STRATEGIES TO ENCOURAGE AND FACILITATE UTILITY OWNER PARTICIPATION IN TRANSPORTATION PROJECTS – GUIDEBOOK

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LIST OF ACRONYMS, ABBREVIATIONS, AND TERMS

AASHTO	American Association of State Highway and Transportation Officials
ANSI	American National Standards Institute
AFA	Advance funding agreement
APA	Alternate Procedure Approval
APRA	Advance Planning Risk Analysis
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
BPMN	Business Process Model and Notation
CD	Compact disc
CE	Categorical exclusion
CFR	Code of Federal Regulations
CSJ	Control section job
CSS	Context-sensitive solution
DOT	Department of transportation
DSR	Design Summary Report
DTM	Digital terrain model
EA	Environmental assessment
EIS	Environmental impact statement
EM	Electromagnetic
EMI	Electromagnetic imaging
FHWA	Federal Highway Administration
FPAA	Federal Project Authorization and Agreement
GPR	Ground penetrating radar
IEEE	Institute of Electrical and Electronics Engineers
IT	Information technology
LOS	Level of service
LPA	Local public agency
MIS	Major investment study
MOU	Memorandum of understanding
MPO	Metropolitan planning organization
MTIP	Metropolitan Transportation Improvement Program
MTP	Metropolitan Transportation Plan
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
PDF	Portable document format
PEL	Planning and environmental linkage
PS&E	Plans, specifications, and estimate
QLA	Quality level A
QLB	Quality level B
QLC	Quality level C
QLD	Quality level D
ROW	Right of way
ROWIS	Right of Way Information System

RTIP	Rural Transportation Improvement Program
SHRP	Strategic Highway Research Program
SMTP	Statewide Multimodal Transportation Plan
SRTP	Statewide Rural Transportation Plan
STIP	State Transportation Improvement Program
STP	Statewide Transportation Plan
TAC	Texas Administrative Code
TTI	Texas A&M Transportation Institute
TMUTCD	Texas Manual on Uniform Traffic Control Devices
TxDOT	Texas Department of Transportation
UAR	Utility accommodation rules
UCM	Utility conflict matrix
UIR	Utility Installation Review
USB	Universal serial bus
USC	U.S. Code
UTP	Unified Transportation Program
VE	Value engineering

CHAPTER 1. INTRODUCTION

Utility accommodation policies around the country provide minimum requirements for the accommodation, adjustment, and maintenance of utility facilities within the highway right of way. Many state rules and guidelines are based on utility accommodation policies and guides developed by the American Association of State Highway and Transportation Officials (AASHTO) (*1, 2*).

In Texas, the Texas Administrative Code (TAC) includes utility accommodation rules (UAR) that provide regulation and guidance for the accommodation and adjustment of utility facilities on the state highway right of way (*3*). Utility owners must also comply with a host of applicable federal and state laws, regulations, and policies, as summarized in the TxDOT *Right of Way (ROW) Utility Manual* (*4*), as well as many other laws ranging from the Texas Engineering Practice Act (*5*) to the Federal Clean Water Act (*6*) and the Americans with Disabilities Act (*7*). In addition, utility owners must comply with a wide range of relevant industry standards and specifications, including, but not limited to, those developed by the American National Standards Institute (ANSI), the American Society for Testing and Materials (ASTM), the American Society of Civil Engineers (ASCE), and the American Water Works Association (AWWA). Additional examples include the Institute of Electrical and Electronics Engineers (IEEE), the National Electrical Manufacturers Association (NEMA), and the National Fire Protection Association (NFPA).

A 2002 survey of state departments of transportation (DOTs), highway contractors, design consultants, and others identified utility adjustments as the most frequent reason for delays in highway construction (*8*). Management of utility conflicts through effective communication, cooperation, and coordination among stakeholders is a critical mechanism to keep transportation projects on schedule (*9*). Delays and inefficiencies in utility-related activities have a tendency to proliferate into project letting and even construction, frequently resulting in higher bids, change orders and/or damage or delay claims, litigation by utility owners or agencies, safety concerns at the job site, frustration of the traveling public, and negative public perception about the project.

Report 0-6624-1 documents the process to assemble a list of 64 potential strategies to improve utility owner participation in the project development process (*10*). This list was based on a comprehensive review of existing and recommended practices at various levels, including local, state, and national levels. The potential strategies were grouped into the following categories:

- Communication and coordination (21 strategies).
- Contracts and agreements (17 strategies).
- Utility data collection and management (19 strategies).
- Land use and corridor preservation techniques (3 strategies).
- Training (4 strategies).

The researchers also held meetings with TxDOT districts and divisions, project advisors, utility owners, and other relevant agencies in the state. These meetings enabled stakeholders to provide input into the strategies identified from the detailed literature review and recommend additional strategies. TxDOT officials interviewed included representatives from urban and rural districts.

Utility stakeholders interviewed included operators of various sizes and in different industries such as oil and gas, communications, water, and electricity.

The result of the meetings with various stakeholders, including project advisors, TxDOT districts and regions, and utility owners was a consolidation and ranking of potential strategies. The following strategies reflect the highest priorities identified through this process:

- Modernization of the utility process at TxDOT.
- Use of utility conflict matrices and associated procedures.
- Streamlining and standardization of utility cost data submissions and reimbursement process, including utility agreements and master utility agreements.
- Core skill training on utility topics.

The following chapters describe each of these strategies in more detail. The discussion includes an implementation plan.

A companion to this content is a set of materials in electronic format (see companion compact disc [CD]). The purpose of these materials is to facilitate access to or otherwise complement information provided in this guidebook. Intended users of these materials include stakeholders such as division and district officials, utility owners, consultants, and contractors. Although the materials are provided as a companion CD to this guidebook, TxDOT could also make them available to stakeholders through other means, e.g., a website, universal serial bus (USB) flash drives, or even email.

The companion CD also includes training materials to assist on the process of disseminating the strategies described in this guidebook. The training materials include one Microsoft® PowerPoint® file per strategy, along with presenter and participant handout materials.

CHAPTER 2. MODERNIZATION OF THE UTILITY PROCESS

INTRODUCTION

The utility process is a critical component of the project development process. Delays in utility activities can easily result in delays to project delivery and increase to overall project cost. The utility process at many state departments of transportation (DOTs), including TxDOT, has evolved overtime to include a wide range of procedures, documents, and forms. At the same time, relevant manuals and other documentation are not necessarily kept up-to-date, making it difficult for state DOT officials, utility owners, and other stakeholders to understand and follow the process.

In the case of the TxDOT *ROW Utility Manual* (*4*), there are discrepancies between activity descriptions and sequencing compared to actual practices both at the district and division levels. During the interviews conducted as part of this research, the researchers learned about a number of issues that stakeholders have with the written documentation at TxDOT that describes the utility process. For example, several stakeholders indicated that the utility process described in the documentation is too complex and difficult to follow. Several utility owners were highly critical of the utility coordination process at TxDOT, particularly regarding the way the process is depicted and described in manuals and other documents. Utility owners highlighted that the TxDOT process was outdated and lacked flexibility. In addition, different districts carry out the utility process differently, which cause difficulties for utility owners that service customers spanning multiple TxDOT districts.

To address these issues, the researchers developed a prototype depiction of the utility process at TxDOT using the Business Process Model and Notation (BPMN), along with written descriptions of activities (*11*). Using BPMN enabled the use of swim lanes to group activities according to specific functions or specialties, while facilitating the development of more detailed (or "zoomed in") views as needed. Additional information about the process followed to characterize the current utility process at TxDOT and identify areas where this process could be improved is included in Report 0-6624-1 (*10*).

The researchers developed three models of the project development and delivery process with increasing detail at each level, as follows:

- **Level 1**. This model provides a high-level depiction of the entire process. The model considers both phases and functional areas. It is suitable for general presentations and handouts. At 100-percent scale, the page size of the Level 1 diagram is 8.5 × 11 inches.

- **Level 2**. This model provides an intermediate level of detail for the entire project development process. The following section provides a diagram, zoomed-in views, and summarized descriptions of the activities depicted at this level. At 100-percent scale, the page size of the Level 2 diagram is 24 × 36 inches.

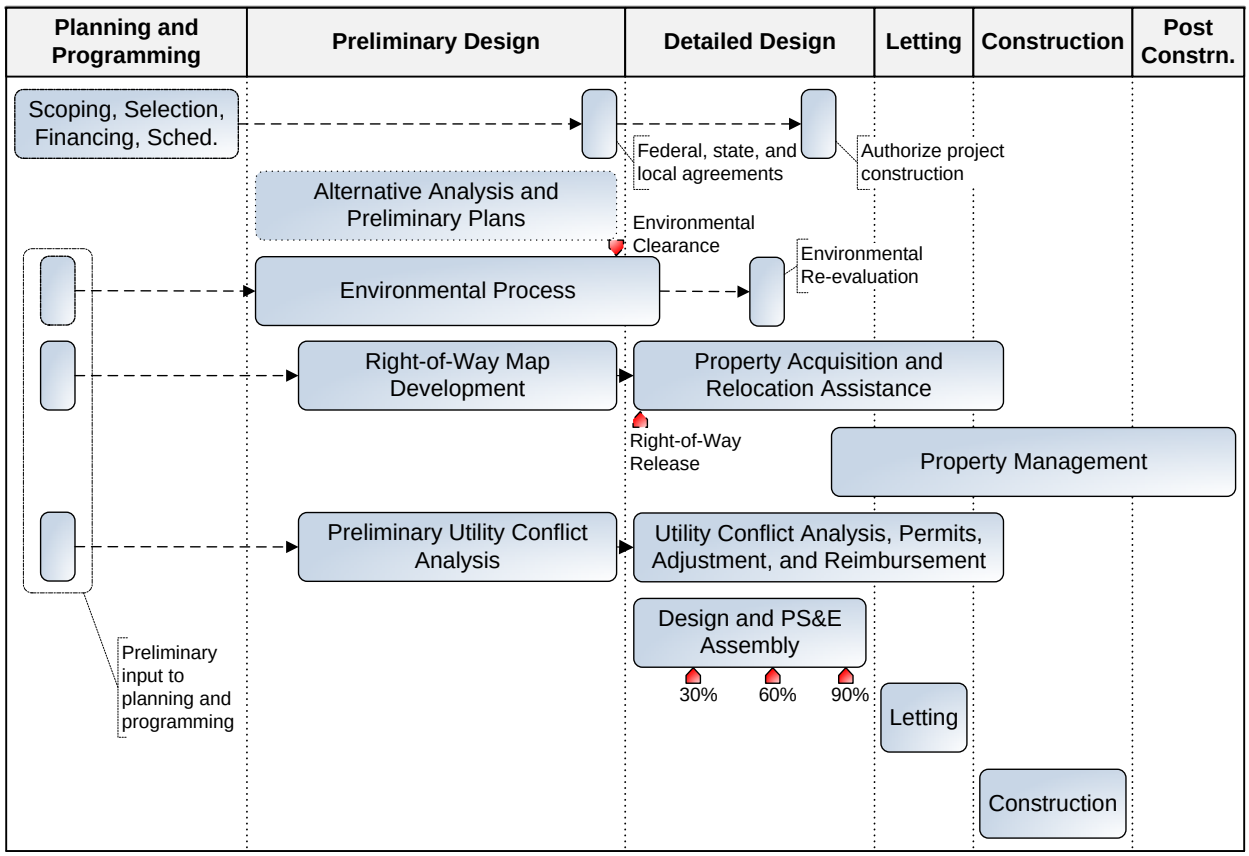
- **Level 3**. This model provides the same level of detail as Level 2 and, in addition, a more detailed depiction of the utility coordination and conflict resolution process at TxDOT.

The last section in this chapter provides a diagram, zoomed-in views, and summarized descriptions of the activities depicted at this level. At 100-percent scale, the page size of the Level 3 diagram is 48 × 36 inches.

The researchers developed the three diagrams using Microsoft Visio®. A Visio file, along with a portable document format (PDF) version, is provided as a standalone file.

LEVEL 1 BUSINESS PROCESS MODEL

As mentioned, this model provides a high-level depiction of the entire process (Figure 1). The model considers both phases and functional areas (represented by individual bars) and is suitable for general presentations and handouts.



Note: Standalone versions of this diagram in Visio format and PDF are also available.

Figure 1. Typical Project Development and Delivery Process (Level 1 Diagram).

LEVEL 2 BUSINESS PROCESS MODEL

Figure 2 shows the Level 2 diagram of the project development and delivery process. Figure 3 through Figure 6 provide zoomed-in views of the Level 2 diagram.

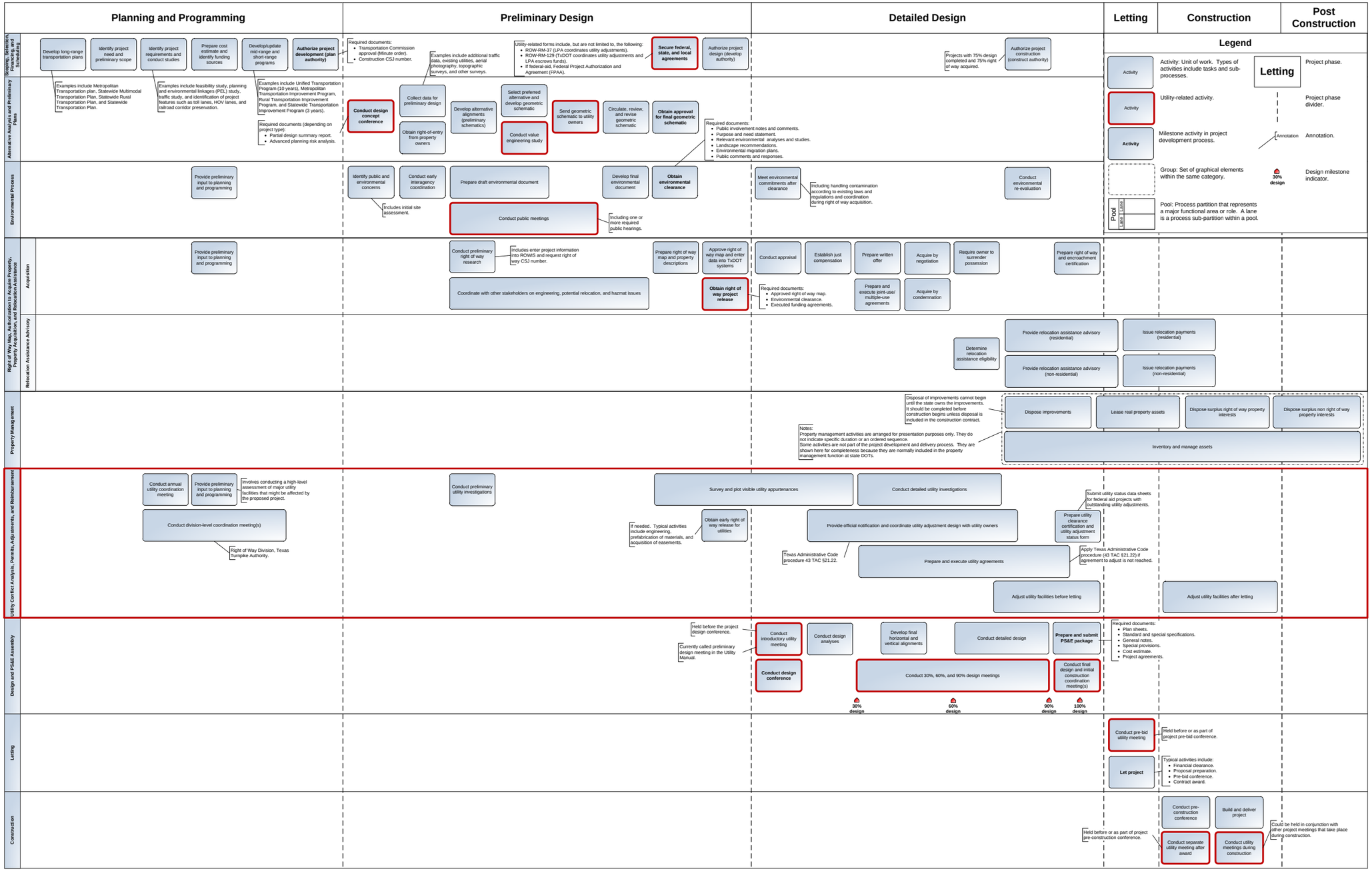


Figure 2. Typical Project Development and Delivery Process (Level 2 Diagram).

