Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FHWA/TX-14/0-6892-1		

4. Title and Subtitle	5. Report Date
MANAGEMENT OF REAL PROPERTY ACQUISITION ACTIVITIES AT TXDOT	February 2017
	6. Performing Organization Code

7. Author(s)	8. Performing Organization Report No.
Cesar Quiroga, Ioannis Tsapakis, Edgar Kraus, and William Holik	Report 0-6892-1

9. Performing Organization Name and Address	10. Work Unit No. (TRAIS)
Texas A&M Transportation Institute College Station, Texas 77843-3135	11. Contract or Grant No. Project 0-6892

12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
Texas Department of Transportation Research and Technology Implementation Office P. O. Box 5080 Austin, Texas 78763-5080	Technical Report: September 2015–May 2016
	14. Sponsoring Agency Code

15. Supplementary Notes

Project performed in cooperation with the Texas Department of Transportation and the Federal Highway Administration.

Project Title: Integration of Right of Way Project Schedules for Decision-Making Purposes

URL: http://tti.tamu.edu/documents/0-6892-1.pdf

16. Abstract

The purpose of research project 0-6892 was (a) to compare project performance tools developed in the recently completed National Cooperative Highway Research Program (NCHRP) Project 20-84 against processes and schedules at the Texas Department of Transportation (TxDOT), and (b) to expand the national research by including a risk-based approach for conducting what-if scenarios and sensitivity analyses. TxDOT terminated the 0-6892 research early because of the possibility of potential overlap between the research deliverables and a new enterprise-level initiative to manage construction projects by tracking a large number of date stamps, including critical date stamps related to the acquisition and delivery of real property interests. This report summarizes activities completed and lessons learned while the 0-6892 research project was active. The report includes a review of similarities and differences between the reference NCHRP 20-84 process and the process for acquisition of real property at TxDOT. It also includes a detailed description of project schedule templates, including templates to manage the acquisition of real property interests, and a summary of interviews with TxDOT officials to gather information about real property acquisition and relocation assistance practices. The report also summarizes a detailed evaluation of Right of Way Information System (ROWIS) date stamp data to characterize the real property interest acquisition process statistically. The report highlights the use of spreadsheet templates by districts to manage the acquisition of real property interests. These templates contain a large number of date fields that broaden the collection of relevant date information compared to what is currently possible with ROWIS, particularly in the case of appraisals and relocation assistance services.

17. Key Words	18. Distribution Statement
Right of Way Acquisition, Real Property Interests, Project Delivery, Uniform Act	No restrictions. This document is available to the public through NTIS: National Technical Information Service Alexandria, Virginia 22312 http://www.ntis.gov

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	86	

Form DOT F 1700.7 (8-72) **Reproduction of completed page authorized**

MANAGEMENT OF REAL PROPERTY ACQUISITION ACTIVITIES AT TXDOT

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DISCLAIMER

The contents of this document 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 the Federal Highway Administration (FHWA) or the Texas Department of Transportation (TxDOT). This document does not constitute a standard, specification, or regulation, nor is it intended for construction, bidding, or permit purposes. The engineer in charge of the project was Cesar Quiroga, P.E. (Texas Registration #84274).

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.

ACKNOWLEDGMENTS

This research was conducted in cooperation with TxDOT and FHWA. The researchers gratefully acknowledge the advice and assistance of the project advisors at TxDOT. The researchers met with numerous other individuals at TxDOT to gather and/or complement data and information needed for the analysis. They gratefully acknowledge the valuable help and information received throughout the process.

TABLE OF CONTENTS

LIST OF FIGURES

Page

LIST OF TABLES

Page

LIST OF ACRONYMS, ABBREVIATIONS, AND TERMS

AASHTO	American Association of State Highway and Transportation Officials
CAD	Computer-aided design
CE	Categorical exclusion
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CSJ	Control section job
DCIS	Design and Construction Information System
DOT	Department of transportation
EA	Environmental assessment
EIS	Environmental impact statement
ESO	Enterprise Systems Office
FHWA	Federal Highway Administration
FONSI	Finding of no significant impact
FPAA	Federal Project Authorization and Agreement
GIS	Geographic information system
LPA	Local public agency
MPPM	Modernized Portfolio and Project Management
NCHRP	National Cooperative Highway Research Program
NEPA	National Environmental Policy Act
P6	Primavera Professional Project Management version 6
PDF	Portable document format
PPM	Portfolio project management
PS&E	Project, specifications, and estimate
QA/QC	Quality assurance/quality control
ROWIS	Right of Way Information System
SQL	Structured query language
TAC	Texas Administrative Code
TxDOT	Texas Department of Transportation
USC	U.S. Code

CHAPTER 1. INTRODUCTION

Inefficiencies in the process to acquire and manage real property have a significant impact on the ability of transportation agencies to develop and deliver transportation projects effectively. Acquisition of real property is frequently on the critical path of transportation projects. Delays in acquiring real property are one of the main reasons for project delays and cost overruns, along with utility relocations, errors in plans and specifications, weather, and permitting issues (*1*).

The purpose of recently completed National Cooperative Highway Research Program (NCHRP) Project 20-84 was to develop improved, integrated real property procedures and business practices during project delivery (*2*). One of the NCHRP 20-84 products was a prototype real property acquisition and relocation assistance schedule template for use in alternative analyses and decision-making. Another product was a set of strategies to address issues and challenges affecting the timely, effective delivery of real property interests. The research included a comparison of typical business practices against the requirements in the Uniform Act (as codified in 42 U.S. Code [USC] 4601 et seq.), but without regulatory encumbrances, more specifically provisions in 49 Code of Federal Regulations (CFR) 24 and 23 CFR 710 (*3*, *4*, *5*). The analysis included an evaluation of factors internal to the acquisition and management of real property as well as factors related to the integration of these activities with the rest of the transportation project development and delivery process.

The purpose of research project 0-6892 was to compare the project performance tools developed in NCHRP Project 20-84 against processes and schedules at the Texas Department of Transportation (TxDOT), expand the national research by including a risk-based approach for conducting what-if scenarios and sensitivity analyses, and adapt relevant strategies developed in NCHRP 20-84 to TxDOT business processes and practices. Anticipated implementable deliverables included the following:

- **Real property acquisition planning and management decision tool**. This deliverable included a real property acquisition work schedule in Oracle ® P6 Primavera format based on the lessons learned in NCHRP 20-84, typical protocols and procedures followed by districts, and TxDOT's recent modernization initiative. The deliverable would also expand the national research by including a risk-based approach for conducting what-if scenarios and sensitivity analyses as well as companion process diagrams, flowcharts, and presentation materials to explain the process.

- **Implementation strategies**. This deliverable included a set of strategies that were identified in NCHRP 20-84 and which would be tailored for use in real property acquisition and management activities at TxDOT.

Six months into the research, TxDOT officials informed the researchers of a separate initiative led by the recently established Enterprise Systems Office (ESO) at TxDOT to implement an enterprise-level system to manage construction projects more effectively. This capability will involve tracking a large number of date stamps, including critical date stamps related to the acquisition and delivery of real property interests. Because of the perception of potential overlap

between the anticipated 0-6892 deliverables and the ESO initiative, TxDOT decided to terminate the 0-6892 research effort.

This report summarizes the following activities that were completed while the 0-6892 research project was active:

- Review of current policy, manuals, and procedures, and identification of similarities and differences between the reference NCHRP 20-84 process and the process for acquisition of real property at TxDOT.

- Interviews with TxDOT officials to gather information about current real property acquisition and relocation assistance practices.

- Exploratory analysis of ROWIS data, with a focus on trends, frequency, and manner of use of date stamp data, as well as activity durations.

CHAPTER 2. COMPARISON BETWEEN REFERENCE NCHRP 20-84 PROCESS AND TXDOT PROCESS

INTRODUCTION

The researchers conducted a review of current policy, manuals, and procedures to identify similarities and differences between the reference process as depicted in the NCHRP 20-84 research and the process for acquisition of real property at TxDOT. First, the researchers compared NCHRP 20-84 project development and delivery activities against those typically followed at TxDOT. Second, they mapped the provisions in the Uniform Act (codified as 42 USC 4601 et seq.) to CFR provisions (more specifically 49 CFR 24 and 23 CFR 710) as well as Texas laws and regulations including 43 TAC and relevant chapters and sections in the TxDOT *Right of Way Manual* (*6*, *7*).

REFERENCE PROCESS AS DEPICTED IN THE NCHRP 20-84 RESEARCH

U.S. Constitution

The Fifth Amendment of the U.S. Constitution, ratified in 1791, prohibits taking real property for public purposes without the payment of just compensation (*8*). The Fourteenth Amendment of the U.S. Constitution, ratified in 1868, further requires states to follow due process when acquiring real property (*9*). Although the power of eminent domain is not explicitly stated in the U.S. Constitution, it is considered a basic principle of the U.S. Constitution that enables taking private property for public use (*10*).

Federal Law

The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (also known as the Uniform Act) was enacted as Public Law 91-646 in January 1971 (*3*). Its purpose was to ensure that people whose real property is acquired, or who are relocated because of projects receiving federal funds, are treated fairly and equitably and receive assistance in moving from the property they occupy. Of the several amendments to the law over the years, the most significant amendment took place as part of the Surface Transportation and Uniform Relocation Assistance Act of 1987.

The Uniform Act, codified as 42 USC 4601 et seq., includes three subchapters, as follows:

- Subchapter I – General Provisions.
- Subchapter II – Uniform Relocation Assistance.
- Subchapter III – Uniform Real Property Acquisition Policy.

Federal Regulations

Several federal laws bear on the acquisition of real property for public use, as described in the Federal Highway Administration (FHWA) *Project Development Guide* (*11*). The main source of federal regulation for implementing the Uniform Act is 49 CFR 24 (*4*). 49 CFR 24 includes seven subparts, as follows:

- Subpart A – General.
- Subpart B – Real Property Acquisition.
- Subpart C – General Relocation Requirements.
- Subpart D – Payments for Moving and Related Expenses.
- Subpart E – Replacement Housing Payments.
- Subpart F – Mobile Homes.
- Subpart G – Certification.

FHWA provides reimburses states and other jurisdictions for eligible costs they have incurred in developing and delivering highways and other transportation related projects. Relevant regulations are contained in 23 CFR 710, which includes six subparts, as follows (*5*):

- Subpart A – General.
- Subpart B – Program Administration.
- Subpart C – Project Development.
- Subpart D – Real Property Management.
- Subpart E – Property Acquisition Alternatives.
- Subpart F – Federal Assistance Programs.

23 CFR 345 prescribes policies, procedures, and provisions for the relocation, reimbursement, and accommodation of utility facilities on federal-aid and direct federal projects (*12*). 23 CFR 345 includes two subparts, as follows:

- Subpart A – Utility Relocations, Adjustments, and Reimbursement.
- Subpart B – Accommodation of Utilities.

23 CFR 771 prescribes policies and procedures at FHWA and the Federal Transit Administration (FTA) for implementing the National Environmental Policy Act (NEPA) of 1969, as amended, and the regulation of the Council on Environmental Quality (CEQ) (*13*).

NCHRP 20-84 Research Findings

As mentioned, the purpose of the NCHRP 20-84 research project was to develop improved, integrated real property procedures and business practices in the project development and delivery process (*2*). The analysis included a comparison of typical business practices against the requirements in the Uniform Act (as codified in 42 USC 4601 et seq.), but without regulatory encumbrances, more specifically provisions in 49 CFR 24 and 23 CFR 710.

The NCHRP 20-84 analysis included an evaluation of factors internal to the acquisition and management of real property as well as factors related to the integration of these activities with the rest of the transportation project development and delivery process. Typical right of way factors included, but were not limited to, appraisal and appraisal review, acquisition and negotiations, titles and closing, condemnation proceedings, settlements, relocation eligibility determination, relocation assistance and payments, and contracting for services. Also included were utility accommodation and relocation, property management, encroachment remediation, and administrative costs.

NCHRP 20-84 included a survey of all 50 state departments of transportation (DOTs) to assess real property acquisition and property management practices. Lessons learned from the national survey, follow-up interviews, and a peer exchange included the following:

- **Issues, challenges, and business practices**. The two most significant challenges identified by state DOTs were (a) changes to real property acquisition requirements late in the design phase and (b) lack of sufficient involvement of right of way staff during design. State DOTs also identified the lack of involvement by right of way personnel in the early phases of the project development process (planning and programming, preliminary design, and environmental process) as well as during utility coordination as a significant issue. Likewise, respondents highlighted critical staffing issues as a challenge, including difficulty in hiring and retaining staff with adequate real property acquisition experience and staff turnover.

- **Outsourcing real property activities**. In general, state DOTs value using consultants when the internal workload is heavy and the DOT does not have the resources to accommodate the demand. However, feedback from state DOTs indicates there are serious issues in terms of effectively utilizing consultant staff. Examples of issues include the quality of deliverables, quality of customer service, and amount of management oversight required. Other issues include higher overall costs to the state DOT and higher condemnation rates when utilizing consultants versus internal staff.

- **Performance measures**. State DOTs use or have a need for a variety of performance measures in connection with the acquisition of real property for transportation projects. However, although most participants agreed about the need to measure the effectiveness

of the real property acquisition process, several participants cautioned about using performance measures blindly in the context of a process that involves taking private property for the benefit of a transportation project.

- **Changes to laws and regulations**. Only a few participants indicated that there was an urgent need for changes to laws and regulations (whether federal or state). Participants did highlight the need for some changes, e.g., in relation to appraisal waiver limits, relocation benefits for businesses, and timelines related to condemnation proceedings.

- **Business practices, unique processes, and strategies**. Participants provided a substantial amount of feedback regarding business practices, unique processes, and strategies their agencies have implemented, or are planning to implement, to streamline real property processes. For example, participants highlighted the need to improve internal coordination within their agencies, particularly with respect to the timing of involvement of right of way personnel in the project delivery process. Participants also highlighted the need for a more effective coordination with external stakeholders, e.g., federal agencies, railroad companies, and utility owners.

- **Training**. State DOTs provide two types of training and development opportunities, in-house and external, in addition to on-the-job training and mentoring. Some of the courses are state certified or pre-approved for continuing education credits for real estate and appraisal licensing. Some agencies have agreements with colleges in their state that offer courses on real property topics. Participants highlighted that training opportunities have decreased substantially in recent years due to budgetary constraints.

- **Property management**. Agencies use a variety of data management platforms for property management purposes. Although databases and web-based mapping tools are increasingly used, computer-aided design (CAD) or geographic information system (GIS) platforms are not used frequently to support property management activities. The most significant challenge in this area identified by participants was difficult-to-use databases or information systems to manage real property assets. Participants also highlighted difficulty in tracking and monitoring real property use as an issue, including how to deal with illegal or unauthorized encroachments.

NCHRP 20-84 resulted in the following products:

- An integrated model of the transportation project delivery process and a real property acquisition and relocation assistance model in accordance with 42 USC 4601 et seq.

- A reference real property acquisition and relocation assistance work schedule.

- A detailed list of improvement or optimization strategies to address issues and challenges affecting project delivery process activities with significant real property components.

The integrated model included diagrams at three levels (in Microsoft® Visio 2010® format and portable document format [PDF]), as follows:

- **Level 1**. This model provides a high-level depiction of the entire process (Figure 1).
- **Level 2**. This model provides an intermediate level of depiction of the entire transportation project development and delivery process (Figure 2).
- **Level 3**. This model provides a detailed depiction of the real property acquisition process according to the Uniform Act, as codified in 42 USC 4601 et seq. (Figure 3).

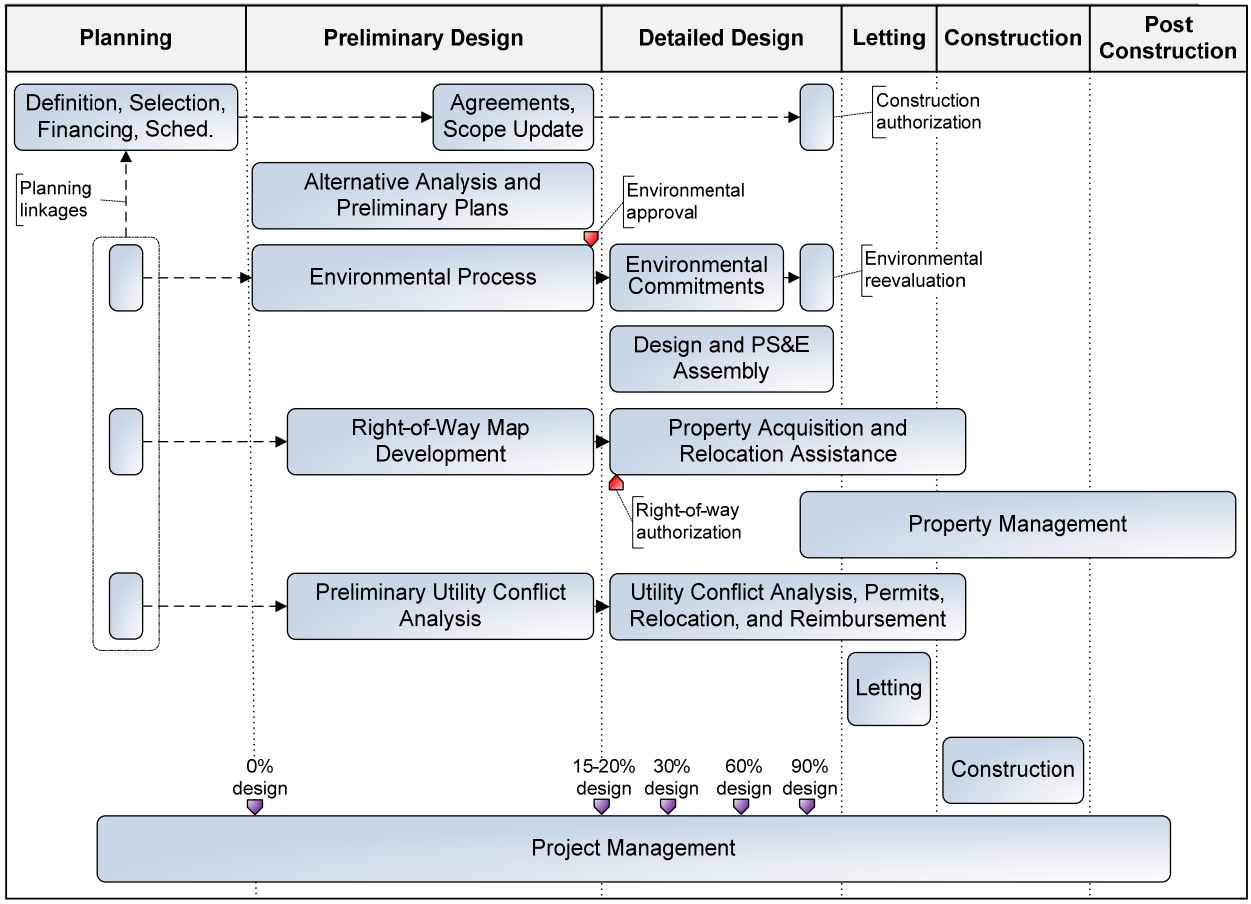


Figure 1. Typical Project Development and Delivery Process (Level 1 Model) (*2*).

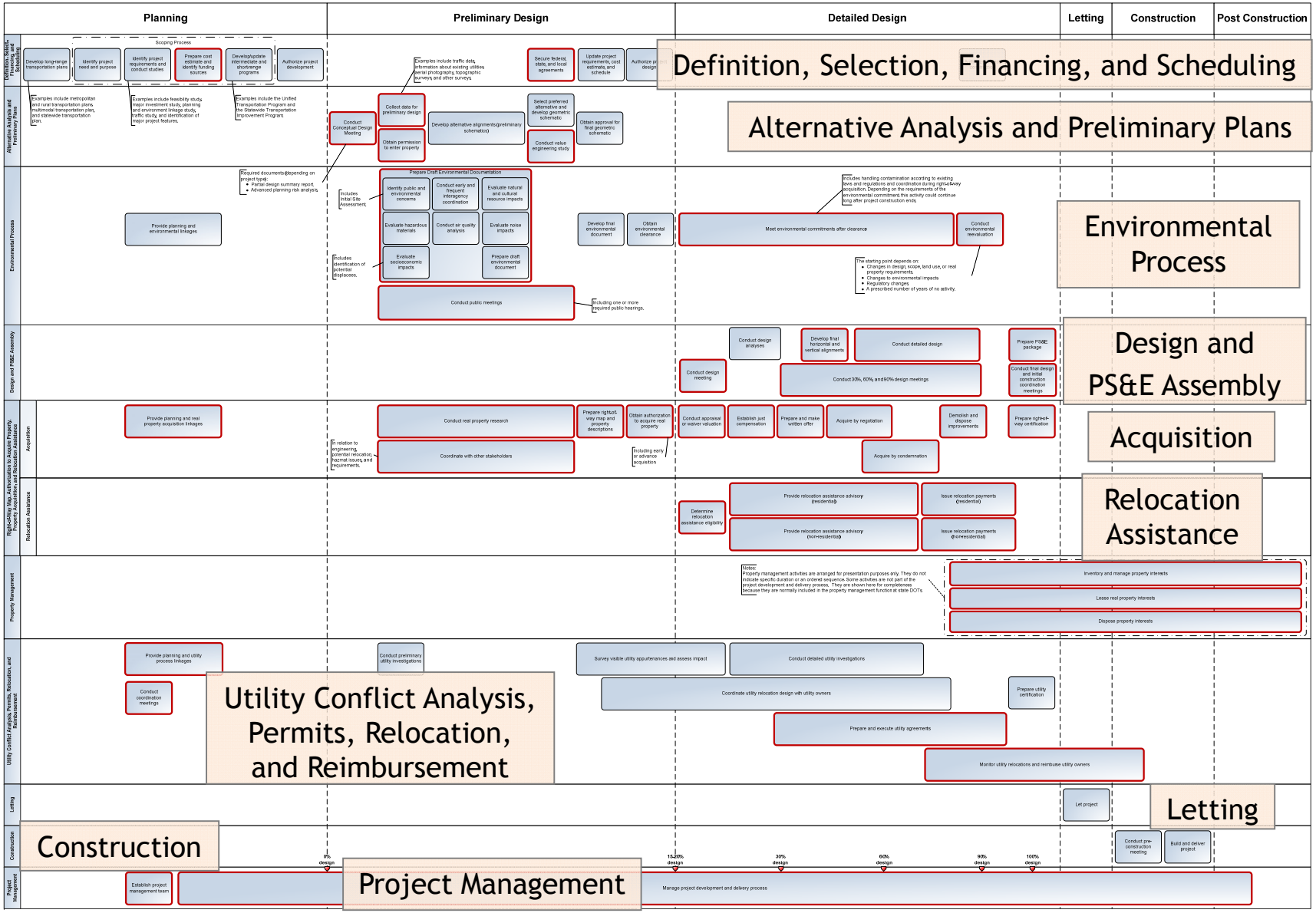


Figure 2. Typical Project Development and Delivery Process (Level 2 Model) (*2*).

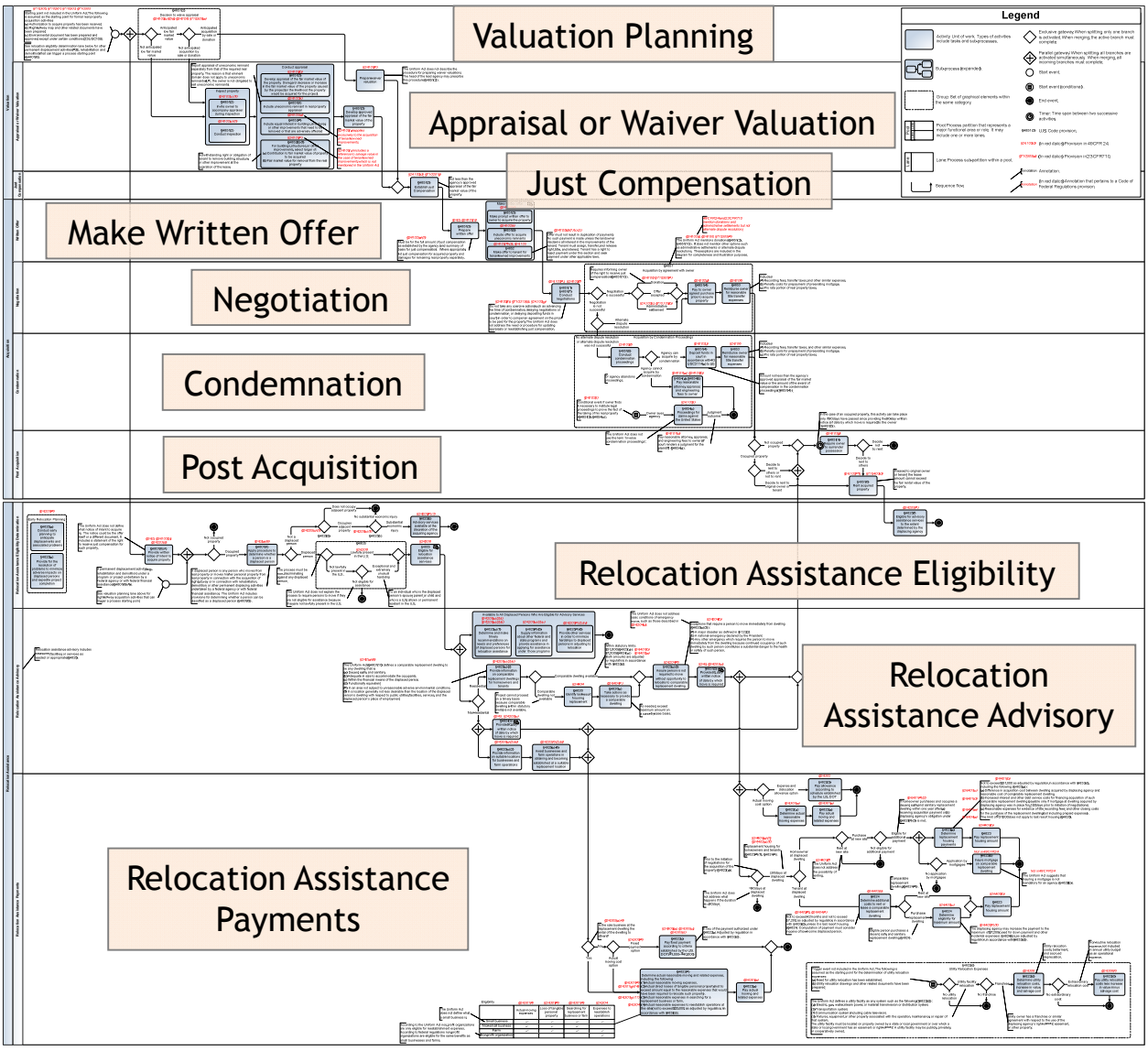


Figure 3. Real Property Acquisition According to the Uniform Act (Level 3 Model) (*2*).

