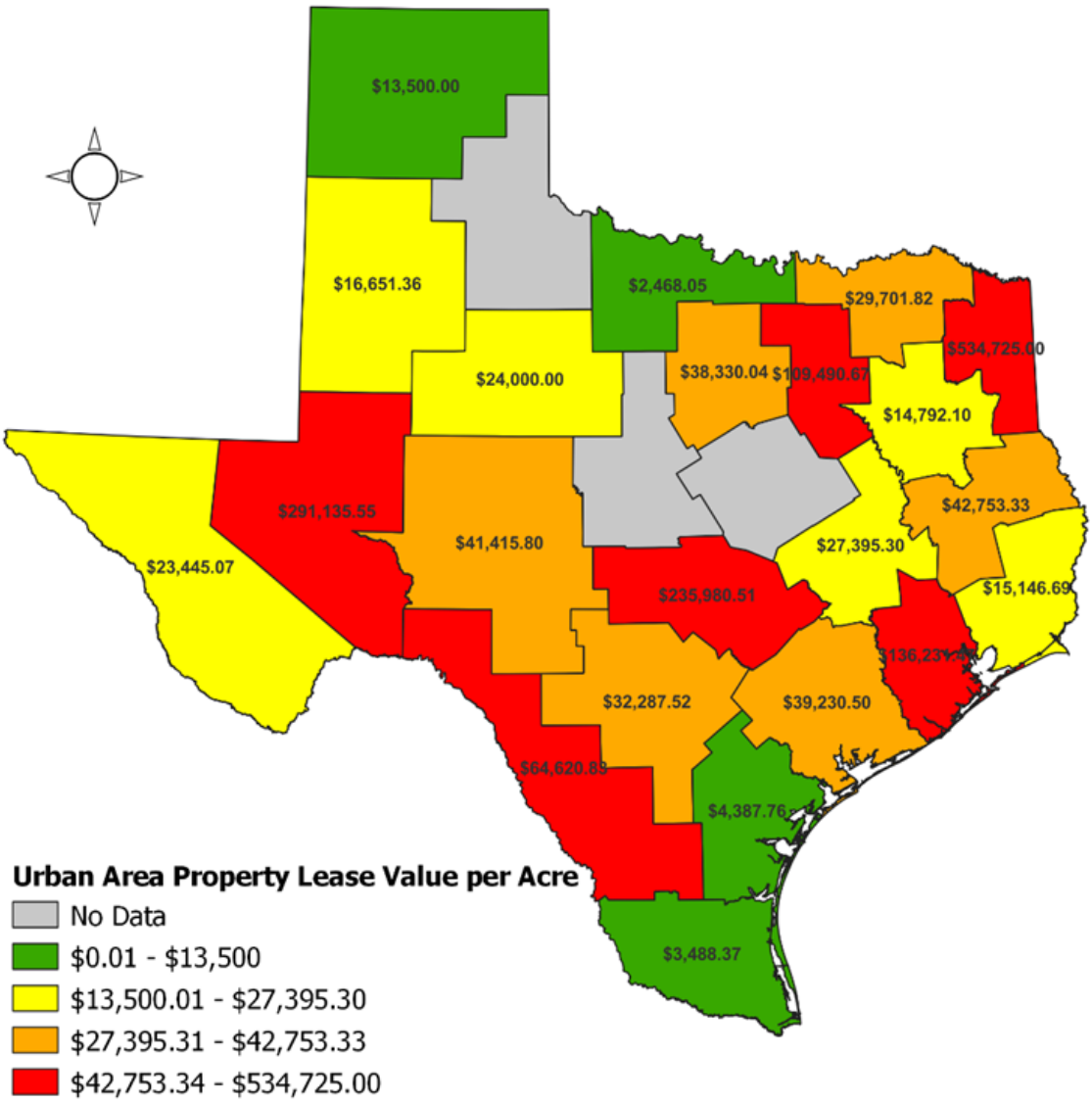

Figure 9. Value of Leases on a per Acre Basis for Urban Areas.

Texas A&M Real Estate Center Data

Rural land sales provide general trends of land valuations throughout Texas. The research team extracted price per acre valuations from 2019 for each of the 33 land areas. Figure 10 shows the range of rural land price per acre valuations throughout Texas in 2019. The values range from $700 dollars per acre to $13,913 per acre. The values are scaled from green to red based on low to high prices to show variations throughout the state. For the most part, higher valuations are found in the more urbanized areas of the state. The rural land values generally follow the same trend as the county tax assessment data. However, the rural land values are lower in West Texas and the Texas Panhandle compared to the county tax assessor's data.

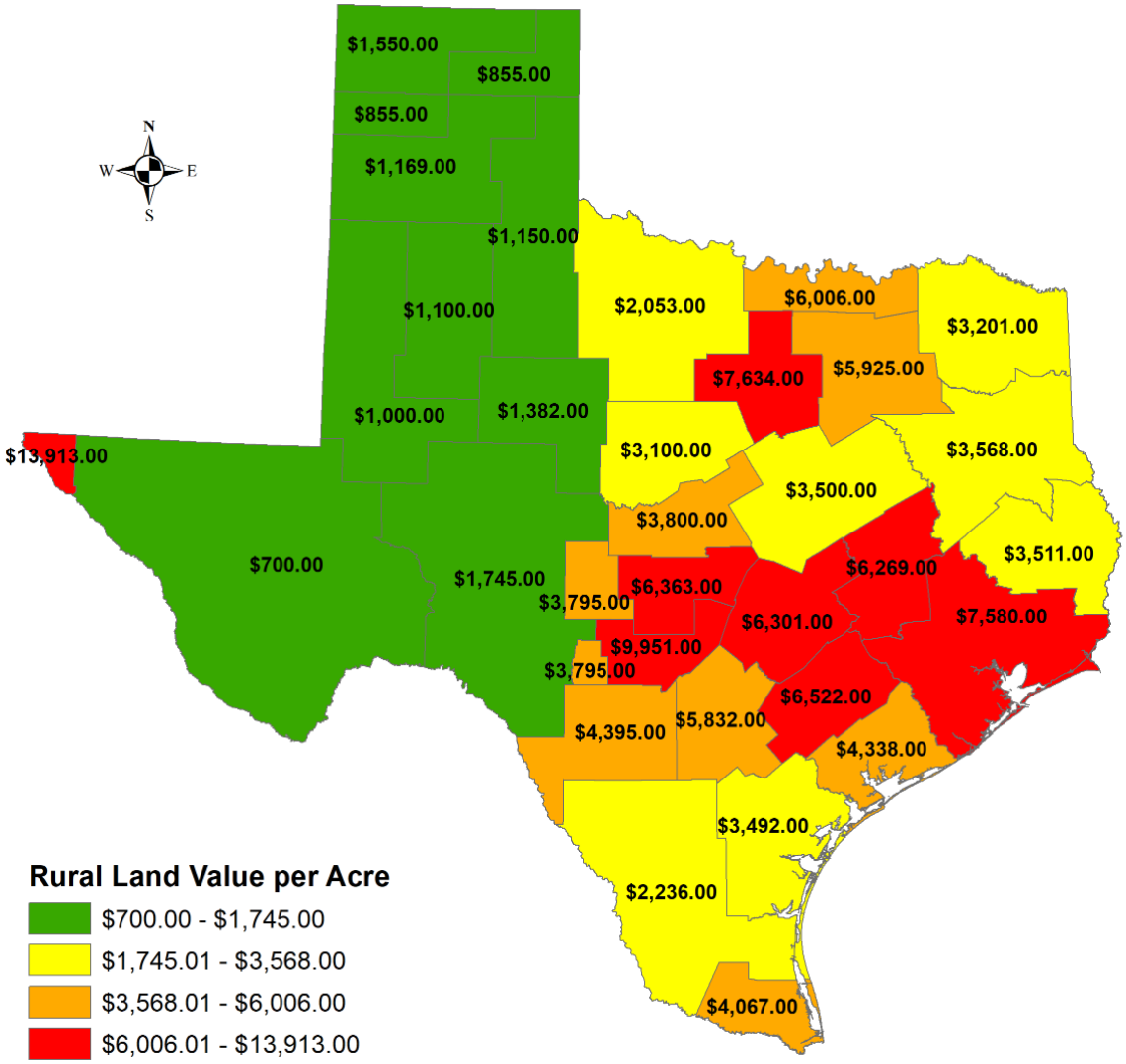

Figure 10. Rural Land Values per Acre for 33 Regions and Scaled Based on Price.

VALUATION METHODOLOGY

Using the various property valuation data available, the research team developed several methodologies to value properties for leases. While formal appraisals are needed for property acquisitions, the valuation methodology may be used to value leases. The research team calculated lease values using two approaches: a direct application of across-the-fence valuation, and a categorical approach where districts are grouped by land value quartile and counties by rural, mid-size urban, and large urban.

Direct Application of Across-the-Fence

As described in Chapter 2, the conventional across-the-fence method for determining an annual lease rate is as follows:

$$(ATF\ value \times corridor\ enhancement\ factor \times usage\ or\ occupancy\ factor) \times rate\ of\ return = annual\ rent$$

Where:

ATF Value is the best available estimate for the value ($/acre) of properties adjacent to the corridor. For counties with data available, researchers used the average rural or urban land value for parcels along the selected highway.

Corridor Enhancement Factor reflects the value of an assembled corridor. In general, it is much easier for a company to negotiate one lease with a corridor owner (e.g., TxDOT) than multiple leases with private landowners.

Usage Factor reflects the degree to which a particular use occupies space. For example, a buried pipeline occupies its cross-sectional area plus some buffer space where no other poles or utilities can be installed.

Rate of Return is the relationship between the factored corridor value and annual rent.

The parameter values used for the four types of leases considered are shown in Table 30 below.

Table 30. Across-the-Fence Parameters.