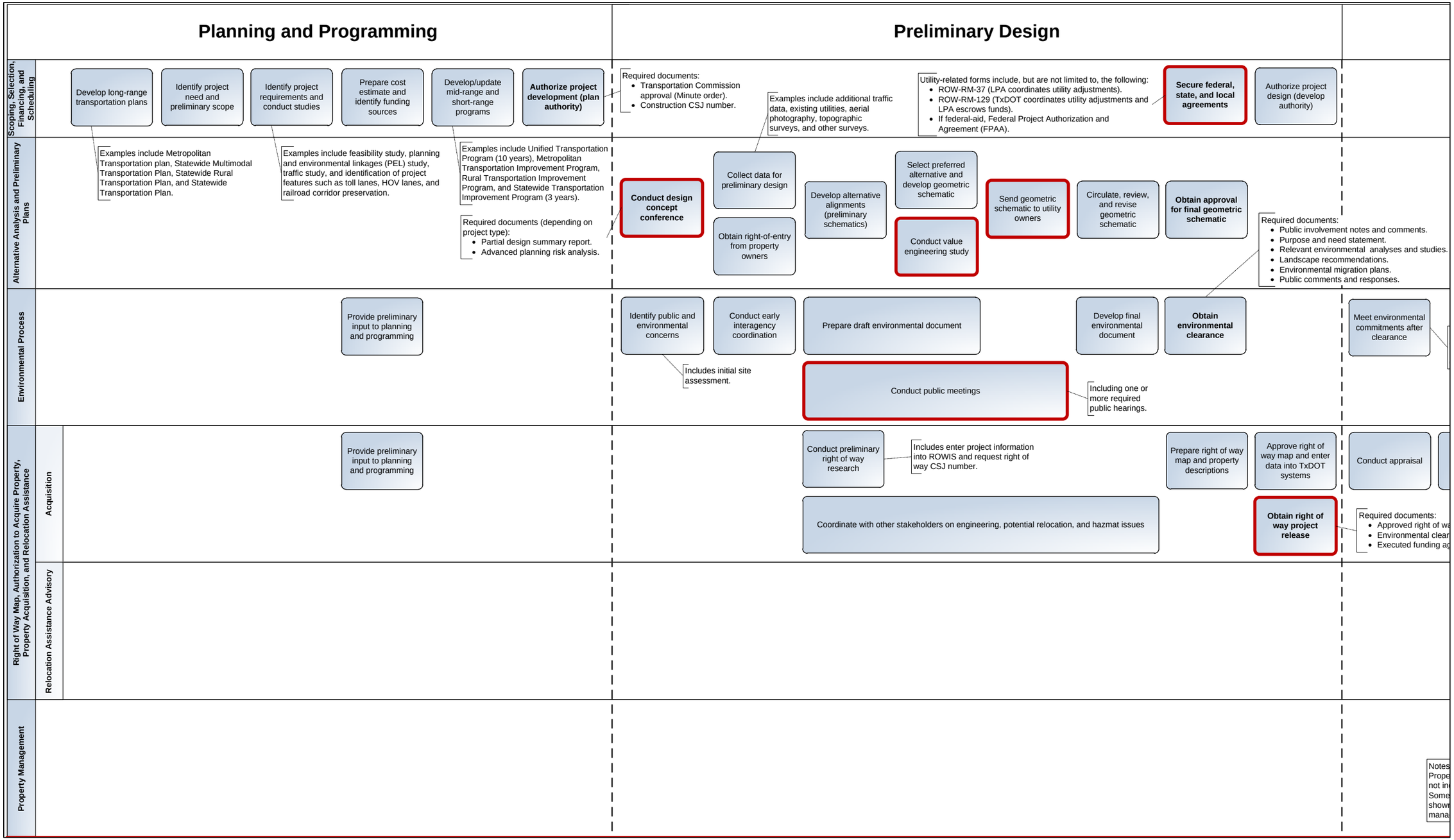


Figure 3. Typical Project Development and Delivery Process (Level 2 Diagram) – Top Left Quadrant.

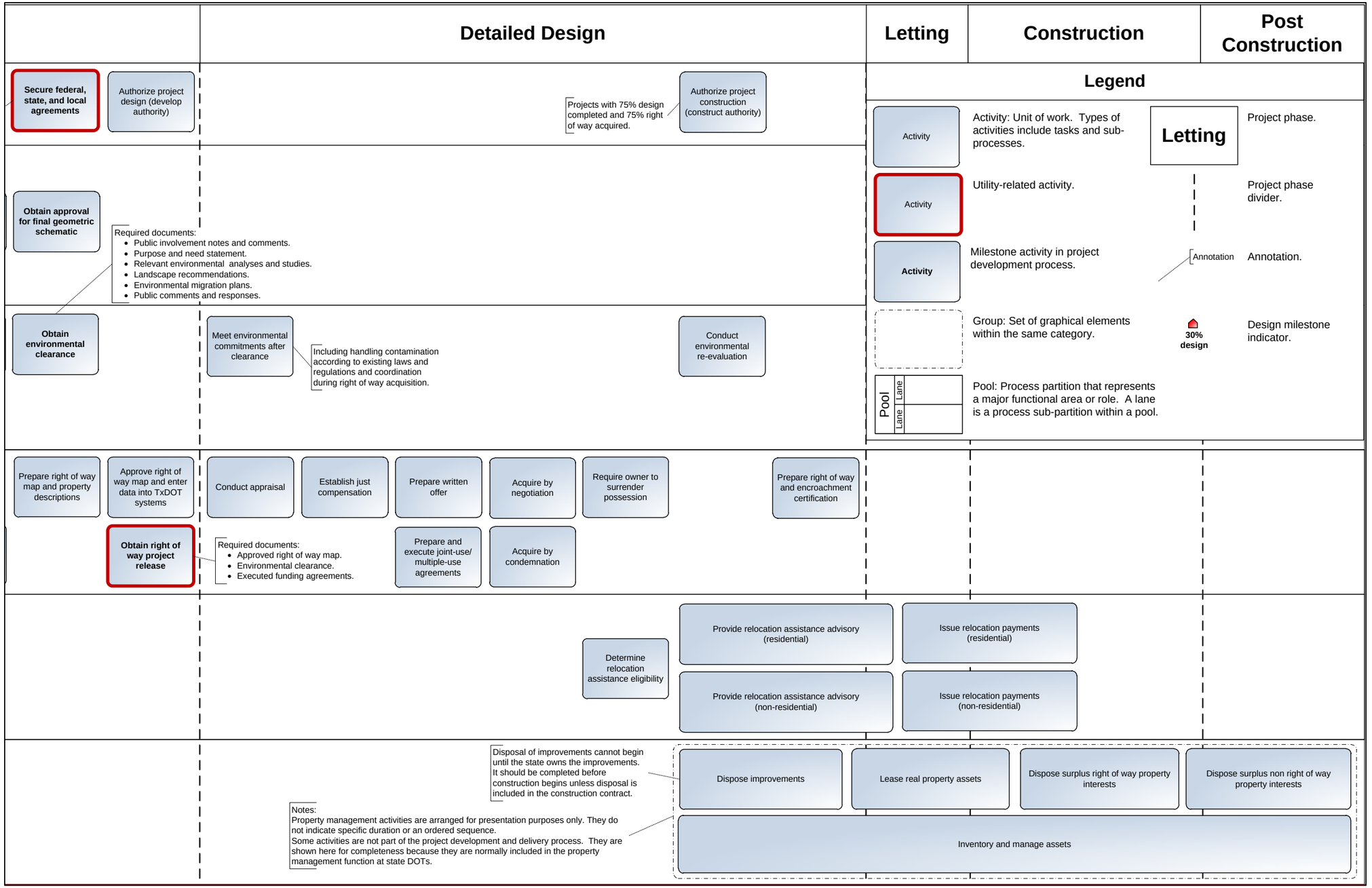


Figure 4. Typical Project Development and Delivery Process (Level 2 Diagram) – Top Right Quadrant.

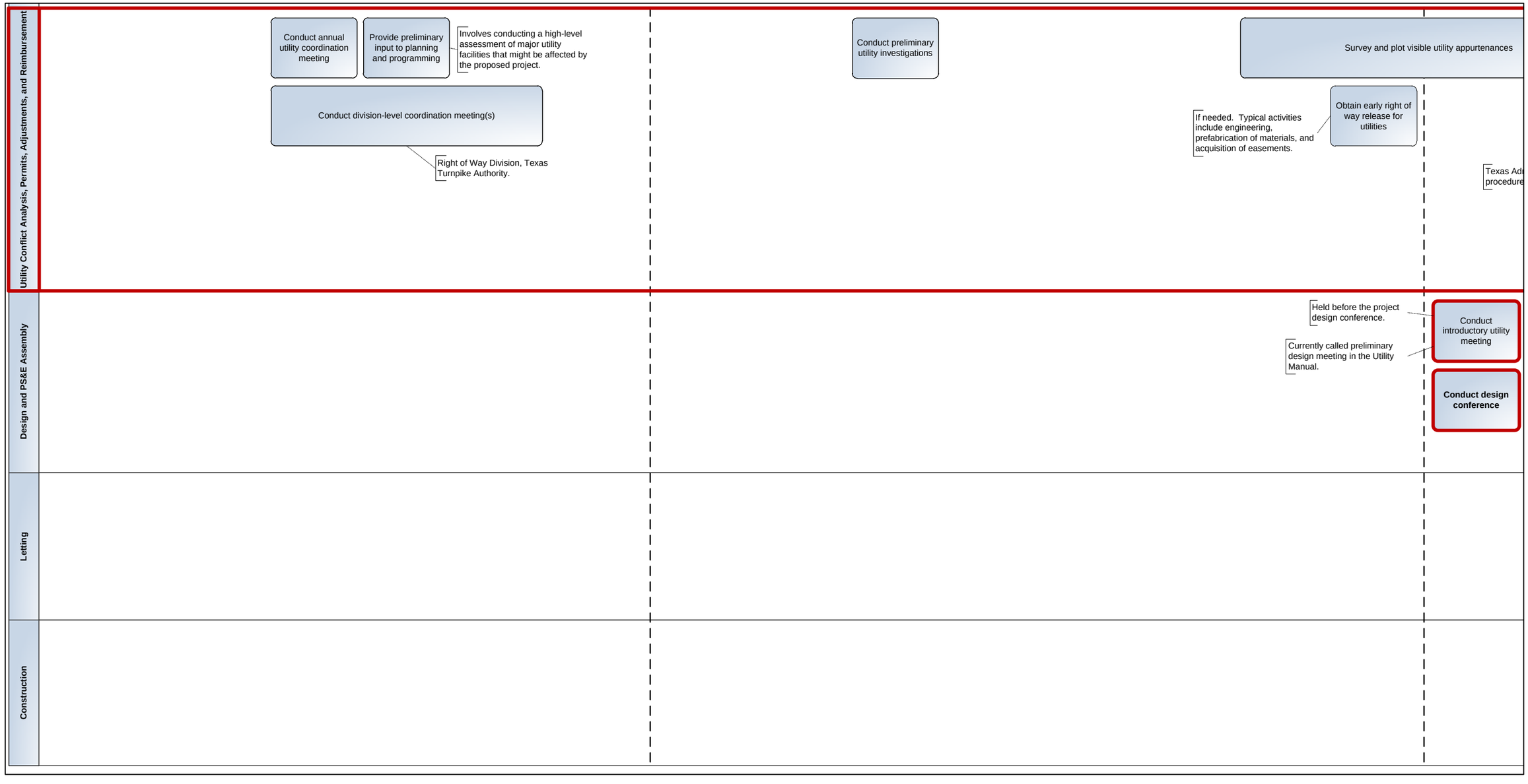


Figure 5. Typical Project Development and Delivery Process (Level 2 Diagram) – Bottom Left Quadrant.

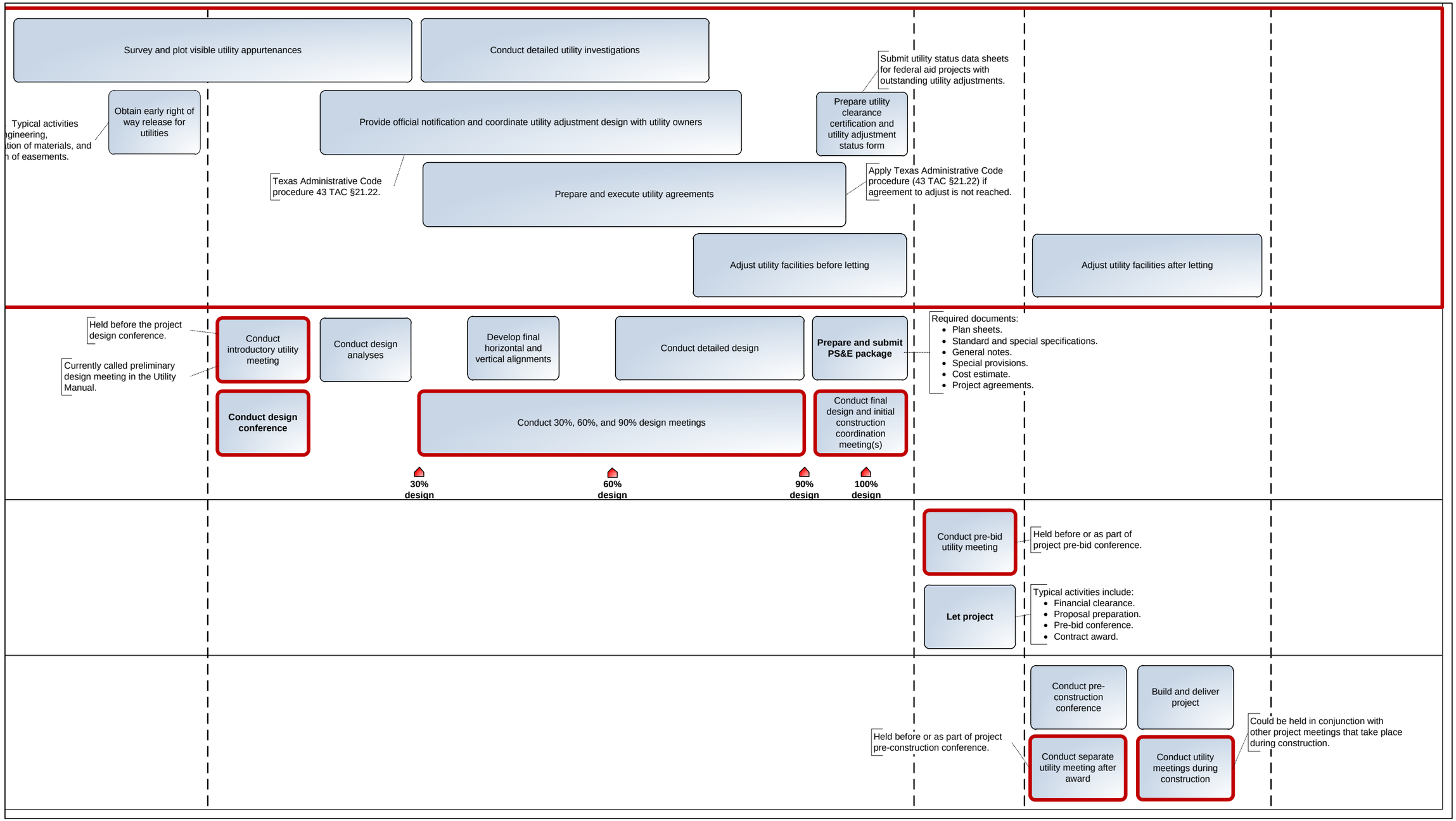


Figure 6. Typical Project Development and Delivery Process (Level 2 Diagram) – Bottom Right Quadrant.

Level 2 activities are arranged in "pools" that represent groups of activities with similar functions, which are further broken down into "lanes" as needed. The pool highlighted with a red outline represents the utility pool ("Utility, Conflict Analysis, Permits, Adjustments, and Reimbursement"). Outside this pool, activity boxes with a red outline represent project development process activities that are typically utility-related.

A description of each activity of the Level 2 model follows, grouped by major phases or functional areas represented by the pools in Figure 2:

- Scoping, selection, financing, and scheduling.
- Alternative analysis and preliminary plans.
- Environmental process.
- Right of way map, authorization to acquire property, property acquisition, and relocation assistance.
- Property management.
- Utility conflict analysis, permits, adjustments, and reimbursement.
- Design and plans, specifications, and estimate (PS&E) assembly.
- Letting.
- Construction.

Activity descriptions are based on several sources, including existing manuals, e.g., the *Project Development Process Manual* (*12*), the *Transportation Planning Process Manual* (*13*), the *Transportation Programming & Scheduling Manual* (*14*), the *Environmental Manual* (*15*), the *ROW Utility Manual* (*4*), and the *Plans, Specifications, and Estimate Preparation Manual* (*16*), as well as feedback from stakeholders at the division, region, and district levels.

Scoping, Selection, Financing, and Scheduling

The initial phase of the process involves identifying and prioritizing needs, identifying funding sources, and adding selected projects to the State Transportation Improvement Program (STIP).

Develop Long-Range Transportation Plans

This activity involves conducting long-range transportation plans to facilitate the identification of needs, priorities, and financial resources. Long-range transportation plans include the Metropolitan Transportation Plan (MTP), the Statewide Multimodal Transportation Plan (SMTP), the Statewide Rural Transportation Plan (SRTP), and the Statewide Transportation Plan (STP). The STP integrates the other plans and provides a framework for long-term planning, development, and preservation of the transportation system in the state. This plan covers at least 20 years, is intermodal, and includes a financial plan. Context sensitive solution (CSS) principles (as a collaborative, interdisciplinary approach to involve all stakeholders in the definition of a shared transportation vision [*17*]) are sometimes used to help establish regional, local, and neighborhood vision or long-term objectives.

Identify Project Need and Preliminary Scope

This activity involves identifying the need for a project as well as project goals, objectives, and preliminary scoping so that preliminary cost estimates and feasibility studies can begin. A common output of this process is a purpose and need statement. Factors for determining the need for a project may include crash frequency and severity, pavement or bridge conditions, and conformance with current geometric standards. For urban projects, particularly capacity improvements, project need may be determined with the assistance of software-based modeling of future travel demands.

Identify Project Requirements and Conduct Studies

This activity involves defining basic project requirements and conducting supporting studies. In some cases, risk analysis tools assist with the identification of risks and critical project elements. Federal and state requirements and state policies frequently affect project requirements and development. Examples include environmental standard requirements, conformity to congestion management requirements, toll lane and HOV lane requirements, and railroad corridor preservation. Studies conducted may include feasibility studies, planning and environmental linkage (PEL) studies, traffic studies, and major investment studies (MISs).

Prepare Cost Estimate and Identify Funding Sources

This activity involves developing a preliminary cost estimate for the project (which needs to be updated throughout the project) and identifying potential funding sources. Identifying funding sources is one of the most critical activities in the project development process. Depending on the type and timing of the project, it may be necessary to consider alternative funding sources, e.g., public improvement districts, public-private agreements, transportation reinvestment zones, private funding or donations, and pass-through financing.

Develop/Update Mid-Range and Short-Range Programs

This activity involves developing or updating programs that lead to the identification of projects that should proceed with the next phase of development. Mid-range and short-range transportation programs include the Unified Transportation Program (UTP), the Metropolitan Transportation Improvement Program (MTIP), the Rural Transportation Improvement Program (RTIP), and the STIP. The UTP is a ten-year, fiscally constrained plan that covers all transportation modes and all types of projects. It identifies projects, indicates the authorized level of development, and lists estimated letting years for project-specific programs. The UTP is updated annually. The STIP is a three-year program that is consistent with the STP and the UTP and includes projects from the MTIPs and RTIPs. It includes a financial plan to document the availability of funds and required matching funds from state and local sources. It is worth noting that a federal-aid project cannot be authorized for construction unless it is included in the STIP. The STIP is updated every two years. Updating STIPs requires refining the project scope and cost estimate.