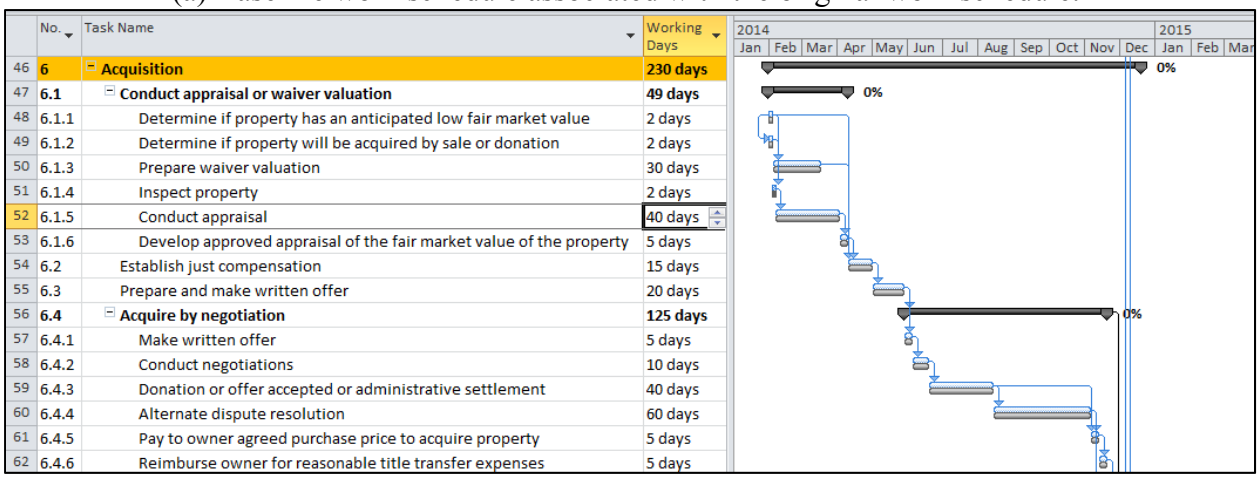
Reference Real Property Acquisition and Relocation Assistance Work Schedule

The NCHRP 20-84 research produced a reference work schedule in Microsoft Project 2010 that incorporates the requirements in the Uniform Act into a reference transportation project and delivery process. The work schedule includes tasks that represent Level 2 model swim lanes and activities, as well as Level 3 model activities.

The reference work schedule could be used for a variety of applications, e.g., for assigning resources to tasks, managing project budgets, analyzing workloads, facilitating coordination with internal and external stakeholders, adjusting schedules, monitoring project progress, and preparing reports. As an illustration, Figure 4 demonstrates the use of baselines for monitoring the progress of a project. Figure 4(a) shows a baseline that represents a hypothetical original

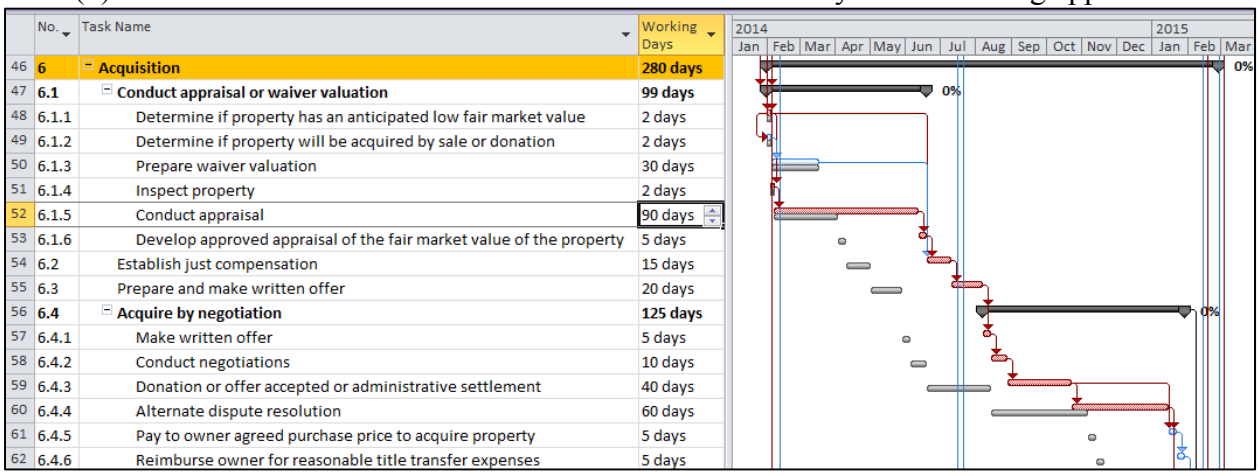
condition that assumes the duration of the appraisal to be 40 days. Figure 4(b) shows the baseline and a modified schedule that result from delaying the completion of the appraisal by 50 days, making Task 6.1.5 (conduct appraisal) part of the critical path.

(a) Baseline work schedule associated with the original work schedule.



	No.	Task Name	Working Days
46	**6**	**Acquisition**	**230 days**
47	**6.1**	**Conduct appraisal or waiver valuation**	**49 days**
48	6.1.1	Determine if property has an anticipated low fair market value	2 days
49	6.1.2	Determine if property will be acquired by sale or donation	2 days
50	6.1.3	Prepare waiver valuation	30 days
51	6.1.4	Inspect property	2 days
52	6.1.5	Conduct appraisal	40 days
53	6.1.6	Develop approved appraisal of the fair market value of the property	5 days
54	6.2	Establish just compensation	15 days
55	6.3	Prepare and make written offer	20 days
56	**6.4**	**Acquire by negotiation**	**125 days**
57	6.4.1	Make written offer	5 days
58	6.4.2	Conduct negotiations	10 days
59	6.4.3	Donation or offer accepted or administrative settlement	40 days
60	6.4.4	Alternate dispute resolution	60 days
61	6.4.5	Pay to owner agreed purchase price to acquire property	5 days
62	6.4.6	Reimburse owner for reasonable title transfer expenses	5 days

(b) Baseline work schedule versus work schedule after delays in conducting appraisal.



	No.	Task Name	Working Days
46	**6**	**Acquisition**	**280 days**
47	**6.1**	**Conduct appraisal or waiver valuation**	**99 days**
48	6.1.1	Determine if property has an anticipated low fair market value	2 days
49	6.1.2	Determine if property will be acquired by sale or donation	2 days
50	6.1.3	Prepare waiver valuation	30 days
51	6.1.4	Inspect property	2 days
52	6.1.5	Conduct appraisal	90 days
53	6.1.6	Develop approved appraisal of the fair market value of the property	5 days
54	6.2	Establish just compensation	15 days
55	6.3	Prepare and make written offer	20 days
56	**6.4**	**Acquire by negotiation**	**125 days**
57	6.4.1	Make written offer	5 days
58	6.4.2	Conduct negotiations	10 days
59	6.4.3	Donation or offer accepted or administrative settlement	40 days
60	6.4.4	Alternate dispute resolution	60 days
61	6.4.5	Pay to owner agreed purchase price to acquire property	5 days
62	6.4.6	Reimburse owner for reasonable title transfer expenses	5 days

Figure 4. Use of Baselines Before and After Changes to the Work Schedule (*2*).

Strategies for Improvement or Optimization

The NCHRP 20-84 research included an analysis of key elements of the state project development and delivery process with a focus on process activities with a significant real property component. Table 1 provides a summary of all the issues, challenges, and strategies that were identified during the research. In total, the research identified 153 issues and challenges as well as 176 strategies for improvement or optimization. It is worth noting that more than 140 of the 176 unique strategies for improvement or optimization listed in Table 1 are process-related strategies that state DOTs could implement without the need for changes in laws or regulations.

Table 1. Issues, Challenges, and Strategies for Improvement or Optimization (*2*).

Project Development and Delivery Process Activity with a Significant Real Property Component	No. of Issues Identified	No. of Strategies Identified
DEFINITION, SELECTION, FINANCING, AND SCHEDULING	**14**	**15**
Prepare Cost Estimate and Identify Funding Sources	6	12
Secure Federal, State, and Local Agreements	8	3
ALTERNATIVE ANALYSIS AND PRELIMINARY PLANS	**7**	**8**
Conduct Conceptual Design Meeting	2	2
Collect Data for Preliminary Design	1	2
Obtain Permission to Enter Property	3	2
Conduct Value Engineering Study	1	2
ENVIRONMENTAL PROCESS	**7**	**14**
Prepare Draft Environmental Documentation	1	5
Conduct Public Meetings	2	4
Meet Environmental Commitments after Clearance	2	3
Conduct Environmental Reevaluation	2	2
DESIGN AND PS&E ASSEMBLY	**11**	**12**
Conduct Design Meeting	2	5
Develop Final Horizontal and Vertical Alignments	3	1
Conduct Detailed Design	2	1
Conduct 30%, 60%, and 90% Design Meetings	1	1
Prepare Project, Specifications, and Estimate (PS&E) Package	1	2
Conduct Final Design and Initial Construction Coordination Meetings	2	2
RIGHT OF WAY MAP, AUTHORIZATION TO ACQUIRE PROPERTY, PROPERTY ACQUISITION, AND RELOCATION ASSISTANCE	**93**	**99**
Provide Planning and Real Property Acquisition Linkages	1	1
Conduct Real Property Research	2	5
Coordinate with Other Stakeholders	6	5
Prepare Right of Way Map and Property Descriptions	7	4
Obtain Authorization to Acquire Real Property	2	2
Conduct Appraisal or Waiver Valuation	14	13
Establish Just Compensation	1	2
Prepare and Make Written Offer	3	5
Acquire by Negotiation	13	15
Acquire by Condemnation	7	5
Demolish and Dispose Improvements	2	2
Prepare Right of Way Certification	1	1
Determine Relocation Assistance Eligibility	10	9
Provide Relocation Assistance Advisory (Residential)	7	7
Provide Relocation Assistance Advisory (Non-Residential)	5	5
Issue Relocation Payments (Residential)	8	11
Issue Relocation Payments (Non-Residential)	4	7

Table 1. Issues, Challenges, and Strategies for Improvement or Optimization (*2*) (continued).

Project Development and Delivery Process Activity with a Significant Real Property Component	No. of Issues Identified	No. of Strategies Identified
PROPERTY MANAGEMENT	**16**	**15**
Inventory and Manage Property Interests	9	7
Lease Property Interests	2	3
Dispose of Property Interests	5	5
UTILITY CONFLICT ANALYSIS, PERMITS, RELOCATION, AND REIMBURSEMENT	**10**	**10**
Provide Planning and Utility Process Linkages	2	2
Conduct Coordination Meetings	2	2
Prepare and Execute Utility Agreements	3	4
Monitor Utility Relocations and Reimburse Utility Owners	3	2
PROJECT MANAGEMENT	**3**	**6**
Establish Project Management Team	1	2
Manage Project Development and Delivery Process	2	4
OTHER[1]	**13**	**16**
Program Management and Administration[1]	2	3
Staffing and Training[1]	6	8
Outsourcing[1]	5	5

CURRENT REAL PROPERTY ACQUISITION PROCESS AT TXDOT

Texas Constitution

Section 17 of Article 1, Bill of Rights, in the Texas Constitution prohibits taking private property for public use without adequate compensation, unless by the consent of that person in specific cases (*14*). If TxDOT acquires property through condemnation but the property is no longer needed for a transportation purpose, TxDOT might sell the property using the provisions of Section 52j, Sale of Real Property Acquired through Eminent Domain. These provisions were added to the Texas Constitution in 2007 (*15*). In 2009, section 17 of Article 1 was amended to establish specific limitations on the term 'public use,' and limiting how the legislature's authority may grant powers of eminent domain, for example to a local entity (*16*).

Texas Laws

The Texas Transportation Commission has the power of eminent domain as codified in the Transportation Code (*17*). The power of eminent domain has limitations, e.g., municipalities cannot use it to condemn right of way owned by a railroad (*18*). In addition, the Texas Property Code states that real property interest acquired through condemnation does not include the fee simple title to real property, unless expressly provided by law (*19*). In that regard,

Transportation Code Section 203.051 expressly authorizes the Transportation Commission to exercise the power of eminent domain to acquire an interest in real property and to condemn the simple fee or a lesser interest in the property (*17*).

Title 4 of the Texas Property Code provides the legal background for condemnation proceedings using the power of eminent domain in terms of jurisdiction, procedures, damages and costs, judgments, and repurchase of real property from the condemning entity (*20*). For example:

- Section 21.0111 provides requirements for the disclosure of certain information and the initial offer (*21*). This section includes the manner by which an entity with eminent domain powers must disclose the initial offer and the maximum allowable time to notify affected parties in a timely manner.

- Section 21.0112 requires providing a copy of the Landowner's Bill of Rights to a property owner whose property may be acquired by eminent domain (*22*). The Texas Government Code Section 402.031 provides a listing of the required content of the Landowner's Bill of Rights (*23*).

- Section 21.0113 states the requirement of entities with eminent domain power to make a bona fide offer to acquire the real property from the property owner voluntarily. All offers must be in writing and must inform the owner of the owner's right to discuss the offer with others or to keep the offer confidential (*24*).

- Section 21.046 is a description of a relocation assistance program that provides for relocation payments and advisory assistance (*25*). This section directs agencies to establish rules and regulations to carry out provisions of the Uniform Act, and authorizes payments and expenditures not in excess of those authorized by the Uniform Act.

Texas Regulations

A number of regulations in the Texas Administrative Code (TAC) apply to the acquisition of real property interests, including the following:

- 43 TAC Chapter 15 includes regulations for cost participation and cost sharing (*26*).

- 43 TAC Chapter 21 includes regulations for real property acquisition (*27*).

- 43 TAC Chapter 1 includes regulations for donations of private property to the state (*28*).

- 43 TAC Chapter 21 includes regulations for disposal of real property (*29*).

- 43 TAC Chapter 21 includes regulations for relocation assistance to displaced persons and businesses.

- 43 TAC Chapter 21 includes regulations for managing property, such as passes, junkyards and automobile graveyards, outdoor advertising signs, leases, quarries, and saltwater pipelines.

Project Development and Delivery Process at TxDOT

As mentioned, NCHRP project 20-84 developed reference project development and delivery process charts at three levels of detail: Level 1 (high-level depiction of the entire process), Level 2 (intermediate level of depiction of the entire process), and Level 3 (detailed description of activities pertaining to the Uniform Act, as codified in 42 USC 4601 et seq.). To facilitate the analysis, the researchers prepared TxDOT project delivery process charts at Level 1 and Level 2 to compare the reference NCHRP 20-84 process and the TxDOT process. The Level 1 process diagram for Texas is essentially the same as the reference NCHRP 20-84 model and is shown in Figure 5. The Level 2 diagram for Texas only has two minor differences compared to the reference NCHRP 20-84 model. For simplicity, the Level 2 diagram for Texas is not shown here. The differences are primarily due to terminology that is commonly used at TxDOT.

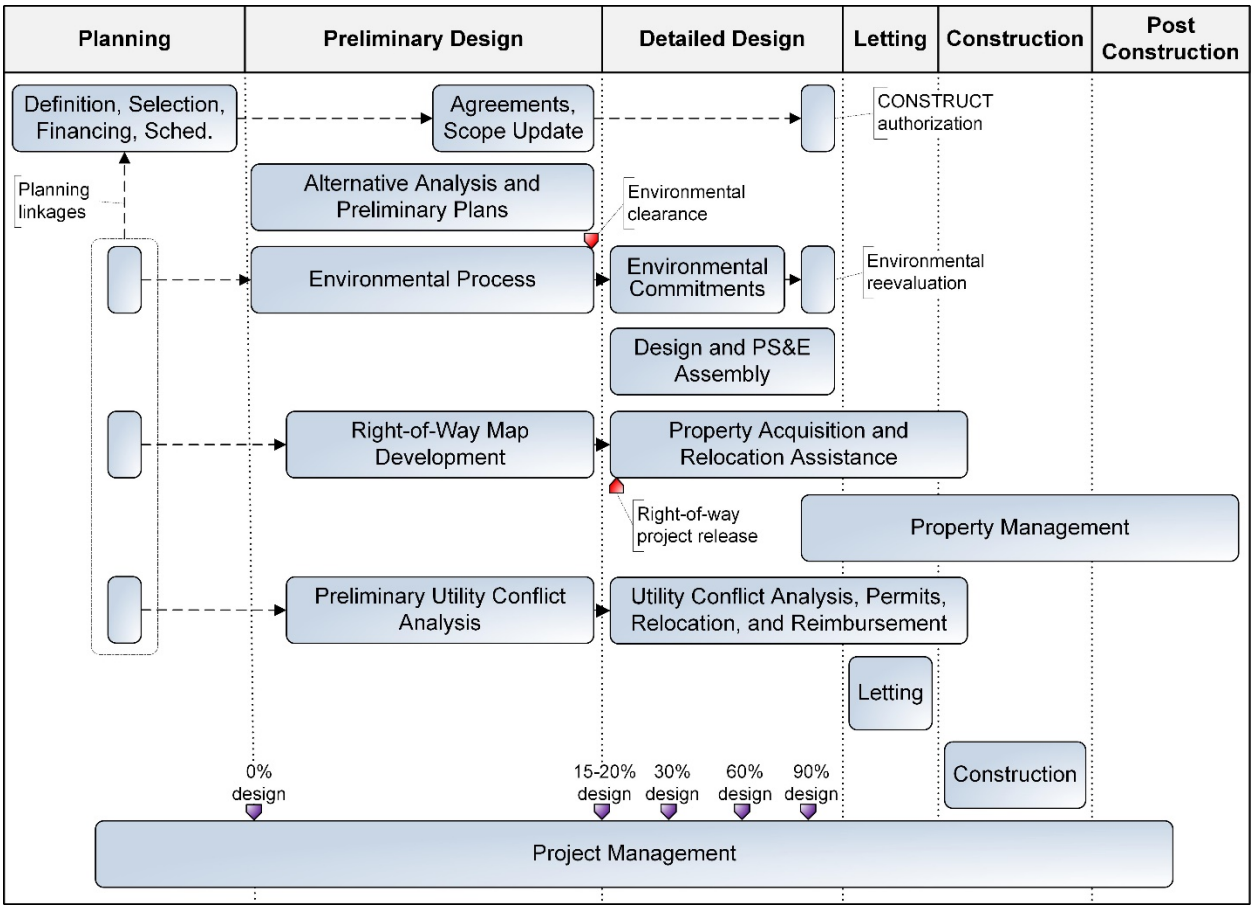


Figure 5. TxDOT Project Development and Delivery Process (Level 1 Model).

TxDOT acquires property interests for transportation projects by using right of way projects that usually require the following (*6, 30*):

- The Transportation Commission has approved the project at a Develop level.
- The project has an approved schematic. This includes approval by the TxDOT Design Division, and if applicable, FHWA.
- The project's public involvement requirements have been fulfilled.
- The project has environmental clearance, specifically approval of one of the following documents, obtained through the TxDOT Environmental Affairs Division:
    - Environmental impact statement (EIS).
    - Environmental assessment (EA).
    - Categorical exclusion (CE).
    - Finding of no significant impact (FONSI).
    - Concurrence that the project is a non-major action project.
- The project has a right of way map that was approved by the appropriate TxDOT district.
- Agreements with local public agencies (LPAs) to contribute funds have been executed.
- FHWA has issued a Federal Project Authorization and Agreement (FPAA), if applicable (*7*).

With these documents in place, the TxDOT Right of Way Division issues a full project right of way release. This release authorizes the acquisition of right of way, relocation of displaced persons or businesses, and removal of property improvements. The right of way release is also the notice to the TxDOT Finance Division to appropriate funds and issue the General Expenditure Authorization. Once the full release is issued, a district can request a right of way control section job (CSJ) number, which allows the district to charge right of way acquisition costs (*7*).

In reality, TxDOT uses seven different types of right of way releases: four that require an environmental clearance (frequently referred to as "regular" right of way releases) and three that do not (frequently referred to as "early" or "limited" right of way releases) (*7*, *30*). All right of way releases require a minute order from the Transportation Commission authorizing the project and a request from the applicable district for the particular type of right of way release. It is worth noting that "early" acquisition is different from "advance" acquisition, which refers to the acquisition of options, as authorized in Section 202 of the Transportation Code (*31*).

Regular right of way releases can be one of four types: full release, partial release, limited release for relocation assistance, and limited release for utility work. Full release and limited release for utility work have the same documentation requirements. A partial release has the same documentation requirements as a full release but only for a number of specific parcels (compared

to all right of way parcels on a project). A limited release for relocation assistance has the same requirements as a full release, except that FPAA authorization and LPA agreement documentation are not required.

Early or limited right of way releases enable the acquisition of real property interests ahead of the environmental clearance and can be of one of three types: limited release for utility investigation, limited release for appraisal work, and early acquisition. These releases also require project authorization and a request from the applicable district for the particular type of right of way release. In addition, these releases also require approval by the director of the Right of Way Division. The limited release for appraisal work also requires an approved right of way map that is administratively complete, and, if applicable, an FPAA. The early acquisition release further requires, if applicable, executable LPA agreements and a minute order approving a donation.

A large number of forms as well as a few process flowcharts complement the information included in the manuals. Figure 6 through Figure 11 provide a graphical depiction of the process to acquire and manage property interests at TxDOT.

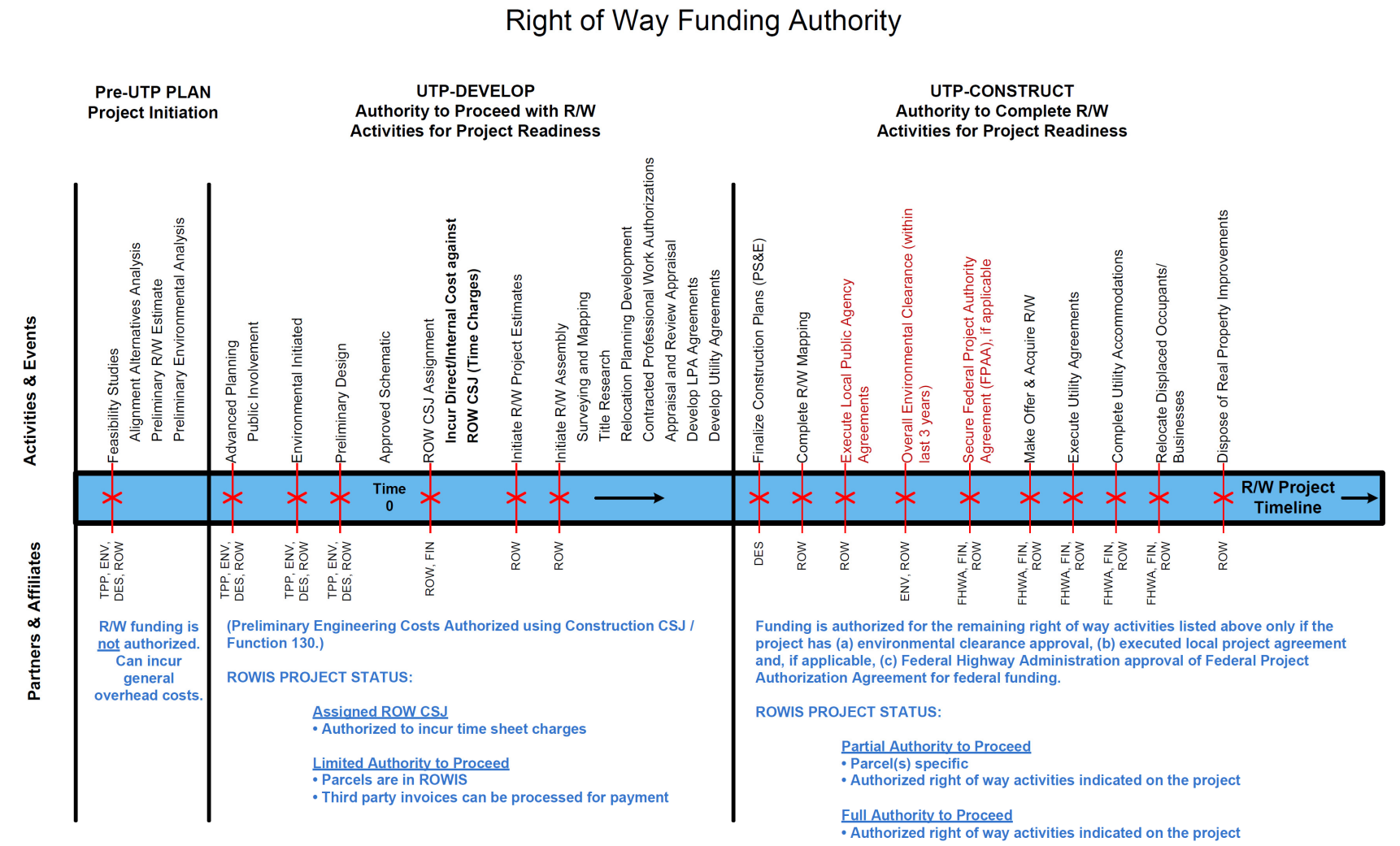


Figure 6. Right of Way Funding Authority Timeline.