Lease Type	CEF	UF	Rate of Return
Small Cell Node	500	300	10%
Temporary Surface Pipeline	5	5	10%
Buried Pipeline	5	5	10%
Property	3	1	10%

Categorical Approach

The direct application of across-the-fence valuation is likely to yield lease rates close to market value. However, parcel-level data were not obtained for all Texas counties, as explained in earlier sections. The research team therefore developed a categorical approach that divides the state into three (or four) value groupings, depending on the lease type.

A multistep process was used to group districts based on relative valuation of land on a per acre basis. The first step was to determine the average per acre value of land in each district from the various sources above (i.e., tax assessors, TxDOT leases, and Texas A&M Real Estate Center). Next, each quartile was determined for each source of data and the quartile that each district falls into. Then, the average of the groupings for each land valuation category was taken to determine the overall district grouping. Table 31 shows the average per acre land values and groupings for each district and data category.

Table 31. TxDOT District Land Value Groupings.

District	Rural Land Value		Land Value		Urban Lease Value		Rural Lease Value		Overall Group
	$/acre	Group	$/acre	Group	$/acre	Group	$/acre	Group	
Abilene	1,531	1	5,034	1	24,000	2	0	1	1
Amarillo	1,193	1	22,424	3	13,500	2	0	1	2
Atlanta	3,283	2	12,552	2	534,725	4	1,866	3	3
Austin	6,655	4	201,347	4	235,981	4	21,495	4	4
Beaumont	6,054	4	17,158	2	15,147	2	2,200	3	3
Brownwood	3,295	2	22,327	3	0	1	5,556	3	2
Bryan	6,126	4	38,089	3	27,935	3	12,439	4	4
Childress	1,360	1	2,989	1	0	1	0	1	1
Corpus Christi	3,726	3	168,561	4	4,388	1	9,394	4	3
Dallas	5,579	3	94,987	4	109,491	4	23,677	4	4
El Paso	2,902	2	5,327	1	23,445	2	47,729	4	2
Fort Worth	6,510	4	75,860	4	38,330	3	104,272	4	4
Houston	7,580	4	331,047	4	136,231	4	0	1	3
Laredo	2,653	2	12,399	1	64,621	4	0	1	2
Lubbock	1,071	1	17,656	2	16,651	2	0	1	2
Lufkin	3,982	3	40,467	3	42,753	4	0	1	3
Odessa	887	1	27,146	3	291,136	4	175	2	3
Paris	4,430	3	50,646	4	29,702	3	0	1	3
Pharr	2,923	2	87,818	4	3,488	1	1,633	3	3
San Angelo	2,131	1	5,527	1	41,416	3	1,482	2	2
San Antonio	6,203	4	26,696	3	32,288	3	1,383	2	3
Tyler	3,817	3	19,495	2	14,792	2	2,943	3	3

District	Rural Land Value		Land Value		Urban Lease Value		Rural Lease Value		Overall Group
	$/acre	Group	$/acre	Group	$/acre	Group	$/acre	Group	
Waco	3,538	3	15,284	2	0	1	0	1	2
Wichita Falls	2,931	2	7,580	1	2,468	1	8,956	4	2
Yoakum	5,625	4	16,728	2	39,231	3	3,848	3	3

The overall groups are shown in Table 32, where Group 4 contains the districts with the highest per acre land valuations and Group 1 contains the districts with the lowest per acre land valuations.

Table 32. District Groupings for Land Values.

Group 1 (Lowest per Acre Land Values)	Group 2	Group 3	Group 4 (Highest per Acre Land Values)
Abilene	Amarillo	Atlanta	Austin
Childress	Brownwood	Beaumont	Bryan
—	El Paso	Corpus Christi	Dallas
—	Laredo	Houston	Fort Worth
—	Lubbock	Lufkin	—
—	San Angelo	Odessa	—
—	Waco	Paris	—
—	Wichita Falls	Pharr	—
—	—	San Antonio	—
—	—	Tyler	—
—	—	Yoakum	—

Note: "—" indicates not applicable.

Determination of Scale Factors

Aboveground Saltwater Pipelines Leases

Subsets of the groupings may be applied to value different types of leases. For aboveground saltwater pipeline leases, the rural land value groupings may be used to determine lease rates that account for differences in land valuations. This requires calculating a scaling factor to adjust the currently used rate of $2,500 for each 7-mile increment of above ground saltwater pipeline. The scaling factor was determined by comparing the average rural land value in each group to the average rural land value statewide and then dividing the group value by the statewide average. This resulted in a scaling factor that can be multiplied to the $2,500 lease fee for aboveground saltwater pipelines. The scaling factors for groups 1 through 4 are 0.4, 0.6, 1.1, and 1.6, respectively. The resulting rates for aboveground saltwater pipeline leases in each group are $1,000, $1,500, $2,750, and $4,000 for each 7-mile increment.

Buried Saltwater Pipeline Leases

Buried saltwater pipeline leases are based on rural, urban, and metropolitan land areas as well as the size of the pipeline. A similar process of developing factors for scaling lease rates can be

developed for buried saltwater pipelines. Counties were grouped based on populations, which were extracted from the U.S. Census Bureau estimates from 2019 (*91*). Three groups of counties were created for large urban (greater than one million), mid-sized urban (100,000 to 999,999), and rural (less than 100,000). The groupings of counties into large urban, mid-sized urban, and rural are as follows:

- Large urban counties: Bexar, Collin, Dallas, Harris, Tarrant, Travis.
- Mid-sized urban counties: Bell, Brazoria, Brazos, Cameron, Comal, Denton, Ector, Ellis, El Paso, Fort Bend, Galveston, Grayson, Gregg, Guadalupe, Hays, Hidalgo, Jefferson, Johnson, Kaufman, Lubbock, McLennan, Midland, Montgomery, Nueces, Parker, Potter, Randall, Rockwall, Smith, Taylor, Tom Green, Webb, Wichita, and Williamson.
- The remaining 214 counties were classified as rural.

Comparing the average land values in each group of counties to the statewide average reveals that the large urban counties have per acre land values 5.8 times greater than average, mid-sized urban counties have land values 3.2 times greater than average, and rural counties have land values 0.5 times greater than average. Based on TxDOT's current saltwater pipeline lease rates shown in Table 33 and the land value factors, new potential lease rates can be determined, as shown in Table 34.

Table 33. Current Buried Saltwater Pipeline Lease Valuations.

Setting	0" to < 4" ($/rod)	4" to < 6" ($/rod)	6" to < 12" ($/rod)	12" to < 24" ($/rod)
Rural	50	55	60	70
Mid-Sized Urban	60	65	70	80
Large Urban	70	80	100	120

Table 34. Potential Land-Based Buried Saltwater Pipeline Lease Valuations.

Setting	0" to < 4" ($/rod)	4" to < 6" ($/rod)	6" to < 12" ($/rod)	12" to < 24" ($/rod)
Rural	30	32.5	35	40
Mid-Sized Urban	192	208	224	256
Large Urban	348	377	406	464

The values for potential land-based lease valuations are significantly higher in mid-sized and large urban areas, making these unlikely to be implemented. Another possibility is to keep the rural and mid-sized urban valuations the same and scale the large urban area valuations based on the increase in land value from mid-sized urban areas to large urban areas, as shown in Table 35.

Table 35. Modified Potential Land-Based Buried Saltwater Pipeline Lease Valuations.

Setting	0" to < 4" ($/rod)	4" to < 6" ($/rod)	6" to < 12" ($/rod)	12" to < 24" ($/rod)
Rural	50	55	60	70
Mid-Sized Urban	60	65	70	80
Large Urban	110	120	130	150

Small Cell Leases

Currently, TxDOT has small cell lease fees for three small cell components: $500 per node, $1,000 per pole, and $336 for transport fiber. Small cell lease fees have a set value regardless of location. A similar process as above can be applied to scale leases for small cell nodes based on land values in the region. Small cell nodes are point based leases, so county level valuation data were used to better capture the differences in land values for large urban, mid-sized urban, and rural counties. The groupings are the same as those used for buried saltwater pipeline leases. The current and the potential valuations of small cell leases considering land-based valuations are shown in Table 36 and Table 37, respectively.

Table 36. Current Land-Based Small Cell Node Lease Valuations.

Setting	Node ($)	Pole ($)	Transport ($)
All	500	1,000	336

Table 37. Potential Land-Based Small Cell Node Lease Valuations.

Setting	Node ($)	Pole ($)	Transport ($)
Rural	250	500	168
Mid-Sized Urban	1,600	3,200	1,075
Large Urban	2,900	5,800	1,949

The potential valuations in urban areas are about six times higher than current valuations, so it is likely that future lease applicants will disagree with this valuation. As an alternative approach, researchers developed a modified land-based small cell node lease valuation that keeps the scaling factor discount for rural areas to encourage small cell node placement in these communities, keeps the same valuation for mid-sized urban areas currently in use, and scales the large urban areas based on the increase in land value from mid-sized urban areas to large urban areas, as shown in Table 38 and Table 39.

Table 38. Current Small Cell Node Lease Valuations.

Setting	Node ($)	Pole ($)	Transport ($)
All	500	1,000	336

Table 39. Modified Potential Land-Based Small Cell Node Lease Valuations.

Setting	Node ($)	Pole ($)	Transport ($)
Rural	250	500	168
Mid-Sized Urban	500	1,000	336
Large Urban	900	1,800	605

Property Leases

Property leases are significantly more challenging to value in this manner because of differences in the use of the lease, size of property, and property improvements. One example of different valuations in leases is for parking property leases. Many parking property leases are for parking areas in front of commercial businesses where only the business owner would be interested in paying for the lease. Other parking property leases are for parking under bridges in urban areas, where multiple developers may be interested in charging for parking and paying for a lease. Finally, some parking property leases are for public transportation agencies to provide parking for access to transit services. These three types of leases have significantly different valuations, and may be negotiated using different procedures. In the first case, TxDOT may execute a lease by negotiating directly with the business owner. In the second case, TxDOT may place the property for bid and receive multiple offers for leasing. In the third case, TxDOT may lease the property to another public agency for a nominal fee to help provide a public service. As a result, property leases will still need to be reviewed on a case-by-case basis to ensure proper valuation for the use of the property.