Authorize Project Development (Plan Authority)

This activity involves authorizing a project to proceed with the development of preliminary plans. This level of authority is called Plan Authority (or Long Range Project Authorization), and a project with this level of authority is considered to be under a long range project (LRP) status. Plan authority enables districts to conduct advance planning, preliminary design, environmental studies, right of way determination, route studies, and public involvement activities. This activity also involves programming the project (or certain phases of the project) as well as the identification of a construction control section job (CSJ) number. Certain projects require a minute order from the Transportation Commission for project authorization, e.g., if a project is not authorized in the current UTP, a project requires control of access, or TxDOT is accepting a donation for right of way purposes.

Secure Federal, State, and Local Agreements

This activity involves preparing and executing agreements with other entities, particularly those that participate in funding for the development and delivery of the project. Many of these agreements are with governmental entities, e.g., local public agencies (LPAs), although agreements with private-sector agencies for specific activities are also possible. For federal-aid projects, it is necessary to execute a project agreement with FHWA before project expenses can be reimbursed. Normally, authorizations and agreements are possible for projects included in an approved STIP and that have met relevant environmental requirements (see the Environmental Process section below).

Agreements with LPAs can cover a wide range of activities, such as preliminary engineering, right of way acquisition, utility coordination and adjustments, design, construction, and maintenance. For right of way acquisition and utility adjustments, the type of form to use depends on what party coordinates activities locally, as follows:

- ROW-RM-37 "Contractual Agreement for Right of Way Procurement (Local Government)." This form is used when the LPA coordinates utility adjustments with utility owners. In this case, the LPA reimburses utility owners for eligible utility adjustment costs if applicable, and TxDOT reimburses the LPA an amount normally equal to 90 percent of what the LPA reimburses utility owners.

- ROW-RM-129 "Agreement to Contribute Funds." This form is used when TxDOT coordinates utility adjustments with utility owners, and the LPA contributes an amount that is normally equal to 90 percent of actual utility adjustment costs that TxDOT incurres. The usual requirement is for an LPA to return a warrant or check payable to TxDOT at the time the agreement is executed based on an estimate of applicable right of way costs. If this amount turns out to be insufficient to pay the LPA's obligation, the LPA is responsible for the difference. Conversely, if the amount is more than 10 percent higher than the actual cost, TxDOT returns any excess amounts to the LPA.

For federal-aid projects, TxDOT must receive federal project authorization before it can issue the project right of way release. This document is called the Federal Project Authorization and Agreement (FPAA), or FHWA Letter of Authorization, and typically includes names of utility owners, locations of existing facilities by station number, and estimated adjustment costs. Another document required for federal-aid projects is the Alternate Procedure Approval (APA), which TxDOT can request concurrently with the FPAA. However, the APA is not necessary for the right of way project release since it can wait until the detailed design, once it becomes evident that a utility adjustment is necessary.

Authorize Project Design (Develop Authority)

This activity involves authorizing a project to proceed with the development of detailed design plans, cost estimates, construction specifications, and right of way acquisition. This level of authority is called Develop Authority (or Priority 2 Authorization), and a project with this level of authority is considered to be under a Priority 2 status. Develop authority enables districts to substantially complete design and right of way activities, after which the project becomes a candidate for construction authorization. In general, Priority 2 projects are selected from the pool of LRP projects using ranking criteria specified for the appropriate UTP category.

Authorize Project Construction (Construct Authority)

This activity involves authorizing a project to proceed with the construction phase. This level of authority is called Construct Authority (or Priority 1 Authorization), and a project with this level of authority is considered to be under a Priority 1 status. Construct authority enables districts to complete all phases of work for a project. Generally, Priority 1 projects are the highest ranked projects and have proposed letting dates within the next four years of anticipated available funding. These projects are funded for construction. Candidate projects are typically those with 75 percent design complete and 75 percent of right of way acquired.

Alternative Analysis and Preliminary Plans

This phase involves conducting studies of alternative locations and alignments, coordinating public and agency interaction as part of the environmental process (see next section), and developing the selected alternative in preparation for the design phase. These activities are also concurrent with early activities for right of way acquisition.

Conduct Design Concept Conference

This activity involves scheduling and conducting a design *concept* conference at the beginning of the preliminary design phase. Note: This activity is not the same as the *design conference* that takes place at the beginning of the detailed design phase. As part of the design concept conference, project personnel meet to identify fundamental concepts and preliminary design criteria for a project. At this point, it is common to start using project summary checklists and forms to help document project requirements, with the understanding that checklists and forms

are dynamic documents that will need be reviewed and updated throughout the rest of the process (particularly at the beginning of the detailed design phase). A recommended document to use in the preparation of the design concept conferences is the Design Summary Report (DSR). Also recommended is the use of the Advance Planning Risk Analysis (APRA).

Collect Data for Preliminary Design

This activity involves identifying and collecting data needed for the preliminary design. Examples of data needed include traffic and traffic crash data; site visit data; information about existing utility facilities; information about previous hydraulic studies; and digital terrain models (DTMs), aerial imagery, and topographic and other relevant surveys. Data gathered also includes information about previous studies and reports.

Obtain Right-of-Entry from Property Owners

This activity involves obtaining the necessary right-of-entry from property owners where data collection needs to take place. This is a critical activity in connection with the collection of data during the preliminary engineering phase. It is recommended to keep right-of-entry requests for engineering surveys separate from environmental surveys. It is also recommended to process right-of-entry requests to access railroad property separately through the district railroad coordinator or through the Railroad Section of the Traffic Operations Division.

Develop Alternative Alignments (Preliminary Schematics)

This activity involves developing alternative alignments (or preliminary schematics) and typical sections. Each alternative includes completing a traffic operational analysis to determine anticipated levels of service (LOS), developing preliminary construction and right of way cost estimates, and evaluating how the alternative meets the project's purpose and need. This activity could also involve preliminary coordination with other stakeholders. Particularly in the case of large projects, coordination with resource agencies for the review of alternative alignments is critical to avoid surprises during the environmental process (see next section).

Select Preferred Alternative and Develop Geometric Schematic

This activity involves the selection of a preferred alternative and development of a geometric alignment in preparation for (or as part of) consultations with the public and the environmental process. Schematic development includes activities such as refining alignments and geometrics, preparing preliminary plans and layouts, developing preliminary pavement design reports, conducting hydraulic studies, and conducting preliminary planning for bridges.

Conduct Value Engineering Study

This activity involves the development of a value engineering (VE) study. A VE study is required for all federal-aid projects with an estimated cost of at least $25 million and all bridge projects with federal-aid funding with an estimated cost of at least $20 million. The purpose of a VE study is to evaluate the degree to which the project meets its objectives safely, efficiently, and at the lowest overall cost, as well as develop recommendations to increase the value and quality of the project and/or reduce the time to complete the project. To encourage objectivity, the VE is normally the responsibility of a multidisciplinary team external to the project. VE study phases include information gathering (if not done prior to the actual study), investigation, speculation, evaluation, development, presentation, a final report, and a process to approve or reject recommendations.

Send Geometric Schematic to Utility Owners

This activity involves transmitting the geometric schematic to all utility owners who are likely to be affected by the project. The submission of the geometric schematic to utility owners should include a request to mark up the schematic with the location of all known utility facilities within the project limits.

Circulate, Review, and Revise Geometric Schematic

This activity involves circulating the geometric schematic for review by stakeholders such as metropolitan planning organizations (MPOs); regional transportation agencies; other agencies at the local, state, and regional levels; and the public. It also includes reviewing the schematic based on feedback from stakeholders.

Obtain Approval for Final Geometric Schematic

This activity involves securing approval of the revised geometric schematic. Pending approval of the environmental document, approval of the preliminary plans is one of the prerequisites for a project to proceed to the detailed design phase.

Environmental Process

This phase involves the development of an environmental document and includes all the activities necessary to consult with environmental resource agencies and the public to ensure the project meets all relevant environmental laws, regulations, and policies.

Provide Preliminary Input to Planning and Programming

This activity involves determining potential environmental impacts that might substantially affect project characteristics and costs, therefore helping to assess the feasibility of the project during the planning and programming phase. TxDOT is implementing strategies to provide early environmental feedback before the official start of the environmental process.

Identify Public and Environmental Concerns

This activity involves identifying environmental variables and plans for public involvement at the beginning of the preliminary design phase. This task also includes an initial assessment of the project site. This task should be performed concurrently with the development of the preliminary schematic (see previous section) and the determination of major utility facility and property ownership concerns within the proposed right of way.

Conduct Early Interagency Coordination

This activity involves contacting resource agencies and other stakeholders to gather feedback and other related information in connection with the project. Resource agencies have regulatory and permitting authority for proposed construction activities within their jurisdiction, which makes it critical to include project scope of work items that cover applying for all the necessary permits and complying with all relevant federal and state laws and regulations. In practice, particularly for large projects, it is common to involve resource agencies to review alternative alignments and get a preliminary concurrence for a preferred alternative (see previous section) before completing the preparation of the environmental documentation.

Prepare Draft Environmental Document

This activity involves preparing an appropriate environmental document, which, depending on the situation, could be one of the following:

- **Categorical exclusion (CE)**. A CE applies to projects that, based on previous experience, do not result in significant environmental impacts.

- **Environmental assessment (EA)**. An EA applies to projects that do not meet the requirements for a CE but do not clearly require the preparation of an environmental impact statement (EIS). An EA also applies when it could assist in determining the need for an EIS, e.g., when the significance of the potential impacts is unknown.

- **Environmental impact statement**. An EIS applies to projects that may have significant social, economic, and/or environmental impacts.

Preparing the environmental document often requires gathering data from ground surveys, as well as federal, state, and local agency databases. It also requires completing a number of impact

assessment evaluations, including natural and cultural resource impacts, hazardous materials, socioeconomic impacts, air quality studies, and noise impacts.

Conduct Public Meetings

This activity involves conducting and documenting one or more meetings to provide public access to the decision-making process and provide an avenue for public input. It is normally required to schedule at least one formal public hearing. However, several public meetings before the formal public hearing are common in situations where a large amount of right of way is acquired for the project, the roadway function changes substantially, controversy about the project is substantial, or for any high-profile project. Public meetings are typically advertised in newspapers and other media in accordance with FHWA and state regulations. Regulations govern a variety of other requirements regarding public meetings, including geographic location, room size, agenda, protocol, and procedures.

Documenting the public meetings involves compiling comments from agencies and the public, as well as preparing a response to each individual comment. Responses are frequently included in the final environmental document.

Develop Final Environmental Document

This activity involves developing the final environmental document based on the feedback received from resource agencies and the public.

Obtain Environmental Clearance

This activity involves obtaining approval of the environmental document, which is a critical requirement to proceed with the design phase. Review and approval of the environmental document is the responsibility of a designated state agency (for non-federal-aid projects) or FHWA (for federal-aid projects). Required documents for the environmental clearance include the following:

- Public involvement notes and comments.
- Purpose and Need Statement.
- Relevant environmental analyses and studies.
- Landscape recommendations.
- Environmental migration plans.
- Public comments and responses.

Meet Environmental Commitments after Clearance

This activity involves conducting activities needed to comply with environmental commitments, e.g., in connection with contamination handling and remediation activities, in accordance with existing laws and regulations. It also involves coordination during right of way acquisition and relocation of displaced persons. This activity usually starts during the detailed design phase and can continue through construction or even beyond during maintenance after construction in order to ensure that activities completed to meet environmental commitments actually work as designed or scheduled.

Conduct Environmental Re-evaluation

This activity involves conducting a re-evaluation of environmental issues after the approval of the environmental document, if necessary. Typical situations that could warrant an environmental re-evaluation include (a) changes in design, scope, land use, or right of way requirements; (b) new environmental impacts or changes to environmental impacts since the approval of the environmental document; (c) regulatory changes; or (d) a prescribed number of years of no activity, e.g., no design work or right of way acquisition.

Right of Way Map, Authorization to Acquire Property, Property Acquisition, and Relocation Assistance

This phase involves a number of activities necessary to identify properties that need to be acquired, obtaining authorization to acquire those properties, acquiring the properties, and providing assistance for the relocation of displaced persons and businesses.

Provide Preliminary Input to Planning and Programming

This activity involves conducting a high-level assessment of potential corridor right of way requirements during the planning and programming phase. This activity is usually not mandatory, but is highly recommended to help identify major right of way acquisition issues early in the process.

Conduct Preliminary Right of Way Research

This activity involves identifying property interests and restrictions such as existing right of way limits and easements from records that local public entities maintain. The purpose of this research is to help refine preferred alignments to minimize right of way impacts to properties. The activity should include a request for a right of way CSJ number, and entering project information into the Right of Way Information System (ROWIS). This activity takes place at the beginning of the preliminary design phase, along with other data collection activities in preparation for the development of alternative alignments.

Coordinate with Other Stakeholders on Engineering, Potential Relocation, and Hazmat Issues

This activity involves coordinating activities with other stakeholders in the project development process, e.g., in relation to preliminary engineering requirements, potential relocation issues, and hazardous materials (hazmat) concerns. Coordination usually takes place through project development teams that include the project manager, staff from various relevant sections, and representatives of local and regional transportation agencies. This activity takes place in conjunction with the development of preliminary alignments and the preparation of the draft environmental documentation.

Prepare Right of Way Map and Property Descriptions

This activity involves developing maps, property descriptions, and other required documents for each parcel or property interest that needs to be acquired for a project. Usually, a registered professional land surveyor prepares the right of way map and property descriptions in accordance with existing surveying laws, standards, and specifications. Although it is common to prepare sketches and other preliminary drawings while developing alternative alignments in support of the environmental process, the official right of way map is prepared after the final geometric schematic is in place.

Approve Right of Way Map and Enter Data into TxDOT Systems

This activity involves reviewing and approving the right of way map as a prerequisite for issuing the right of way project release. This activity also involves entering relevant data into relevant TxDOT information systems such as ROWIS and district tracking databases. The review and approval process includes several steps. Typically, the designated surveyor submits preliminary maps (marked as preliminary), property descriptions, reports, and closure sheets to the district for review. The district then submits this documentation to the Right of Way Division, along with a recommendation to acquire property and a request for right of way release. If changes to parcels or ownership occur at any point after the initial submission, the district prepares and submits revisions and updates to the right of map and companion documents. Once all right of way map revisions are complete, all new right of way is acquired, and all documents are recorded, the district sends a final version of the right of map (marked as final) and other documents to the Right of Way Division for permanent archiving.

Obtain Right of Way Project Release

This activity involves preparing the right of way project release. The right of way project release is the authorization by the Right of Way Division for a district to begin right of way acquisition activities and incur right of way expenditures. The right of way project release is a prerequisite to authorize reimbursable utility adjustments. It also acts as a notice to the TxDOT Finance Division to issue a fund authorization. A district initiates the request for a right of way project release, which must include a statement that the district is prepared to start the work.

Typical documents that are necessary for a right of way project release include an approved right of map, environmental clearance, and executed funding agreements.

Conduct Appraisal

This activity involves preparing a written appraisal of the fair market value of the property. A qualified appraiser must prepare the appraisal, using as a basis an agreed-upon scope of work that outlines the expectations of the agency and the responsibilities of the appraiser. Typical requirements for an appraisal include disregarding decreases or increases in the fair market value of the property that the project causes (or the likelihood the property would be acquired for the project); including uneconomic remnants in the appraisal; and including equal interests in buildings, structures, or other improvements that need to be removed or that are adversely affected.

After the initial appraisal has been conducted, a review appraiser conducts a review of the appraisal for consistency with both industry and agency standards and practices. As needed, the review appraiser requests corrections or revisions to the appraisal. The review appraiser identifies each appraisal report as *Recommended* (as the basis for the establishment of the amount believed to be just compensation), *Accepted* (meets all requirements, but not selected as recommended or approved), or *Not Accepted*.

In some instances, the acquiring agency can waive an appraisal when the agency determines that an appraisal is unnecessary because the valuation is uncomplicated and the property to be acquired has an anticipated low fair market value. The waiver limit is $10,000, although it can be increased up to a maximum of $25,000, if the agency acquiring the real property offers the property owner the option of having the agency appraise the property.

Establish Just Compensation

This activity involves determining the amount of just compensation for the property being acquired, i.e., the amount that results in both the property owner and the public being treated fairly (*18*). This activity is the exclusive responsibility of the acquiring agency. The amount must not be less than the approved appraisal of the market value of the property, as described in the previous section, taking into account the value of allowable damages or benefits to any remaining property (*19*). Just compensation and fair market value are not defined or used consistently in all 50 states. Typically, an appraiser develops an estimate of the fair market value, and just compensation is the amount the state DOT offers or pays. In Texas, the appraiser estimates the fair market value. The sum of this value and any associated damages becomes the amount of just compensation.

Prepare Written Offer

This activity involves making a written offer to the owner to acquire the property for the full amount believed to be just compensation. Along with the initial written purchase offer, the

agency must provide a written statement of the basis for the offer of just compensation and, in the case of a partial acquisition, the compensation for damages to the remaining real property (listed separately). The agency must also provide a description and location identification of the real property and the interest in the real property to be acquired, as well as an identification of the buildings, structures, and other improvements (including removable building equipment and trade fixtures) that are included as part of the offer of just compensation.

Prepare and Execute Joint-Use and Multiple-Use Agreements

This activity involves preparing and executing joint-use and multiple-use agreements for specific right-of-way uses. Joint-use agreements enable TxDOT to use land for a transportation project where others have a prior interest, e.g., cities, counties, utility owners, and railroad companies. Typically, these agreements are needed when entities do not (or cannot) sell right of way but agree to share it for a transportation project. However, in some cases, TxDOT is not interested in acquiring the property interest because of the implications in terms of assuming ownership and maintenance of certain improvements. The Right of Way Division is normally involved during the preparation of joint-use agreements.

In the case of joint-use agreements with utility owners, TxDOT uses an appropriate utility joint-use and occupancy form. The joint-use agreement describes the rights and responsibilities of both parties, including provisions related to access, maintenance, and notification of changes to their facilities. It involves determining whether existing utility facilities within the affected right of way (a) meet UAR requirements and can remain "as is" without affecting the construction or maintenance of the highway, or (b) can be adjusted within the affected property interest and be allowed to remain within the highway right of way with no replacement right of way charges.