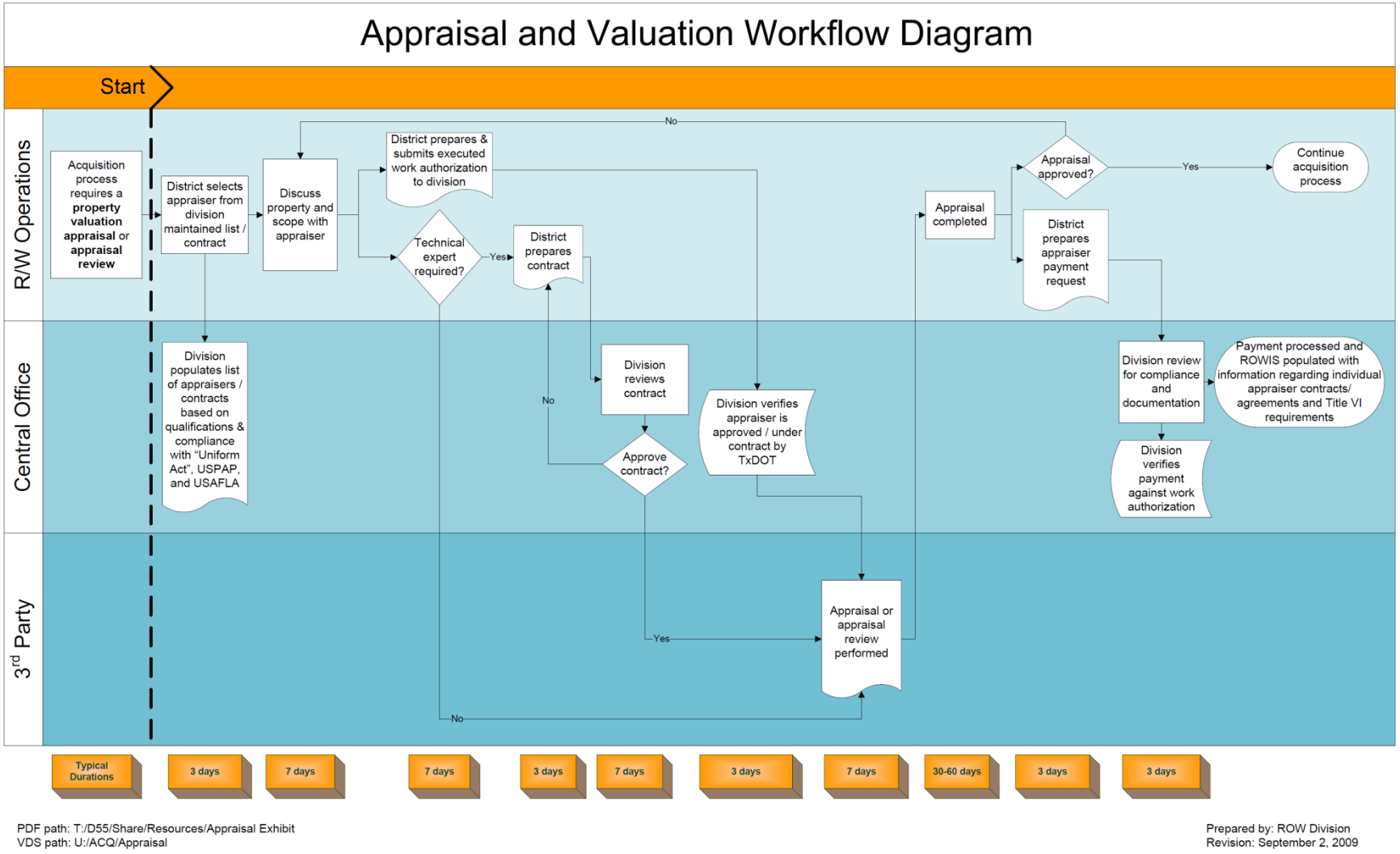


Figure 7. Appraisal and Valuation Workflow Diagram.

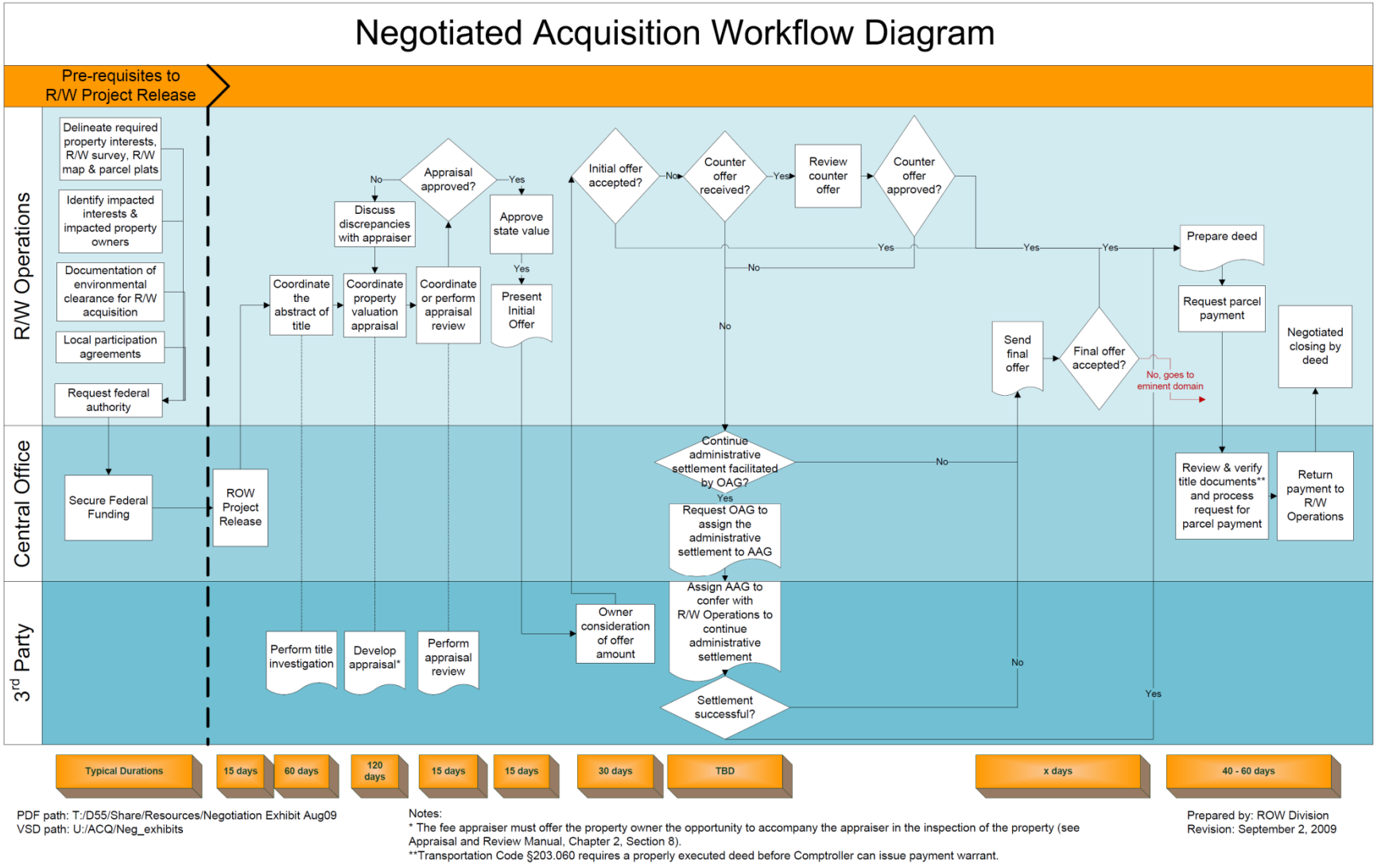


Figure 8. Negotiated Acquisition Workflow Diagram.

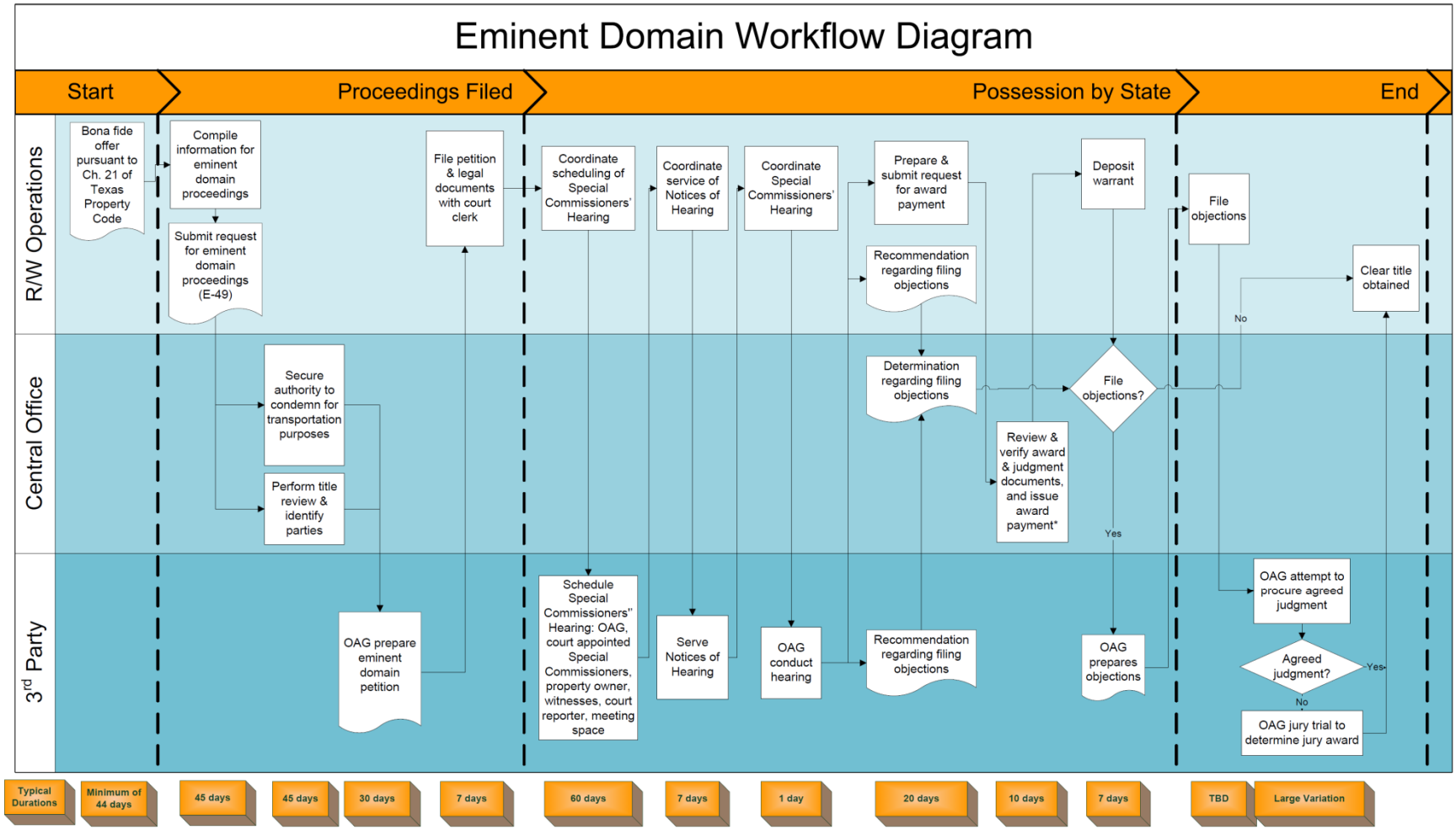


Figure 9. Eminent Domain Workflow Diagram.

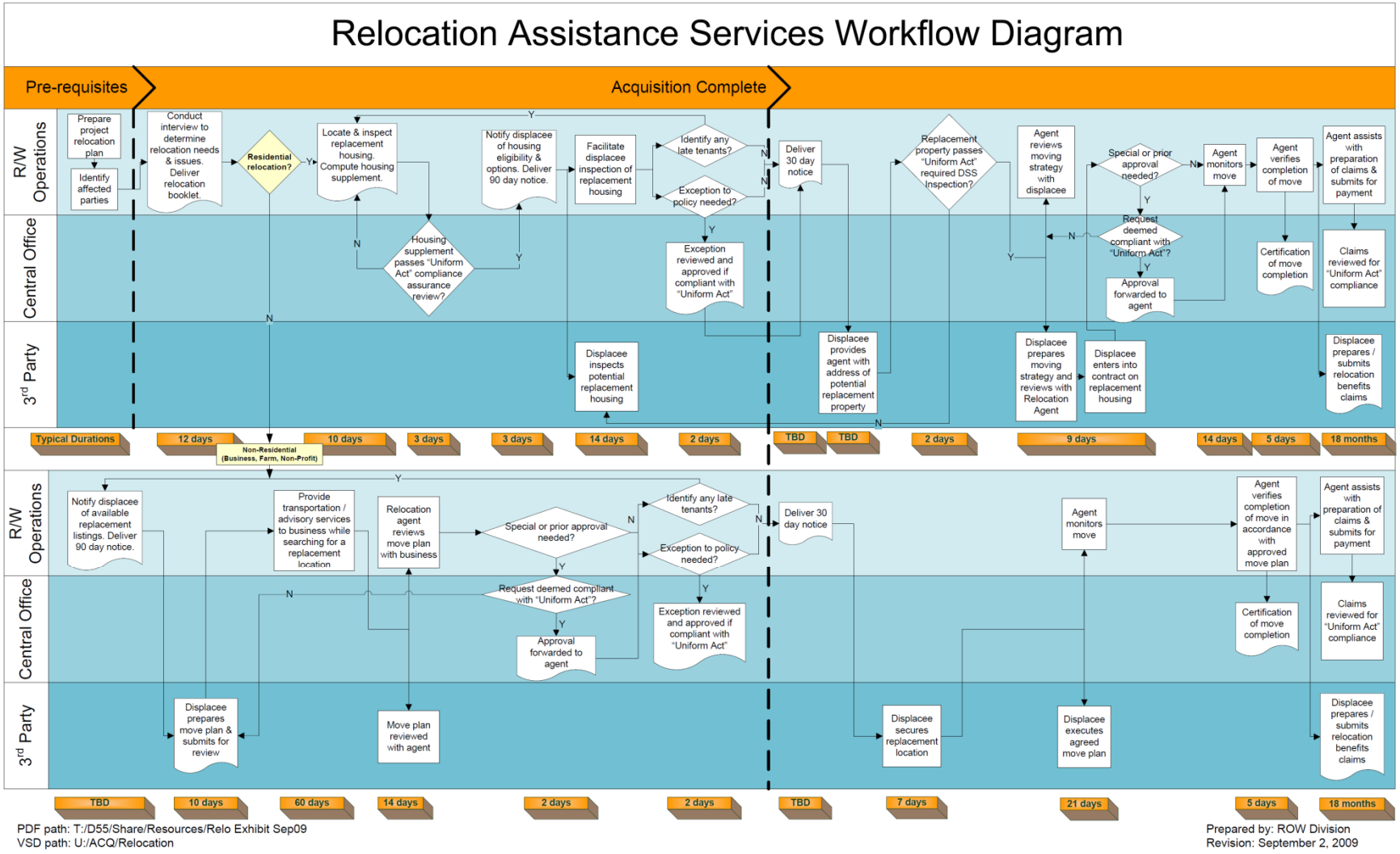


Figure 10. Relocation Assistance Services Workflow Diagram.

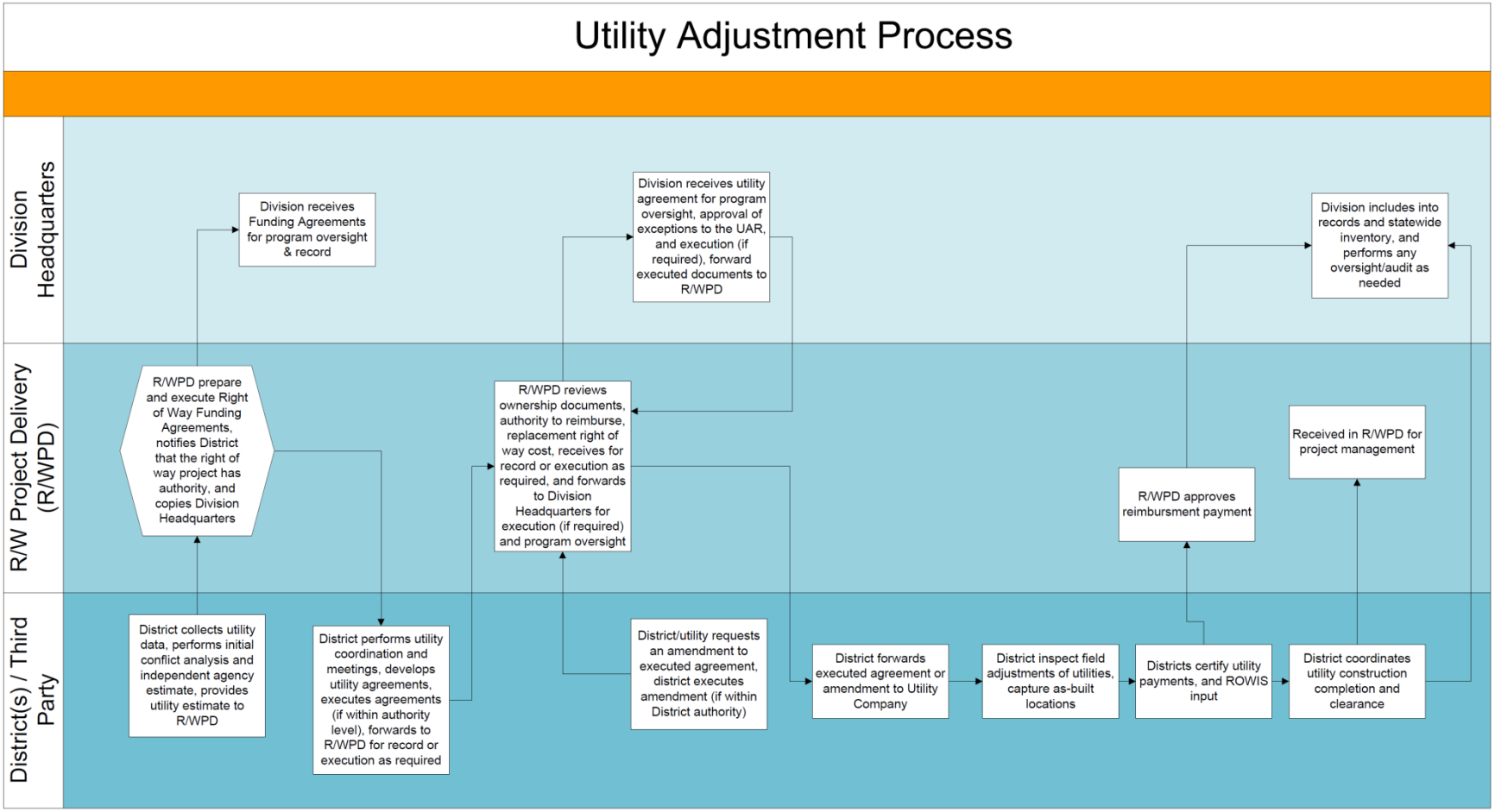


Figure 11. Utility Adjustment Process.

Right of Way Information System

The Right of Way Division implemented ROWIS in 1997 to track and report financial data associated with the acquisition of real property interests for transportation projects (*32*). The system enables users to capture, track, and report on property acquisition processes such as right of way parcel development during negotiations, settlements, or eminent domain proceedings. The Right of Way Division also uses ROWIS to track reimbursable utility agreement payments by creating parcel records in ROWIS to represent utility agreements. Figure 12 provides a screenshot of the ROWIS user interface.

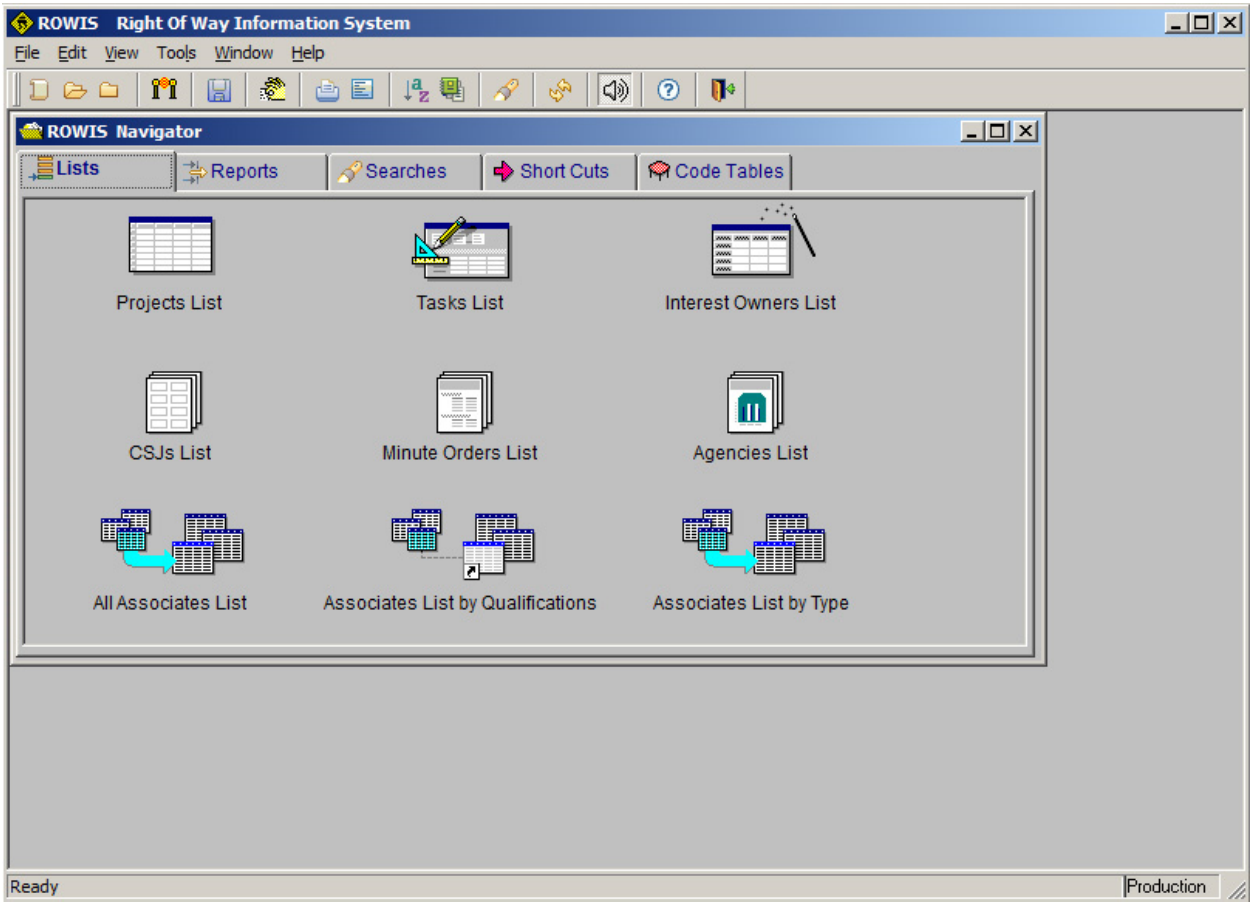


Figure 12. ROWIS Screenshot.

ROWIS runs on a Microsoft® Structured Query Language (SQL) Server™ database platform. Table 2 provides a listing of most tables in ROWIS (*33*). Figure 13 shows a high-level representation of the ROWIS logical data model that only includes the most relevant entities.

Table 2. ROWIS Tables.