Parking leases are the most common property lease executed. In addition, they are more uniform from one location to the next than other types of property leases. Therefore, scaling factors can be used for rural, mid-sized urban, and large urban counties. The same scaling factors that resulted from comparing the average land values in each group of counties above to the statewide average can be applied: 0.5 to leases in rural counties, 3.2 in mid-sized urban counties, and 5.8 in large urban counties. The average lease TxDOT executes for parking is $76,000 per year and acre. Table 40 shows the average values of parking leases in rural, mid-sized urban, and large urban counties using the scaling factors to account for land valuations. These baseline values could be scaled to account for inflation and tied to the consumer price index for future year increases.

Table 40. Parking Annual Lease Valuations on a per Acre Basis.

Setting	Annual Lease Rate for Parking ($/acre)
Rural Counties	38,000
Mid-Sized Urban Counties	243,200
Large Urban Counties	440,800

VALUATION FRAMEWORK

The research team demonstrated two frameworks, including a map-based framework and a macro-enabled version of the database. A database is the main repository for all the land valuation information that the other frameworks are built on. However, the database as a stand-alone tool is not capable of calculating lease valuations only for finding land valuations. For that reason, the research team exported the database to Microsoft Excel and added built-in functionality to convert the land valuations to lease valuations. These tools and their capabilities are described below.

Interactive Map

The research team developed an interactive mapping tool as a way to visualize the processed valuation data. The tool was written in JavaScript, using the Leaflet library for mapping, and can display geospatial data in GeoJSON format. The map-based framework includes a user login and registration page for granting access and managing user levels. District staff may not need access to the entire statewide valuations, while division staff will require statewide access.

The framework renders a map of Texas with each county and TxDOT maintained highways visible. Researchers converted processed data from shapefile to GeoJSON format for three counties with geospatial data (i.e., Anderson, Brazoria, and Cameron) to develop and demonstrate the interactive map tool. Data are displayed for one county at a time to maximize performance. Users select the county they are interested in from a dropdown box, the map re-centers on that county, and then users are free to navigate and select features. Clicking on a feature displays its attributes, including the highway system, highway number, and average rural or urban land values per acre. Some highways may only be present in rural or urban sections of the county, in which case the other attribute is blank. Lease information can be selected by an input at the bottom of the page, similar to the spreadsheet-based framework. When users select a highway, the value is stored in memory. Users select the type of lease being requested and input the length or area and the duration of the lease. Once the calculate lease button is clicked, the lease valuation is populated based on the user selected fields and the property valuation for the selected highway.

Figure 11 shows an overview of the map-based framework with three counties of data loaded. The image shows the map, counties, highways, and lease calculation fields. Figure 12 shows the popup that appears when a highway is selected. The popup includes information about the highway and property valuation summaries. Figure 13 shows the zoomed in view of a county highway network.

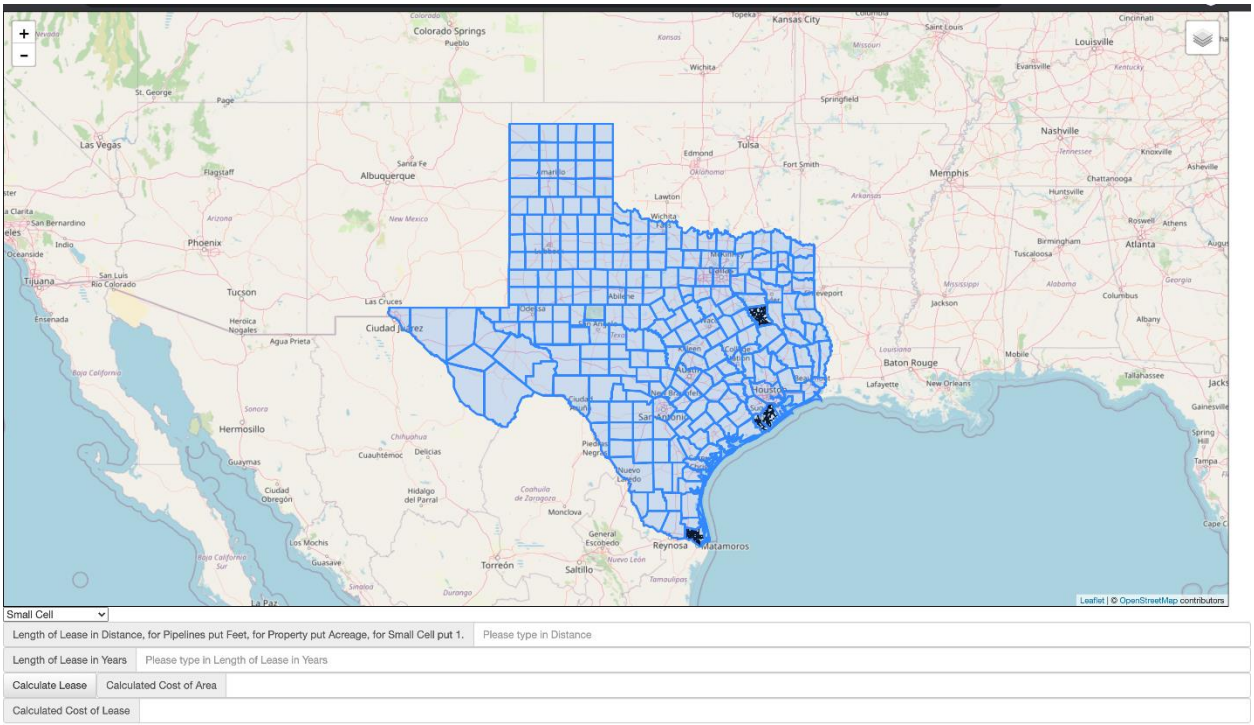

Figure 11. Map-Based Framework Overview.

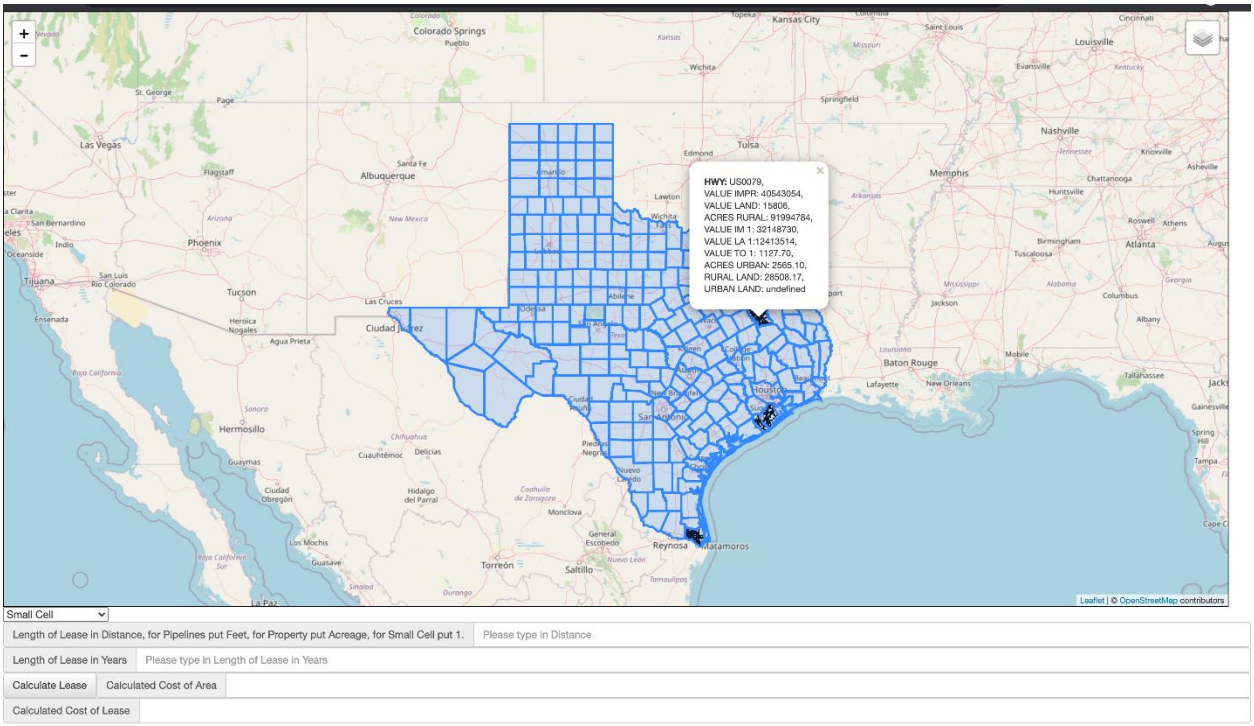

Figure 12. View of Data When Selecting a Roadway.