Multiple-use agreements enable the use of TxDOT right of way for purposes other than highways. Typical multiple-use agreements include parking lots, hike-and-bike trails, boat ramps, or landscape areas. The Maintenance Division is usually involved in the preparation of multiple-use agreements.

Acquire by Negotiation

This activity involves conducting all activities necessary to acquire the property through negotiations. The activity begins with the presentation of the written offer to the property owner, followed by negotiations that result in both parties agreeing on a purchase price (through a donation, accepting the initial offer, or an administrative settlement), paying the agreed-upon price, and reimbursing the owner for reasonable title transfer expenses. Negotiations must be conducted free of any attempt to coerce the property owner into reaching an agreement. The offer letter has to be in plain understandable English. The agency has to document the offer has been received either in person or by certified mail. According to current regulations, a property owner has 30 days to respond to the offer.

In the case of administrative settlements, the purchase price for the property may exceed the amount offered as just compensation when reasonable efforts to negotiate an agreement at that amount have failed and an authorized agency official determines the administrative settlement to be reasonable, prudent, and in the public interest. The agency must also prepare a written justification for the administrative settlement when federal funds pay for or participate in acquisition costs.

Acquire by Condemnation

This activity involves conducting all activities necessary to acquire the property when the parties cannot reach a mutual agreement regarding the terms and conditions of the purchase (and it has been determined that the agency has the power of eminent domain for that particular acquisition). Eminent domain proceedings provide the mechanism for the acquiring agency to take private property for public use upon payment of just compensation.

Require Owner to Surrender Possession

This activity involves requiring the owner to surrender possession of the property after transferring title to the acquiring agency. An agency cannot require a parcel owner to relinquish possession until the agency provides compensation for the parcel. Depending on the type of property and the project timing, the acquiring agency may decide to rent the property to the original owner or tenant, rent to others, or not to rent until the property is needed for construction.

Prepare Right of Way and Encroachment Certification

This activity involves preparing a certification documenting that the required right of way for the project has been acquired, or that the acquisition will be complete by a certain date. This certification is usually one of the documents needed for the preparation of PS&E packages. An encroachment certification, which may be part of the right of way certification, is also prepared to document that the right of way is free of encroachments, or if they remain temporarily, they will not pose a safety or constructability conflict during construction. Owners of encroaching property must remove those encroachments from the right of way.

Determine Relocation Assistance Eligibility

This activity involves determining whether a person can be classified as a displaced person. In general, a displaced person is any person who moves from real property or moves his/her personal property from real property in connection with the acquisition of right of way or in connection with rehabilitation, demolition, or other permanent displacing activities undertaken by a federal agency or with federal financial assistance.

Provide Relocation Assistance Advisory (Residential)

This activity involves providing relocation assistance advisory services to displaced persons in connection with residential acquisitions. In general, the focus is on providing information about comparable replacement dwellings for homeowners and tenants and on finding a comparable dwelling, which can include identifying a last-resort housing replacement and taking the necessary actions to provide a comparable dwelling.

Provide Relocation Assistance Advisory (Non-Residential)

This activity involves providing relocation assistance advisory services to displaced persons in connection with non-residential acquisitions. A number of services are available, including the following:

- Determining and making timely recommendations on needs and preferences of displaced persons for relocation assistance.
- Supplying information about other federal and state programs.
- Providing other services in order to minimize hardships to displaced persons.
- Providing information on suitable replacement locations.

Issue Relocation Payments (Residential)

This activity involves determining payment amounts and issuing payments to displaced persons in connection with residential acquisitions. A number of payment items and options are possible. In general, payments include moving and related expenses, as well as replacement housing costs, which vary depending on whether the displaced person purchases or rents property at the new location. Eligible payments also vary depending on the length of time the displaced person lived at the displaced dwelling (at least 180 days, 90–180 days).

Issue Relocation Payments (Non-Residential)

- This activity involves determining payment amounts and issuing payments to displaced persons in connection with non-residential acquisitions. Payments include moving and related expenses, which can be fixed according to U.S. DOT-established criteria or actual expenses. The second option includes reasonable moving expenses, actual direct losses of tangible personal property (not to exceed amount equal to the reasonable expenses that would have been required to relocate such property), actual reasonable expenses in searching for a replacement business or farm, and actual reasonable expenses to reestablish operations at the site (not to exceed $10,000).

Property Management

Property management involves a number of activities to manage property assets for as long as the agency holds those assets. Activities include inventorying and managing assets, rental or leasing of acquired property, disposal of property no longer needed for transportation purposes, and disposal of property improvements. Activities also include management of non-right of way property interests. Property management is a continuous activity that spans complete property life cycles.

Dispose Improvements

This activity involves disposing improvements on right of way acquired for a transportation project. Improvements can be either salable or nonsalable. Nonsalable improvements are items that have little or no value, as determined in the appraisal process. Disposal can be included in the construction contract or performed by maintenance forces. Disposal of improvements cannot begin until the state owns the improvements. This activity should be completed before construction begins, unless disposal is included in the construction contract. Disposal of improvements, particularly buildings, should occur as soon as possible to prevent reoccupation and additional relocation expense.

Lease Real Property Assets

This activity involves leasing real property interests to others. Examples include right of way leases (including the airspace above as well as space at or below grade), leasebacks (i.e., leases involving recently acquired property back to the owner or tenant who occupied the property at the time of acquisition), mineral rights, and office space. The ability of TxDOT to lease real property assets is heavily regulated. For example, leases must normally be at least at the appraised fair market rental value (although there may be exceptions for social, economic, or environmental reasons). It is also common to require that leasing revenue can only be used for eligible activities under the federal-aid highway program. Prior FHWA approval is normally required for leasing right of way on interstate highways.

Dispose Surplus Right of Way Property Interests

This activity involves disposing right of way property assets or interests that are no longer needed for transportation purposes. Depending on the situation, disposal of the right of way property interest could be to an LPA, an adjoining landowner, or a fee owner. This activity could also include exchanging right of way that is no longer needed with property that is needed for transportation purposes.

Dispose Surplus Non Right of Way Property Interests

This activity involves disposing non right of way property assets or interests. Depending on the situation, disposal of the non-right of way property interest could be to an LPA, an adjoining landowner, or a fee owner.

Inventory and Manage Assets

This ongoing activity involves conducting and maintaining an inventory of property assets as well as managing those assets. The inventory of property assets includes not just an inventory of parcels, but also improvements as well as other items such as machinery and equipment. Management of the property assets also include maintaining accounting records of receipts and expenses in connection with lease or rental agreements, demolitions, and disposal of acquired real property and related improvements.

Utility Conflict Analysis, Permits, Adjustments, and Reimbursement

This phase involves several necessary activities to identify utility locations within the project limits; identify, manage, and resolve utility conflicts; coordinate with stakeholders; develop and execute utility agreements, coordinate and inspect utility adjustments; and coordinate utility reimbursement payments and audits.

Conduct Annual Utility Coordination Meeting

This activity involves scheduling and conducting a district-level annual coordination meeting with utility owners. The purpose of the meeting is to provide a forum for discussing upcoming highway construction projects with utility owners, therefore enabling these owners to conduct early fiscal planning and anticipate budget cycle impacts, construction schedules, and consumer service requirements that might be affected by those highway projects. In preparation for the annual meeting, the district should send a list of anticipated highway projects to utility owners within two weeks of the meeting.

Conduct Division-Level Coordination Meeting(s)

This activity involves scheduling and conducting division-level coordination meetings (Right of Way Division and/or Texas Turnpike Authority) with utility owners. These meetings are high-level coordination activities between TxDOT and utility owners that provide an opportunity to discuss general issues, policies, and initiatives. At this level, master agreements and memoranda of understanding (MOUs) can be particularly helpful to develop partnering relationships between TxDOT and utility owners to promote the goals of collaboration, coordination, and coordination among stakeholders.

Provide Preliminary Input to Planning and Programming

This activity involves conducting a high-level assessment of major utility impacts. This activity takes place during the planning and programming phase after transportation plans have been developed, and project requirements, studies, and cost estimates are under development. Although providing input into the planning process is not a mandatory activity, involving utility coordinators in this activity can help identify major utility issues early in the project development process.

Conduct Preliminary Utility Investigations

This activity involves collecting data from existing records, field visits, or oral recollections, and conducting a preliminary assessment of utility impacts on the project. It includes requesting utility owners to provide information about existing installations within the project limits. Typically, TxDOT sends project drawings to utility owners with a request to mark up those drawings with relevant utility information. Collecting preliminary utility data may also include contacting a one-call notification center to request utility owners to locate and mark existing facilities on the ground. Although it is common to collect this type of information at the beginning of the design phase, it is increasingly common to complete this activity in conjunction with other data collection activities while developing alternative alignments at the beginning of the preliminary design phase. Collecting preliminary utility information is a routine activity, but certifying the corresponding utility data as quality level D (QLD) is more rigorous than traditional practice and is not as common.

After collecting preliminary utility data, TxDOT conducts an initial assessment of utility impacts. The outcome of this activity is an early assessment of utility facilities that potentially need to be adjusted or a determination that additional information is needed.

Survey and Plot Visible Utility Appurtenances

This activity involves surveying visible aboveground utility facilities, such as manholes, valve boxes, and posts; correlating this information with existing utility records; and making inferences about underground linear utility facilities that connect those appurtenances. This level of utility investigation typically occurs early in the design phase in conjunction with other data collection activities needed for the production of 30-percent design plans. After surveying visible aboveground utility facilities, TxDOT typically conducts an assessment of utility impacts, which can result in a new or updated utility conflict matrix. As with QLD data, surveying visible aboveground utility facilities is a routine activity, although certifying the corresponding utility data as quality level C (QLC) is more rigorous than traditional practice and is not as common.

Conduct Detailed Utility Investigations

This activity involves using surface, non-invasive geophysical methods to determine the approximate horizontal location of underground utility installations and/or exposing utility facilities at critical locations (e.g., using vacuum excavation) to survey the horizontal and vertical location of the facilities at those locations. Using geophysical methods to assist in the depiction of underground utility facilities is increasing in situations where it is critical to obtain more complete, accurate information about underground utility facilities. Quality level B (QLB) data collection is still not very common, for reasons that range from data collection costs to lack of knowledge about the benefits that better utility facility data can offer in the form of lower project costs or decrease or elimination of utility conflicts, particularly during construction.

The purpose of exposing utility facilities at critical locations is to obtain location information to a level of accuracy, i.e., quality level A (QLA), which is sufficient for developing plans and profiles and making final design decisions. After surveying the exposed utility facilities, TxDOT typically conducts an assessment of utility impacts, which can result in a new or updated utility conflict matrix.

Obtain Early Right of Way Release for Utilities

This activity involves preparing an early right of way release for utility work to enable TxDOT to incur certain costs before the normal right of way project release. Typical activities allowed include engineering, prefabrication of materials, and acquisition of easements, i.e., activities that do not involve excavation or disturbance of the soil. An early right of way release for utilities requires the final geometric schematic to be complete.

Provide Official Notification and Coordinate Utility Adjustment Design with Utility Owners

This activity involves notifying utility owners that adjusting one or more of their facilities is necessary and coordinating with utility owners in all aspects leading to the identification and design of utility conflict resolution measures. 43 TAC 21.22 provides guidance on the procedure to provide the official notification that a utility adjustment is necessary (*3*). TxDOT must provide the written notification by certified mail. The notification must include a final plan for the utility adjustment and the standard utility agreement form, and must provide a date by which the utility adjustment must be complete.

Utility owners are typically responsible for the design to adjust utility facilities that are in conflict with the project or other facilities. However, it is the utility coordinator's responsibility to ensure that lines of communication between utility and transportation project designers are open, design documents are exchanged quickly and efficiently, coordination meetings are scheduled and conducted, and agreement documents are processed in a timely manner. Utility coordination activities also involve LPAs in case where LPAs are responsible for coordinating utility adjustments with utility owners.

Prepare and Execute Utility Agreements

This activity involves preparing and executing agreements with utility owners, typically for the adjustment of utility facilities that are eligible for reimbursement. For non-reimbursable utility adjustments in which the utility facility is adjusted to a location within the highway right of way, the usual procedure is to use the utility permitting process and Form 1082. Utility agreements outline the conditions that govern the accommodation of utility facilities on the state right of way and specify each party's rights, responsibilities, and timelines with regard to required utility adjustments. Utility agreements typically include standard agreement forms and attachments, utility adjustment plans, cost estimates, and other supporting documentation. 43 TAC 21.22 provides guidance on the procedure that applies if an agreement to adjust is not reached (*3*).

Utility agreements can be executed as soon as the method of utility conflict resolution has been identified, typically after 60-percent design (when critical project design elements such as drainage have been substantially completed). One goal at TxDOT is to execute all utility agreements by the time the project design is complete, so that utility owners can adjust their facilities before the start of the highway construction.

Adjust Utility Facilities before Letting

This activity involves monitoring and inspecting the progress of utility adjustments in the field and processing requests for eligible reimbursable items from utility owners. Utility adjustment costs normally under the category of right of way costs. TxDOT's goal is to have utility adjustments completed by the time the project goes to letting. However, it is common to have pending utility adjustments items at the beginning of construction. It is common to include some utility adjustment items in the highway contract, e.g., in the case of water lines, sanitary sewer lines, duct banks, manholes, and junction boxes. If the items are not reimbursable, utility owners must escrow the funds before construction starts to ensure that TxDOT can pay the highway contractor for the utility adjustment items.

Prepare Utility Clearance Certification and Utility Adjustment Status Form

This activity involves preparing a utility certification for inclusion in the PS&E package. As outlined in the *PS&E Preparation Manual*, two types of utility certifications could apply (*16*): Certification for Utility Adjustment (*None* or *Clear*) and Certification for Utility Adjustment (*Not Clear*). The first version is used if all utility facilities have been adjusted and/or there are no utility conflicts before the complete PS&E package is submitted to Austin for review. The second version is used if there are utility conflicts that could not be adjusted ahead of letting in order to alert the contractor about potential impacts on construction scheduling. This certification is submitted with a special triple zero special provision that lists pending utility conflicts, utility owners, locations, and estimated clearance date. Projects that involve federal funds require an additional data sheet called Utility Status, which can be updated up to two weeks before the project's Letter of Authority (for construction) date.

Adjust Utility Facilities after Letting

This activity involves monitoring and inspecting the progress of utility adjustments and processing requests for eligible reimbursable items from utility owners after a project has been let.

Design and PS&E Assembly

This phase involves a number of necessary activities to complete and submit the project design in preparation for letting. It includes detailed and supplemental data collection; detailed engineering and design analyses to finalize the project horizontal and vertical alignment; detailed design of elements such as roadway, operations, bridges, drainage, retaining walls and other structures, sequence of work, and traffic control plans; development of specifications and cost estimates, and PS&E assembly. Major milestones include a design conference at the beginning of the design phase; 30-percent, 60-percent, and 90-percent design completion (referred to sometimes as Stage 1, 2, 3 Design); 100-percent design completion, and completion and submission of the PS&E package.

Conduct Introductory Utility Meeting

This activity involves scheduling and conducting an introductory meeting with utility owners. The purpose of the meeting is to notify utility owners that a project has moved into the design phase and to begin design-level coordination activities. The meeting invitation includes a list of TxDOT contacts, including the project manager, and requests that utility owners provide existing as-built plans or system drawings to indicate utility facility locations and other features, unless stakeholders have already submitted that information. The district sends the meeting invitation no later than two weeks before the introductory utility meeting. Required documents for this meeting are the DSR, project data, constraints, and important project schedules and milestones.

The meeting provides an opportunity for TxDOT to describe the project, including items of particular interest to utility owners such as drainage facilities, typical sections, and special structures; the anticipated schedule; and potential utility impacts. The discussion also includes identified utility conflicts, potential solutions, and constraints and information needed for the design conference, including potential modifications of the roadway design, if feasible. The discussion also includes criteria for utility reimbursement eligibility.

Note: in the *ROW Utility Manual* (*4*), this activity is currently called “Preliminary Design Meeting.” The manual also includes an activity called Initial Project Notification – Process Activity II. To avoid confusion with the Design Concept Conference at the beginning of the preliminary design phase (which TxDOT used to call Preliminary Design Meeting), the researchers recommend using the term *Introductory Utility Meeting* to refer to the first design-level utility coordination meeting, which includes an initial design-level project notification.

Conduct Design Conference

This activity involves scheduling and conducting a meeting to officially start the design phase. This meeting typically occurs after the environmental clearance and the right of way release. The purpose of the design conference is to review the basic design parameters, concepts, and criteria that were established during the preliminary design phase or by the project manager. It also includes confirming or updating design criteria necessary to start the detailed design work. Required documents for the design conference include the DSR, project data, and project item costs. TxDOT also recommends using the APRA tool to identify project risks. Prior to the design conference, it may be necessary to update some background information, particularly if the project has been inactive for some time.

The design conference provides a forum to discuss potential utility impacts and promote cooperative solutions before the detailed design starts. To facilitate this discussion, the TxDOT project design engineer should present anticipated location and type of drainage facilities, structures, and other roadside features. Utility issues to discuss may include need, justification, and scope of work for any proposed utility adjustment, UAR compliance, and possible TxDOT design modifications to minimize utility conflicts. Other issues that may be applicable are escrow agreements for non-reimbursable utility work included in the PS&E documentation.

Conduct Design Analyses

This activity involves completing a series of detailed analyses in preparation for the development of the final horizontal and vertical alignments. Examples of detailed analyses, which may be performed concurrently, include the following:

- Collect supplemental, detailed design data.
- Develop environmental mitigation details.
- Conduct construction sequence and detour/road closure analysis.
- Conduct hydrologic and hydraulic analyses.

Develop Final Horizontal and Vertical Alignments

This activity involves developing the final horizontal and vertical alignments based on which the detail design of a wide range of structures will proceed. This activity normally takes place between 30-percent and 60-percent design and includes a thorough review of previous data collection activities and analyses. It involves producing detailed plans, profiles, cross sections, and, increasingly, 3-D models.