AGENCIES	INVOICES	PBCATVLD
APPRAISALS	INVOICES TASKS	PROJECTS
APPRAISED ITEMS	LEGAL NAMES	PRSNL PROP MOVES
ASSOCIATES	LOGIC DRILLDOWN	QUALIFICATIONS
ASSOCIATES DISTRICTS	LOGIC HELP	RENTAL SUPPLEMENTS
ASSOCIATES TASKS	LOGIC LINK	REPORTS SCHEDULED
ASSOCTASK DISPLACEE	LOGIC SEARCH	RESIDENTIAL MOVES
AUDIT LOG	LOGIC WINDOW	ROWIS STATS
CACHE CONTROL	LOGIC WINDOW CONTROL	SECURITY APPS
COMMENTS	MAP SHEET INDEX	SECURITY GROUPINGS
COMPONENTS	MESSAGES	SECURITY INFO
CONTROL SECTION JOBS	MINUTE ORDERS	SECURITY TEMPLATE
CONTROL SECTION JOBS PARCELS	MINUTE ORDERS PARCELS	SECURITY USERS
DISPLACEE	MINUTE ORDERS PROJECTS	SEGMENTS
DISPLACEE DOCUMENTS	NEW ROWIS LOGINS	SEQUENCE NBRS
DOCUMENTS	NON RESIDENTIAL MOVES	STATUS VALUES
ENCUMBRANCES	PARCELS	TASKS
ESTIMATED EXPENSES	PARTICIPATING AGENCIES	TEMP ASSOCIATES TASKS REF
EVENT HISTORY	PARTICIPATING AGENCIES DEPOSIT	TEMP OWNER REFERENCE
EXP CATG CD	PARTICIPATING AGENCIES PARCELS	TEMP PARCEL REFERENCE
EXP TYPE CD	PAYMENT ERRORS	TEMP PROJ PARCEL REFERENCE
FORMS	PAYMENTS	TXDOT DISTRICTS
HOUSING SUPPLEMENTS	PBCATCOL	TYPE CODES
IMPROVEMENTS	PBCATEDT	WORKORDERS
INTEREST OWNERS	PBCATFMT	WORKORDERS TASKS
INTEREST OWNERS ITEMS	PBCATTBL	

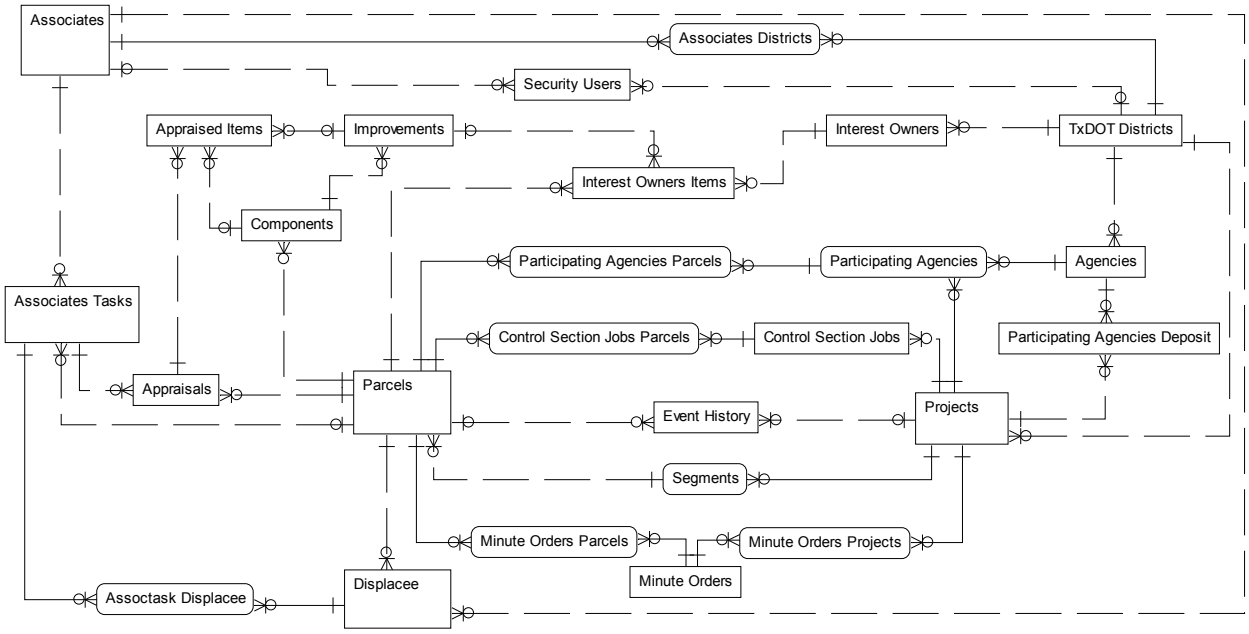


Figure 13. ROWIS High-Level Logical Data Model.

A description of the core entities in ROWIS follows:

- **Parcels**. This entity contains attributes that describe property parcels, such as description, appraised value, acquisition status, and a variety of date stamps. Chapter 4 provides a detailed analysis of date stamp data in ROWIS. The primary key or identifier in Parcels is Parcel ID (which is also a foreign key in entities Projects, Agencies, Control Section Jobs, and Associates).

- **Projects**. This entity includes attributes that characterize a project, such as project type code, beginning and ending limits, project CSJ, right of way CSJ, and several date attributes such as estimated letting date or right of way clearance date. The primary key in Projects is Project ID (which is not the same as project CSJ or right of way CSJ). Project ID is a foreign key in entities Parcels, Control Section Jobs, and Agencies. In Projects, the right of way CSJ and right of way account number attributes are inversion entry keys (i.e., they are frequently accessed, non-unique attributes).

- **Control Section Jobs**. This entity includes attributes that provide additional information about projects, including project CSJ, CSJ type, project limits, and federal funding eligibility. The primary key in Control Section Jobs is CSJ ID (which is not the same as the project CSJ). CSJ ID provides a linkage between Control Section Jobs and Parcels through the many-to-many entity Control Section Jobs Parcels.

ROWIS uses data managed in the Design and Construction Information System (DCIS), such as CSJ numbers, federal project number, project limits, and authorized funds. ROWIS is not integrated with DCIS, which means that DCIS data must be manually entered into ROWIS, increasing the risk of data synchronization issues when there are data updates in DCIS but a similar updated is not completed in ROWIS.

ROWIS provides very little support for the management and inventory of right of way assets after the conclusion of the real property acquisition process. In addition, ROWIS does not have the functionality to display (or to provide a link to) right of way parcels or utility adjustments on a map. In fact, the Parcels entity in ROWIS does not contain any spatial data except for a general description of the physical location of the parcel.

Modernization Initiatives

2010 Management and Organizational Review (Grant Thornton Report)

In 2010, Grant Thornton completed a management and organizational review and prepared recommendations to improve the organizational structure, transparency, and accountability at TxDOT (*34*). Issues identified in the report concerning the acquisition of real property and corresponding cost management practices were as follows:

- Lack of standards or guidance regarding when to begin real property acquisition activities and how much property acquisition to complete by the time a project goes to letting. The result was districts starting right of way activities at different points in time during the

project delivery process and a significant number of projects having parcels without acquiring at letting time.

- Real property acquisition costs not included in project cost estimates.

- Inaccurate estimates of right of way costs that were not based on project specifics but on a general assumption of right of way costs representing 12 percent of total construction costs.

- Limited accountability for right of way budgets allocated to districts.

Recommendations to improve real property acquisition practices included the following:

- Include all project costs in project planning and programming activities.

- Create performance plans that hold district leadership accountable for documenting project prioritization procedures; allocating district resources on priority projects first; working on projects that are outside fiscal constraints; working on projects that never let or are not let on time; and establishing clear protocols for changing plans and timelines.

- Reduce overall department costs associated with real property acquisition issues by adhering to right of way project milestones prior to letting and by holding districts accountable to acceptable standards for parcels outstanding at letting.

- Develop right of way cost estimates using a consistent process based on certain attributes such as number of parcels and number of commercial and residential properties.

- Document real property acquisition procedures to clarify roles and responsibilities and provide district agents more clear guidance on how to follow regulations and policies. Conduct training on the new procedures.

2011 TxDOT Restructure Council Recommendations

In July 2010, the Texas Transportation Commission formed the TxDOT Restructure Council to examine reports and audits on TxDOT's operations and identify recommendations to restructure, reform, and modernize TxDOT (*35*). The council reviewed and prioritized a series of recommendations and grouped them into the nine categories defined in the Grant Thornton report. Grant Thornton recommendations that the council identified as having the highest priority for implementation included the following:

- Develop a structured process and establish project priorities to improve transparency and communication with external stakeholders regarding TxDOT plans and to improve efficiency and reduce costs associated with low-priority projects.

- Develop a clear, transparent, and disciplined project planning process to address unexpected issues.

- Consider redefining how planning and programming are executed.

- Standardize construction and maintenance project definitions so that similar projects are managed in the same manner and through the same systems.

- Track project data and information in a system to create a single record for all TxDOT projects and increase transparency.

In general, the council concluded that, similar to the environmental review process, the right of way acquisition process could be lengthy, delaying the delivery of transportation projects. Because of these delays, the council supported efforts to expedite the real property acquisition process. One of the recommendations was to implement streamlined acquisition practices throughout TxDOT's right of way acquisition and utility relocation processes and work with FHWA to formalize these processes.

Right of Way Function Consolidation and Alignment

Over the last few years, TxDOT has undergone significant changes in the way the department conducts right of way business operations. In the mid- to late 2000s, TxDOT implemented a regionalization initiative. The goal of this initiative was to consolidate a number of functions that were previously the responsibility of individual districts while, at the same time, absorbing a few responsibilities that were previously handled at the division level. Right of way was one of the regionalized functions (other functions including project delivery and purchasing). Core business functions related to design, construction, and maintenance were kept at the district level. As a reference, Figure 14 shows the four regions that were implemented.

In the regional right of way model, the Right of Way Division retained responsibility for setting policy and verifying compliance. Regional right of way managers were responsible for right of way acquisitions within the several districts served by the region. Regions were also in control of the right of way budget. Regions also handled items such as administrative settlements and mediations. Relocation assistance was managed at the division level, given FHWA's preference for a single point of contact in this matter. With the regionalization initiative, officials could also be called to assist on projects outside their own district or region.

In the late 2000s and early 2010s, TxDOT faced a dramatic reduction in the availability of funds for the construction of new highway projects. One of the results was the need to eliminate a large number of right of way positions, particularly at the district level. With this reduction, it became critical for the remaining staff to become proficient in several right of way areas, and for regions and districts to standardize procedures to assist in this process.

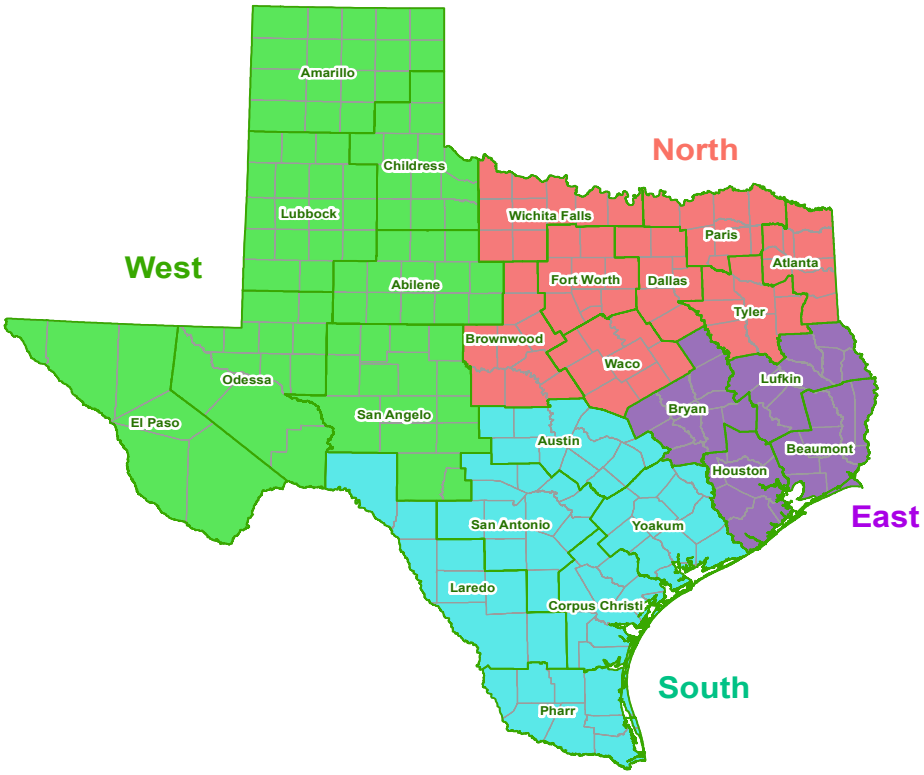


Figure 14. TxDOT Regions.

In 2012, as part of the streamlining recommendations from the TxDOT Restructure Council, TxDOT identified 22 initiatives to streamline the real property acquisition and utility accommodation process (*36*). As a reference, Table 3 lists the 22 initiatives, along with the corresponding type (i.e., quick win or initiative) and priority (i.e., very high, high, medium, low).

TxDOT's expectation from the implementation of the 22 initiatives was $50 million in annual cost savings and a 50 percent reduction in right of way project delivery time. From the implementation of concurrent right of way processes alone, TxDOT expected to realize $30 million in annual cost savings and a 50 percent reduction in right of way project delivery time. As an illustration, Figure 15 provides a comparison between the existing (mostly linear) and the new (concurrent) right of way and utility accommodation processes.

In 2013, TxDOT began a process to consolidate right of way functions by realigning personnel from regions and districts to the division level (*37*). While the physical location of these officials remained essentially the same, the realignment changed how officials with a right of way function reported within the TxDOT organizational structure. The result was a reconfiguration of areas of responsibility and redistribution of the right of way workforce. In 2015 and 2016, TxDOT reversed course at the five metro districts by reassigning right of way personnel from the division level back to those districts.

Table 3. Right of Way Streamlining Initiatives (*36*).

	Initiative	Expected Finish	Lead Point of Contact	Type	Priority
1	FHWA & Utility Coordination	1/31/12	J. Campbell	Quick Win	2 - High
2	Open House	3/8/12	S. Mills	Quick Win	2 - High
3	AG Point of Contact	3/8/12	B. Ritts	Quick Win	3 - Medium
4	Attorney Staffing	4/1/12	S. Mills	Quick Win	1- Very High
5	Direct Deposit of Funds	4/1/12	L. Good	Initiative	4 - Low
6	Eliminate N-72 Form	4/16/12	J. Zimmerman	Quick Win	3 - Medium
7	Electronic Processing for Relo & Acq	4/16/12	J. Zimmerman	Quick Win	3 - Medium
8	MOA/Purchase Agreement	4/16/12	T. Morgan	Initiative	4 - Low
9	Relocation Process	5/1/12	D. Toner	Initiative	1- Very High
10	Pre-Appraisal Activities	5/1/12	D. Toner	Initiative	2 - High
11	Negotiation Process	5/1/12	J. Wallis	Initiative	1- Very High
12	Possession and Use Agreement	5/1/12	JD Ewald	Initiative	1- Very High
13	Concurrent Eminent Domain	5/15/12	J. Zimmerman	Initiative	1- Very High
14	Consistent Appraiser	6/1/12	D. Toner	Initiative	2 - High
15	Update List of Appraisers	6/1/12	M. Beitler	Initiative	3 - Medium
16	Petty Cash Policy	6/1/12	M. Moses	Initiative	4 - Low
17	Concurrent ROW Processes (To-Be Process)	6/1/12	S. Mills	Initiative	1- Very High
18	**Succession Planning & Training Program**	6/29/12	J. Campbell	Initiative	1- Very High
19	Region Use of Experts	6/29/12	M. Beitler	Initiative	3 - Medium
20	Utility Improvements	7/2/12	C. Williams	Initiative	1- Very High
21	Acquisition of lease hold interest (orig. name	8/11/12	M. Bayer	Initiative	3 - Medium
22	ROW IT Assessment	8/31/12	S. Mills	Project	2 - High

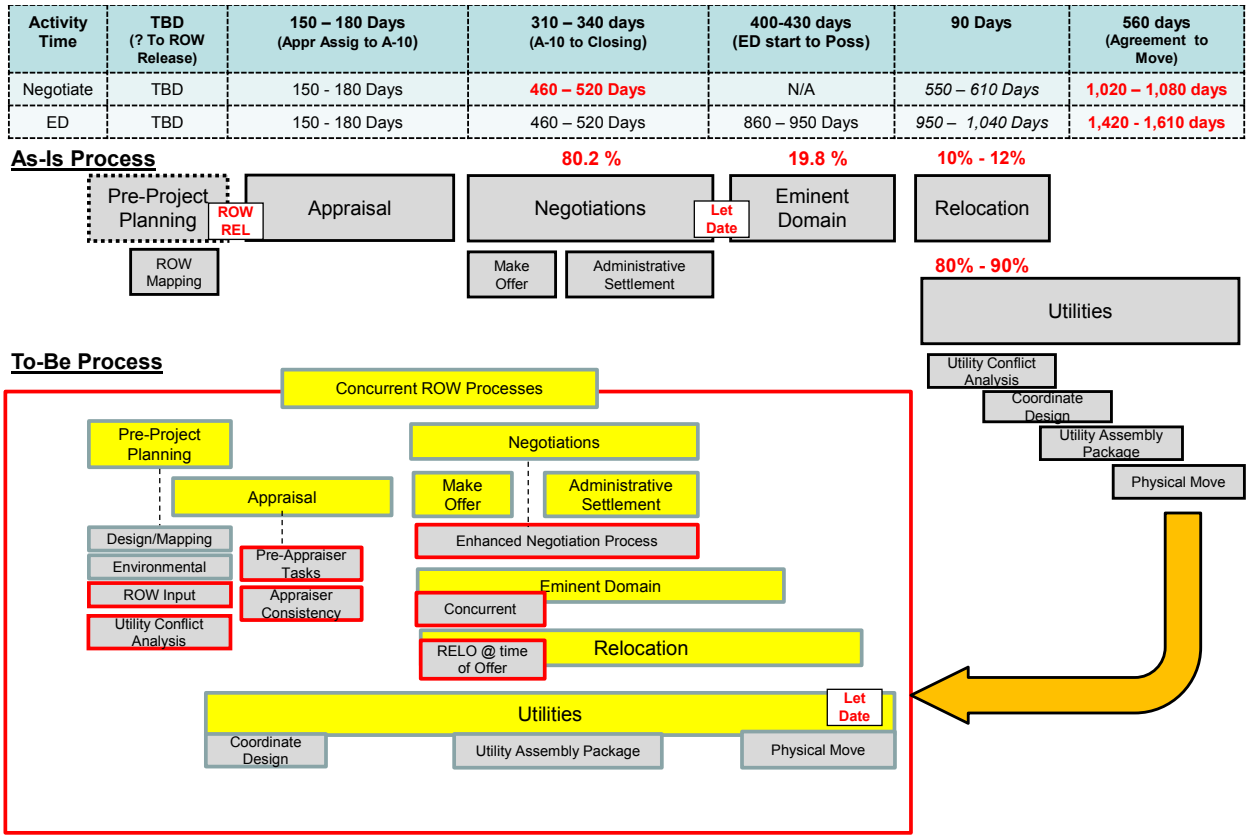


Figure 15. Linear versus Concurrent Right of Way and Utility Processes (*36*).

Modernized Portfolio and Project Management (MPPM) Initiative

In 2013, the Project Management Office at TxDOT completed an assessment of existing systems for managing capital improvement projects, which led to the development of a strategic implementation plan for new portfolio project management (PPM) technologies (*38*). The analysis involved collecting information about existing systems and subsystems, data usage, and data requirements across a broad range of users. It also involved identifying PPM practices and developing a vision for PPM implementation and maturation at TxDOT.

The study found that existing PPM processes and technologies at TxDOT were fragmented, non-standardized, and inconsistent across the agency. Recommendations to address these shortcomings included the following:

- Develop a robust project identification structure to provide unambiguous project identification and support integrated scope change management.
- Define the program and portfolio levels for capital improvement projects and determine how they align with the agency's goals and objectives.
- Develop a common data blueprint to allow effective data migration across all systems.

- Link critical supporting systems and subsystems to the new project and portfolio management system to ensure data quality and accurate reporting.

In 2015, the Enterprise Systems Office started a project to implement an MPPM system. TxDOT expects MPPM to support various functions pertaining to transportation project delivery by replacing DCIS and by integrating a number of existing systems and platforms into MPPM. For example, TxDOT expects to include a number of critical date stamps associated with the acquisition of real property interests. At this point, it is not clear whether this will entail replacing ROWIS completely or integrating date stamps that are managed in ROWIS into the MPPM system.

OTHER RELEVANT RESEARCH INITIATIVES

0-4617, Durations for Acquiring Roadway Right of Way and Assorted Expediting Strategies

In 2005, TxDOT completed a research project to evaluate delays in the acquisition of real property and utility relocations (*39*). For real property acquisitions, the research included an evaluation of critical milestones and grouping of activities into the following duration categories:

- From right of way release to possession of property.
- From initial appraisal to possession of property.

Other duration categories included the following:

- From initial appraisal to appraisal approval.
- From end of negotiations to eminent domain start.
- From eminent domain starts to eminent domain request submission.
- From eminent domain request submission to minute order for eminent domain approved by transportation committee.
- From minute order for eminent domain approved by transportation committee to possession of property.

For the analysis, the researchers evaluated data from 45 completed projects that had at least 10 parcels per project. The average number of parcels per project was 36. A first subsample, which excluded "critical path parcels" (see next paragraph) had a sample size of 124 parcels, of which 12 parcels (or 9.7 percent) were acquired by condemnation proceedings. For this subsample, the mean time to move from right of way release to possession of the property was 18 months, while the mean time to move from the initial appraisal to possession of the property was 11 months.

The researchers also observed a wide dispersion in durations. For example, from right of way release to possession of the property, the standard deviation and range were 16 and 69 months, respectively. From the initial appraisal to possession of the property, the standard deviation and range were 13 and 59 months, respectively.

The researchers also considered a subsample of parcels they named "critical path parcels," which corresponded to the last parcel acquired before a project was let (and could presumably provide an indication that the parcel was the most difficult and resource-consuming). The sample size under this category was 45 parcels, of which 29 parcels (or 71 percent) were acquired by condemnation proceedings. In this case, the mean time to move from right of way release to possession of the property was 33 months, while the mean time to move from the initial appraisal to possession of the property was of 24 months. The dispersion around the mean for this subsample was also quite significant.

For the parcels analyzed, the researchers noted that the time it took to acquire real property depended on factors such as the following:

- Total number of parcels in a project (projects with fewer parcels had faster acquisition times).
- District right of way staff size (districts with fewer agents tended to spend longer acquiring property).
- District annual right of way budget (districts with larger right of way acquisition budgets tended to take longer to acquire right of way, presumably because of work volume and complexity of projects and job requirements).

0-5246, Engineering Design Data Management – Practices and Framework Development

In 2008, TxDOT completed a research project to evaluate engineering design data practices at TxDOT (*40*). The focus was on data types, spatial and temporal data attributes, and associated documentation. Recommendations for implementation included the following:

- Project development process:
    - Review project development process and update manuals.
    - Develop tool to extract project delivery process components and required documentation for specific projects.
    - Accelerate DCIS modernization.
- CAD documents:
    - Update and enforce CAD document standards.
    - Develop strategy to build GIS-based datasets from CAD documents.
    - Develop standards and/or guidelines for CAD document management.

- GIS practices:
    - Disseminate the TxDOT data architecture standard.
    - Apply the TxDOT data architecture standard to all GIS datasets at TxDOT.

2008 International Scan

In 2008, a scan team sponsored by FHWA and the American Association of State Highway and Transportation Officials (AASHTO) visited Australia and Canada to learn about innovative practices for right of way and utility processes that might be applicable for implementation in the United States (*41*). This scanning study complemented a 2000 scanning study of European countries, which covered Germany, the Netherlands, Norway, and the United Kingdom. The study team identified some 20 potential implementation ideas, including the following, which are related to the acquisition and management of real property interests:

- Project development and delivery methods:
    - Promote an earlier integration of real property acquisition and utility coordination activities in the project development process.
    - Establish an operation and maintenance fee for developer-initiated transportation infrastructure.

- Real property acquisition:
    - Promote a cooperative relationship with property owners to facilitate the timely acquisition of real property.
    - Develop GIS-based real property acquisition and asset management systems.
    - Promote visualization techniques to communicate anticipated project impacts to property owners.

- Property management:
    - Develop GIS-based real property acquisition and asset management systems.
    - Promote active management of real property assets to maximize value and return on investment.
    - Establish a template for roles and responsibilities of multiple parties that use infrastructure corridors.

- Other:
    - Pursue strategies to facilitate corridor preservation.
    - Develop a framework to establish proficiency of right of way and utility professionals in core disciplines.

0-5788, Right-of Way Real Property Asset Management-Prototype Data Architecture

In 2009, TxDOT completed a research project to develop a prototype data architecture for managing real property assets in a GIS-based environment (*33*). The goal was to facilitate the identification of right of way boundaries, tracking of right of way boundary changes, automatic mapping of right of way surveying data to other layers of information such as control section job and route number locations, and complete attribution of right of way assets. Recommendations for implementation included the following:

- Implement a strategy for a permanent repository of electronic files that supports right of way asset management plans effectively.
- Implement strategies to populate a right of way asset GIS database that relies on geo-referenced MicroStation files, existing paper records at the Right of Way Division, and field survey data.
- Add standardized certification and disclaimer text labels to all relevant geospatial documents (including documents in electronic format).
- Clarify the requirements for topographic information outside the right of way.
- Modify Form ROW-MapCheck to address electronic file delivery requirements.
- Consider requiring the submission of right of way feature data in a GIS format.
- Update ROWIS to support modernization initiatives at the Right of Way Division.

0-5696, Analysis and Integration of Spatial Data for Transportation Planning

In 2009, TxDOT completed a research project to develop a catalog of spatial data sources for transportation planning (*42*). The work included a synthesis of current transportation planning practices in Texas with a focus on spatial data integration and exchange issues, developing a map of data sources, and developing a preliminary logical data model of spatial data entities composed of 589 data entities grouped into 7 categories and 63 subcategories. Some of the data entities included real property assets. General recommendations for improving data exchange practices among stakeholders included the following:

- Facilitate access to data, e.g., by developing web-based applications to store and share data with all local agencies, improving and/or establishing interagency agreements, increasing bandwidth capabilities for large dataset downloads, and establishing data connections with interagency networks.
- Develop local and regional visions for spatial data and improve practices regarding data storage and archiving, data quality, and data completeness.

- Add standardized certification and disclaimer text labels to all relevant geospatial documents.

0-5534, Asset Management – Texas Style

In 2010, TxDOT completed a research project to develop techniques to support resource allocation decisions for early real property interest acquisitions (*43*, *44*). The research produced two simulation tools. The first simulation tool, called TAMSIM, provided statistical measures of the impact of real property interest acquisition on the cost and the completion date of a highway construction project. As Figure 16 shows, TAMSIM models costs and milestone durations both with and without early real property interest acquisition. Costs include the purchase of the real property interest and cost estimates related to potential delays during the real property acquisition process.