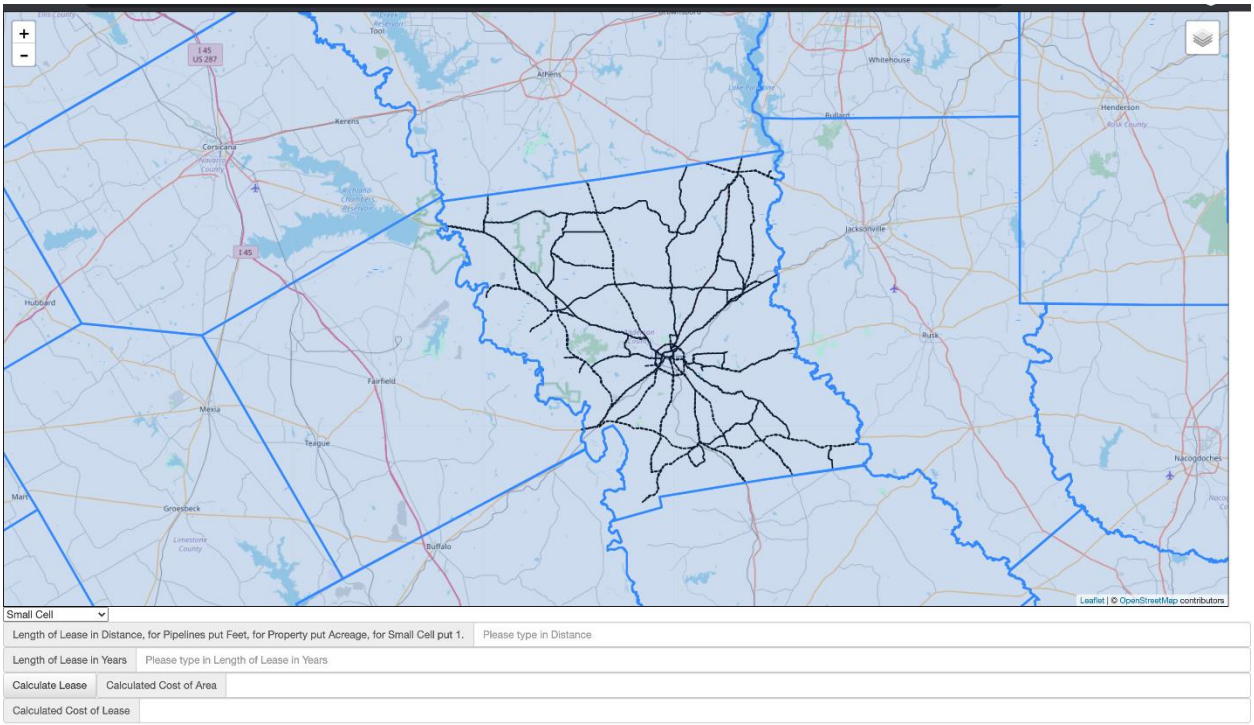

Figure 13. Zoomed in View of County Highway Network.

Spreadsheet Tool

The research team developed a spreadsheet tool that contains county level information for land valuations along TxDOT highways. A screenshot is shown in Figure 14. The user selects the county, highway, and the type of lease using dropdown boxes. Depending on the type of lease selected, there are different required inputs. Small cell nodes require only location (i.e., urban, rural) and lease duration. Surface and buried pipelines require these inputs plus pipeline length. Property leases require location, duration, and land area. Once all required values have been filled in, the spreadsheet will calculate the value of the lease by applying the direct across-the-fence method as described above.

ROW Valuation Spreadsheet Tool

This spreadsheet contains valuation data for TxDOT maintained highways in each county
Select below to calculate lease rates for various ROW uses

County	Highway	Rural Land Value per Acre	Urban Land Value per Acre
Anderson	SH0019	2,102.54	$ 356,947.28

Lease Type	Urban or Rural	Length or Area*	Duration of Lease (Years)	Total Lease Cost	Annualized Lease Cost if Applicable
Small Cell Node	Urban	1	1	$ 122,915.73	$ 122,915.73

*Enter length in feet for temporary pipelines and buried pipelines.
*Enter area in acres for property leases.
*Enter 1 for small cell node.

Figure 14. Spreadsheet Tool.

CHAPTER 6. SUMMARY OF REGIONAL WORKSHOPS

INTRODUCTION

This chapter describes the process to prepare for and conduct the workshops for the preliminary valuation frameworks. This includes a description of the frameworks included in the workshops, the process to identify and invite participants, and the feedback received from workshop participants.

REGIONAL WORKSHOPS

Identifying and Inviting Participants

The research team worked with TxDOT to identify participants that would be likely users of the frameworks and therefore have the most interest in providing feedback. The primary participants were staff from the ROW Division and district permit coordinators. An email was drafted that introduced the project, described the purpose of the workshops, and provided the dates and times of the four workshops. The draft email was shared with the technical panel for comment and feedback. The final email was sent to identified participants inviting them to participate in one of the workshops. Follow up invitations were sent to each participant that included information for joining the workshops. The research team used Microsoft Teams to host virtual workshops.

Overview of Discussions

Researchers developed a presentation that provided a brief introduction to the overall research project, including findings from the literature review, discussion with TxDOT stakeholders, and discussions with external stakeholders. Researchers provided an overview of the valuation frameworks, including sources of valuation data and data processing techniques. The actual frameworks were demonstrated to participants. Throughout the workshops, participants were asked to provide comments and feedback, which are documented by the research team.

In total 24 people attended the workshops, not including those attendees who joined multiple workshops. This includes four members of the research team and 20 attendees from TxDOT. The majority of the TxDOT attendees were from various districts.

Participant Feedback

Members of the research team documented feedback from the workshop participants throughout the four meetings. The feedback ranged from general comments about the data and data processing to functionality of the frameworks. The following sections break down the comments and discussions from various aspects of the workshops.

Feedback on Project Background Presentation

As previously mentioned, the research team began the workshops with introductions and a brief overview of the research project to this point. When discussing companies leasing the right-of-way for parking installations, a comment was raised that while the companies prefer direct negotiations, TxDOT prefers to put the properties out for bid. This portion of the project was

gathering feedback from external stakeholders, and the research team agreed that having open bids for certain highly desirable properties was the best option for TxDOT.

Several questions arose during the discussion of Senate Bill 507, which will allow broadband-only providers to access the right-of-way by permit (*92*). One question was about how these companies will be accommodated in the right-of-way. The language in the bill states they are to be accommodated, but the specifics of how are up to the Texas Transportation Commission and TxDOT. The ROW Division noted it would be by permit. A follow up question was whether these companies would have the authority to install longitudinally as part of the permit, which they will be allowed.

Feedback on Data and Data Analysis

One comment that came up during the data analysis discussion was that currently, temporary pipelines are leased for a flat fee of $2,500 per pipeline for up to 7 miles. An attendee from a district noted that this made things simple for them and lease applicants. They were concerned that having lease rates based on the location would complicate things for the districts and confuse applicants. It was noted by a participant that introducing a tool to calculate lease values could introduce errors into the valuation if information is not entered correctly. A common complaint from companies is that different districts have different practices, and this could compound that issue.

This discussion continued with the possibility of the research team updating the flat fee charged for temporary pipelines based on the valuation data they were collecting. The ROW Division noted the research team could evaluate historical leases and develop a weighted average based on the locations with the most leases and the land valuations in those areas.

One participant asked if the research team was taking into account mineral rights for the valuations. The discussion concluded that this was not necessary for leases because there was no property right conveyed to the company executing the lease. The ROW Division noted that they do not acquire mineral rights from landowners when acquiring property, though there are restrictions on how and from where mineral rights owners can access the property. If mineral rights data are of interest, some county tax assessors collect royalty information since these are taxed as part of property valuations.

For the small cell node lease valuations, the research team may need to investigate having additional lease types depending on the installation. TxDOT is getting requests for poles around 150 feet tall that will hold 4G transmitters that send signals to rooftop dish receivers on people's homes and businesses. While these towers have a small footprint, the impacts to the right-of-way are large and will need to be accounted for with the lease valuation. Another question that arose was how easily the data can be updated and what is involved in that process.

Feedback on Frameworks

The feedback on the frameworks varied from potential additional uses of the tools to usability suggestions and features to make it easier to visualize. One additional use of the tool was noted by the ROW Division: the information could be used to benchmark valuations during dispositions. Since the dataset contains property value information along highways at the county

level, ROW Division staff could use this to check if appraisals for dispositions are within a reasonable range.

A comment was made that for leases longer than one year, an annual inflation factor should be included to grow the annual lease valuation. TxDOT noted they commonly use 3 percent inflation and will negotiate from there with lease applicants. This is a function the research team will add to the spreadsheet and map-based framework.

There was discussion about how to manage leases that cross from urban to rural areas, are in multiple counties, or are along multiple highways. It would be beneficial to have the ability to add multiple records and distances to manage these types of leases. The research team will implement the ability to add records to leases that will allow for parameters to change and then sum the total lease costs. For example, a button will be added to the spreadsheet that allows users to add another record. This can be used to calculate the lease value for the portion along one highway and the portion along another highway and then sum the two values for the total lease cost.

Regarding visualization, several comments were received about adding in the boundaries for urban areas. The research team has a GIS layer of these locations, which will be added to the map-based framework. Attendees noted that having the selected roadway standout more when highlighted would be beneficial for knowing exactly which roadway is selected. This is a feature that could easily be added to the map-based framework.

For the map-based framework it was noted that additional formatting of the popup data when a highway is selected would be beneficial. Currently, the information shown includes the data table label, but the values are not formatted as currency fields. This change is fairly minor and could be made without too much difficulty.

It was noted that having the corridor enhancement factors and occupancy factors visible to users would be beneficial. This would also allow users to change these factors. This can easily be incorporated into both frameworks.

CHAPTER 7. REVIEW OF TXDOT APPRAISAL DATA

INTRODUCTION

This chapter reviews TxDOT appraisal data that TxDOT collects during the appraisal process and stores in several TxDOT systems. The ROW Division acquires property and collects information about appraisals and actual sales. This data could improve or update the valuation data acquired by the research team from other sources. The purpose of the review was to determine the feasibility of using existing TxDOT data sources to update and improve the valuation framework. Secondly, the review evaluated the need to update TxDOT Connect in order to store additional, critical data elements from the property appraisal process.

APPRAISAL DATA IN TXDOT DATA SYSTEMS

TxDOT appraisal data are stored in several databases, including TxDOT's Onbase appraisal data system and TxDOT Connect. Onbase is a digital online filing system that TxDOT uses to store data throughout the appraisal process. TxDOT's Onbase appraisal data system has more information about appraisals than what is stored in TxDOT Connect. In particular, Onbase stores information from appraisal reports, including comparable sales information that was used during the valuation process. During the project development process, some of the project's appraisal data are transferred from Onbase to TxDOT Connect. The research team reviewed to what degree appraisal data are stored in TxDOT Connect and what changes, if any, should be made to store this information.