Conduct Detailed Design

This activity involves completing a series of detailed design tasks in preparation for the PS&E assembly. Examples of detailed design tasks, which may be performed concurrently, include the following:

- Complete roadway design.
- Execute railroad agreements.
- Complete operational design.
- Complete bridge design.
- Complete drainage design.
- Complete design of retaining and noise walls.
- Complete design of miscellaneous structures.
- Complete sequence of work and traffic control plan.
- Prepare construction specifications and provisions.
- Prepare cost estimate.
- Execute agreements and obtain permits.

Conduct 30-, 60-, and 90-Percent Design Meetings

This activity involves scheduling and conducting several milestones meetings (typically at 30-, 60-, and 90-percent design). The meetings are intended to track the progress of ongoing design processes, further develop design concepts from previous meetings, identify design conflicts, and investigate solution alternatives. During this phase of project development, utility owners may begin actual physical adjustment of their facilities. If utility adjustments are eligible for reimbursement, a utility agreement must be executed before beginning work.

What to include and what documents to prepare for each of the meetings depend on factors such as project type, urgency, and local conditions. For example, for a 30-percent design meeting, it is common to review design analysis results and progress made to finalize the horizontal and vertical alignments. Right of way acquisition and utility coordination activities are also discussed (although it is common for utility owners to start participating actively once the horizontal and vertical alignments are substantially complete). A 60-percent design meeting normally includes a review of detailed plans, profiles, and cross sections; specific requirements for detailed design features; and progress of right of way acquisition and utility coordination and adjustments. A 90-percent design meeting normally includes a review of all design documents and a discussion of forms and other requirements to prepare the PS&E package.

Conduct Final Design and Initial Construction Coordination Meeting(s)

This activity involves scheduling and conducting meetings to finalize the design phase and begin the transition to the construction phase. Finalizing the design phase includes reviewing and approving the PS&E package to facilitate the letting process as well as coordinating with

affected stakeholders (e.g., design project manager, designers, utility owners, and construction project manager) all activities necessary for a successful hand-off from design to construction.

Prepare and Submit PS&E Package

This activity involves assembling the PS&E package and supporting documents and forwarding to TxDOT divisions in Austin for review. The PS&E package is the complete plan set that the design team prepares to construct the project, pending district review and update. Major items that should be included in the package are plan sheets, standard and special specifications, general notes, special provisions, cost estimate, and project agreements. Supporting documents included in the PS&E package include the right of way clearance certification and the utility clearance certification. The *PS&E Preparation Manual* provides a detailed list of items to include in the PS&E package (*16*).

Letting

This phase involves a number of necessary activities to move a project that is ready for bidding to the construction phase.

Conduct Pre-Bid Utility Meeting

This activity involves scheduling and conducting a pre-bid meeting to identify utility concerns for prospective bidders. This meeting, which is conducted before or during the pre-bid conference, is held to discuss the coordination of outstanding utility adjustments with the sequence of work of the highway project and to alert bidders about potential project modifications that may affect utility adjustments after the submission of the PS&E package. The meeting provides a final opportunity to refine special provisions before receipt of bids.

Note: in the *ROW Utility Manual*, this activity is called "Conduct Pre-Letting Utility Meeting" (*4*). The researchers changed the name of this activity because it is part of the letting phase and may be tied to the pre-bid conference.

Let Project

This activity involves scheduling and completing all the necessary steps to select the contractor for the project. Steps usually include advertising the project for construction bids, receiving contractor bids, evaluating the offers (including items such as collusion detection and comparing bids against the engineer's estimate), selecting the winning bid, awarding the contract, notifying the public in advance of construction, and storing and retaining project records. One or more pre-bid conferences may be necessary to provide specific project information to bidders and address bidder questions.

Construction

This phase involves a number of necessary activities to build and deliver the project.

Conduct Pre-Construction Conference

This activity involves scheduling and conducting a pre-construction conference meeting with the selected contractor after the Texas Transportation Commission has awarded the contract and a work order has been issued. The purpose of the conference is to establish lines of authority and communication; determine the responsibilities and duties of contractor's personnel, subcontractors, and department personnel; clarify potential sources of misunderstanding and work out the detailed arrangements necessary for the successful completion of the contract. In addition to TxDOT and contractor personnel, attendees might include utility owners and resource agencies, e.g., if the project includes conditional permits that require resource agency notification (*21*). Depending on the project, participants might also include news media, LPAs, and emergency services such as fire departments and law enforcement.

Conduct Separate Utility Meeting after Award

This activity involves scheduling and conducting a meeting after the project award to discuss utility issues with the contractor and utility owners. This utility coordination meeting should occur before the start of the construction, and may be combined with the pre-construction conference for less complex projects as determined by the project construction engineer. The meeting provides an opportunity to discuss the status of outstanding parcel acquisitions and the various methods by which utility adjustments will be coordinated with the project, both in the case of adjustments that are included in the highway contract and adjustments that utility owners handle separately. Discussion of utility work, particularly in the case of adjustments included in the highway contract, should include coordination of inspection responsibilities with all affected parties.

For utility adjustments outside the highway contract, the meeting provides an opportunity to discuss the status of those adjustments in relation to the clearance dates identified in the special provisions and any project sequencing modifications that may be necessary to accommodate the work schedules of both highway contractor and utility owners.

Conduct Utility Meetings during Construction

This activity involves scheduling and conducting utility meetings during the construction phase. The TxDOT project construction engineer determines the frequency and format of these meetings, including scheduling them in conjunction with other regular construction project meetings. The purpose of the utility meetings is to maintain appropriate utility coordination throughout the project in order to track adjustment schedules, minimize delays, and avoid contractor claims. Particularly in the case of reimbursable adjustments, coordination with utility

owners is invaluable for clarifying inspection requirements and ensuring appropriate recording of utility personnel, materials, and equipment used in the adjustment.

Build and Deliver Project

This activity involves all the necessary activities to build and deliver the project. In addition to the activities mentioned above, examples of typical construction-level activities include the following:

- Conduct construction activities.
- Inspect the construction site to determine if the contractor's performance follows the construction contract.
- Maintain project records such as progress schedules, project diaries, materials received, temporary suspension or resumption work notices, working day charges, contractor labor payrolls, and change orders.
- Monitor and respond to contractor requests for information.
- Manage the review and approval of potential project change orders.
- Communicate and coordinate with affected stakeholders, including property owners who are adjacent to the project site.
- Deliver project and prepare as-builts.

LEVEL 3 BUSINESS PROCESS MODEL

Figure 7 shows the Level 3 model of the project development and delivery process model with a focus on utility activities. This model provides a more detailed view of utility data collection, coordination, and adjustment activities than the Level 2 model, by dividing the Utility Conflict Analysis, Permits, Adjustments, and Reimbursement pool into three lanes: Utility Data Collection and Assessment, Utility Coordination, and Utility Owner. Figure 8 through Figure 10 provide more detailed views of these lanes. This section includes a description of each activity in these three lanes. With a few exceptions, activities in other pools and lanes are shown at the same level of detail as in the Level 2 model, for which the descriptions included in the previous section apply.

In the Level 3 model, the entire Utility Conflict Analysis, Permits, Adjustments, and Reimbursement pool is highlighted in red. Many other activities in the project development process are also utility-related. For simplicity, the diagram only highlights some of the most critical utility-related activities in red.

The Level 2 model provides an approximate indication of when activities normally take place during the project development process. By comparison, the more detailed Level 3 model depicts typical utility activities in the Utility Conflict Analysis, Permits, Adjustments, and Reimbursement pool, but not necessarily when those activities need to occur chronologically. In general, the detailed utility adjustment process starts whenever a utility adjustment is found to be necessary (Intermediate Event A). This determination could happen at any point during the project development process. Utility adjustment activities are assumed to continue as long as a

utility adjustment is necessary. If a utility adjustment is no longer necessary at any point, the process automatically reverts to the no-adjustment end-of-process condition under Utility Data Collection and Assessment.

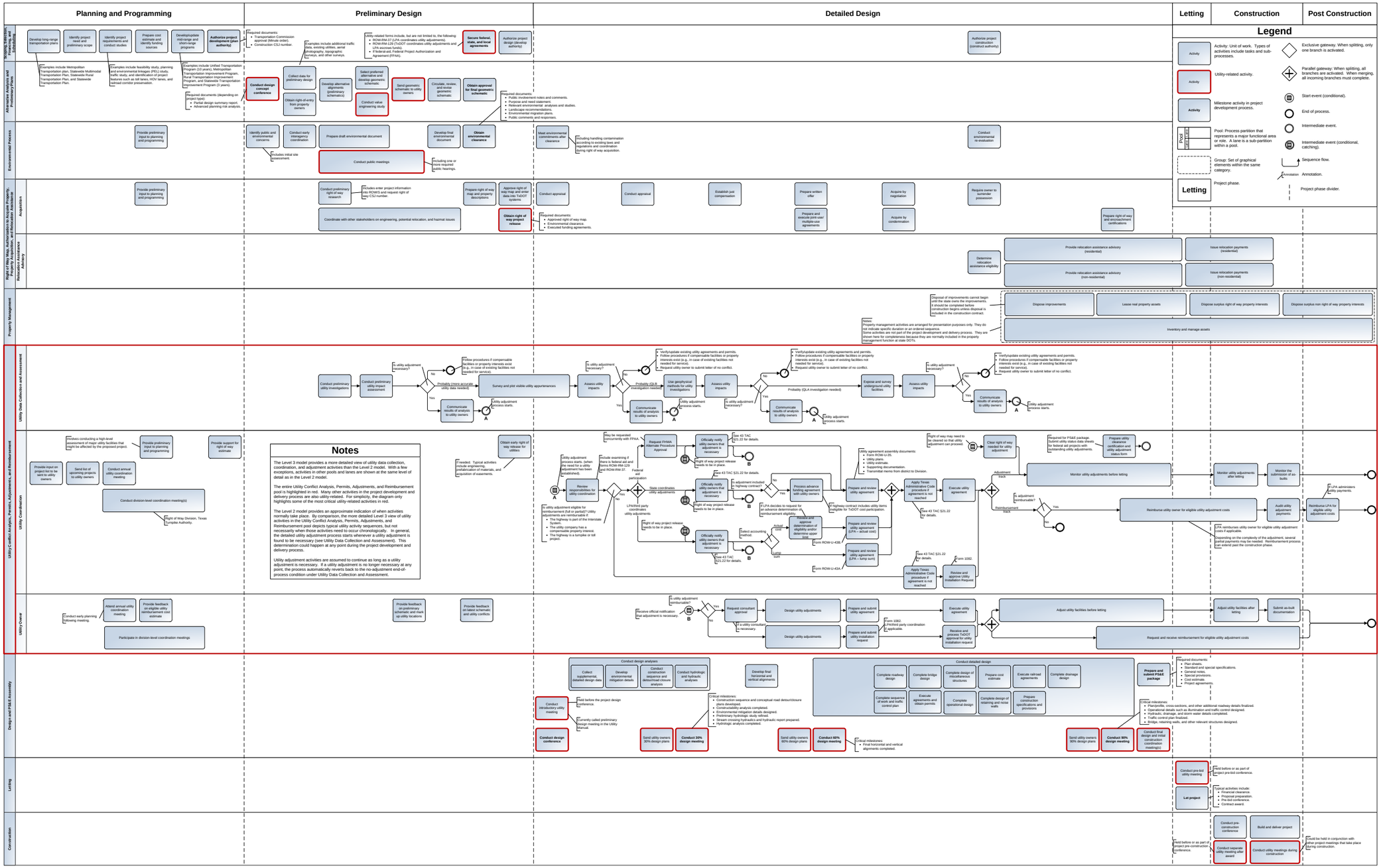


Figure 7. Typical Project Development and Delivery Process (Level 3 Model).

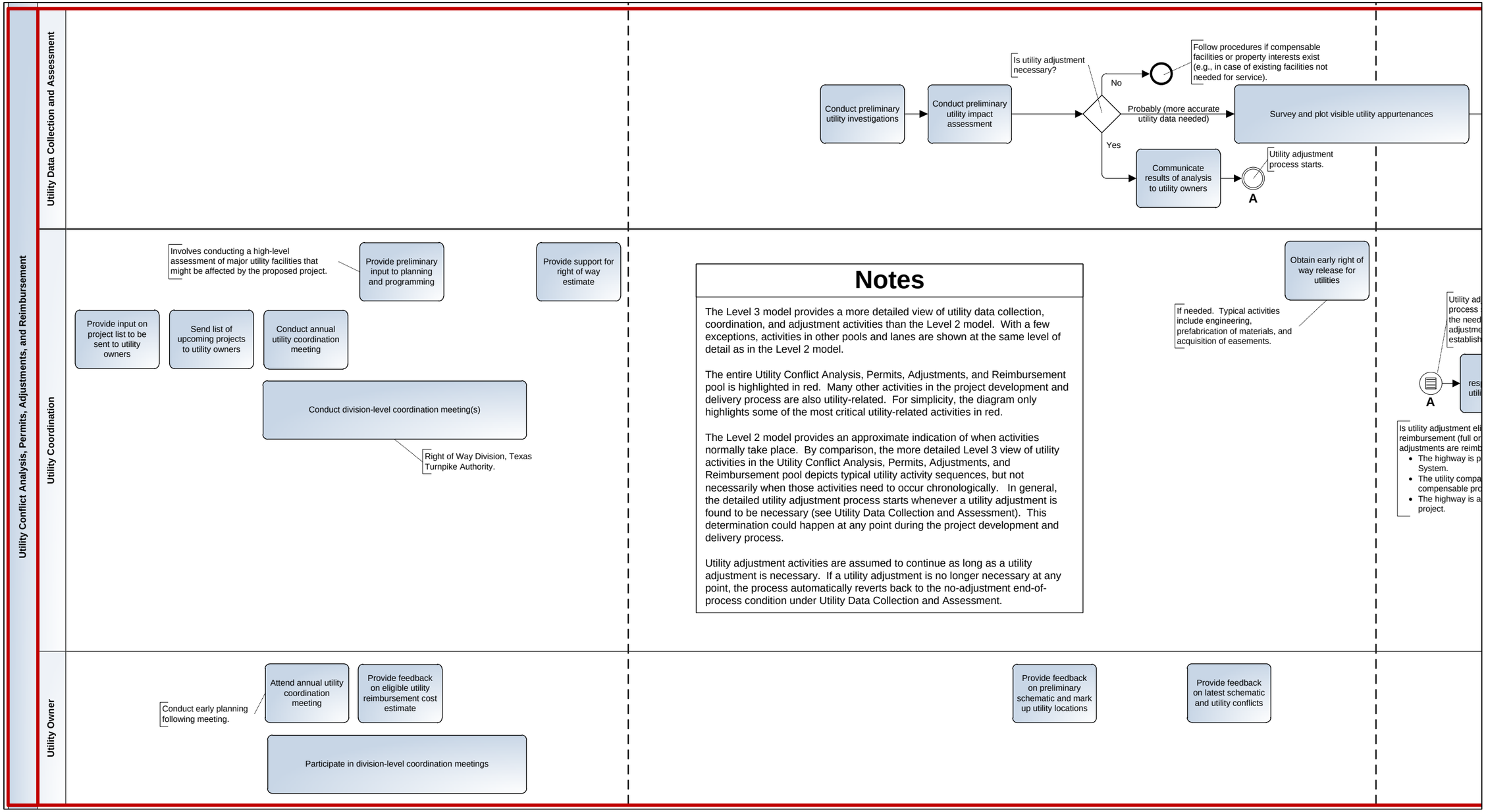


Figure 8. Typical Utility Process (Level 3 Model) – Left Portion.

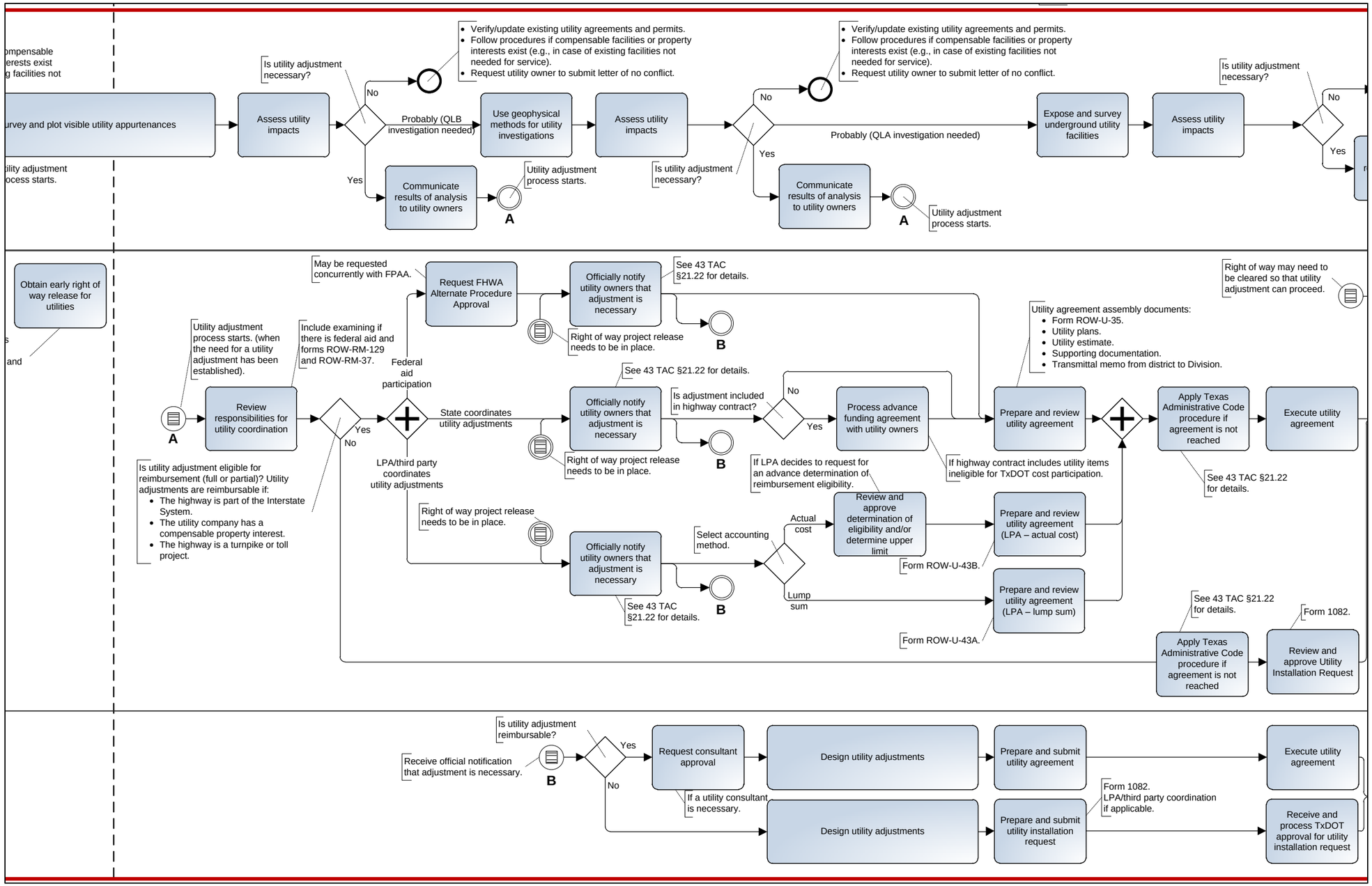


Figure 9. Typical Utility Process (Level 3 Model) – Middle Portion.