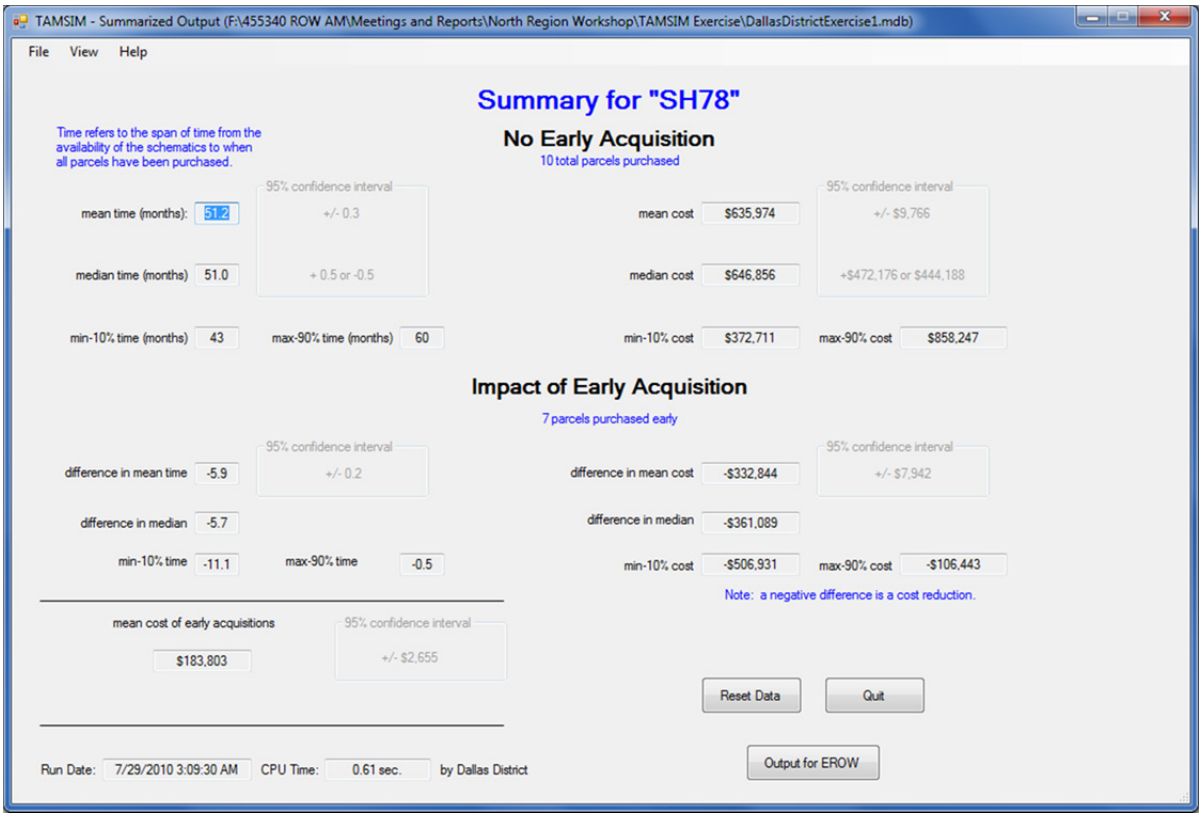


Figure 16. Sample TAMSIM Interface.

TAMSIM users select how many project realizations or replications occur during the simulation. Each realization generates parcel purchase times according to probability distributions defined on the data input screen. Individual parcel purchase costs are also generated according to probability distributions. All data points are statistically analyzed, and TAMSIM displays estimates for mean and standard deviation for total parcel costs with and without early acquisition of parcels as well as time durations to complete parcel purchasing. Potential savings from early acquisition of parcels is estimated from these results.

The second decision-support tool, called EROW, is an optimization process for simultaneously considering numerous projects to develop recommendations for optimal system-wide use of early acquisition procedures. EROW uses linear programming techniques for simultaneously considering numerous projects to develop recommendations for optimal system-wide use of early acquisition procedures. Using TAMSIM output files, EROW features incremental rate of return analyses, comparing incremental returns to a minimum attractive rate of return specified by the user, thereby determining when additional early parcel purchases are no longer more beneficial to taxpayers than other uses of these funds. Output from EROW includes two early acquisition budget possibilities: the budget amount likely to provide the highest rate of return, and the budget amount likely to provide the maximum amount of taxpayer savings.

CHAPTER 3. PRACTICES FOR MANAGING REAL PROPERTY ACQUISITION SCHEDULES

INTRODUCTION

This chapter documents current practices and tools for managing real property acquisition schedules at TxDOT. To complete this activity, the researchers reviewed available manuals, procedures, project schedule templates, and data files.

GENERIC PROJECT SCHEDULE TEMPLATES

Recommendations from the Sunset Commission in 2008 to improve project transparency at TxDOT resulted in the acquisition of Primavera Professional Project Management version 6 (P6) (*45*). In addition to gathering project data into a single platform, TxDOT anticipated using P6 for portfolio management, project scheduling, and staff utilization management (*34*).

TxDOT conducted P6 training classes from July 2009 to February 2010, including a class for project managers (436 participants), a class for resource managers (206 participants), a class called *Setting User Preferences in Primavera 6.2* (568 participants), and a class called *Using Progress Sheets to Update Projects in Primavera 6.2* (740 employees). In February 2010, training sessions also took place at districts (typical participants: district engineer, deputy district engineer, and transportation planning and development directors) and regions (typical participants: directors and assistant directors) (*34*).

TxDOT prepared P6 project schedule templates for each of the following areas:

- Key Dates.
- Planning.
- Design.
- Environmental.
- Right of Way.
- Utilities.
- District Review Letting.
- Construction.

TxDOT provided two project schedule templates: *Simple* (Figure 17) and *Medium* (Figure 18 through Figure 20). The *Simple* project schedule template contains 20 activities. The *Medium* project schedule template contains 129 activities. Some of the first-level groups of activities,

including right of way, do not contain any activities. In the case of right of way activities, users have to select and import into the project schedule template one of six right of way schedule templates (see next section).

In addition to the *Simple* and *Medium* project schedule templates, TxDOT developed a more detailed project schedule template that contains a large number of project activities. TxDOT has not used this template to the same extent as the other two templates, mainly because it is more complex and requires a significant amount of time to enter data into P6, making the management of a project more cumbersome.

TxDOT prepared six real property acquisition schedule templates, each one assuming a different duration to acquire real property interests: 12, 18, 24, 30, 36, and 41 months. The goal of having multiple templates is to facilitate the management of different types of projects, depending on the number of parcels to acquire and the overall complexity of the project.

Each schedule template contains 38 activities organized into three phases: preliminary phase, negotiation phase, and eminent domain phase. For the preliminary and eminent domain phases, some activities are also divided depending on whether the Right of Way Division or the districts are responsible to conduct these activities. For example, districts are responsible for preparing right of way maps and property descriptions, but it is the responsibility of the Right of Way Division to review them.

As an illustration, Figure 21 shows the 12-month real property acquisition schedule template. The remaining five templates have the same number of activities, predecessors, and successors, but some activities have different durations. Table 4 shows the duration of every activity according to the six real property acquisition schedule templates.

In addition to the real property acquisition schedule templates, TxDOT developed a utility schedule template that assumes 17 months to complete 17 utility-related activities. The activities are organized into three phases: Preliminary Phase, Coordination Phase, and Letting/Construction Phase. In all three phases, some activities are also divided depending on whether the activities fall within the responsibility of the Right of Way Division or the district.

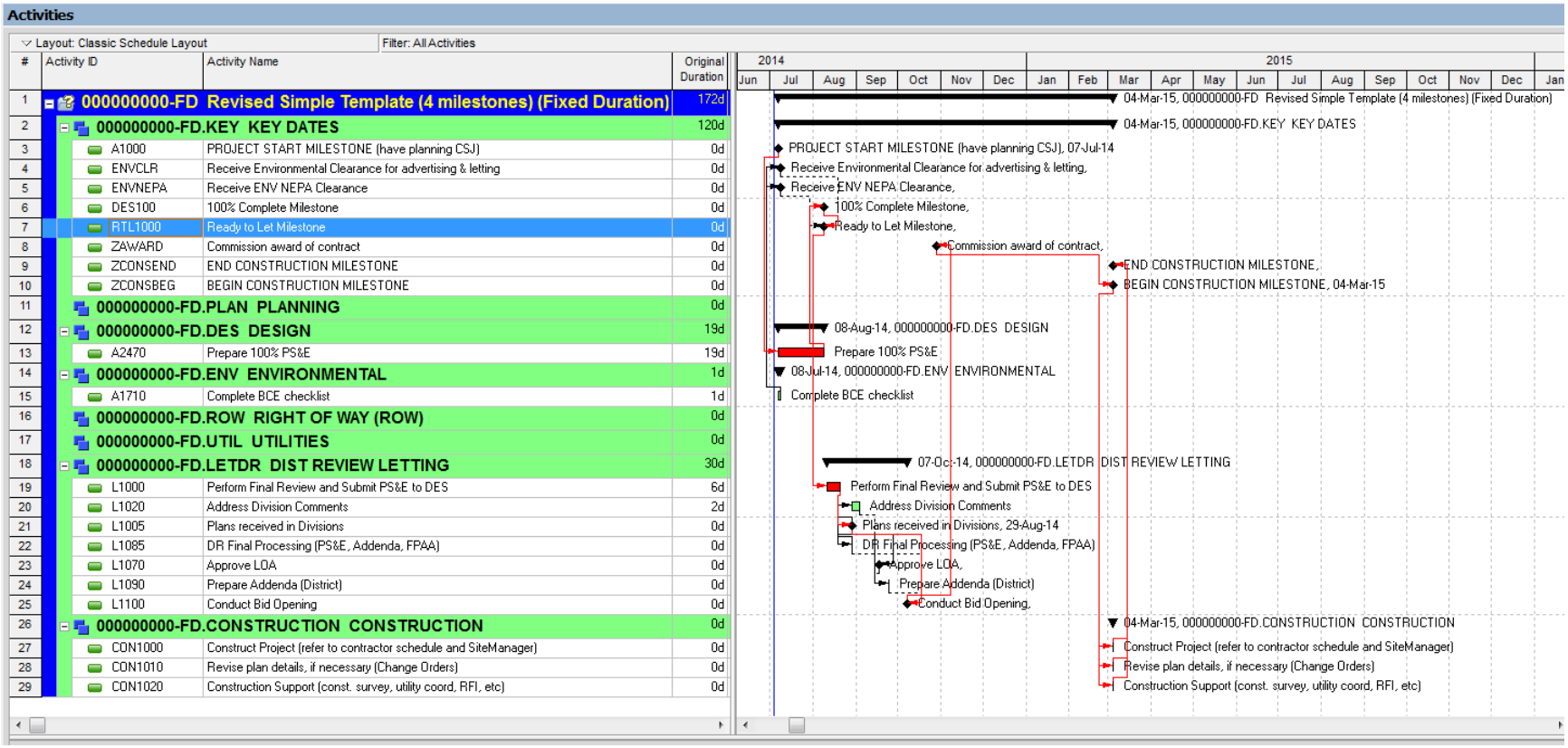


Figure 17. Simple Project Schedule Template.

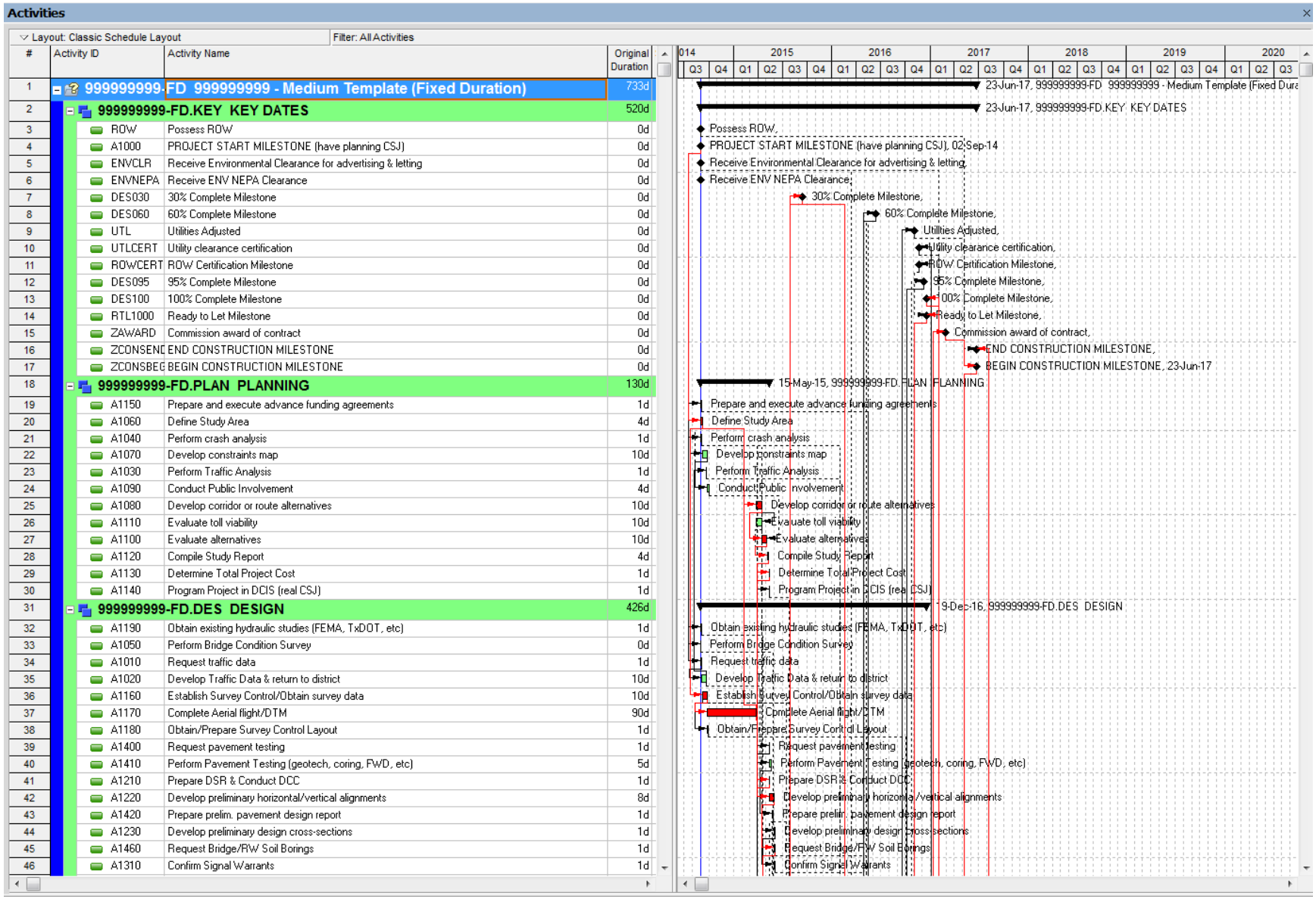


Figure 18. Medium Project Schedule Template (Part A).

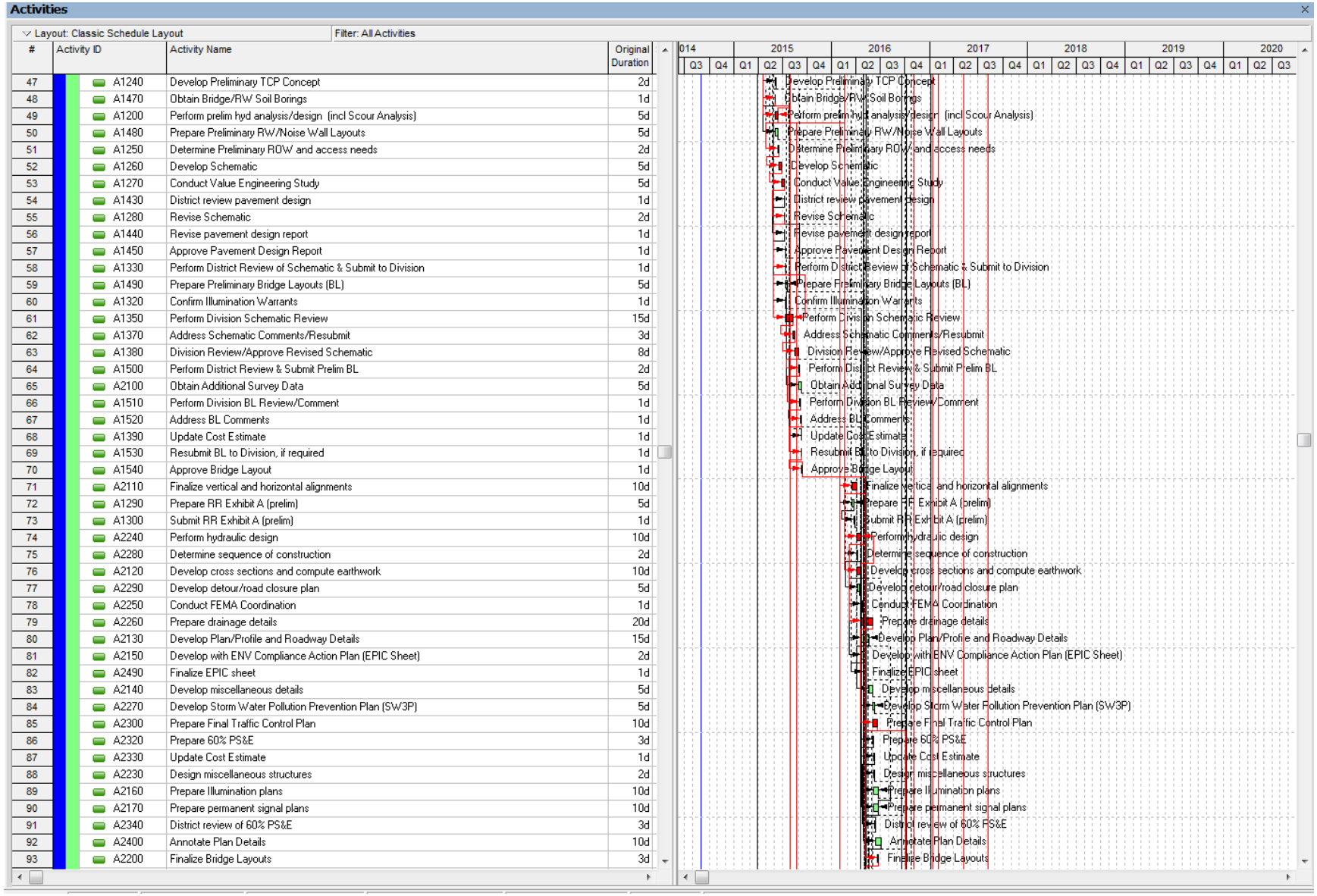


Figure 19. Medium Project Schedule Template (Part B).

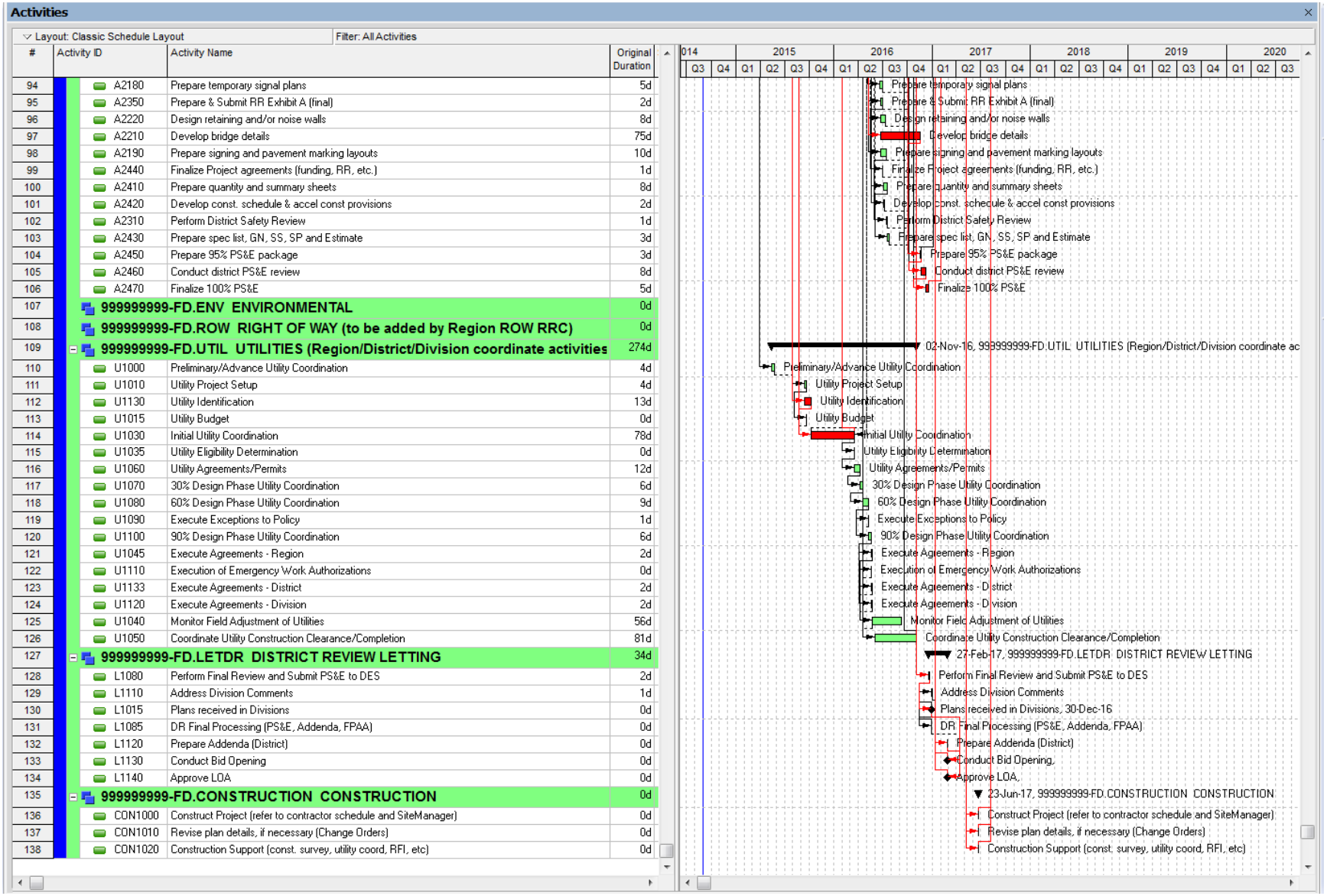


Figure 20. Medium Project Schedule Template (Part C).

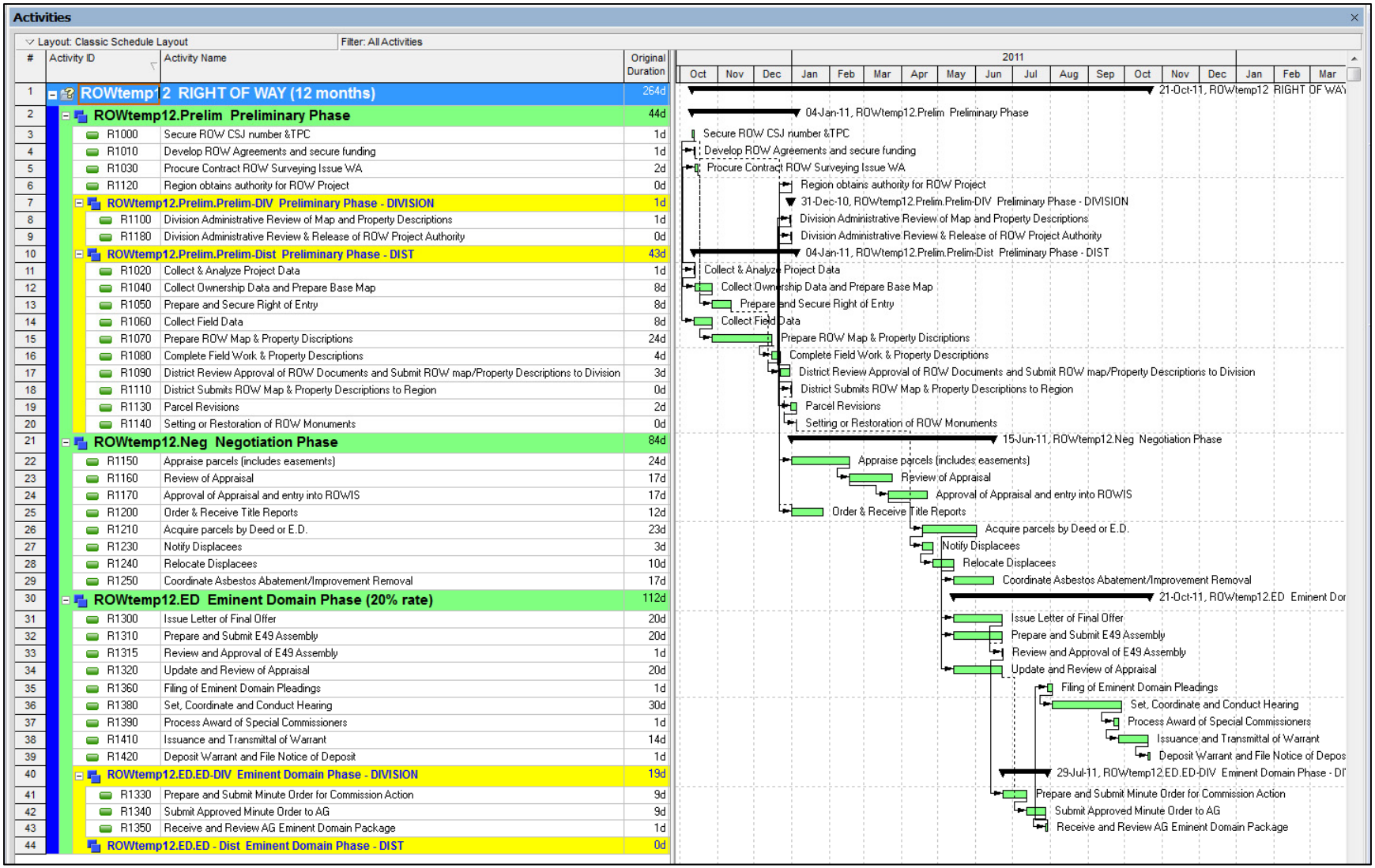


Figure 21. Real Property Acquisition Schedule Template (12 Months).