Appraisal Data in TxDOT Connect

TxDOT provided a dataset of sample records related to property appraisals that are managed in TxDOT's Onbase data system after the data were transferred to TxDOT Connect. Researchers reviewed the data to determine if TxDOT Connect should be updated to include more appraisal information. The data provided by TxDOT included appraisal records from projects with an *Appraisal As Of Date* between July 1, 2020, and April 4, 2022, and with at least one property parcel for acquisition. The dataset included information from 72 TxDOT Connect data fields related to appraisal data, as shown in Table 41.

Table 41. List of TxDOT Connect Field Included in Analysis.

Appraisal Data Type	TxDOT Connect Data Field
Parcel Details	District, County, RCSJ, Highway, Parcel ID, ROWIS Parcel ID, Parcel Stage, Parcel Status, Possession Date, Possession Type, Final Amount Paid, Property ID/Tax Number, Interest Type
Appraisal List (for each appraisal on the list)	Organization Name, Appraiser, Appraisal Task, Property Current Use, Property Highest/Best Use, Total Compensation, Appraisal As Of Date
Summary Information	Appraisal Format, Appraisal Usage, Appraisal Report Date, Cost/Unit (include unit of measurement), Whole/Partial Acquisition, Date of Take, Direct Access Denial (Y/N), Approval Date, ROW Manager Approved Amount, Owner Donation Value

Appraisal Data Type	TxDOT Connect Data Field
Compensation Summary	Whole Property, Part to Be Acquired, Value Remainder Before Taking, Value Remainder After Taking, Net Damages, Enhancements, Access, Cost-To-Cure, Total Compensation (should match Total Compensation in Appraisal List)
Acquisition Interest Values (for each parcel part)	Appraised Value Land Only, Improvements (Improvement Type, Quantity, Measurement, Unit of Measure, Description [comment box], Appraised Value of Improvement, Retention Value, Construction Type, Bisection Type, Bisection Clause)
Appraisal Review	Review Appraiser, Assignment Date, Completion Date, Appraisal Value, Review Appraiser Recommended Value, Review Status, Reviewer Notes
Comparable Sales	Sales Comparison Approach (check box Whole, Part to be Acquired, Remainder After, Land, Improved), Entire Valuation Grid (Grantor), Grantee, Date of Sale, Unit Price, Relative Location, Size (Acres), Size (Square Feet)

The dataset contained 118,256 parcel records. A preliminary review of the dataset found that it contained data from 289 unique projects based on the field *ROW Project CSJ*. The number of unique projects per district ranged from 1 to 64, as shown in Table 42, and the number of parcel records per district ranged from 8 to 29,630, as shown in Table 43.

Table 42. Count of Projects per District.

No.	District	Count
1	Abilene	2
2	Amarillo	7
3	Atlanta	3
4	Austin	13
5	Beaumont	8
6	Brownwood	6
7	Bryan	11
8	Childress	2
9	Corpus Christi	6
10	Dallas	64
11	El Paso	8
12	Fort Worth	11

No.	District	Count
13	Houston	52
14	Laredo	6
15	Lubbock	5
16	Lufkin	6
17	Odessa	1
18	Paris	1
19	Pharr	16
20	San Angelo	1
21	San Antonio	22
22	Tyler	8
23	Waco	1
24	Wichita Falls	6
25	Yoakum	23
	Total	**289**

Table 43. Count of Records by District.

No.	District	Count
1	Abilene	83
2	Amarillo	292
3	Atlanta	1,329
4	Austin	11,077
5	Beaumont	4,947
6	Brownwood	637
7	Bryan	3,946
8	Childress	34
9	Corpus Christi	1,630
10	Dallas	24,133
11	El Paso	1,240
12	Fort Worth	3,130

No.	District	Count
13	Houston	29,360
14	Laredo	1,409
15	Lubbock	2,481
16	Lufkin	2,074
17	Odessa	8
18	Paris	117
19	Pharr	7,346
20	San Angelo	25
21	San Antonio	8,807
22	Tyler	6,338
23	Waco	603
24	Wichita Falls	1,902
25	Yoakum	5,308
	Total	**118,256**

Further analysis of the data found that the 289 projects had 13,954 unique parcels. Each project had between 1 and 343 unique parcels, with a mean of 48 parcels per project. For each unique parcel, researchers found between 1 and 296 parcel records, or parcel transactions. The mean number of records per parcel was eight.

Most of the parcel records had an assigned value in the field *Appraisal Task*. Researchers found eight different appraisal task values, as shown in Table 44.

Table 44. Count of Parcel Records by Appraisal Task.

No.	Appraisal Task	Count
1	Initial Appraisal	66,869
2	Recommend Parcel Value (District)	27,973
3	Contract Review Appraiser	8,756
4	Eminent Domain Appraisal—Update or New	7,823
5	Update Appraisal for Negotiations	2,236
6	Trial Appraisal	929

No.	Appraisal Task	Count
7	RPD Primary Review	22
8	Appraiser Payment—No Report Submitted	1
	Blank	3,647
	Total	**118,256**

Most of the parcel records also had an assigned value in the field *Appraisal Usage*. Researchers found five different appraisal usage values, as shown in Table 45.

Table 45. Count of Parcel Records by Appraisal Usage.

No.	Appraisal Usage	Count
1	Basis for Values	56,801
2	Current Recommended Values	40,635
3	Prior Recommended Values	13,375
4	Undetermined	2,928
5	Commercial Signs Value	44
	Blank	4,473
	Total	**118,256**

During the acquisition process, the stage of the parcel in the acquisition process is indicated by the field *Parcel Stage*, which can have any of 15 values. Table 46 shows the parcel stages along with a count of records for each parcel stage.

Table 46. Count of Parcel Records by Parcel Stage.

No.	Parcel Stage	Count
1	Acquired—Deed	22,276
2	Acquired—Judgment	4,476
3	Appraisal Approved	2,784
4	Appraisal Reviewed	4,209
5	Appraised	2,230
6	Change Requested	54
7	Completed	33,692
8	Created	1,887

No.	Parcel Stage	Count
9	Deactivated	1,188
10	Final Offer	12,809
11	Initial Offer	10,831
12	New	1,253
13	Pre-Litigation	8,663
14	Special Commissioner Phase	8,006
15	Trial Phase	3,898
	Total	**118,256**

Researchers found that each of the 13,954 unique parcels had only one parcel stage. Researchers expected there would be multiple parcel stage records for each parcel as a parcel progressed through the acquisition process from initial offer to acquisition. For example, parcel P00009976 of project 200009075 had 20 records, each with a parcel stage of "Final Offer." Half of the records had an appraisal task of "Initial Appraisal" and an appraisal usage of "Basis for values," while the other half of the records had the appraisal task "Contract Review" and appraisal usage "Current Recommended." Records of the "Initial Appraisal" came from TxDOT's Real Estate Appraisal Report (form ROW-A-5,) while records from "Contract Review" came from TxDOT's Tabulation of Values (form ROW-A-10), as indicated by the field *Appraisal Format* (*93*, *94*). A potential explanation for this is that TxDOT Connect only keeps a record of the latest parcel stage for each record.

For parcel P00009976, the 10 records of the initial appraisal included records for two improvements as indicated by the field *Improvement ID*, I000318473 and I000318472, with five records each. Records for each improvement were similar, including identical information for value information such as appraised values for whole property, part to be acquired, remainder before and after taking, and cost-to-cure. However, the fields grantor, grantee, unit price, and size in acres provided different information. Most likely, these were records from comparable sales information that were included in the appraisals. However, several fields from the appraisal forms were not included in the dataset, such as the unit of the unit price and the indicated unit value, which is an adjusted unit price that takes market conditions, physical characteristics, location, and utility into consideration. The research team tried various options to relate the given unit price to the compensation values but was unable to generate comparable sales values within range of the compensation values.

Comparison of Datasets

In TxDOT Connect, parcel information is tracked using the following categories:

- Parcel Details.
- Funding.

- Appraisal.
- Negotiations.
- Acquisition.
- Eminent Domain.
- Relocation.
- Demolition.
- Minute Order.
- Workflow, Forms, and Documents.
- Comments.

The category *Appraisal* tracks appraisals performed for each parcel. In the case of parcel P00009983, there were two associated appraisals, the initial appraisal with information from form ROW-A-5 and the contract review appraisal with information from form ROW-A-10. Information from each appraisal is stored in four tabs, *Summary Information*, *Acquisition Interest Values*, *Appraisal Review*, *and Comparable Sales*.

Researchers compared the data available in TxDOT Connect with the appraisal data TxDOT provided separately. In the example below, researchers selected project 0200-09-075, which contained 418 records for 37 unique parcels in the TxDOT appraisal dataset, with a range of 1 to 190 records per parcel. TxDOT Connect provided exactly one record for each parcel ID, as shown in Table 47.

Table 47. Comparison of Data in TxDOT Connect and TxDOT Appraisal Dataset.