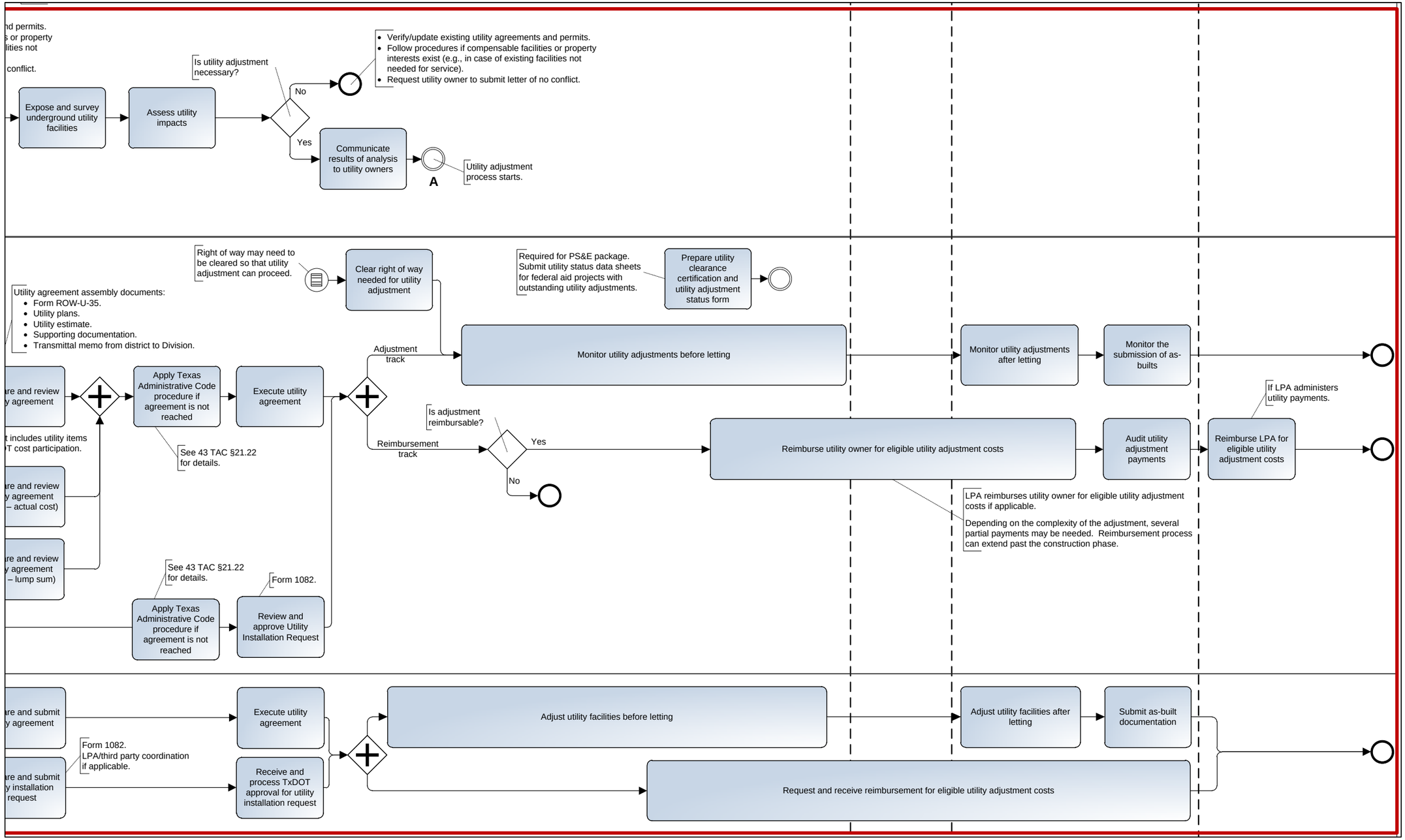


Figure 10. Typical Utility Process (Level 3 Model) – Right Portion.

Utility Data Collection and Assessment Activities

This lane focuses on activities to conduct utility investigations, collect utility data, and conduct utility impact assessments to determine if utility facilities are in conflict with proposed highway design features and to determine which options would be feasible to remove these conflicts.

Conduct Preliminary Utility Investigations

This activity involves collecting data from existing records, field visits, or oral recollections. It includes requesting utility owners to provide information about existing installations within the project limits. Typically, TxDOT sends project drawings to utility owners with a request to mark up those drawings with relevant utility information. Collecting preliminary utility data may also include contacting a one-call notification center to request utility owners to locate and mark existing facilities on the ground. Although it is common to collect this type of information at the beginning of the design phase, it is increasingly common to complete this activity in conjunction with other data collection activities while developing alternative alignments at the beginning of the preliminary design phase. Collecting preliminary utility information is a routine activity, but certifying the corresponding utility data as QLD is more rigorous than traditional practice and is not as common.

Activity participant responsibilities:

- TxDOT project manager
  - Determine extent of preliminary utility investigations and assign duties.

- TxDOT utility coordinator
  - Collect, request, and compile QLD data as needed.
  - Perform field review.
  - Coordinate with consultant in charge of utility investigations.
  - Contact utility owners as needed.
  - Contact one-call center as needed.
  - Develop list of utility conflicts or utility conflict matrix.
  - Compile QLD data and add to right of way map.

- Utility owner
  - Provide QLD data as requested by TxDOT.

- Consultant
  - Collect and request QL D data if requested by TxDOT.
  - Develop list of utility conflicts or utility conflict matrix if requested by TxDOT.

Conduct Preliminary Utility Impact Assessment

This activity involves conducting a preliminary assessment of utility impacts on the project based on the information gathered in the preliminary utility investigation. The outcome of the activity is an early assessment of utility facilities that potentially need to be adjusted or a determination that additional information is needed. If a utility facility needs to be adjusted, the utility adjustment process starts (see the Utility Coordination section). If additional information is needed, the next step is normally surveying and plotting visible appurtenances. If a utility adjustment is not necessary, the district should follow appropriate procedures if compensable facilities or property interests exist, e.g., in the case of existing facilities that are not needed to provide service.

Activity participant responsibilities:

- TxDOT project manager
  - Conduct or review preliminary utility impact assessment.
  - Develop action plan for QLC data collection.

- TxDOT utility coordinator
  - Review utility data collected to date.
  - Assess which utility facilities need to be adjusted and which utility conflicts need additional information to make a determination.
  - Develop recommendation for additional data collection, including need and extent of survey, and responsible party to perform survey.

- Utility owner
  - Provide input into assessment if requested by TxDOT.

- Consultant
  - Provide input into assessment if requested by TxDOT.

Communicate Results of Analysis to Utility Owners

This activity involves communicating the results of the preliminary utility investigation analysis to utility owners. Data transmitted to utility owners should include a copy of the utility conflict matrix and an assessment of the potential impact of the highway project on utility facilities.

Activity participant responsibilities:

- TxDOT utility coordinator
  - Send utility impact information and utility conflict matrix to utility owners.

- Utility owner
  - Receive and review utility impact information and provide feedback to TxDOT.

Survey and Plot Visible Utility Appurtenances

This activity involves collecting utility location data by surveying visible aboveground utility facilities, such as manholes, valve boxes, and posts; correlating this information with existing utility records; and making inferences about underground linear utility facilities that connect those appurtenances. This level of utility investigation often occurs early in the design phase in conjunction with other data collection activities needed for the production of 30-percent design plans. However, if feasible, it is recommended to start collecting this type of data during the preliminary design phase, e.g., in conjunction with the data collected for the production of the right of way map. As with QLD data, surveying visible aboveground utility facilities is a routine activity, although certifying the corresponding utility data as QLC is more rigorous than traditional practice and is not as common.

Activity participant responsibilities:

- TxDOT surveyor
  - Conduct survey if requested.
  - Format and provide survey data.

- TxDOT utility coordinator
  - Receive and review survey data.
  - Update list of utility conflicts or utility conflict matrix.

- Utility owner
  - Provide utility data as requested by TxDOT, surveyor, or consultant.

- Consultant
  - Conduct survey and provide data to TxDOT.
  - Update utility conflict matrix if requested by TxDOT.

Assess Utility Impacts

This activity involves conducting an assessment of utility impacts based on the information collected during the survey of visible utility facilities. The outcome of this assessment is a determination of whether it is necessary to adjust a utility facility or if additional data is necessary to make that determination. If a utility facility needs to be adjusted, the utility adjustment process starts (see the Utility Coordination section). If additional information is needed, the next step is to use noninvasive geophysical methods and/or expose utility facilities. If a utility adjustment is not necessary, the district should follow appropriate procedures if compensable facilities or property interests exist, e.g., in the case of existing facilities that are not needed to provide service. The district should also verify or update existing utility agreements and permits, and request the utility owner to provide a letter of no conflict.

Activity participant responsibilities:

- TxDOT project manager
  - Review utility impact assessment and develop action plan for QLB data collection.

- TxDOT utility coordinator
  - Review utility data collected to date.
  - Assess which utility facilities need to be adjusted and which utility conflicts need additional information to make a determination.
  - Develop recommendation for further data collection (QLB or QLA), including need for survey, extent of survey, and responsible party to perform survey (utility owner, TxDOT staff, or consultant).

- Utility owner
  - Provide input into assessment if requested by TxDOT.

- Consultant
  - Provide input into assessment if requested by TxDOT.

Communicate Results of Analysis to Utility Owners

This activity involves communicating the results of the preliminary utility investigation analysis to utility owners. Data transmitted to utility owners should include a copy of the utility conflict matrix and an assessment of the potential impact of the highway project on utility facilities.

Activity participant responsibilities:

- TxDOT utility coordinator
  - Send utility impact information and utility conflict matrix to utility owners.

- Utility owner
  - Receive and review utility impact information and provide feedback to TxDOT.

Use Geophysical Methods for Utility Investigations

This activity involves using surface, non-invasive geophysical methods to determine the approximate horizontal location of underground utility installations. Using geophysical methods to assist in the depiction of underground utility facilities is increasing in situations where it is critical to obtain more complete, accurate information about underground utility facilities. QLB data collection is still not very common, for reasons that range from data collection costs to lack of knowledge about the benefits that better utility facility data can offer in the form of lower project costs or decrease or elimination of utility conflicts, particularly during construction.

Collecting and interpreting QLB utility data requires specialized geophysical and engineering expertise. The type of data collection technologies and data interpretation techniques to use depend on a myriad of factors, including soil and soil moisture characteristics, as well as utility facility type, size, material, and depth. Readers should note that relying exclusively on electromagnetic (EM) locators and process typically used for one-call damage prevention purposes is usually inadequate for design purposes because of the unacceptably high levels of positional uncertainty and coverage gaps that characterizes the data that results from this process. These data do not meet QLB standards.

One of the responsibilities of the project manager is to determine whether to use an evergreen contract for subsurface utility investigations or to include utility investigations in the highway consulting contract. TxDOT has developed guidelines to help project managers decide on the most cost-effective data collection efforts. In addition, there may be district-specific guidelines or standard operating procedures in place for the determination, use, and deliverables from utility investigations.

Activity participant responsibilities:

- TxDOT surveyor
  - Provide or assist with ground control for the utility investigation.

- TxDOT utility coordinator
  - Receive QLB utility data.
  - Update list of utility conflicts or utility conflict matrix.

- Utility owner
  - Provide utility data as requested by TxDOT, surveyor, or consultant.

- Consultant
  - Conduct survey and provide data to TxDOT.
  - Update utility conflict matrix if requested by TxDOT.

Assess Utility Impacts

This activity involves conducting an assessment of utility impacts based on the information collected during the geophysical survey of underground utility facilities. The outcome of this assessment is a determination of whether it is necessary to adjust a utility facility or if additional data is necessary to make that determination. If a utility facility needs to be adjusted, the utility adjustment process starts (see the Utility Coordination section). If additional information is needed, the next step is to expose utility facilities at critical locations to determine their precise horizontal and vertical coordinates. If a utility adjustment is not necessary, the district should follow appropriate procedures if compensable facilities or property interests exist, e.g., in the case of existing facilities that are not needed to provide service. The district should also verify or update existing utility agreements and permits, and request the utility owner to provide a letter of

no conflict. This utility impact assessment typically occurs between the 30-percent and 60-percent design meetings.

Activity participant responsibilities:

- TxDOT project manager
  - Review utility impact assessment and develop action plan for QLA data collection.

- TxDOT utility coordinator
  - Review utility data collected to date.
  - Assess which utility facilities need to be adjusted and which utility conflicts need additional information to make a determination.
  - Develop recommendation for further data collection (QLA), including need for survey, extent of survey, and responsible party to perform survey (utility owner, TxDOT staff, or consultant).

- Utility owner
  - Provide input into assessment if requested by TxDOT.

- Consultant
  - Provide input into assessment if requested by TxDOT.

Communicate Results of Analysis to Utility Owners

This activity involves communicating the results of the preliminary utility investigation analysis to utility owners. Data transmitted to utility owners should include a copy of the utility conflict matrix and an assessment of the potential impact of the highway project on utility facilities.

Activity participant responsibilities:

- TxDOT utility coordinator
  - Send utility impact information and utility conflict matrix to utility owners.

- Utility owner
  - Receive and review utility impact information and provide feedback to TxDOT.

Expose and Survey Underground Utility Facilities

This activity involves exposing utility facilities at critical locations to survey the horizontal and vertical location of the facilities at those locations. Obtaining accurate horizontal and vertical data at these test holes enables the production of 3-D data needed to resolve utility conflicts for which other types of utility data collection are not sufficient. The resulting data are considered QLA if certified by a professional engineer. When used, this level of utility investigation typically occurs around or after the 60-percent design stage. Exposing utility facilities is typically performed using air or water vacuum excavation methods. As with QLC data, test hole

data of utility facilities is a routine TxDOT activity, although certifying the corresponding utility data as QLA is more rigorous than traditional practice and is not as common.

One of the responsibilities of the project manager is to determine whether to use an evergreen contract for subsurface utility investigations or to include utility investigations in the highway consulting contract. A utility owner and TxDOT could also collect the data jointly, where the utility owner exposes its underground facilities in the field and a TxDOT surveyor records the horizontal and vertical location of the facilities at those locations.

As part of this process, the project manager should determine an adequate number of test holes and their location. TxDOT has developed guidelines to help project managers decide on the most cost-effective data collection efforts. In addition, there may be district-specific guidelines or standard operating procedures in place for the determination, use, and deliverables from utility investigations.

Activity participant responsibilities:

- TxDOT surveyor
  - Conduct survey if requested.
  - Format and provide survey data.

- TxDOT utility coordinator
  - Receive QLA utility data.
  - Update list of utility conflicts or utility conflict matrix.

- Utility owner
  - Expose utility facility if requested by TxDOT.

- Consultant
  - Contact owners of utility facilities that will be exposed.
  - Conduct survey and provide data to TxDOT.
  - Update utility conflict matrix if requested by TxDOT.

Assess Utility Impacts

This activity involves conducting an assessment of utility impacts based on the information gathered from the test holes. The outcome of this assessment is a determination of whether or not it is necessary to adjust a utility facility. If it is, the utility adjustment process starts (see the Utility Coordination section). Otherwise, the district should follow appropriate procedures if compensable facilities or property interests exist, e.g., in the case of existing facilities that are not needed to provide service. The district should also verify or update existing utility agreements and permits, and request the utility owner to provide a letter of no conflict. This utility impact assessment typically occurs at or after the 60-percent design stage.

Activity participant responsibilities:

- TxDOT project manager
  - Review utility impact assessment and develop action plan to clear utility conflicts.

- TxDOT utility coordinator
  - Review utility data collected to date.
  - Assess which utility facilities need to be adjusted and conditions under which other facilities can remain in place.
  - Develop recommendations to clear utility conflicts.

- Utility owner
  - Provide input into assessment if requested by TxDOT.

- Consultant
  - Provide input into assessment if requested by TxDOT.

Communicate Results of Analysis to Utility Owners

This activity involves communicating the results of the preliminary utility investigation analysis to utility owners. Data transmitted to utility owners should include a copy of the utility conflict matrix and an assessment of the potential impact of the highway project on utility facilities.

Activity participant responsibilities:

- TxDOT utility coordinator
  - Send utility impact information and utility conflict matrix to utility owners.

- Utility owner
  - Receive and review utility impact information and provide feedback to TxDOT.

Utility Coordination Activities

This lane focuses on activities to coordinate highway design activities with utility owners to minimize utility impacts on highway construction.

Provide Input on Project List to be Sent to Utility Owners

This activity involves providing feedback on the project list that is sent to utility owners in preparation for the annual coordination meeting. The project list is an updated list of projects included in the STIP. For maximum effectiveness, the list should be in a format that non-TxDOT officials can clearly understand, preferably in chronological order by proposed letting date. The list should also minimize the inclusion of projects that are not very likely to result in utility conflicts, e.g., overlays, pavement markings, and maintenance contracts.

Activity participant responsibilities:

- TxDOT project manager
  - Request TxDOT utility coordinator to provide input on project list for utility owners.

- TxDOT utility coordinator
  - Provide input on project list.
  - Identify utility owners and contact utility owners for input on project list as needed.