Table 4. Activity Durations of Real Property Acquisition Schedule Templates.

Activity ID	Activity Name	Duration					
		12 months	18 months	24 months	30 months	36 months	41 months
		264d	390d	520d	636d	762d	866d
Prelim	**Preliminary Phase**	**44d**	**70d**	**95d**	**119d**	**143d**	**164d**
R1000	Secure ROW CSJ number &TPC	1d	2d	2d	3d	3d	4d
R1010	Develop ROW Agreements and secure funding	1d	1d	2d	2d	3d	3d
R1030	Procure Contract ROW Surveying Issue WA	2d	3d	4d	6d	7d	8d
R1120	Region obtains authority for ROW Project	0d	1d	1d	1d	1d	1d
Preliminary Phase - DIVISION		1d	2d	3d	4d	4d	5d
R1100	*Division Administrative Review of Map and Property Descriptions*	*1d*	*2d*	*2d*	*3d*	*3d*	*4d*
R1180	*Division Administrative Review & Release of ROW Project Authority*	*0d*	*0d*	*0d*	*1d*	*1d*	*1d*
Preliminary Phase - DIST		43d	69d	93d	117d	139d	160d
R1020	*Collect & Analyze Project Data*	*1d*	*1d*	*2d*	*2d*	*3d*	*3d*
R1040	*Collect Ownership Data and Prepare Base Map*	*8d*	*12d*	*16d*	*21d*	*25d*	*28d*
R1050	*Prepare and Secure Right of Entry*	*8d*	*13d*	*18d*	*23d*	*27d*	*31d*
R1060	*Collect Field Data*	*8d*	*13d*	*18d*	*23d*	*27d*	*31d*
R1070	*Prepare ROW Map & Property Discriptions*	*24d*	*38d*	*52d*	*65d*	*78d*	*89d*
R1080	*Complete Field Work & Property Descriptions*	*4d*	*7d*	*9d*	*11d*	*14d*	*16d*
R1090	*District Review Approval of ROW Documents and Submit ROW map/Property Descriptions to Division*	*3d*	*5d*	*7d*	*9d*	*11d*	*13d*
R1110	*District Submits ROW Map & Property Descriptions to Region*	*0d*	*0d*	*0d*	*0d*	*0d*	*1d*
R1130	*Parcel Revisions*	*2d*	*3d*	*4d*	*5d*	*6d*	*7d*
R1140	*Setting or Restoration of ROW Monuments*	*0d*	*0d*	*0d*	*0d*	*0d*	*1d*
Negotiation Phase		**84d**	**117d**	**147d**	**176d**	**206d**	**232d**
R1150	Appraise parcels (includes easements)	24d	38d	52d	65d	79d	89d
R1160	Review of Appraisal	17d	27d	36d	45d	53d	62d
R1170	Approval of Appraisal and entry into ROWIS	17d	27d	36d	44d	55d	63d
R1200	Order & Receive Title Reports	12d	19d	26d	32d	40d	45d
R1210	Acquire parcels by Deed or E.D.	23d	23d	29d	35d	44d	50d
R1230	Notify Displacees	3d	5d	7d	9d	11d	13d
R1240	Relocate Displacees	10d	16d	22d	26d	33d	38d
R1250	Coordinate Asbestos Abatement/Improvement Removal	17d	27d	35d	46d	55d	63d
ED	**Eminent Domain Phase (20% rate)**	**112d**	**174d**	**243d**	**298d**	**364d**	**417d**
R1300	Issue Letter of Final Offer	20d	33d	42d	55d	65d	74d
R1310	Prepare and Submit E49 Assembly	20d	32d	42d	55d	66d	74d
R1315	Review and Approval of E49 Assembly	1d	2d	2d	3d	3d	4d
R1320	Update and Review of Appraisal	20d	32d	42d	55d	65d	74d
R1360	Filing of Eminent Domain Pleadings	1d	2d	3d	4d	4d	5d
R1380	Set, Coordinate and Conduct Hearing	30d	42d	58d	71d	87d	100d
R1390	Process Award of Special Commissioners	1d	2d	3d	4d	4d	5d
R1410	Issuance and Transmittal of Warrant	14d	18d	27d	31d	41d	44d
R1420	Deposit Warrant and File Notice of Deposit	1d	2d	3d	4d	4d	5d
Eminent Domain Phase - DIVISION		19d	25d	38d	44d	55d	62d
R1330	*Prepare and Submit Minute Order for Commission Action*	*9d*	*12d*	*18d*	*21d*	*27d*	*29d*
R1340	*Submit Approved Minute Order to AG*	*9d*	*12d*	*18d*	*21d*	*26d*	*29d*
R1350	*Receive and Review AG Eminent Domain Package*	*1d*	*1d*	*2d*	*2d*	*2d*	*3d*
Eminent Domain Phase - DIST		0d	0d	0d	0d	0d	0d

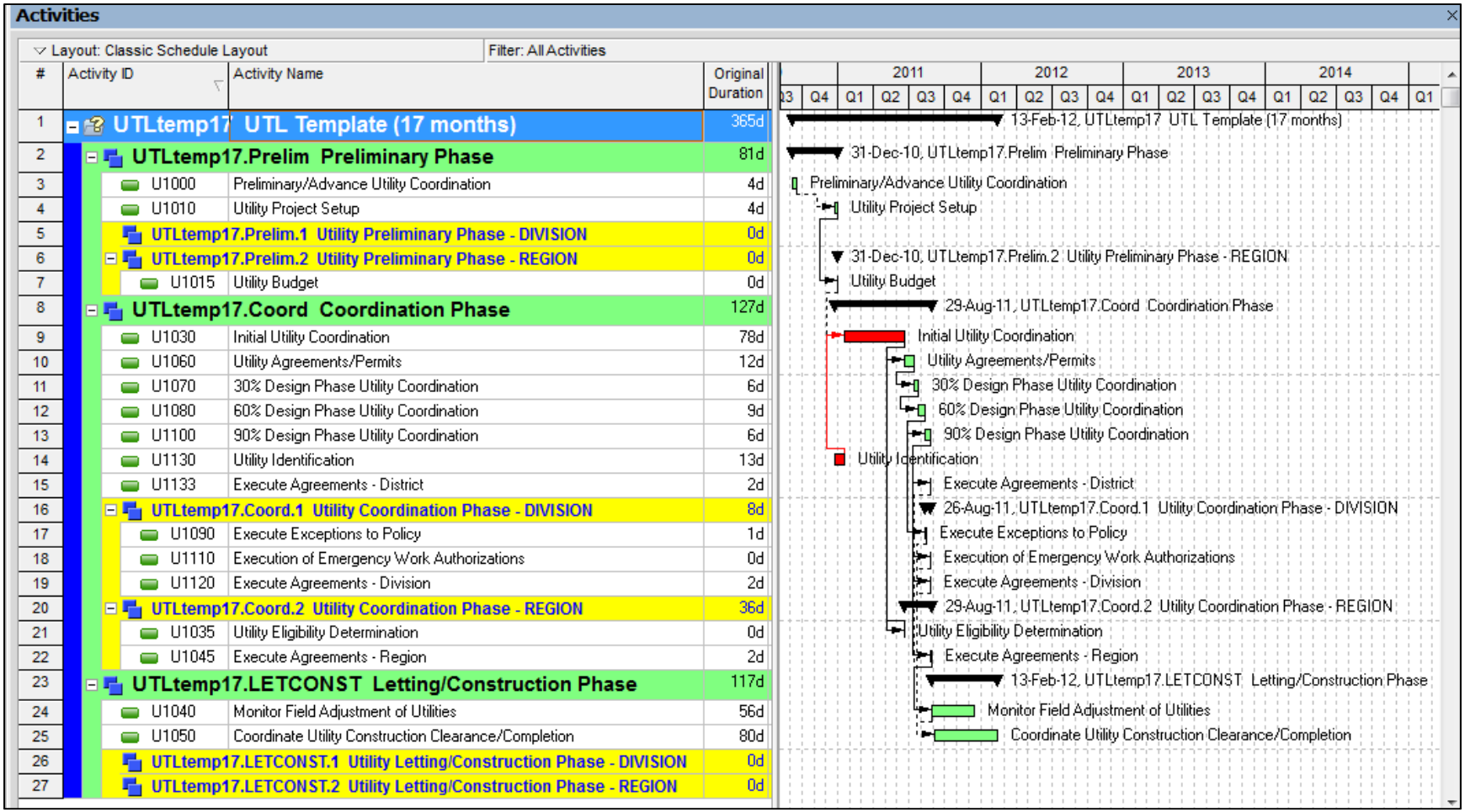


Figure 22. Utility Schedule Template (17 Months).

REAL PROPERTY ACQUISITION SCHEDULING AND MANAGEMENT PRACTICES

Discussions with TxDOT officials revealed that many districts only used P6 to document project progress at a very high level of aggregation, e.g., one activity for environmental, one activity for right of way, and one activity for utilities. Discussions with district and division officials then focused on identifying the reasons for such a high-level approach to project monitoring; how well P6 has served its purpose and how it currently fits into the real property acquisition management process; and what kind of protocols, data management methodologies, and software districts use to manage the acquisition of real property interests.

Trends

Most district officials contacted consider the property acquisition and utility schedule templates too complex because they contain a large number of activities that are difficult to manage. Entering detailed project data and assigning resources (e.g., names, hours, durations, dates, and costs) for every activity in P6 is time consuming and further complicates the management of real property acquisitions. A challenge that P6 users face is how to insert data and manage real property acquisition activities at the individual parcel level, particularly when it is necessary to acquire multiple parcels for a project. District officials stated that at least two full-time staff members could be needed at the district level to enter data and manage projects in P6. However, budgetary constraints do not allow districts to hire new staff or allocate enough resources for real property acquisition management purposes.

A source of inefficiency is the lack of integrated systems that collect data only once, resulting in increased workloads that do not improve the management process, e.g., by having to enter similar project data in ROWIS, P6, and timesheets. A related inefficiency is that only a small number of TxDOT officials know how to use P6, and an even lower number actually use it in practice. Commonly cited reasons included inadequate training, a heavy workload that does not enable TxDOT staff to manage projects using P6, and a lack of motivation for learning how to use P6. Some officials who either attended P6 training or tried to become acquainted with the software do not find the software interface user friendly, and this sometimes discourages them from using it.

The 2010 Grant Thornton report identified inefficiencies, challenges, and barriers that partly explain the current situation with regard to the limited use of P6 at TxDOT (*34*). Some of the findings in the Grant Thornton report were as follows:

- Rushing to address project transparency concerns without clearly defining objectives and requirements for selecting a project management and resource allocation tool (P6). Further, TxDOT did not establish a clear roadmap for integrating P6 with other systems.

- Not considering adequate time between final definition development and training and full-scale implementation. As of May 2010, not all users were trained on the tool and districts were not consistently using it.

- Lack of reliable project information, which did not allow tracking project status or allocating resources accurately. For example, by December 4, 2009, after the initial P6 training was complete, only 250 of the 2,100 licensed users had entered any information in P6. In 2010, while most projects under development had been entered into P6, only 43 percent of projects met the established quality assurance/quality control (QA/QC) requirements and were uploaded to Project Tracker.

- Intense focus on P6 and importing project data into the tool, which undermined the critical need to focus on effective project management and project scheduling practices.

- Limited guidance or training to project and resource managers on how to develop detailed project baselines. Prior to the P6 implementation, managers were responsible for establishing a letting date and other key milestones, but with the implementation of P6 they also became responsible for allocating resources based on specific hours required to complete tasks (which is challenging in an environment where officials must work on multiple projects simultaneously).

- Focusing on staff involved in implementing the P6 tool, not on personnel with project management expertise.

To address some of these challenges and limitations, in February 2015 TxDOT revised the minimum requirements for P6 project schedules by simplifying the number of activities and focusing on milestone information, as follows:

- Start milestone (does not require predecessor activity).

- 30-percent design (omitted for simple template).

- 60-percent design (omitted for simple template).

- 100-percent design.

- Ready to let.

- Environmental clearance.

- NEPA clearance.

- Right of way certification (omitted for simple template).

- Right of way possessed (omitted for simple template).

- Utility certification (omitted for simple template).

- Adjusted utilities (omitted for simple template).

- Commission award of contract.
- Begin construction.
- End construction (does not require successor activity).

To support the use of these milestones, TxDOT introduced additional requirements, including the following:

- All projects would be required to have an initial baseline and at least one activity to represent the following processes: environmental, planning or design, letting, and right of way and utilities.
- A P6 schedule should be created when a contract CSJ is established in DCIS. Further, all projects should have a valid project ID that matches a valid contract CSJ in DCIS.
- All project schedules should be updated at least once a month.
- All projects should have estimates of budgeted units for TxDOT resources (hours) and original duration (days) for each activity.
- All projects should have a longest path that considers all elements of the schedule, with no open ends.

In compliance with these requirements, most TxDOT officials indicated that they only use P6 to document projects at the highest level of aggregation in order to feed Project Tracker with the most important key dates and milestones. However, for detailed project tracking and monitoring purposes, most right of way agents and project managers indicated that they rely on commonly used tools such as Excel, which they use extensively.

Excel Templates

As part of recent modernization efforts, TxDOT developed Excel templates to track activities related to the acquisition of real property interests and relocation assistance. The templates contain a relatively large number of fields that enhance the collection of relevant date information that is currently possible with ROWIS.

TxDOT developed the first Excel template several years ago. The template contains three worksheets: Acquisition, Eminent Domain, and Relocation. Table 5 shows the data fields within each worksheet. In addition to these fields, users can enter general information about a project such as roadway, county, federal number, CSJ number, limits, title company, TxDOT contact, consultant contact, surveyor, environmental release date, approved right of way map date, letting date, ROW started date, original parcel count, spreadsheet date, and other comments. Currently, ROW agents maintain one Excel file per transportation project.

Table 5. Data fields of the Original Real Property Acquisition Management Template.

Acquisition (Appraisal & Negotiation)	Eminent Domain	Relocation
Parcel	Parcel	Parcel
Property Owner	Property Owner	Occupant
Priority (1,2,3 & 4 category) (1= highest)	49 Package to GAR	Relo Agent
Anticipated clear date	49 Package to Austin	Type of Occupancy
Date Cleared -Ready for Construction	ED Minute Order	90 Day Notice
Relo (Y or N)	49 Package to OAG	Calculate Supplement and Prepare ROW R 107
Improvements within Acquisition to be removed (Y or N)	Assigned AAG	TxDOT Approval of Supplement
Fee Appraiser	Owner's Attorney	Date of Possession
Appraisal Started	Petition Received in GAR	30 Day Notice to Vacate Letter
Title Opinion Received	ED Petition Filed	Actual Move Date
Appraisal Submitted to TxDOT	Notification of Lis Pendens	Release of Property Form Signed
Appraisal Review Complete	Recess and Reset	
Appraisal Approved	Commissioner Award Date (Hearing Date)	
Updated Commitment Requested	Date of Deposit with Court	
Updated Appraisal Requested	Date Objections Filed	
Updated Appraisal Approved	JAO Filed	
Negotiator (Associate Name)	Jury Trial State Appraiser	
Initial Offer Date	Mediation Date	
30 day Expires	Jury Trial Date	
Administrative Settlement Request Received	Jury Award	
Administrative Settlement Approved (Y or N)	Jury Trial Appealed	
Administrative Settlement Decision Date		
PUA Signature Date		
PUA Funds Requested		
Final Offer Date		
Updated Final Offer Letter		
PUA Funds Disbursed		
Deed Signed		
Funding Pkg sent to TxDOT		
Possession Date		
30 Day Notice to Vacate		
Date Improvements removed		
Recommended Payment to Title Company		

Although the original template has been widely used by TxDOT staff, it contains many fields that are not typically used in every project. Some users considered the first template too heavy and tended to modify it to fit their needs. TxDOT then simplified the template by removing or consolidating some fields and listing them into one worksheet called Acquisition. For example, among all the fields included in the Eminent Domain worksheet of the original template, only the Eminent Domain Hearing Date was kept in the revised template. Table 6 shows the data fields contained in the Acquisition worksheet of the revised template. Similar to the original template, the revised version allows users to enter generic project information.

Table 6. Data Fields of the Revised Real Property Acquisition Management Template.

Acquisition
Parcel
Property Owner
Priority (1,2,3 & 4 category) (1= highest)
Anticipated clear date
Date Cleared (Ready for Construction)
Relo (Y or Blank)
Improvements within Acquisition to be removed (Y or N)
Preliminary Value Estimate
Fee Appraiser
Appraisal Started
Title Opinion Received
Appraisal Submitted to TxDOT
Appraisal Review Complete
Appraisal Approved
Updated Commitment Requested
Updated Appraisal Requested
Updated Appraisal Approved
Negotiator (Associate Name)
Initial Offer Date
Approved Offer $ Amount
Counter Offer $ Amount
30 day Extension Expires
Administrative Settlement Request Received
Administrative Settlement Approved (Y or N)
Administrative Settlement Decision Date
PUA Signature Date
PUA Funds Requested
Final Offer Date
Updated Final Offer Letter
PUA Funds Disbursed
Deed Signed
Recommended Parcel Payment Request Date
Eminent Domain Hearing Date
Possession Date
30 Day Notice to Vacate
Clear for Construction
Recommended Payment to Title Company

The revised template also includes a second worksheet (called Status) that provides a bar chart overview of the parcel acquisition process (Figure 23). The chart includes eight columns. The first column shows the total number of parcels to be acquired for a transportation project. Each of the remaining seven columns corresponds to different phases of the acquisition process and shows the number of parcel acquisitions that are at a particular phase at that point in time.

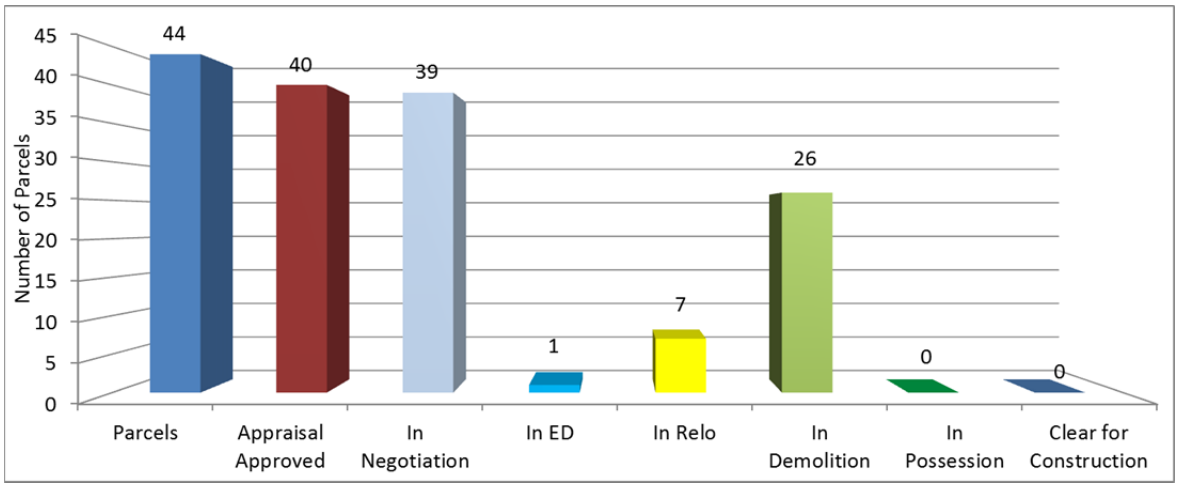


Figure 23. Overall Parcel Status Bar Chart.

In addition to the revised template, TxDOT officials developed a new Excel template to monitor the overall status of all ongoing projects within a region or district. This template includes two worksheets: Overall Project Status and Overall Status. In the first worksheet, users can enter project-specific information such as the RCSJ number, CCSJ number, highway name, project limits, LPA, local funding participation, agreement status, right of way map status, environmental status, TxDOT project manager, project status (e.g., open, released), right of way release date, let date, ROWAPS provider, number of parcels, number of parcels in appraisal, number of parcels in negotiation, number of parcels in possession, number of parcels in eminent domain, anticipated possession date, and other comments. The second worksheet includes a bar chart (Figure 24) that uses information from the first worksheet and shows the total number of projects as well as the number of projects in which critical milestones (e.g., preparation of right of way maps) have been completed.

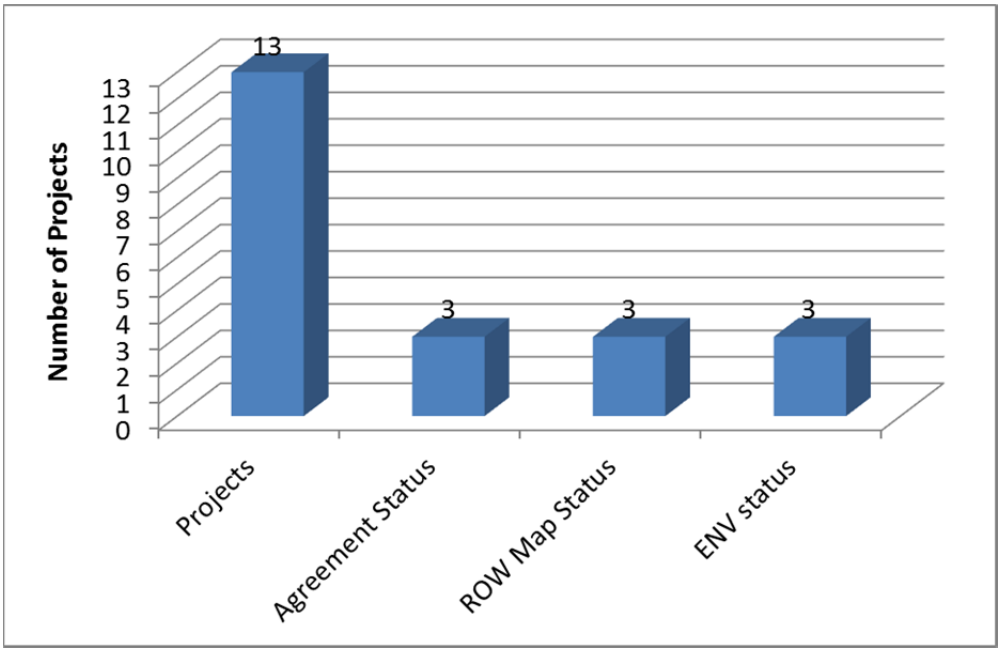


Figure 24. Overall Project Status Bar Chart.

CHAPTER 4. ROWIS DATABASE ANALYSIS

INTRODUCTION

This chapter documents the evaluation of ROWIS data to provide a foundation for typical durations in the acquisition of real property interests and relocation assistance. For the analysis, the researchers downloaded parcel, payment, and project data from ROWIS and imported the data into a Microsoft Access database. The Project, Parcel, and Payments tables within ROWIS contain several date milestone fields. The researchers evaluated these date fields to determine the number of records with valid dates as well as the sequence of milestone events.

ANALYSIS OF KEY ROWIS TABLES

The researchers downloaded ROWIS project, parcel, and payment data into Access from 1997 (when ROWIS was first implemented) to December 2015. The analysis focused primarily on date fields to determine (a) which date fields were used more frequently, (b) which date fields were used in conjunction with other date fields, (c) if there was a typical sequence for date fields, and (d) what was the duration between any two date fields for the same parcel record.

Table 7 provides an overview of record counts in tables Project, Parcel, and Payments, along with their corresponding unique identifiers. The table also shows the number of unique records based on an analysis of the unique identifier field to detect records with blank or non-unique ID field values. In addition, linking the *row_csj_nbr* field in Parcel to the *projects_row_csj_nbr* field in Payments resulted in 1,923 unique records. For each of these right of way CSJs, there were between 1 and 1,785 payment records. While this information was interesting, the main focus was on durations between critical milestones. For this reason, the rest of the analysis focused on date stamps found in tables Project and Parcel.

Table 7. Overview of Key ROWIS Tables.

Item	Table		
	Project	**Parcel**	**Payments**
Unique identifier	*project_csj_nbr*	*row_csj_nbr* and *parcel_nbr*	*payments_payment_id*
Number of records	3,340	46,909	172,175
Number of unique records	3,146	46,638	172,053

A preliminary review of tables Project and Parcel revealed 35 date fields (10 from Project and 25 from Parcel) that might be of use to determine a typical sequence of events in the process to acquire real property interests. The relationship between Project and Parcel is such that each project could have one or many parcels associated with it. After joining both tables, the result was 2,574 usable instances where a record in Project could be successfully linked to one or more records in the Parcel table. On average, there were between 1 and 407 records in Parcel for each corresponding record in Project.