TxDOT Connect Parcel ID	TxDOT Connect ROWIS ID	TxDOT Connect Parcel Status	TxDOT Connect Parcel Stage	Appraisal Data Parcel ID	Appraisal Data ROW Project CSJ	Appraisal Data Count of Records
P00009955	020009075-31	Active	Acquired—Deed	P00009955	020009075	2
P00009956	020009075-52	Cancelled	Deactivated	P00009956	020009075	3
P00009957	020009075-53	Active	Acquired—Deed	P00009957	020009075	2
P00009958	020009075-54	Cancelled	Deactivated	P00009958	020009075	3
P00009959	020009075-55	Cancelled	Deactivated	P00009959	020009075	11
P00009960	020009075-203	Cancelled	Deactivated	P00009960	020009075	1
P00009961	020009075-204	Cancelled	Deactivated	P00009961	020009075	1
P00009962	020009075-206	Cancelled	Deactivated	P00009962	020009075	1
P00009963	020009075-214	Active	Acquired—Deed	P00009963	020009075	2

TxDOT Connect Parcel ID	TxDOT Connect ROWIS ID	TxDOT Connect Parcel Status	TxDOT Connect Parcel Stage	Appraisal Data Parcel ID	Appraisal Data ROW Project CSJ	Appraisal Data Count of Records
P00009964	020009075-215	Cancelled	Deactivated	P00009964	020009075	2
P00009965	020009075-205	Cancelled	Deactivated	P00009965	020009075	2
P00009966	020009075-207	Active	Acquired—Deed	P00009966	020009075	6
P00009967	020009075-370	Cancelled	Deactivated	P00009967	020009075	2
P00009968	020009075-371	Cancelled	Deactivated	P00009968	020009075	6
P00009969	020009075-372	Active	Acquired—Deed	P00009969	020009075	2
P00009970	020009075-373	Active	Acquired—Deed	P00009970	020009075	2
P00009971	020009075-374	Active	Acquired—Deed	P00009971	020009075	6
P00009972	020009075-379	Active	Acquired—Deed	P00009972	020009075	6
P00009973	020009075-382	Active	Acquired—Deed	P00009973	020009075	2
P00009974	020009075-383	Cancelled	Deactivated	P00009974	020009075	2
P00009975	020009075-ROWAPS	Cancelled	Deactivated	P00009975	020009075	1
P00009976	020009075-1	Active	Final Offer	P00009976	020009075	20
P00009977	020009075-2 PT1 PT2	Active	Final Offer	P00009977	020009075	6
P00009978	020009075-3 PT 1 PT2	Active	Final Offer	P00009978	020009075	10
P00009979	020009075-4	Active	Final Offer	P00009979	020009075	6
P00009980	020009075-5	Active	Final Offer	P00009980	020009075	6
P00009981	020009075-6	Active	Final Offer	P00009981	020009075	20
P00009982	020009075-7	Active	Final Offer	P00009982	020009075	30
P00009983	020009075-8	Active	Final Offer	P00009983	020009075	190

TxDOT Connect Parcel ID	TxDOT Connect ROWIS ID	TxDOT Connect Parcel Status	TxDOT Connect Parcel Stage	Appraisal Data Parcel ID	Appraisal Data ROW Project CSJ	Appraisal Data Count of Records
P00009984	020009075-9	Active	Initial Offer	P00009984	020009075	15
P00009985	020009075-10	Active	Final Offer	P00009985	020009075	6
P00009986	020009075-11	Active	Final Offer	P00009986	020009075	30
P00009987	020009075-12	Active	Final Offer	P00009987	020009075	10
P00009988	020009075-13	Cancelled	Deactivated	P00009988	020009075	1
P00009989	020009075-14	Cancelled	Deactivated	P00009989	020009075	1
P00009990	020009075-15	Cancelled	Deactivated	P00009990	020009075	1
P00009991	020009075-16	Cancelled	Deactivated	P00009991	020009075	1
						Total: 418

The researchers reviewed parcel P00009983 of the TxDOT dataset in more detail and found that it contained five records each for 38 improvements, such as chain link fence, concrete paving, porched covered parking, and several buildings. The appraised value of the improvement did not vary for any of the five records. Researchers noted that 19, or half, of the improvements (i.e., I000329377 to I000329407) had the appraisal task of *Initial Appraisal* and appraisal usage of *Basis for Values*, while the other half (i.e., I000329408 to I000329426) had the appraisal task of *Contract Review Appraiser* and an appraisal usage of *Current Recommended Values*.

A closer review of each set of improvements revealed that that each set described the same 19 parcel improvements, based on the description of the improvement, type, measurement, and values. As such, it appeared that each improvement was re-appraised but given a new Improvement ID in the process. A review of the appraised value of the 19 improvements found that the total for the initial appraisal was $455,040, while the total for the contract review appraisal was $638,927. The reason for the difference in the total appraisal was an increase of appraised values of two improvements, I000329423 and I000329424.

Researchers were unable to establish a relationship between the appraised values for improvements, appraised values for the property parcel, and total appraised value. Parcel values were given as *Whole Property*, *Part to be Acquired*, *Value Remainder Before Taking*, *Value Remainder After Taking*, *Net Damages*, *Cost to Cure*, and *Compensation Summary Total Compensation*. Values followed the following calculations:

Whole Property = Part to be Acquired + Value Remainder Before Taking

Net Damages = Value Remainder Before Taking – Value Remainder After Taking

Compensation Summary Total Compensation = Part to be Acquired + Net Damages + Cost to Cure

The *Compensation Summary Total Compensation* amount was identical for all records, with a value of $847,884. "Cost to Cure" did not change for any record, however, all records of the initial appraisal had net damages with a value of $183,887, while the contract review appraisal had net damages of $0. The total compensation amount for both initial appraisal and contract review appraisal records stayed the same because the *Part to Be Acquired* amount increased by $183,887, apparently including the amount of net damages.

As mentioned above, each improvement ID was associated with five records that provided varying unit prices—apparently comparable sales information. A review of these unit prices revealed five different unit prices for each improvement. However, these unit prices repeated for each improvement so that each improvement had the same five unit prices. This indicated that comparable sales information was associated with the land acquisition and not the improvement. These values also did not change based on the appraisal task, initial appraisal versus contract review appraisal, which indicates that both appraisals used the same comparable sales information.

Researchers compared the *Compensation Summary Total Compensation* value for each parcel with the *Final Amount Paid* value in TxDOT Connect. Of 37 parcels, TxDOT Connect provided a final amount paid for 19 parcels. Parcels that did not have a final value had a *Parcel Stage* value of "deactivated," with the exception of parcel P00009979, which had a *Parcel Stage* value of *Final Offer* in the dataset and *Pre-Litigation* in TxDOT Connect. For most parcels, the *Parcel Stage* value in the dataset was the same as the *Parcel Stage* value in TxDOT Connect.

Under *Acquisition Interest Values*, the column *Appraised Value of Improvement* matched the information provided in TxDOT's dataset. Further, the values in the comparable sales tab matched the values provided in TxDOT's dataset. Both appraisers used the same five comparable sales for their appraisal with identical unit prices, as noted previously. Researchers evaluated the use of the comparable sales information for several projects in TxDOT Connect and found that usage varies; in some cases, comparable sales information was only available for one appraisal, while in other cases no comparable sales information was available. This was similar to the dataset provided by TxDOT, where 162 of 289 unique projects (i.e., 56 percent) included unit prices of comparable sales.

Location Information

Location information for parcels in TxDOT Connect was limited. While many projects have a location map that provides the limits of the project, there is no mapping component currently in TxDOT Connect to show the location of the property parcel. In the category *Parcel Details*, a field called *Physical Location* sometimes provides a text description of the location, for example, a reference of an offset from an intersection. However, this field was rarely populated in the sample of projects reviewed by the research team. Further, the field *Physical Location* was not included in the dataset provided by TxDOT. If the field *Physical Location* was consistently populated, it might be feasible to use a geolocating algorithm to determine the approximate

location of the parcel. However, a manual process would be required to tie the appraised property parcel to a specific parcel from the local appraisal district.

A different approach to tie appraisal data in TxDOT Connect to data from a local appraisal district would be the use of the field *Property ID/Tax Number* in TxDOT Connect. This field contains a property identifier that is used by the local appraisal district. TTI compared a few records with available data from an appraisal district and was able to relate the two parcels. However, researchers noted that in the dataset TxDOT provided, about 76 percent of records did not have a valid property ID value in that field.

CHAPTER 8. CONCLUSIONS AND RECOMMENDATIONS

Researchers reviewed a variety of literature relating to laws and regulations, right-of-way valuation methodologies, land value information in Texas, practices at other agencies, and emerging uses of the right-of-way. The first portion of the literature review focused on the laws and regulations related to accessing the right-of-way and charging for that access. Much of the literature review focused on valuation methodologies and understanding the fees that other agencies charge for access to the right-of-way for various installations.

There are several applicable federal regulations related to accessing the right-of-way and TxDOT's ability to charge for that access. In summary, public and private utilities have a right to install in the right-of-way if they are serving the public. Several regulations allow states to permit the use of the airspace above and below ground so long as it does not interfere with highway purposes. When access to unused right-of-way is granted, DOTs must charge fair market value or rent for the use of the land. Federal regulations do provide an exception to charging fair market rent if the DOT shows and the FHWA approves that such an exception is in the overall public interest for social, environmental, or economic purposes.

In addition to federal regulations, there are many Texas regulations that govern TxDOT's ability to grant access and lease the right-of-way. Much of the language is similar to the federal regulations in that TxDOT may lease part of the right-of-way or the airspace above, at, or below ground if the leased area is not needed for a highway purpose during the time of the lease. One of the main stipulations in several of the Texas regulations is that TxDOT must charge fair market value for leases. Some of the regulations are adopted into portions of TxDOT's *Use of Right of Way by Others Manual* and *Right of Way Property Management Manual* (*19*, *20*). These manuals describe the ability of utilities to access the right-of-way as well as the requirements and forms developed by TxDOT.

Researchers reviewed a wide variety of valuation practices as they relate to understanding right-of-way valuations. Many of the practices related to utility and rail corridors and determining the lease rates for pipelines or telecommunication lines. For right-of-way valuation, one common theme that emerged was using the ATF value as the starting point. Some research indicated an enhancement factor could be applied to the methodology to represent the value of an existing corridor already assembled compared to the costs to assemble a similar continuous corridor. In general, corridor enhancement factors ranged from 1–6 depending on the existing land use and urbanization. Some of the valuation research was related to valuing easements, which provide more rights to the user of the corridor than through a lease. Since TxDOT does not grant easements on its right-of-way, the property value needs to be related to leasing, where the lessee has no property interest.