- Utility owner
  - Provide input on project list development if requested by TxDOT.

Send List of Upcoming Projects to Utility Owners

This activity involves sending the list of upcoming TxDOT projects to potentially affected utility owners in preparation for the annual utility coordination meeting.

Activity participant responsibilities:

- TxDOT utility coordinator
  - Send project list to utility owners before annual utility coordination meeting.

- Utility owner
  - Receive and review project list before annual utility coordination meeting.

Conduct Annual Utility Coordination Meeting

This activity involves scheduling and conducting a district-level annual coordination meeting with utility owners. The purpose of the meeting is to provide a forum for the discussion of upcoming highway construction projects with utility owners, therefore enabling utility owners to conduct early fiscal planning and anticipate budget cycle impacts, construction schedules, and consumer service requirements that might be affected by those highway projects. In preparation for the annual meeting, the district should send a list of anticipated highway projects to utility owners within two weeks of the meeting.

Activity participant responsibilities:

- TxDOT district engineer
  - Determine responsible party to invite participants and conduct meeting.

- TxDOT right of way representative
  - Attend meeting.

- TxDOT utility coordinator
  - Attend meeting and highlight potential utility conflicts.

- Local public agency (LPA) representative
  - Attend meeting and highlight potential utility conflicts.

- Utility owner
  - Attend meeting and highlight potential utility conflicts.

Other potentially interested parties:

- FHWA representative
- TxDOT environmental representative
- Director of Transportation Planning and Programming
- TxDOT Advance Planning Engineer

Conduct Division-Level Coordination Meeting(s)

This activity involves scheduling and conducting division-level coordination meetings (Right of Way Division and/or Texas Turnpike Authority) with utility owners. These meetings are high-level coordination activities between TxDOT and utility owners, which provide an opportunity to discuss general issues, policies, and initiatives. At this level, master agreements and MOUs can be particularly helpful to develop partnering relationships between TxDOT and utility owners to promote the goals of collaboration, coordination, and coordination among stakeholders.

Activity participant responsibilities:

- TxDOT Division representative
  - Invite participants to utility coordination meeting.
  - Develop master agreements and/or MOUs.

- Texas Turnpike Authority representative
  - Attend utility coordination meeting.
  - Develop master agreements and/or MOUs.

- TxDOT utility coordinator
  - Coordinate meeting with division representative.
  - Attend utility coordination meeting as needed.

- Utility owner
  - Attend utility coordination meeting.
  - Develop master agreements and/or MOUs.

Provide Preliminary Input to Planning and Programming

This activity involves conducting a high-level assessment of major utility impacts. This activity takes place during the planning and programming phase after transportation plans have been developed, and project requirements, studies, and cost estimates are under development. Although providing input into the planning process is not a mandatory activity, involving utility coordinators in this activity can help identify major utility issues early in the project development process.

Activity participant responsibilities:

- TxDOT project manager
  - Request input from utility coordinator as needed.

- TxDOT utility coordinator
  - Conduct high-level assessment of major utility facilities and potential conflicts, as needed.

Provide Support for Right of Way Estimate

This activity involves assisting with the determination of a high-level estimate of potential right of way and utility costs. This is an important activity considering that right of way and utility adjustment costs can vary significantly from project to project. Although not a mandatory activity, it is highly recommended to provide input into the cost estimating process to improve cost estimates and alert project planners to potential risks that might affect project development and delivery.

Activity participant responsibilities:

- TxDOT project manager
  - Request input from right of way representative as needed.

- TxDOT right of way representative
  - Prepare preliminary estimate of right of way costs, as needed.
  - Prepare preliminary estimate for utility adjustment costs, as needed.

Obtain Early Right of Way Release for Utilities

This activity involves preparing an early right of way release for utilities to enable TxDOT to incur certain costs before the normal right of way project release. Typical activities allowed include engineering, prefabrication of materials, and acquisition of easements, i.e., activities that do not involve excavation or disturbance of the soil. An early right of way release for utilities requires the final geometric schematic to be complete.

Activity participant responsibilities:

- TxDOT Right of Way Division
  - Document justification for and review of early right of way release for utilities.
  - Approve early right of way release for utilities as appropriate.

- TxDOT utility coordinator
  - Identify need and requirements for an early right of way release for utilities.
  - Request early right of way release for utilities from the Right of Way Division.

Review Responsibilities for Utility Coordination

This activity involves reviewing and confirming levels of responsibility for subsequent utility coordination activities, including whether there is federal funding for the project and what entity, TxDOT or an LPA, will have the responsibility for coordinating utility adjustments. This activity is usually the first activity that takes place after a utility adjustment is deemed necessary. Typically, it includes a review of existing project-level agreements (including forms such as FPAA, APA request, Form ROW-RM-37, and Form ROW-RM-129), which will guide the utility adjustment and reimbursement process.

Reviewing responsibilities for utility coordination could have the following outcomes:

- The utility adjustment is not reimbursable. In this case, the normal utility permitting process applies, including the use of Form 1082.

- The utility adjustment is eligible for full or partial reimbursement. Utility adjustments are reimbursable if (a) the highway is part of the Interstate system, (b) the utility owner has a compensable property interest, of (c) the highway is turnpike or toll project. If the utility adjustment is eligible for reimbursement, the analysis includes a determination of the applicability of existing agreements, including FPAA (federal aid participation), Form ROW-RM-37 (when the LPA coordinates utility adjustments), and Form ROW-RM-129 (when TxDOT coordinates utility adjustments, and the LPA contributes funds).

Activity participant responsibilities:

- TxDOT utility coordinator
  - Review existing project-level agreements.
  - Confirm eligibility for adjustment reimbursement and entity responsible for reimbursement costs.
  - Determine need to escrow funding from LPAs.

Request FHWA Alternate Procedure Approval

This activity involves requesting FHWA approval for using the Alternate Procedure. If a project involves federal funding, TxDOT must receive FHWA approval to act on its behalf for

reviewing and approving agreements and other matters related to the utility adjustments. The request must include the list of utility adjustments and the best available estimate of the total costs involved. The request may be sent concurrently with the FPAA.

Activity participant responsibilities:

- TxDOT Right of Way Division
  - Submit APA request to FHWA.
  - Document approval of the request from FHWA.

Officially Notify Utility Owners that Adjustment is Necessary

This activity involves sending an official notification to the utility owner that a utility adjustment is necessary. 43 TAC 21.22 includes precise instructions on how to provide that notification, including the need to send the notification by certified mail (*3*). The rule also lists documents that need to be included in the notification, such as final plans, TxDOT's standard utility agreement, and a date by which the adjustment must be complete.

Activity participant responsibilities:

- TxDOT project manager
  - Review and sign official notification packages to utility owners.
  - Send official notification packages to utility owners by certified mail.

- TxDOT utility coordinator
  - Identify utility owner contact information.
  - Assemble plans sufficient for the utility owner to design the utility adjustment.
  - Determine the date by which the utility facility adjustment must be complete.
  - Prepare the official notification packages.

Process Advance Funding Agreement with Utility Owners

This activity involves preparing and processing an advance funding agreement (AFA) with a utility owner if a utility adjustment is included in the highway contract, and the highway contract includes items that are ineligible for TxDOT cost participation. The AFA must be signed and funds must be collected and escrowed before a project can go to letting. The PS&E package should have a statement describing which items are related to the utility adjustment and indicating that an AFA covers the funding for those items.

Activity participant responsibilities:

- TxDOT project manager
  - Process or coordinate AFA with utility owner.

- TxDOT utility coordinator
  - Coordinate AFA with utility owner.

- Utility owner
  - Coordinate AFA with TxDOT utility coordinator.
  - Execute AFA and provide funds to TxDOT escrow account.

Prepare and Review Utility Agreement

This activity involves preparing and/or reviewing an agreement with the utility owner, typically for the adjustment of utility facilities that are eligible for reimbursement. For non-reimbursable utility adjustments in which the utility facility is adjusted to a location within the highway right of way, the usual procedure is to use the utility permitting process and Form 1082. Utility agreements outline the conditions that govern the accommodation of utility facilities on the state right of way and specify each party's rights, responsibilities, and timelines with regard to required utility adjustments. Reviewing and approving utility agreements follows approval authority levels for districts, regions, and divisions. Tier 1 districts can approve utility adjustments up to $100,000 (both actual cost and lump sum). The Right of Way Division reviews and approves all other agreements. It is estimated that districts review and approve approximately 50 percent of all agreement assemblies.

Utility agreements typically include standard agreement forms and attachments, utility adjustment plans, cost estimates, and other supporting documentation, as follows:

- Standard Utility Agreement (Form ROW-U-35, Standard Utility Agreement).
- Attachment A, Plans, Specifications, and Estimated Costs. This attachment should include the following:
  - Itemized estimate of adjustment costs.
  - Detailed utility plans in support of estimate, sufficient to determine scope of work, UAR compliance, and joint use purpose.
  - Statement listing components of overhead rates used in the estimate.
  - Eligibility analysis, if applicable.
  - Betterment analysis, if applicable.
- Attachment B, Utility's Accounting Method.
- Attachment C, Utility's Schedule of Work and Estimated Date of Completion.
- Attachment D, Statement Covering Contract Work, if applicable (form ROW-U-48).
- Attachment E, Utility Joint Use and Occupancy (ROW-U-JUAA, Utility Joint Use and Occupancy).
- Attachment F, Eligibility Ratio.
- Attachment G, Betterment Calculation and Estimates.
- Attachment H, Proof of Property Interest, if required (Affidavit of Compensable Interest, either form ROW-U-1A, ROW-U-1B, or ROW-U-1C or Attorney Certificate, Form ROW-U-84).
- Attachment I, Inclusion in Highway Construction Contract (if applicable).

Other documents that may be necessary to complete a utility agreement assembly include the following:

- Indemnity Agreement for Fiber Optic Facility (form ROW-U-139).
- Master Indemnity Agreement for Fiber Optic Facilities (form ROW-U-139A).
- Statement of location of records and availability of records for audit.
- Additional documentation, as appropriate. For example, a Grant of Signature Authority may be required for documents executed by non-company officers who do not already have signature authorization on file with TxDOT.

Activity participant responsibilities:

- TxDOT Right of Way Division
  - Provide guidance for preparation of utility agreements if requested.
  - Review and approve utility agreement assembly.

- TxDOT district director of transportation planning and development
  - Review and approve utility agreement assembly, as appropriate.
  - Prepare utility agreement assembly for execution.

- TxDOT utility coordinator
  - Determine need for utility agreement and supporting documentation.
  - Coordinate agreement with utility owner and provide guidance and examples.
  - Review supporting documentation for completeness.
  - Request guidance from Right of Way Division as needed.
  - Execute agreement or forward to Right of Way Division for execution, if applicable.

- Utility owner
  - Coordinate agreement with TxDOT utility coordinator.
  - Provide necessary documentation for agreement.
  - Request guidance and examples from TxDOT utility coordinator as needed.
  - Execute agreement with TxDOT.

Review and Approve Determination of Eligibility and/or Determine Upper Limit

This activity involves reviewing and approving a determination of eligibility in situations where the LPA coordinates utility adjustments and an actual cost accounting method has been selected. This activity is optional, but is recommended when the LPA is interested in an advance determination of reimbursement eligibility. The activity could also include determining an upper eligibility limit. Deciding not to exercise this option presents an element of risk to the LPA because the actual determination of reimbursement eligibility is usually not made until all cost information has been submitted after completing the adjustment in the field. For this reason, TxDOT encourages LPAs to exercise the option to request a determination of eligibility.

Activity participant responsibilities:

- TxDOT Right of Way Division
  - Determine eligibility for reimbursement and upper eligibility limit.

- TxDOT utility coordinator
  - Coordinate eligibility request between the Right of Way Division, the LPA utility coordinator, and the utility owner.

- LPA utility coordinator
  - Determine need for determination of eligibility and upper limit.
  - Coordinate eligibility request with utility owner.

Prepare and Review Utility Agreement (LPA – Actual Cost)

This activity involves preparing and/or reviewing an agreement between the LPA, the utility owner, and TxDOT in situations where the LPA coordinates utility adjustments and an actual cost accounting method is used. In this case, the form to use is Form ROW-U-43B.

Activity participant responsibilities:

- TxDOT Right of Way Division
  - Review and approve agreement.

- TxDOT district engineer
  - Review and approve agreement.

- TxDOT utility coordinator
  - Coordinate agreement with utility owner and LPA utility coordinator.

- LPA utility coordinator
  - Coordinate agreement with utility owner and TxDOT utility coordinator.
  - Review and approve agreement.

- Utility owner
  - Coordinate agreement with LPA utility coordinator.
  - Prepare agreement with LPA and TxDOT.

Prepare and Review Utility Agreement (LPA – Lump Sum)

This activity involves preparing and/or reviewing an agreement between the LPA, the utility owner, and TxDOT in situations where the LPA coordinates utility adjustments and a lump-sum accounting method is used. In this case, the form to use is Form ROW-U-43A.

Activity participant responsibilities:

- TxDOT Right of Way Division
  - Review and approve agreement.

- TxDOT district engineer
  - Review and approve agreement.

- TxDOT utility coordinator
  - Coordinate agreement with utility owner and LPA utility coordinator.

- LPA utility coordinator
  - Coordinate agreement with utility owner and TxDOT utility coordinator.
  - Review and approve agreement.

- Utility owner
  - Coordinate agreement with LPA utility coordinator.
  - Prepare agreement with LPA and TxDOT.

Apply Texas Administrative Code Procedure if Agreement is Not Reached

This activity involves applying the requirements in 43 TAC 21.22 if an agreement with a utility owner is not reached within a certain period of time. In particular, if TxDOT and the utility owner have not entered into a written agreement within 30 days after TxDOT provides plans and specifications sufficient to determine the future utility facility location, TxDOT can send written notice to the utility that the adjustment of the utility facility may be required. Further, 90 days after the utility owner receives this official notice, TxDOT may adjust the facility at the utility owner's expense, unless the utility owner has executed the agreement, is negotiating with TxDOT to relocate the facility, or has received a time extension from TxDOT.

Activity participant responsibilities:

- TxDOT Right of Way Division
  - Provide guidance on procedure to adjust utility facilities without agreement from utility owners.

- TxDOT project manager
  - Review information about nonresponsive utility owners.
  - Start procedure to adjust utility facilities without agreement from utility owners.
  - Request guidance from Right of Way Division as needed.

- TxDOT utility coordinator
  - Monitor responses from utility owners that have received official notification to adjust, modify, relocate, or remove utility facilities.

- Determine which utility owners have not responded after 30 days of receiving the official notification, have not executed an agreement, are not in the process of negotiating in good faith, and have not received a time extension to sign the agreement.
- Send information about unresponsive utility owners to the project manager.

Execute Utility Agreement

This activity involves executing the utility agreement between TxDOT and the utility owner. Before a utility owner begins a utility adjustment that is reimbursable, a utility agreement should be executed between TxDOT and the utility owner, and, if applicable, the LPA.

Activity participant responsibilities:

- TxDOT Right of Way Division
  - Execute utility agreement.

- TxDOT district
  - Execute utility agreement.

- LPA
  - Execute utility agreement.

- Utility owner
  - Execute utility agreement.

Review and Approve Utility Installation Request

This activity involves reviewing and approving a utility owner's request for installing a utility facility on the state right of way, in situations where a non-reimbursable utility adjustment occurs within the state right of way. In this case, the form to use is Form 1082 (Utility Installation Request). Utility owners can submit this form online using the Utility Installation Request (UIR) system.

Activity participant responsibilities:

- TxDOT district director of maintenance
  - Review and approve utility installation request.

- Utility owner
  - Submit installation request online using the UIR system.

Clear Right of Way Needed for Utility Adjustment

This activity involves clearing the right of way needed for a utility adjustment. Once it has been determined that a utility facility will be adjusted within the state right of way, the district can proceed with clearing the right of way so that the utility owner can adjust its facility. In practice, the ability to clear the right of way depends on the completion of the acquisition of all necessary right of way parcels where the utility adjustment will occur.

Activity participant responsibilities:

- TxDOT project manager
  - Develop a plan to clear the right of way to allow utility adjustments.
  - Implement right of way clearance plan and monitor the execution of the plan.

- TxDOT utility coordinator
  - Assist project manager with the development and implementation of the right of way clearing plan.

Monitor Utility Adjustments before Letting

This activity involves monitoring and inspecting the progress of utility adjustments in the field (before letting) and processing requests for eligible reimbursable items from utility owners. Utility adjustment costs normally under the category of ROW costs. TxDOT's goal is to have utility adjustments completed by the time the project goes to letting. However, it is common to have pending utility adjustment items at the beginning of construction. It is common to include some utility adjustment items in the highway contract, e.g., in the case of water lines, sanitary sewer lines, duct banks, manholes, and junction boxes. If the items are not reimbursable, utility owners must escrow the funds before construction starts to ensure that TxDOT can pay the highway contractor for the utility adjustment items. Monitoring and inspections of the utility adjustment process is particularly critical to ensure conformance with the UAR, plan requirements, and traffic control plans in accordance with the *Texas Manual on Uniform Traffic Control Devices* (TMUTCD) (*22*).

Activity participant responsibilities:

- TxDOT project manager
  - Update utility coordinator about design progress and modifications.
  - Request updates on utility adjustment status from utility coordinator on a regular basis to maintain adequate project control.
  - Address major utility adjustment issues to avoid project delays.

- TxDOT utility coordinator
  - Provide utility adjustment updates as requested.
  - Communicate design modifications and progress to utility owners.
  - Provide support to utility owners with questions regarding utility adjustments, as needed.

- Inspect adjustment progress on a regular basis.
- Update utility conflict matrix and utility status sheet on a regular basis.
- Communicate adjustment issues and concerns to project manager.

- Utility owner
  - Provide updates on adjustment progress.
  - Communicate adjustment issues and concerns to utility coordinator.
  - Communicate diversions from and modifications of approved plans to utility coordinator.