Frequency of Date Field Use

Table 8 shows the 35 date fields that were included in the analysis, the source table, and the number of records where the date was not blank after joining tables Project and Parcel. Of the 35 dates, only one date (*Lupdate Date*) did not describe a process milestone but rather the date of the last record update. Because no record had a blank *Lupdate Date*, Table 8 uses this field to show the highest number of records possible for any particular date field. In practice, the number of records varied widely, from 46,909 to zero (in the case of *Continuous Occupancy Approval Date, Final ROW Map Received Date, and Final ROW Map Processed Date*).

Table 8. Frequency of Date Field Use within ROWIS.

Date Field Name	Source Table	Count Non-Blank Records
Lupdate Date	Parcel	46,909
Parcel Status Date	Parcel	46,794
Map Admin Date	Parcel	43,984
Environmental Clearance Date	Project	43,281
Parcel Release Date	Parcel	41,948
ROW Release Date	Project	41,297
Estimated Let Date	Project	39,802
Map Complete Date	Project	28,361
Actual Let Date	Project	27,039
Parcel Possession Date	Parcel	26,733
Value Approved Date	Parcel	25,158
Total Paid Date	Parcel	15,882
ROW Clearance Date	Project	15,727
Initial Offer Date	Parcel	7,536
E49 Submitted to OAG Date	Parcel	5,661
Administrative Settlement Approval Decision Date	Parcel	4,451
Administrative Settlement Request Received Date	Parcel	4,293
Deed Signature Date	Parcel	4,145
Final Offer Date	Parcel	4,037
Commissioner Award Date	Parcel	3,984
Commissioner Deposit Date	Parcel	3,666
Utility Adjustment Begin Date	Parcel	2,013
Utility Adjustment End Date	Parcel	2,007
Petition Filed Date	Parcel	1,821
Administrative Settlement Offer Notification Date	Parcel	1,499
Possession and Use Agreement Signature Date	Parcel	747
Award Objections Required By Date	Parcel	666
Award Objections Filed Date	Parcel	620
Possession and Use Agreement Filing Date	Parcel	227
Refund Received Date	Parcel	178
Utility Agreement Alternate Procedure Date	Parcel	95
Initial ROW Map Received Date	Project	27
Cont Occu Approval Date	Project	-
Final ROW Map Processed Date	Project	-
Final ROW Map Received Date	Project	-

Changes in Date Field Use over Time

Although Table 8 shows the overall use of date fields in ROWIS from 1998 to 2015, it does not show any trends or changes over time. To illustrate changes in use over time, Figure 25 through Figure 31 show five-year moving averages for each of the date fields in the database. To normalize the process, the figures show relative percentages for each date field representing the count of records with a specific date field with respect to the count of records with non-null *Lupdate Date* for the same period. To improve readability of the figures, each figure limits the display to about five date fields.

A review of the trends in Figure 25 through Figure 31 indicates the following:

- *Parcel Status Date, Map Admin Date, and Environmental Clearance Date* are included in over 90 percent of records in ROWIS since 2000.

- *Parcel Release Date, Estimated Let Date, and Right of Way Release Date* are consistently included in 80 to 90 percent of records since ROWIS was implemented.

- *Map Complete Date* was used infrequently when ROWIS was first implemented, but its use has increased over time. Since 2006, it has been consistently included in at least 70 percent of records in ROWIS.

- The use of the *Right of Way Clearance Date* has declined considerably over time. From 1998-2002, about 80 percent of records used the date, but from 2011-2015, less than 20 percent of records used that date field.

- *Parcel Possession Date, Actual Let Date, and Value Approved Date* have been used between 40 and 75 percent of ROWIS records over time.

- Many date fields were used sparingly or not at all prior to 2005, but their use has increased to around 30 percent of ROWIS records or less.

- Many date fields have lower percentages for the 2011-2015 period compared to previous years, possibly because recent parcels and projects are in the process of being completed.

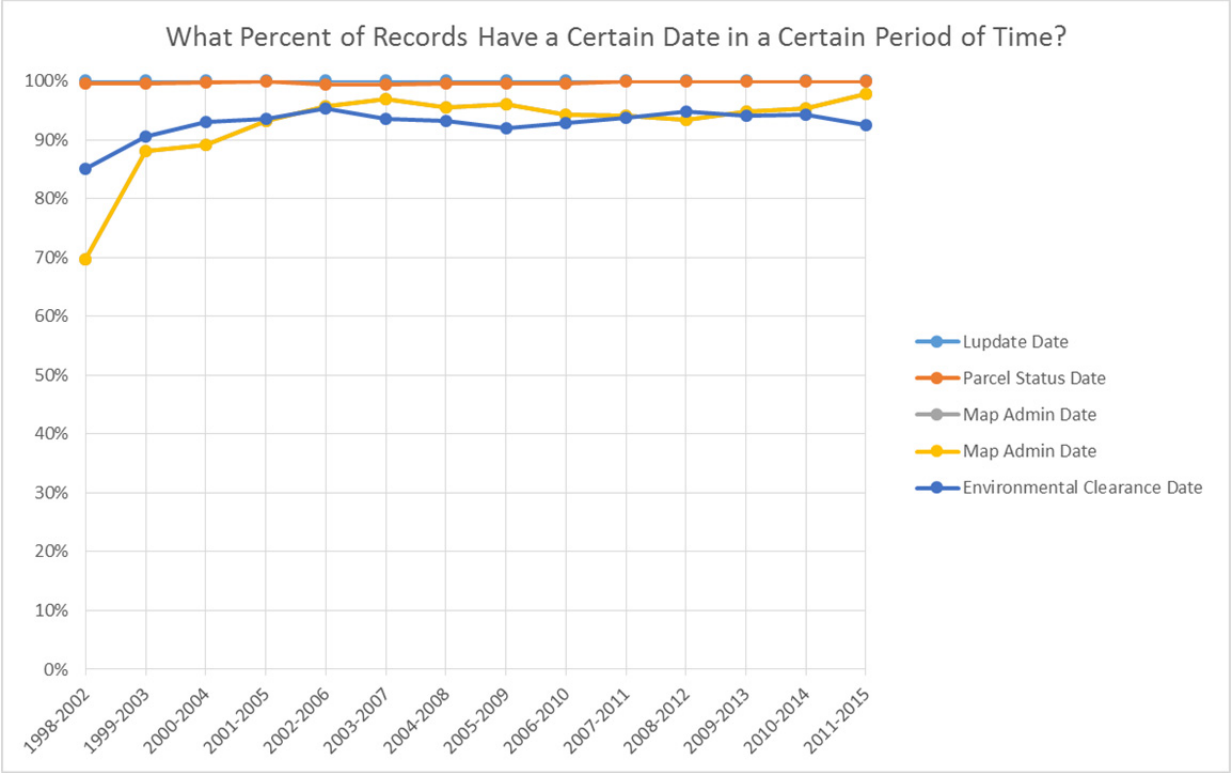


Figure 25. Five Year Moving Average of ROWIS Date Fields.

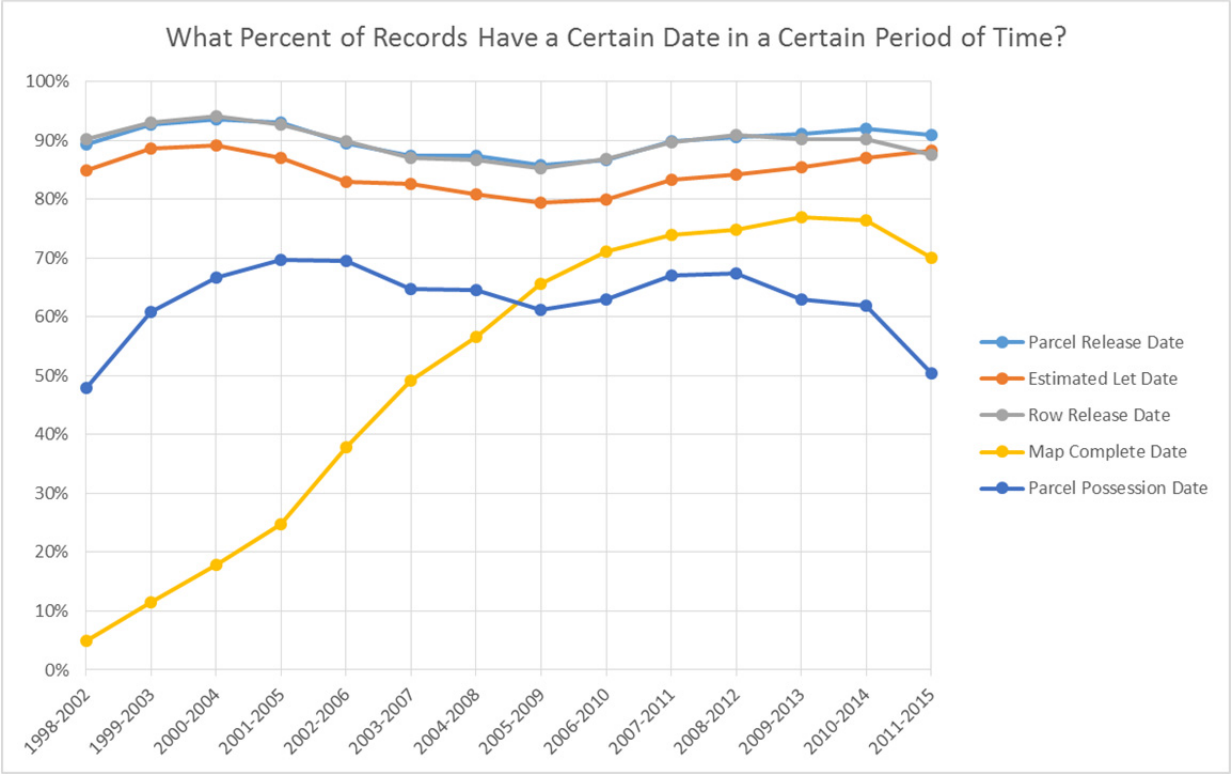


Figure 26. Five Year Moving Average of ROWIS Date Fields.

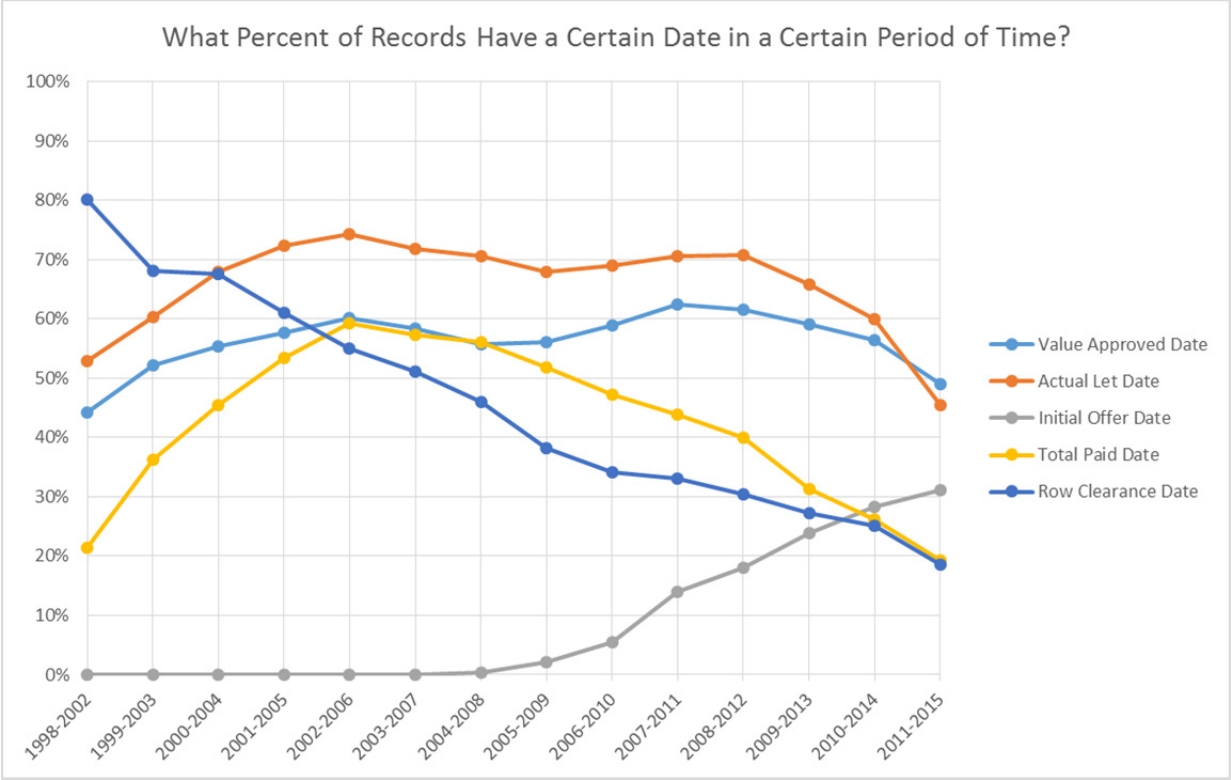


Figure 27. Five Year Moving Average of ROWIS Date Fields.

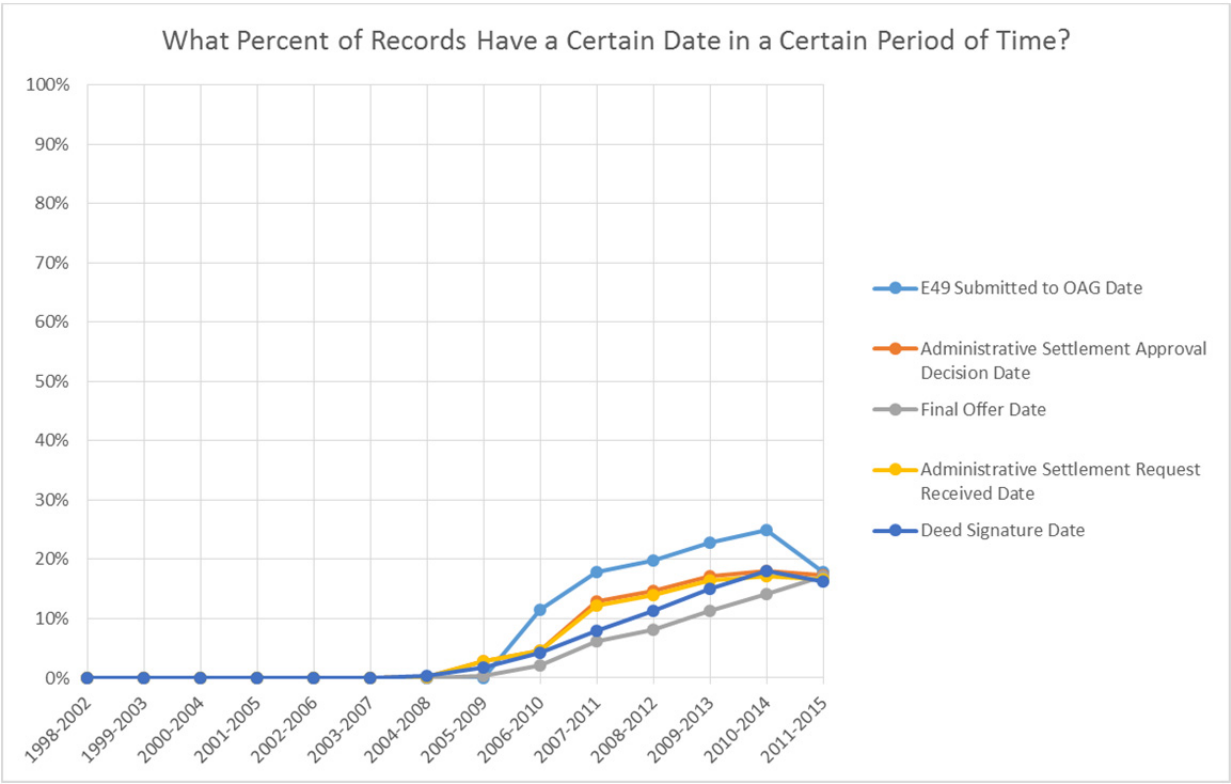


Figure 28. Five Year Moving Average of ROWIS Date Fields.

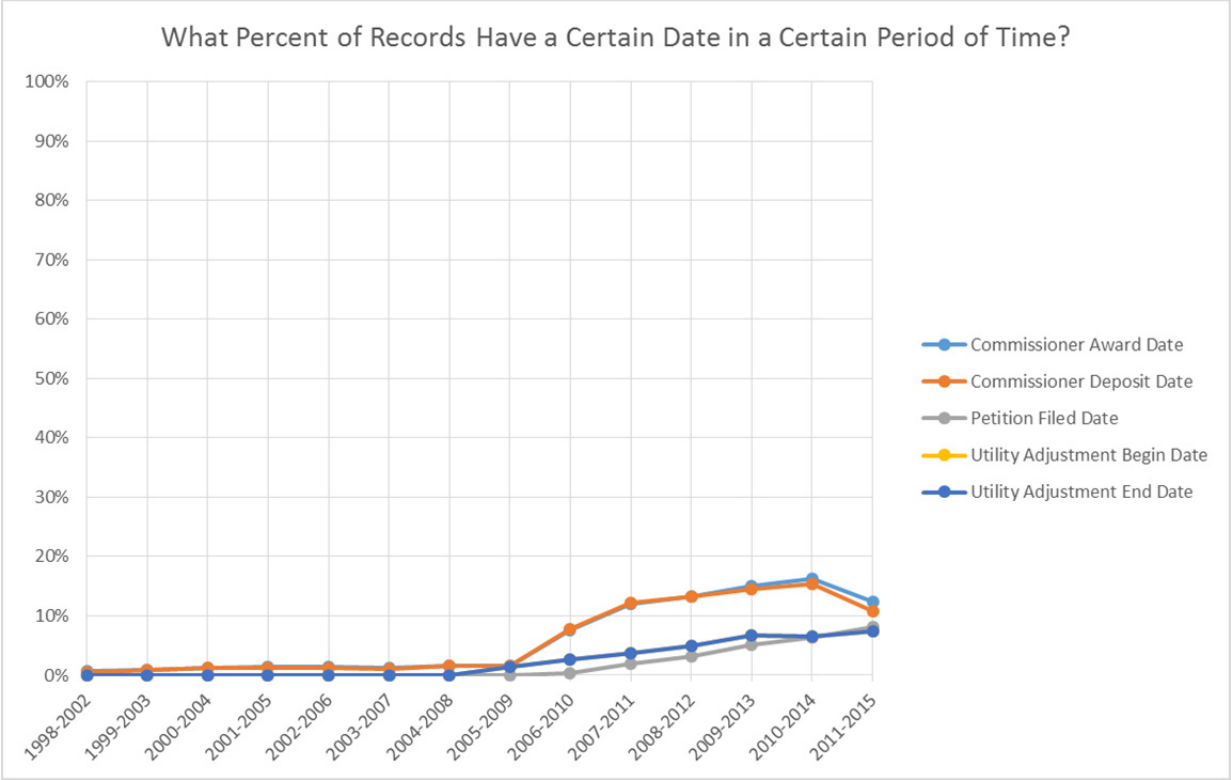


Figure 29. Five Year Moving Average of ROWIS Date Fields.

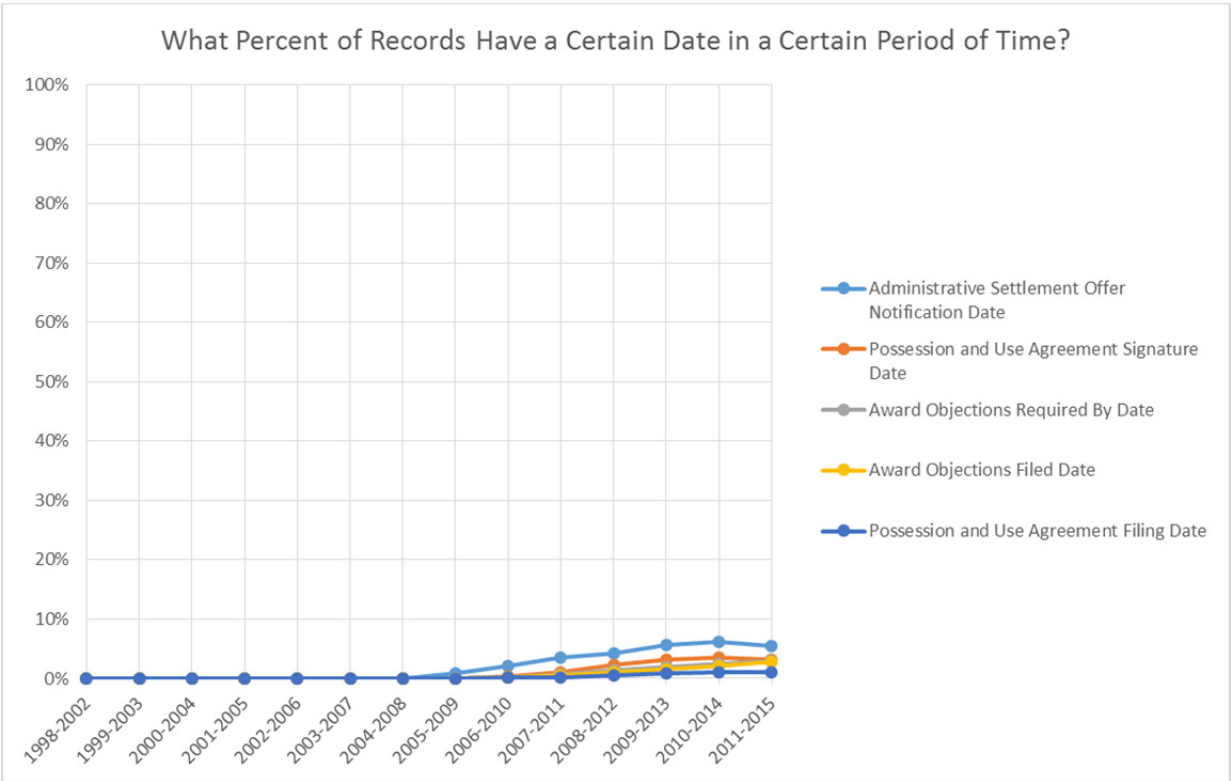


Figure 30. Five Year Moving Average of ROWIS Date Fields.

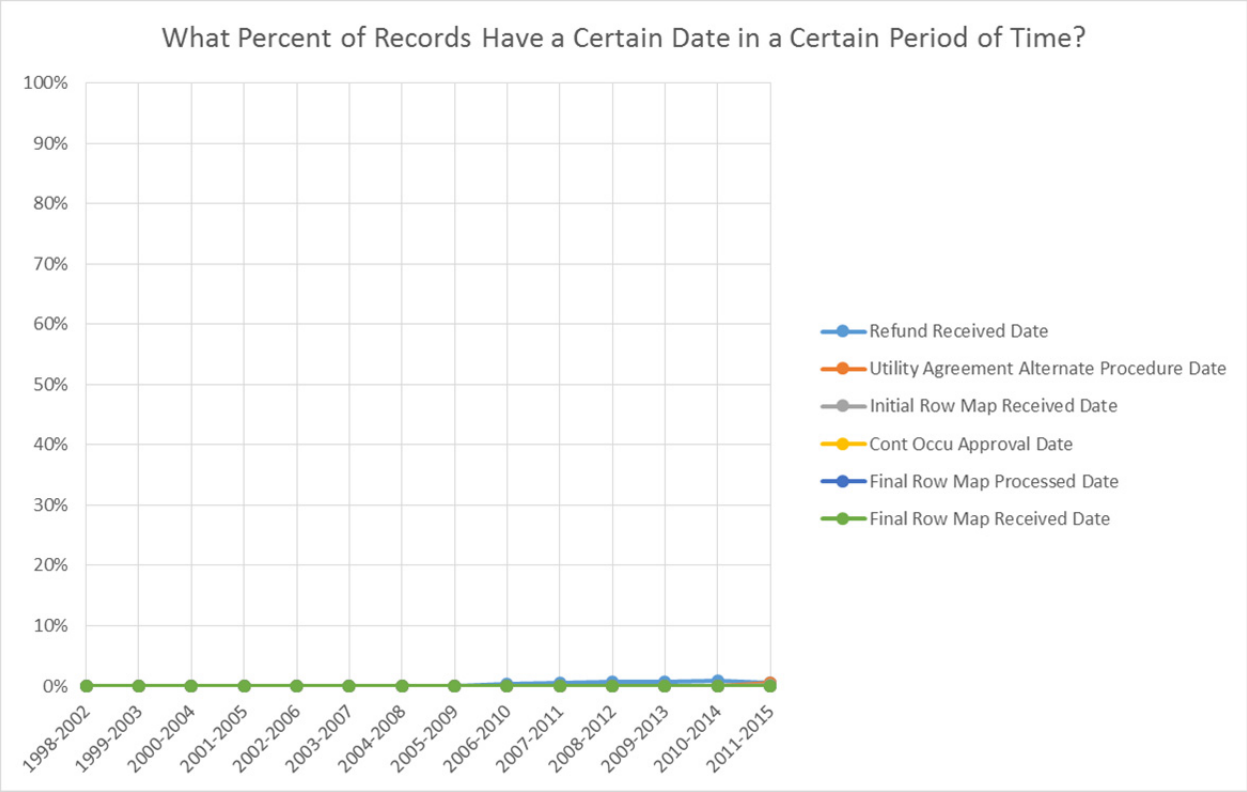


Figure 31. Five Year Moving Average of ROWIS Date Fields.

Event Sequence Modeling

Although the process to acquire real property interests would seem predictable at first glance, an analysis of event sequences relying primarily on date stamps in a database carries considerable risks in the absence of precise, quantifiable information related to database quality controls and other related protocols. For this reason, the next phase in the analysis involved comparing date field values systematically in an effort to determine how many times a particular date field was earlier, equal to, or later than other date fields. The goal of this approach was to identify date fields that consistently preceded or followed other date fields and, therefore, map out a typical sequence in the process to acquire real property interests.