Many of the articles on valuation pointed to the fact that comparing parcels to similar, recently sold parcels can be difficult due to a lack of sales on the open market of longitudinal corridors and the varied details of each corridor. APWA proposed an equation to calculate lease rates for telecommunication facilities in public right-of-way that uses the land value, size of installation, rate of return, alienation factor, and use factor. In addition, FTA published a report detailing the valuation of railroad right-of-way. FTA noted that the ATF approach was most reasonable for

their uses, followed by the ATF approach with a corridor enhancement factor. FTA noted that corridor enhancement factors are speculative and subject to controversy.

The literature search revealed several agencies that developed lease rates and fees for access to their right-of-way. Leases were established for point-based installations, longitudinal installations, and area-based installations. Point based installation fees were identified for microcell and macrocell installations. Longitudinal fees were found for general longitudinal installations as well as specific installations such as fiber optic cables and pipelines. Area-based installations include parking lots, parking structures, and solar energy generation sites.

For point-based installations, many agencies charge fixed rates depending on the location and type of installation. The type generally relates to the size and height, in that agencies charge higher fees for larger installations. Typically, agencies charge higher fees for urban areas, recognizing the increased land values. Several agencies use escalation factors for multiyear leases, with 3.5 percent being the most common.

Practices at other agencies varied regarding longitudinal installations. Some agencies charge an application fee and a distance-based fee. Alaska charges $1 per linear foot of installation but caps their longitudinal fee at $10,000. Some agencies provide a rate per mile for installation depending on the type and location, while others use an equation based on the actual distance to calculate fees. One agency charges a separate fee to trench the right-of-way and to install fiber.

Specific details for area-based leases were difficult to find. Many DOTs enter into lease agreements for parking spaces and structures. Florida stipulates that leases for parking areas must be for fair market value or that the DOT must receive a percentage of parking revenues. In one example, a hospital leased a parking garage from a political subdivision of Texas for a fee that included a predetermined rent and a percentage of revenue. Massachusetts DOT entered into a lease agreement for solar power generation where the third-party leases the land at an average value of $2,500 per acre per year.

Various other uses of the right-of-way were reviewed, and several emerging or potential opportunities were identified. Agencies have evaluated the possibility, and on a limited scale, leased right-of-way for wind power generation and bioenergy projects. Wind power generation leases have mostly been executed for excess land at maintenance sites and safety rest areas. Additional literature related to energy harvesting and locating alternative fuel facilities within the right-of-way were presented as potential future practices.

TXDOT LEASE PROCESS AND VALUATION PROCEDURES

Feedback from TxDOT Stakeholders

TxDOT stakeholders responsible for administering the leasing process at the district and division level provided feedback to the research team pertaining to lease processes, valuation procedures, violations of permits/leases, and right-of-way management practices during a series of discussions. TxDOT stakeholders of interest included real estate analysts, asset managers, permit coordinators, and maintenance personnel.

The lease process is generally the same for all types of leases at each district. For saltwater pipeline leases companies submit an application that includes the beginning and ending locations of the pipeline, the entry and exit points in the right-of-way, and a map showing the route. Once a saltwater pipeline lease application is submitted, it is reviewed for conflicts with construction and maintenance projects as well as conflicts with other existing leases. When conflicts are discovered, districts work with applicants and the contractor to see if the installation can be accommodated, whether another location could be used, or if the installation should be delayed.

Several districts raised issues regarding the quality of plans for subsurface pipelines and telecommunication leases. The districts indicated that most plans only show the alignment of the proposed installation and are not surveyed using TxDOT monuments. In addition, TxDOT does not provide them with as-built plans or documents showing the existing right-of-way grade. Applicants do not include grade as part of their plans.

Small cell leases are being executed in eight districts currently, with several more starting to accept leases soon. Districts review lease applications to ensure compliance with utility accommodation rules and lease requirements. Sometimes the district denies the location but provides a nearby alternative. Some districts indicated a portion of their review was for construction practices (e.g., traffic control, notification, and returning the right-of-way to its original condition) and safety of the devices. Once local approval is obtained from the district, the ROW Division will execute a lease.

Some districts indicated they use digital signatures to help speed up the lease process. Some districts indicated that they were only using it during remote work operations due to Covid-19 but see the advantages of using it moving forward.

Districts indicated that they are unsure about the fair market value for lease fees for surface saltwater pipelines and small cell nodes. These fees are set by the ROW Division, but districts indicated they were unsure if they should vary by location and length of installation. Several districts indicated that both surface and subsurface pipeline leases are significantly less expensive than leasing from private landowners adjacent to the right-of-way. In addition, companies only need to work with TxDOT rather than multiple landowners.

Violations for surface saltwater pipelines are somewhat common. Some districts indicated finding very few issues, while other indicated having issues with around half of their leases. Common issues noted include pipelines installed without a lease, pipelines installed improperly, and companies not placing signage with installations.

Districts mentioned that companies will try to work with expired leases rather than obtaining new ones. In addition, some companies will begin the application process, but when TxDOT sends them the draft lease for execution and payment, they do not send the payment or finalize the lease. They will then use the draft lease as if it is the fully executed version.

Maintenance issues were raised by several districts regarding saltwater pipelines and small cell leases. Districts noted that many companies do not return the right-of-way to its original condition after construction, including repairing sidewalks and roadside features. One issue is the number of companies involved after a lease is executed. Companies contract construction and

may have multiple contractors for different parts of construction. This creates communication lapses when the company does not pass information to all contractors.

Several districts mentioned there are instances where private companies claim to be a public company because they have a certificate from the Public Utility Commission of Texas. Most districts indicated that they review the intended use of the installation and determine whether it can be installed by lease, permit, or not at all. However, some districts mentioned that there are no issues with private companies installing facilities by permit because it is easy to check whether they are registered with the Public Utility Commission of Texas. This indicates that in the district's opinion, having a certificate from the commission makes their installations public use.

Feedback from External Stakeholders

Researchers gathered information from external stakeholders that lease TxDOT right-of-way for various purposes. Lease summaries were gathered from the TxDOT ROW Division and from districts to better understand the amount and types of leases. External stakeholders in the oil and gas, pipeline, telecommunications, and property management industries were identified from existing leases. The attributes of the leases were analyzed including physical installations, usages of the leases, and locations. Requests for discussions were sent to a cross cutting sample of stakeholders from each industry, focusing on those with the most experience leasing TxDOT right-of-way. Discussions with stakeholders were held to gather information about lease practices, valuation information, potential process improvements, and details about specific installations.

Information gathered from leases varied depending on the lease type. Saltwater pipeline leases, both surface and subsurface, provided information about the physical attributes of the pipelines, locations of the leases, and costs associated with the leases. Property leases detailed the type of lease, usage of the property, location of the property, and lease terms (i.e., costs and length of lease). Small cell leases noted the location of the lease, attributes of the installation, and costs associated with the lease.

Discussions were held with external stakeholders that had executed surface pipeline leases, subsurface pipeline leases, and property leases. No small cell node operators responded to the requests for discussions. The discussions focused on the lease process, right-of-way valuation information, and right-of-way management. Specifically, inefficiencies or issues in the leasing process were discussed. Topics included limitations that would result in companies seeking a lease on private property in lieu of TxDOT right-of-way, or that would result in companies violating terms of their lease. Right-of-way valuation practices were discussed to the extent possible since these practices could have been related to private companies' business operations. Right-of-way management practices were discussed, including access to install and maintain facilities.

Several common themes emerged from the discussion regarding lease processes. Many companies leasing the right-of-way indicated that digitizing the process as much as possible would be beneficial. This was most prevalent amongst companies executing many leases for surface saltwater pipelines. Another common theme that emerged about the leasing process was

the standardization of requirements across all districts. Many respondents indicated that details vary for what each district requests. Several companies also noted that having longer leases would be desirable and would give them more certainty in their business operations. If longer leases are acceptable, TxDOT should review its commonly assessed 3 percent annual inflation rate in light of recent inflation increases.

In general, surface and subsurface pipeline operators noted huge advantages to working with TxDOT compared to private landowners. This was because they only needed to negotiate or work with TxDOT rather than multiple property owners. Also, the companies know what TxDOT expects from them, and the lease terms are consistent from previous leases. A major advantage noted by surface pipeline operators was that the TxDOT right-of-way is open and clear compared to private property. Surface pipeline and subsurface pipeline operators indirectly acknowledged that leasing from TxDOT was cheaper than leasing from private property owners. Subsurface pipeline operators noted that if there were a significant number of utilities in the right-of-way it may be easier to work with private property owners.

Many of the surface saltwater pipeline operators noted that they would be in favor of executing leases with TxDOT to install pumps in the right-of-way and install lines in culverts under driveways that are parallel to the roads. They mentioned TxDOT developing standard rates for these installations.

Surface pipeline operators noted that while most companies abide by TxDOT's leasing policies, there are many small operators that do not. These companies will install surface pipelines (and occasionally pumps) for short periods of time and remove them before TxDOT finds them or finds out who is operating the pipeline.

TxDOT places the burden for maintenance on the companies that lease the right-of-way regardless of the type of lease and installation. Companies responded that this is fair. Surface pipeline operators noted they maintain vegetation to keep their pipelines visible. Subsurface pipeline operators commonly maintain the area above their pipelines on private property, and this is no different. Companies leasing the right-of-way for business purposes maintain the property as part of business operations.

VALUATION METHODOLOGY AND FRAMEWORK

The research team collected property valuation data from county tax assessors, TxDOT leases, and the Texas A&M Real Estate Center. In addition, the research team received a sample of TxDOT Connect property appraisal data from acquisitions throughout Texas. The research team processed and extracted fields of interest to determine land valuations for counties and TxDOT districts. Property valuations were found for rural land, all land, TxDOT property leases in urban areas, and TxDOT property leases in rural areas. Valuations were used to scale lease rates for rural, mid-sized urban, and urban areas. The proposed lease rates are based on land valuations and in general reduce lease rates in rural areas and increase them in urban areas.