The analysis involved creating a 32×32 matrix to represent all 32 date fields that were used at least once in the ROWIS database. Each row was then subdivided three times to add "before," "equal," and "after" counts. As an illustration, Table 9 shows a sample of this analysis using seven date fields. In the table, *Initial Offer Date* occurred 275 times before *Parcel Release Date*, 10 times on the same day as *Parcel Release Date*, and 7,133 times after *Parcel Release Date*.

Table 9. Sample Comparison of Date Occurrence Before, After, or Equal to Other Dates

		Administrative Settlement Approval Decision Date	Parcel Release Date	Right of Way Release Date	Environmental Clearance Date	Initial Offer Date	Map Complete Date	Estimated Let Date
Administrative Settlement Approval Decision Date	Before	-	103	4,377	4,440	47	3,841	4,280
	Equal	-	2	-	-	3	-	-
	After	-	4,322	-	-	3,039	-	-
Parcel Release Date	Before	4,322	-	39,675	40,326	7,133	25,974	36,557
	Equal	2	-	-	-	10	-	-
	After	103	-	-	-	275	-	-
ROW Release Date	Before	-	-	-	16,883	-	10,172	1,087
	Equal	-	-	-	47	-	473	-
	After	4,377	39,675	-	23,654	7,397	15,612	35,578
Environmental Clearance Date	Before	-	-	23,654	-	-	15,681	1,893
	Equal	-	-	47	-	-	46	-
	After	4,440	40,326	16,883	-	7,523	11,689	36,320
Initial Offer Date	Before	3,039	275	7,397	7,523	-	6,621	7,215
	Equal	3	10	-	-	-	-	-
	After	47	7,133	-	-	-	-	-
Map Complete Date	Before	-	-	15,612	11,689	-	-	682
	Equal	-	-	473	46	-	-	-
	After	3,841	25,974	1,172	15,681	6,621	-	24,554
Estimated Let Date	Before	-	-	35,578	36,320	-	24,554	-
	Equal	-	-	-	-	-	-	-
	After	4,280	36,557	1,087	1,893	7,215	682	-

The researchers used the 32×32 matrix to prepare a business process model representing a "typical" sequence of events in the process to acquire real property interests. If a date appeared mostly before another date, it was placed on the business process model in that order. The resulting business process model is shown in Figure 32 and Figure 33. Note the diagram is divided into two figures for ease of reading, and the *Award Objections Filing Date* is included in both figures for reference. Note also that the diagram provides only the before, equal, and after counts for two dates placed next to each other.

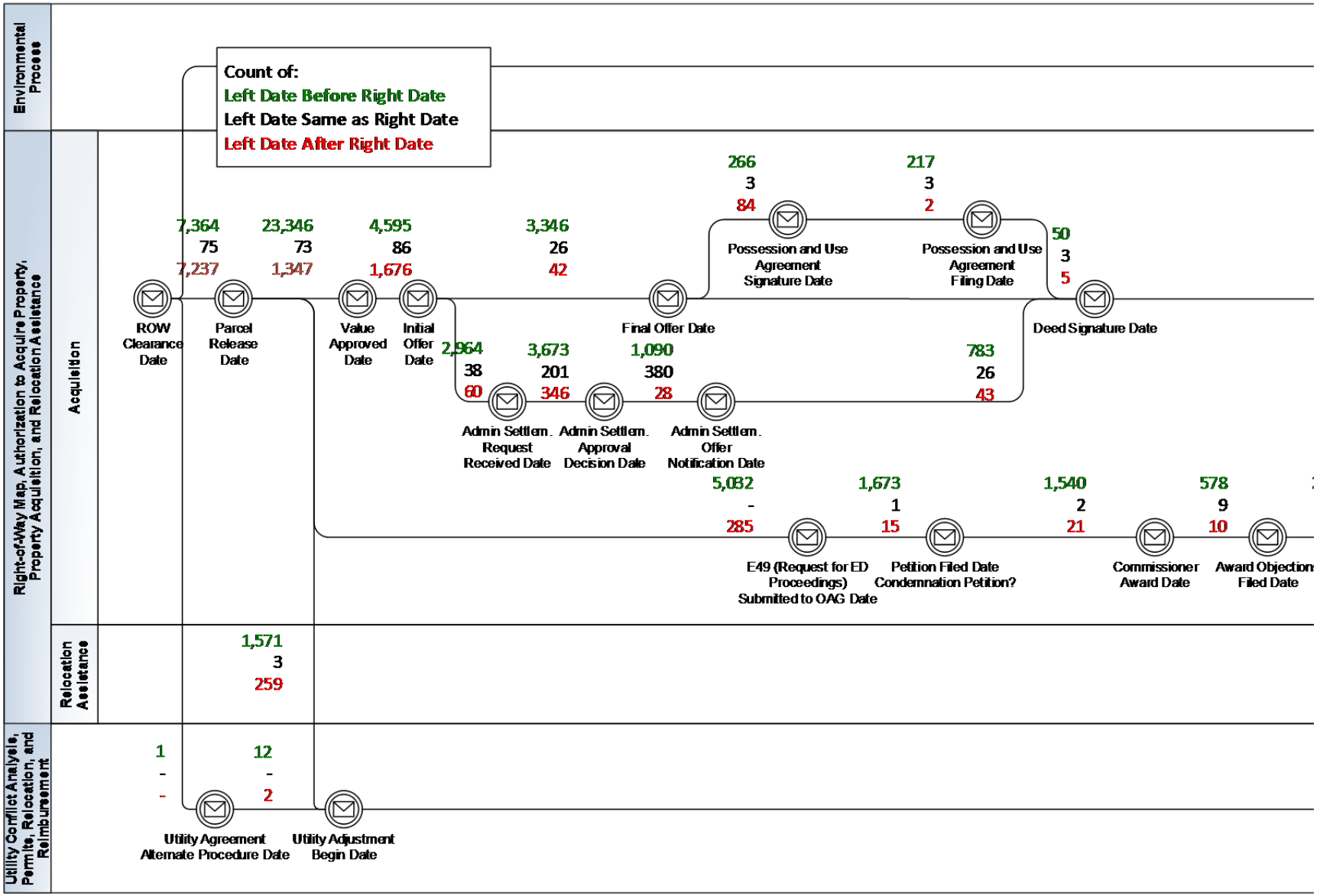


Figure 32. Process to Acquire Real Property Interests based on ROWIS Date Field Data (Part A).

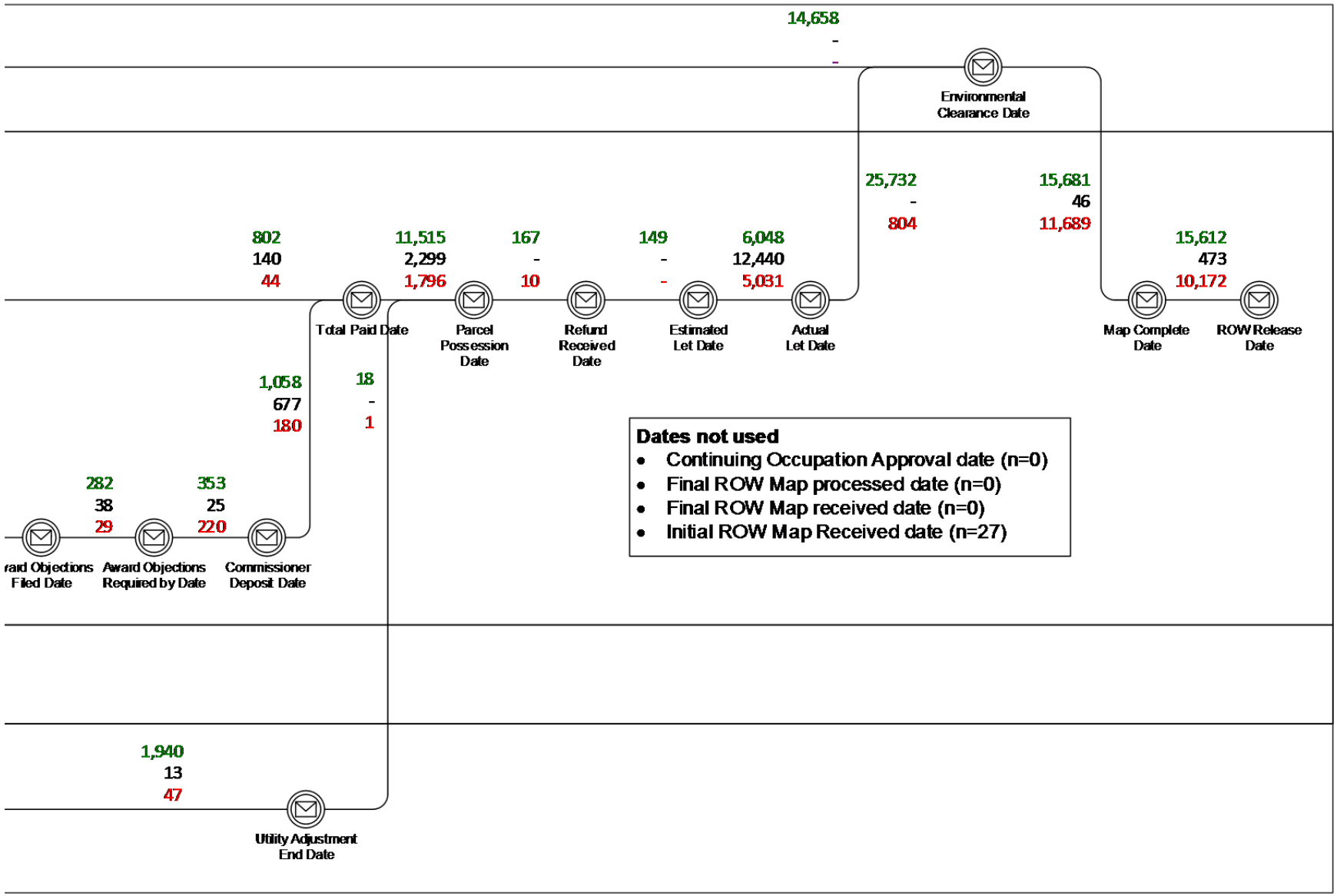


Figure 33. Process to Acquire Real Property Interests based on ROWIS Date Field Data (Part B).

In the diagram, the horizontal position of an activity indicates approximately when that activity occurs relative to other activities in the diagram (i.e., before, at the same time as, or after). For some fields, date placement was straightforward, e.g., *Right of Way Release Date* occurred zero times before, zero times at the same time as, and 39,675 times after *Parcel Release Date*. However, when the frequency of before and after occurrences were similar, date placement was not simple. For example, *Map Complete Date* occurred 11,689 times before, 46 times at the same time as, and 15,681 times after *Environmental Clearance Date*. In this case, the researchers compared *Map Complete Date* to all other dates to adjust the business process model.

The next step involved identifying typical durations. Based on the information compiled in the 32×32 matrix, the researchers calculated metrics such as maximum number of days, minimum number of days, mean, and standard deviation for *Initial Offer Date*, both for the records in the "before" group and for the records in the "after" group. Figure 34 and Figure 35 show how *Initial Offer Date* compares to all other dates in the business process model (not just the ones to the immediate left or right). Comparing *Initial Offer Date* to *Final Offer Date* shows there were 3,344 records where both dates were in the database and the initial offer date occurred before the final offer date (i.e., the "before" group). The model also shows that the maximum duration found was 2,085 days, the minimum duration was 1 day, the mean duration was 83 days, and the standard deviation was 111 days.

Figure 34 and Figure 35 show the statistics for only one (or dominant) of two groups, depending on the position of a date relative to the other dates. For example, for the dates left of *Initial Offer Date*, the figures show the statistics about the "after" group, but for the dates right of *Initial Offer Date*, the figures show the statistics about the "before" group. There were 41 cases where *Initial Offer Date* occurred after *Final Offer Date*. Because the opposite was the case in 3,344 records, the figures show the statistics for the opposite case.

There are small differences between the numbers shown in Figure 32 and Figure 33 compared to those in Figure 34 and Figure 35. For example, Figure 32 and Figure 33 show that there were 3,346 cases where *Initial Offer Date* occurred before *Final Offer Date*, but Figure 34 and Figure 35 show a count of 3,344 records. The difference was due to a filter that removed all comparisons if the date range was larger than 3,650 days (or 10 years). The reasoning was that if two date fields were more than 10 years apart, it was likely that one of the date fields in the database was wrong.

Unfortunately, it was not possible to complete this portion of the analysis because of the decision to terminate the research early. However, the methodology described here provides enough guidance on how to proceed to finish the task. The ultimate goal would be to prepare an estimate of typical durations (such as maximum number of days, minimum number of days, mean, and standard deviation) and other related metrics (e.g., statistical distribution) between any pair of date stamps and, more importantly, between any pair of major milestone dates. The result would be useful to characterize the process to acquire real property interests statistically, therefore helping to reduce uncertainty and risk in the process and make project delivery more predictable and reliable.

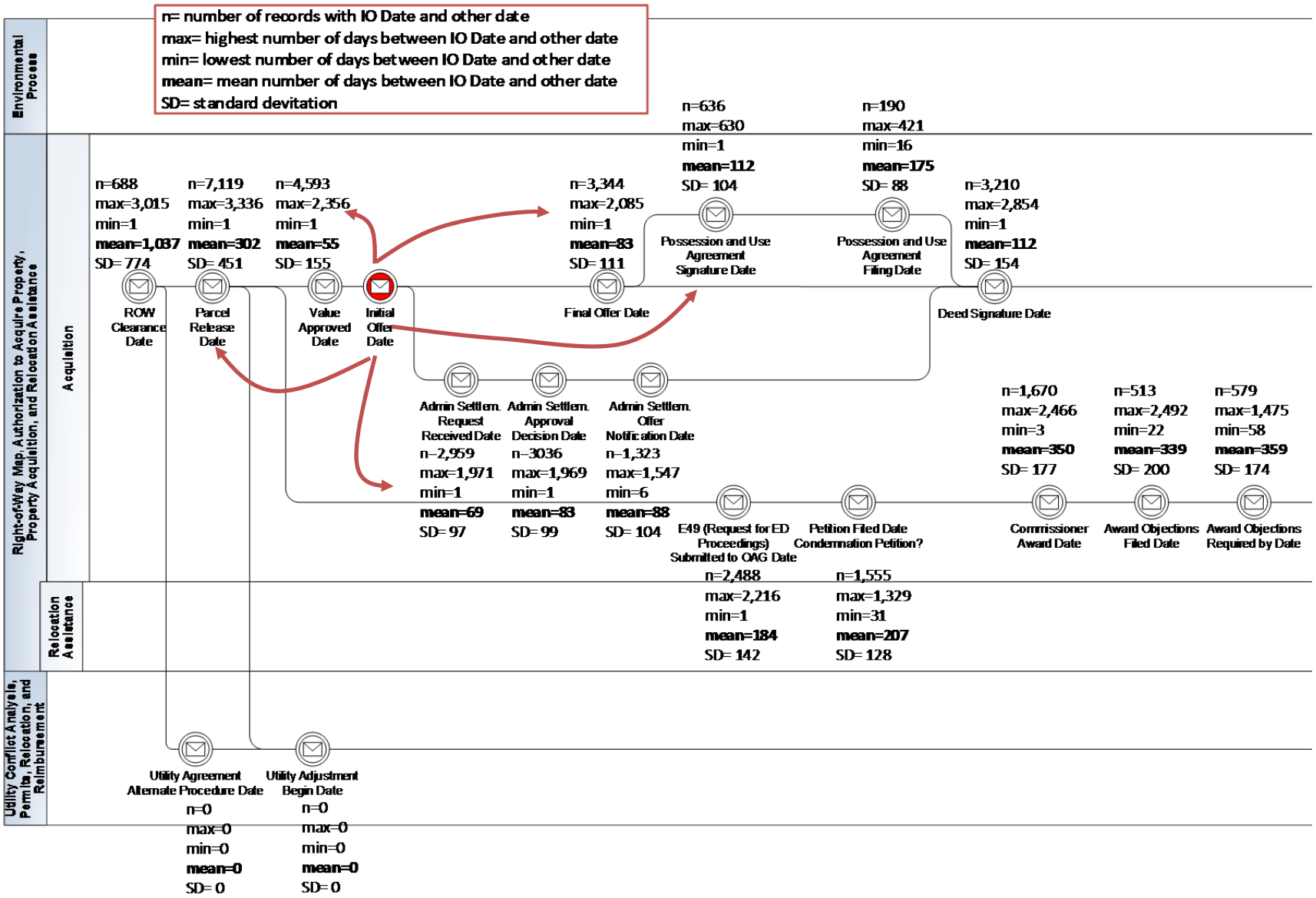


Figure 34. Duration between Initial Offer Date and Other Dates (Part A).

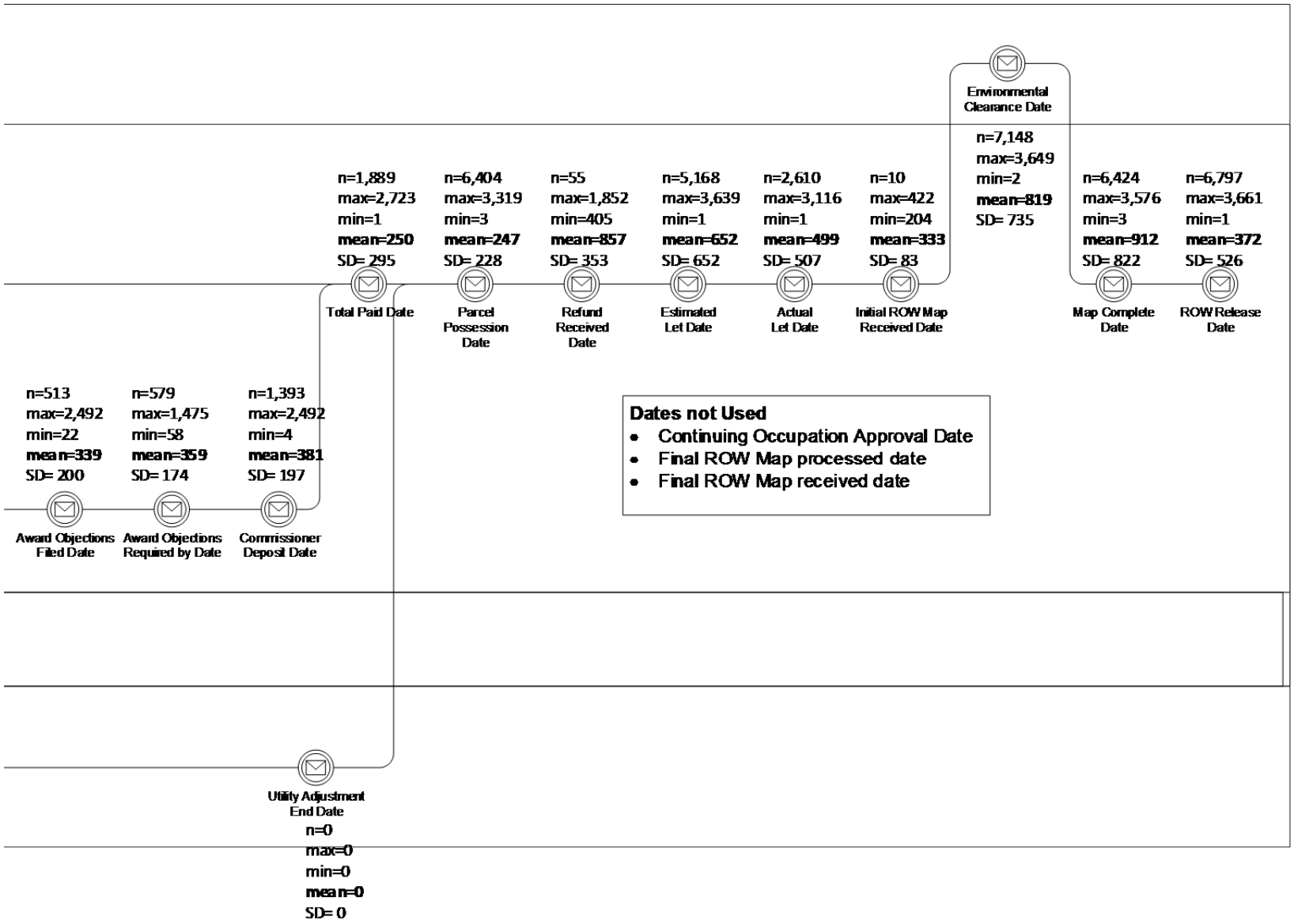


Figure 35. Duration between Initial Offer Date and Other Dates (Part B).

CHAPTER 5. CONCLUDING REMARKS

The purpose of recently completed NCHRP Project 20-84 was to develop improved, integrated real property procedures and business practices during project delivery. One of the NCHRP 20-84 products was a prototype real property acquisition and relocation assistance schedule template for use in alternative analyses and decision-making. Another product was a set of strategies to address issues and challenges affecting the timely, effective delivery of real property interests.

The purpose of research project 0-6892 was to compare the project performance tools developed in NCHRP Project 20-84 against processes and schedules at TxDOT, expand the national research by including a risk-based approach for conducting what-if scenarios and sensitivity analyses, and adapt relevant strategies developed in NCHRP 20-84 to TxDOT business processes and practices. Anticipated implementable deliverables included the following:

- **Real property acquisition planning and management decision tool**. This deliverable included a real property acquisition work schedule in P6 format based on the lessons learned in NCHRP 20-84, typical protocols and procedures followed by districts, and TxDOT's recent modernization initiative.

- **Implementation strategies**. This deliverable included a set of strategies that were identified in NCHRP 20-84 and which would be tailored for use in real property acquisition and management activities at TxDOT.

Six months into the research, TxDOT officials informed the researchers of a separate initiative to implement an enterprise-level system to manage construction projects more effectively. This capability will involve tracking a large number of date stamps, including critical date stamps related to the acquisition and delivery of real property interests. Because of the perception of a potential overlap between the anticipated 0-6892 deliverables and the enterprise-level initiative, TxDOT decided to terminate the 0-6892 research effort.

Previous chapters summarized activities that were completed while the 0-6892 research project was active. More specifically:

- Chapter 2 provided a review of current policy, manuals, and procedures, and identification of similarities and differences between the reference NCHRP 20-84 process and the process for acquisition of real property at TxDOT. This chapter also provided a summary of modernization initiatives at TxDOT and a summary of recent relevant research efforts.

- Chapter 3 provided a detailed description of project schedule templates, including templates to manage the acquisition of real property interests, which were developed during the initial phases of the P6 implementation at TxDOT. This chapter also provided a summary of interviews with TxDOT officials to gather information about real property acquisition and relocation assistance practices. More specifically, the focus of the interviews was to identify (a) the reasons that districts only use P6 at a high-level of activity aggregation and (b) tools and protocols that districts use to manage the

acquisition of real property interests. The chapter also described templates in Excel format that districts have developed to assist in this process, containing a relatively large number of fields that enhance the collection of relevant date information that is currently possible with ROWIS.

- Chapter 4 documented an evaluation of ROWIS data to provide a foundation for typical durations in the acquisition of real property interests and relocation assistance. For the analysis, the researchers downloaded parcel, payment, and project data from ROWIS and imported the data into a Microsoft Access database. The Project, Parcel, and Payments tables within ROWIS contain several date milestone fields. The researchers evaluated these date fields to determine the number of records with valid dates as well as the sequence of milestone events.

The early termination of the research project prevented the completion of critical activities, including the development and analysis of relevant strategies and the formulation of appropriate recommendations. Nevertheless, the data gathered and corresponding analysis, as summarized in Chapters 2, 3, and 4, might be relevant and useful for future reference. In particular:

- Districts use Excel templates to track activities related to the acquisition of real property interests and relocation assistance. The templates contain a relatively large number of fields that enhance the collection of relevant date information that is currently possible with ROWIS. These templates have gone through a couple of iterations in recent years, relying primarily on the experience and expertise of end users. The Excel template approach is low-tech but highly effective. There is every reason to believe that districts will continue to use this approach to manage the acquisition of real property interests in the near future.

- Districts have begun to use bar charts and other visual reporting tools in Excel to consolidate and present real property acquisition information to project managers and other team members. As districts become more comfortable with these low-tech approaches, the use of the tools will likely continue to increase.

- A comparison between the date fields in ROWIS and those in the Excel templates reveals that districts use the Excel templates to track a significant number of date stamps that ROWIS currently does not handle. Specifically, ROWIS was initially implemented to manage activities related to the acquisition of property interests by negotiation, administrative settlements, or condemnation proceedings. The date stamps in ROWIS are a reflection of this software design approach. By comparison, the Excel templates were implemented to track a much wider set of activities. In addition to date fields to track the acquisition of property interests, the Excel templates include date stamps to track appraisals and relocation assistance activities. This makes the Excel templates particularly versatile and flexible.

- The Enterprise Systems Office started a project to implement a modernize portpolio and project management system. TxDOT expects MPPM to support various functions pertaining to transportation project delivery by replacing DCIS and by integrating a

number of existing systems and platforms into MPPM. At this point, it is not clear whether this will entail replacing ROWIS completely or integrating date stamps that are managed in ROWIS into the MPPM system. It is also not clear whether MPPM will only include date stamps that are currently managed in ROWIS or whether it will include additional date stamps, e.g., those used to track appraisals and relocation assistance activities. Because of the usefulness of these date stamps, it would be advisable to include them in the MPPM implementation.

- This research started, but did not complete, the analysis of typical date stamps in ROWIS. To the extent that the analysis began to identify date stamps that districts have systematically used throughout the years, it would be advisable to use (and expand as appropriate) the results of the analysis for the MPPM implementation,

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