The research team developed frameworks for displaying and assessing property valuations in Texas. Frameworks consisted of two tools, a spreadsheet-based valuation tool and a map-based valuation tool. The spreadsheet-based valuation tool allows a user to query a database of lease

and valuation information. The database also serves as the backbone of the map-based valuation framework. Users can select which county they want to view valuations and lease rates, which are displayed on the screen. The valuation frameworks were populated with data from several local appraisal districts and could be populated with additional data as the data become available.

The research team held workshops for TxDOT to provide an overview of the project and methodology and demonstrate the valuation frameworks. The target audience included TxDOT ROW Division staff as well as district permit coordinators. The workshops included a presentation from the research team introducing the project and frameworks, followed by a demonstration of the spreadsheet-based framework and map-based framework. Feedback from participants indicated that the frameworks could be useful to check professional appraisals, but not necessarily to appraise project parcels. As such, the tools could be useful to get a sense of the property value and some feedback if the appraisal provides a reasonable value.

Based on conversations with TxDOT's ROW Division and various districts, priorities for the valuation frameworks are ease of implementation, ease of maintenance (i.e., values can be updated on a regular basis without requiring significant staff time or resources), and transparency (i.e., lease rates are defensible and can be understood by various stakeholders). As described in previous chapters, the process to develop valuation data based on local appraisal data varied depending on the structure of the dataset included in the process, required skilled technical staff, and labor intensity. In addition, several datasets were unavailable or required annual fees. TxDOT could use the process developed by the research team to update valuation data on an annual basis using skilled internal staff or an external consultant. Alternatively, TxDOT could implement the categorical approach outlined in chapters 5 and 7. This approach, which divides the state into rural, mid-sized urban, and large urban categories, is closest to TxDOT's current practice but adjusts particularly urban values upwards based on average land values. Furthermore, the categorization of counties and the average land values used in this method come from analysis by the Texas A&M Real Estate Center. Assuming that the Real Estate Center continues to perform these studies and release similar figures on land value in future years, TxDOT would be able to update the categorization of counties and the lease values with relatively little data analysis.

APPRAISAL DATA IN TXDOT CONNECT

Researchers reviewed appraisal data in TxDOT Connect to determine if appraisal data collected in other TxDOT systems, including Onbase, could be used to improve data currently in TxDOT Connect and to determine if TxDOT Connect data could be used to update the valuation frameworks developed by the research team.

Researchers found that currently, as a parcel progresses through the acquisition process, only the last parcel stage is maintained in TxDOT Connect. It is unclear to what degree this affects related data that are stored with each parcel, such as appraisal data. Data that are updated throughout the acquisition currently might not be stored in TxDOT Connect. In addition, several items from appraisal reports are not transcribed to TxDOT Connect, such as pictures of the property, survey information, a location map, aerial photography, topographic map, and flood zone map, both for each parcel and for comparable sales properties. TxDOT Connect could be expanded to include

additional fields to store this information. Alternatively, appraisal reports in a PDF could be attached to the parcel records.

It appears that TxDOT Connect currently has sufficient fields to track parcels and associated comparable sales information. For example, researchers found several projects where TxDOT Connect provided for each parcel a list of appraisals with information from the ROW-A-5 form, including acquisition interest values, appraisal review, and comparable sales. Acquisition interest values appeared to come from the cost approach table, while comparable sales values appeared to come from the valuation grid of ROW-A-5.

The issue of linking appraisal data with data from local appraisal districts could be resolved by using data from the *Property ID/Tax Number* field. Researchers successfully linked the data to local appraisal data for a sample of records. However, the dataset provided by TxDOT indicated that about 76 percent of records did not have a valid property ID.

Researchers noted that not all data in TxDOT Connect is easily accessible. It is not always clear to a novice user that additional data for a parcel or improvement are available, and this additional information only becomes visible when selecting or double-clicking a parcel or improvement. TxDOT Connect could be modified to improve access to the data. Further, researchers noted that it was difficult to navigate within TxDOT Connect, especially when going forward and backward between parcels of a project. Often, TxDOT Connect would not be able to go back to the previous page, which required researchers to restart the parcel search at the project level. Overall, there is an opportunity to improve browser navigation within TxDOT Connect.

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APPENDIX A. ANALYSIS OF TXDOT APPRAISAL DATA

Table 48 provides further details about the TxDOT appraisal data reviewed for this project. The table shows what percentage of data for each attribute was unavailable for analysis.

Table 48. List of Attributes and Missing Data.

No.	Attribute	Missing
1	Parcel ID	0.0%
2	ROW Project CSJ	0.0%
3	District/Division	0.0%
4	Project County	0.0%
5	Project Highway	0.0%
6	Parcel Stage	0.0%
7	Parcel Status	0.0%
12	Organization	3.1%
13	Appraiser	3.1%
14	Appraisal Task	3.1%
26	Direct Access Denial Flag	3.1%
30	Owner Donation Value	3.1%
36	Enhancements	3.1%
37	Access	3.1%
17	Compensation Summary Total Compensation	3.1%
39	Compensation Summary Total Compensation_1	3.1%
40	Parcel Part ID	3.1%
42	Appraised Value Land Only	3.1%
15	Property Current Use	3.4%
19	Appraisal Format	3.6%
41	Interest Type	3.6%
20	Appraisal Usage	3.8%
24	Whole/Partial Acquisition	3.8%
22	Cost/Unit—Cost	4.2%

No.	Attribute	Missing
31	Whole Property	4.5%
21	Appraisal Report Date	4.5%
18	Appraisal As Of Date	4.9%
57	Appraisal Value	5.7%
29	ROW Manager Approved Amount	12.0%
32	Part To Be Acquired	12.0%
35	Net Damages	12.0%
38	Cost-To-Cure	12.0%
33	Value Remainder Before Taking	12.0%
34	Value Remainder After Taking	12.0%
43	Improvement ID	12.2%
50	Retention Value	12.2%
49	Appraised Value of Improvement	12.2%
44	Type	12.2%
51	Construction Type	13.2%
9	Parcel Possession Type	18.3%
23	Cost/Unit - Cost - Unit	18.7%
46	Measurement	19.5%
47	Unit of Measure	21.7%
52	Bisection Type	21.9%
45	Quantity	28.1%
48	Description	30.6%
10	Final Amount Paid	33.7%
28	Approval Date	42.5%
27	Is the Denial Direct Access Material?	45.2%
56	Completion Date	49.7%
59	Review Status	50.1%
54	Review Appraiser	50.3%

No.	Attribute	Missing
58	Review Appraiser Recommended Value	50.5%
8	Parcel Possession Date	50.7%
16	Property Highest/Best Use	53.4%
61	Whole Flag	58.0%
62	Part To Be Acquired Flag	58.0%
63	Remainder After Flag	58.0%
64	Land Flag	58.0%
65	Improved Flag	58.0%
67	Grantee	58.1%
66	Grantor	58.1%
69	Unit Price	58.2%
68	Date of Sale	58.5%
70	Relative Location	60.0%
55	Assignment Date	62.7%
11	Property ID/Tax Number	66.0%
71	Size (Acres)	77.0%
72	Size (Square Feet)	81.4%
60	Reviewer Notes	87.4%
25	Date of Take	90.2%
53	Bisection Clause	97.8%

APPENDIX B. VALUE OF RESEARCH

This appendix summarizes the procedure and calculations to estimate the value of research associated with this research. The research team considered two types of benefits: economic (or quantitative) and qualitative.

QUALITATIVE BENEFITS

The research team expects that an implementation of the proposed framework and the categorical approach to calculating lease rates would have the following qualitative benefits:

- Increased transparency about how lease rates are determined, which should lead to the new rates being better understood and accepted by lease applicants/holders.
- Improved consistency in lease rules and rate setting across districts. This will be appreciated by companies that apply for leases in multiple districts, particularly those in the oil and gas industry.
- Adjusted lease rates to be more in line with market value, meaning that some rural lease rates will decrease while large urban lease rates will increase. To the extent that lease applicants have a choice of location, this rate structure will incentivize them to avoid urbanized areas. For example, a drilling operation may have multiple choices of disposal wells for produced water. The proposed lease rates will encourage a saltwater pipeline route that avoids any town of 2,500 people or greater, even if that route is slightly longer.

QUANTITATIVE BENEFITS

The research team expects that adopting the proposed framework and categorical approach to calculating lease rates may increase TxDOT's revenue from leases. The impact of lease rate changes will vary by category, as described below:

- Aboveground saltwater pipeline lease rates are broken into four categories based on district land value. The exact impact on lease revenue will depend on where oil and gas activities take place in future years. Revenue could increase if more aboveground pipeline leases are executed in higher value districts, such as Corpus Christi, Odessa, and Fort Worth, or decrease if leases are concentrated in lower value districts such as Amarillo, Laredo, and Lubbock.
- Buried saltwater pipeline lease rates follow the same categories that are currently used, but the rates are adjusted based on average land values. Lease revenue could decrease in future years if most buried pipelines are placed in rural counties. However, the proposed rates in mid-sized and large urban counties are significantly higher than current rates, so revenue from counties such as Ector, Midland, and Webb could offset decreases in rates for rural counties.
- Small cell node leases could be a significant source of revenue since many are located in mid-sized and large urban counties, where the proposed rates are higher than the current rates.
- Property leases could also be a significant source of revenue, since many of these leases are in large urban counties and the analysis of land values suggests that they are currently well below market rates. The revenue impact for property leases is difficult to quantify

because values are very site-specific and some leases are set below market rates for policy reasons (e.g. parking leases to public agencies).