Prepare Utility Clearance Certification and Utility Adjustment Status Form

This activity involves preparing a utility certification for inclusion in the PS&E package. As outlined in the *PS&E Preparation Manual*, two types of utility certifications could apply (*16*): Certification for Utility Adjustment (None or Clear) and Certification for Utility Adjustment (Not Clear). The first version is used if all utility facilities have been adjusted and/or there are no utility conflicts before the complete PS&E package is submitted to Austin for review. The second version is used if there are utility conflicts that could not be adjusted ahead of letting in order to alert the contractor about potential impacts on construction scheduling. This certification is submitted with a special triple zero special provision that lists pending utility conflicts, utility owners, locations, and estimated clearance date. Projects that involve federal funds require an additional data sheet called Utility Status, which can be updated up to two weeks before the project's Letter of Authority (for construction) date.

Activity participant responsibilities:

- TxDOT project manager
  - Determine responsible party for developing the triple zero special provision, if needed.

- TxDOT utility coordinator
  - Determine which utility adjustment certification is needed.
  - Determine if the utility status form is needed.
  - Complete all forms as needed and submit to project manager.

Monitor Utility Adjustment after Letting

This activity involves monitoring and inspecting the progress of utility adjustments in the field (after letting) and processing requests for eligible reimbursable items from utility owners. Utility adjustment costs normally under the category of right of way costs. TxDOT's goal is to have utility adjustments completed by the time the project goes to letting. However, it is common to have pending utility adjustments items at the beginning of construction. It is common to include some utility adjustment items in the highway contract, e.g., in the case of water lines, sanitary sewer lines, duct banks, manholes, and junction boxes. If the items are not reimbursable, utility owners must escrow the funds before construction starts to ensure that TxDOT can pay the

highway contractor for the utility adjustment items. Monitoring and inspections of the utility adjustment process is particularly critical to ensure conformance with the UAR, plan requirements, and traffic control plans in accordance with the TMUTCD (*22*).

Activity participant responsibilities:

- TxDOT construction manager
  - Update utility coordinator about design progress and modifications.
  - Request updates on utility adjustment status from utility coordinator on a regular basis to maintain good control of the project construction.
  - Address major utility adjustment issues to avoid project delays.

- TxDOT utility coordinator
  - Provide utility adjustment updates as requested.
  - Communicate modifications and construction progress to utility owners.
  - Provide support to utility owners with questions regarding utility adjustments, as needed.
  - Inspect adjustment progress on a regular basis.
  - Update utility conflict matrix and utility status sheet on a regular basis.
  - Communicate adjustment issues and concerns to construction manager.

- Utility owner
  - Provide updates on adjustment progress.
  - Communicate adjustment issues and concerns to utility coordinator.
  - Communicate diversions from and modifications of approved plans to utility coordinator.

Monitor Submission of As-Builts

This activity involves monitoring the utility owner's submission of as-built documentation. TxDOT requires utility owners to submit as-builts after a utility adjustment is complete. Examples for appropriate as-built documentation are available from the Right of Way Division.

Activity participant responsibilities:

- TxDOT Right of Way Division
  - Request as-built documentation if not included in the final bill, as applicable.
  - Provide sample as-built documentation to utility owners if requested by utility owner.

- TxDOT utility coordinator
  - Remind utility owners about the requirement for as-built documentation when submitting the final bill.
  - Request as-built documentation if not included in the final bill, as applicable.
  - Provide sample as-built documentation to utility owners if requested by utility owner.

- Utility owner
  - Provide as-built documentation along with final bill.

Reimburse Utility Owner for Eligible Utility Adjustment Costs

This activity involves TxDOT reimbursing utility owners for eligible utility adjustment costs. It includes coordinating with utility owners to ensure that bills are prepared and submitted in a format that is compatible with the approved estimate in the utility agreement assembly. The bill must provide sufficient detail for analysis and documentation and should follow the order of items in the estimate as closely as possible. The totals for labor, overhead, construction cost, travel, transportation, equipment, materials, supplies, or other services should be shown in a manner that enables a comparison of the bill with the approved estimate.

All bills should include the approved eligibility ratio, appropriate credits, mailing information for payment delivery, and other supporting documentation as needed. A variety of payment methods are available, including monthly partial payments, a pre-approved lump-sum payment, or a single final payment upon completion of work. TxDOT can provide partial payments as frequently as each month, in an amount not exceeding 80 percent of the approved estimated cost of work completed to date. A lump-sum payment usually corresponds to the amount stated in the approved utility adjustment assembly and is not subject to audit. Frequently, TxDOT reimburses utility owners with a single payment after the utility owner submits a final billing upon completing the work. TxDOT usually pays 90 percent of the bill immediately and retains 10 percent until completion of a TxDOT audit. The utility owner should provide the final bill within one year following completion of the utility work. Otherwise, previous payments may be considered final or the utility owner may need to make a direct claim to the Texas legislature.

TxDOT reimburses utility owners directly for eligible utility adjustment costs, except in situations where an LPA coordinates utility adjustments, in which case TxDOT reimburses the LPA after the LPA has reimbursed the utility owner.

Activity participant responsibilities:

- TxDOT Right of Way Division
  - Review utility bills, determine eligible items, and determine actual reimbursement amount, if applicable.
  - Reimburse LPA or utility owner less retainer, if applicable.
  - After receipt of final bill, send billing documentation to the TxDOT Audit Section for auditing.
  - After the audit, release retainer and reimburse LPA or utility owner, as appropriate.

- TxDOT project manager
  - Monitor actual versus estimated reimbursement costs for utility adjustments.

- TxDOT utility coordinator
  - Determine responsible party for utility reimbursements.

- Provide documentation utility owners, including sample billings as needed.
- Send billing information to the region or the Right of Way Division, as appropriate.
- Review utility bills, determine eligible items, and determine actual reimbursement amount, if applicable.

- Utility owner
  - Provide billing and adequate supporting documentation for partial and/or final bills in a timely manner.

Audit Utility Adjustment Payments

This activity involves conducting an audit of utility adjustment payments in accordance with established auditing procedures.

TxDOT usually performs an audit of cost information submitted, except for lump-sum agreements, which do not require audits. Audits that the TxDOT External Audit Section conducts determine which costs are allowable for both federal and state cost participation. If final billing assemblies are adequate, audits are usually limited to a desk review. However, there are instances when a district may need to obtain additional information from a utility owner and will need to summarize its findings to authorize payment. For projects that involve federal-aid participation, single audits are usually satisfactory, i.e., a subsequent FHWA audit is normally not required.

Activity participant responsibilities:

- TxDOT Right of Way Division
  - Send final bill to External Audit Section.
  - Prepare from ROW-A-15.
  - Request voucher from Finance Division for payment of utility owner.

- TxDOT External Audit Section
  - Perform audit as appropriate.
  - Request additional information from district utility coordinator to support costs, as needed.
  - Send results of audit to Right of Way Division.

- TxDOT utility coordinator
  - Request additional information from utility owners, as needed.
  - Send information provided by utility owner to External Audit Section.

- Utility owner
  - Provide additional information to support cost data submitted, as TxDOT utility coordinator had requested.
  - Review audit citations and accept citations, or provide rebuttal including further information to support cited costs.

Reimburse LPA for Eligible Utility Adjustment Costs

This activity involves reimbursing the LPA for eligible expenses incurred in reimbursing utility owners. TxDOT requires LPAs to submit a certification and appropriate documentation to confirm that they have made the appropriate reimbursement to utility owners. Two general cases apply when requesting reimbursement for incurred utility adjustment costs:

- Case 1. The LPA reimburses the utility owner for eligible costs without previously requesting a TxDOT review of the final bill and a commitment of TxDOT's participation. In this case, TxDOT determines the amount eligible for participation through an audit, and reimbursement to the LPA proceeds accordingly.

- Case 2. The LPA does not reimburse the utility owner, or makes a partial payment to the utility owner and requests a TxDOT review of the final bill. In this case, the LPA secures a commitment from TxDOT before making the final payment to the utility. TxDOT determines the amount eligible through an audit, with the eligible amount becoming the upper limit for TxDOT participation. Reimbursement to the LPA is based on TxDOT's commitment or the net cost to the LPA, whichever is lower.

Activity participant responsibilities:

- TxDOT Right of Way Division
  - Forward final bill to External Audit Section.
  - Prepare from ROW-A-15.
  - Request voucher from Finance Division for payment of utility owner.

- TxDOT Finance Division
  - Prepare voucher as final reimbursement of LPA.
  - Send voucher to LPA.

- TxDOT External Audit Section
  - Perform audit as appropriate.
  - Request additional information from district utility coordinator to support costs, as needed.
  - Send results of audit to Right of Way Division.

- TxDOT utility coordinator
  - Send final bill to Right of Way Division.
  - Request additional information from LPA to support costs, as requested from External Audit Section.
  - Send additional information from LPA to support costs to External Audit Section.

- LPA
  - Request as-built documentation if not included in the final bill, as applicable.

- Send final bill to TxDOT utility coordinator.
- Request additional information from utility owner to support costs, as requested from External Audit Section.
- Send additional information from utility owner to TxDOT utility coordinator.

- Utility owner
  - Submit final bill to LPA, including as-built documentation.
  - Provide addition information to support costs, as requested by LPA.
  - Review audit citations and accept citations, or provide rebuttal including further information to support cited costs.

Utility Owner Activities

This lane focuses on high-level activities for which utility owners are responsible.

Attend Annual Utility Coordination Meeting

This activity involves attending an annual coordination meeting with TxDOT. TxDOT conducts the annual utility meeting within two weeks of sending a utility-friendly project list to utility owners. This meeting is intended to provide a forum for discussion of TxDOT construction projects and schedules. During the meeting, particular emphasis should be placed on awareness about major utility concerns that might affect project development and delivery. Early communication of this type provides utility owners with the information needed to plan future activities, particularly in areas related to budget cycles, construction schedules, and consumer service requirements.

Activity participant responsibilities:

- Utility owner
  - Attend annual coordination meeting.
  - Discuss upcoming projects and provide feedback.
  - Start internal fiscal planning for upcoming projects, as needed.

Participate in Division-Level Coordination Meetings

This activity involves attending meetings involving the Right of Way Division and/or the Texas Turnpike Authority. These coordination meetings are high-level coordination activities between TxDOT and utility owners that provide opportunities to discuss general issues, policies, and initiatives (e.g., master agreements or MOUs). Master agreements and MOUs can be particularly helpful to develop partnering relationships between TxDOT and utility owners to promote the goals of collaboration and coordination among stakeholders.

Activity participant responsibilities:

- Utility owner
  - Attend division-level coordination meetings, as needed.
  - Develop MOUs as needed.

Provide Feedback on Eligible Utility Reimbursement Cost Estimate

This activity involves providing feedback on utility reimbursement cost estimates for major planned highway projects.

Activity participant responsibilities:

- Utility owner
  - Review and provide feedback on utility reimbursement cost estimate.
  - Forward comments to TxDOT project manager.

Provide Feedback on Preliminary Schematic and Mark Up Utility Locations

This activity involves reviewing and marking up the preliminary schematic with utility locations. Once a preliminary schematic is available for a project, the district utility coordinator sends a copy of the schematic to utility owners to mark the approximate locations of major utility facilities.

Activity participant responsibilities:

- Utility owner
  - Review preliminary project schematic.
  - Mark utility facilities on schematic and forward to TxDOT utility coordinator.

Provide Feedback on Latest Schematic and Utility Conflicts

This activity involves reviewing the latest schematic providing feedback on previously identified utility conflicts. Once TxDOT finalizes and approves the geometric schematic, utility owners should have an opportunity to review and providing feedback on the latest schematic before TxDOT begins with detailed design. This activity provides an early opportunity for TxDOT design engineers to identify and address major utility issues.

Activity participant responsibilities:

- Utility owner
  - Review final geometric schematic.
  - Double-check location of utility facilities and additional feedback as appropriate.
  - Send comments and markups to TxDOT utility coordinator.

Request Consultant Approval

This activity involves requesting approval of the utility owner's consultant contract. If the adjustment is reimbursable and the utility owner intends to hire a utility design consultant, TxDOT should review and approve the contract to ensure the utility owner will be reimbursed. If TxDOT does not review the contract, there is a risk to the utility owner that the contract may include cost items that are not eligible for reimbursement after the design consultant completes the design work. If an LPA coordinates utility adjustments, and a utility owner needs to use consultants, consultant approval is not required but encouraged to ensure eligibility of cost reimbursement.

Activity participant responsibilities:

- TxDOT Right of Way Division
  - Review and approve utility design contract, as appropriate.

- LPA utility coordinator
  - Request consultant approval from TxDOT Right of Way Division, if desired.

- Utility owner
  - Determine need for utility design consultant.
  - Forward consultant contract documentation to LPA or TxDOT and request approval, as appropriate.

Design Utility Adjustments

This activity involves conducting the design required to adjust a utility facility. This activity requires close coordination among TxDOT, utility owners, and other stakeholders to ensure the utility design addresses both the needs of the utility owner and TxDOT, while avoiding or minimizing situations that would introduce conflicts or delays during the design and construction phases. Utility coordination meetings usually take place throughout the project development process, including at 30-percent, 60-percent, and 90-percent design.

Utility owners are typically responsible for the design to adjust utility facilities that are in conflict with the project or other facilities. Utility owners are also responsible for working with the TxDOT utility coordinator to ensure that lines of communication between utility owner and transportation project designers are open, design documents are exchanged quickly and efficiently, coordination meetings are scheduled and conducted, and agreement documents are processed in a timely manner. Utility coordination activities also involve LPAs.

Activity participant responsibilities:

- TxDOT utility coordinator
  - Notify utility owner that utility adjustment design can begin, as appropriate.

- Utility owner
  - Ensure that agreement is in place before starting design of the utility adjustment.
  - Coordinate utility adjustment design at intermediate design meetings.

Prepare and Submit Utility Agreement

This activity involves preparing and submitting the utility agreement assembly to TxDOT. Utility owners are typically responsible for completing this activity. In reality, completing the agreement assembly should be a cooperative process between the utility owner and the TxDOT district coordinator. This process involves the TxDOT utility coordinator providing all the necessary information the utility owner needs to prepare the agreement assembly (including sample documentation and guidelines on how to prepare forms and supporting documents) and the utility owner preparing the utility agreement assembly in ways that meet the project requirements and existing regulations. The TxDOT utility coordinator is also responsible for reviewing the agreement assembly, providing timely feedback to the utility owner, and sending the assembly to the district or the Right of Way Division for review and approval.

Activity participant responsibilities:

- Utility owner
  - Coordinate agreement with TxDOT or LPA utility coordinator.
  - Request guidance and examples from TxDOT utility coordinator as needed.
  - Provide necessary documentation for agreement.

Execute Utility Agreement

This activity involves executing the utility agreement between TxDOT and the utility owner. Before a utility owner begins a utility adjustment that is reimbursable, a utility agreement should be executed between TxDOT and the utility owner, and if applicable, the LPA.

Activity participant responsibilities:

- TxDOT Right of Way Division
  - Execute utility agreement.

- TxDOT district
  - Execute utility agreement.

- LPA
  - Execute utility agreement.

- Utility owner
  - Execute utility agreement.

Prepare and Submit Utility Installation Request

This activity involves preparing and submitting a utility installation request to TxDOT in situations where the adjustment is non-reimbursable and the proposed new location is on the state right of way. Utility owners are typically responsible for completing this activity. As in the case of reimbursable utility agreements, completing the utility installation request (using Form 1082) should be a cooperative process between the utility owner and TxDOT. Utility owners can submit this form using the UIR system.

Activity participant responsibilities:

- TxDOT utility coordinator
  - Provide assistance determining eligibility for reimbursement.
  - Provide assistance with the use of UIR system, as needed.

- LPA utility coordinator
  - Provide assistance determining eligibility for reimbursement.

- Utility owner
  - Coordinate with TxDOT and/or the LPA determining reimbursement eligibility.
  - If the adjustment is not reimbursable, submit utility installation request using the UIR system.

Receive and Process TxDOT Approval for Utility Installation Request

This activity involves acknowledging receipt of TxDOT' approval of the utility installation request, in situations where the adjustment is non-reimbursable and the proposed new location is on the state right of way. After TxDOT approves the proposed installation using Form 1082, the utility owner prepares to execute the adjustment in the field. This activity could involve preparing a traffic control plan according to the approval provisions as well as coordinating with a TxDOT inspector and other stakeholders. The UIR system enables the utility owner to notify the TxDOT inspector online.

Activity participant responsibilities:

- TxDOT district inspector
  - Prepare for utility installation after receiving notice from utility owner.

- Utility owner
  - Give TxDOT a 48-hour notice using UIR before proceeding with installation in the field.

Adjust Utility Facilities before Letting

This activity involves adjusting utility facilities in the field (before letting). This activity requires close coordination among TxDOT, utility owners, and other stakeholders to ensure that

utility adjustments proceed according to plan. Utility coordination meetings usually take place throughout the project development process, including at 30-percent, 60-percent, and 90-percent design. The utility owner is responsible for monitoring and inspecting utility adjustments in the field to ensure conformance with the UAR, plan requirements, and traffic control plans in accordance with the TMUTCD (*22*).

Activity participant responsibilities:

- TxDOT utility coordinator
  - Coordinate utility adjustment inspections with utility owner.

- Utility owner
  - Ensure that agreement is in place before starting the utility adjustment.
  - Coordinate utility adjustment with TxDOT utility coordinator.
  - Proceed with utility adjustment.
  - Coordinate inspections with TxDOT utility coordinator.
  - Notify TxDOT utility coordinator of adjustment completion.

Adjust Utility Facilities after Letting

This activity involves adjusting utility facilities in the field (after letting). This activity requires close coordination among TxDOT, utility owners, and other stakeholders to ensure that utility adjustments proceed according to plan. Utility coordination meetings usually take place throughout the project development process, including at 30-percent, 60-percent, and 90-percent design. The utility owner is responsible for monitoring and inspecting utility adjustments in the field to ensure conformance with the UAR, plan requirements, and traffic control plans in accordance with the TMUTCD (*22*).

Activity participant responsibilities:

- TxDOT utility coordinator
  - Coordinate utility adjustment inspections with utility owner.

- Utility owner
  - Ensure that agreement is in place before starting the utility adjustment.
  - Coordinate utility adjustment with TxDOT utility coordinator.
  - Proceed with utility adjustment.
  - Coordinate inspections with TxDOT utility coordinator.
  - Notify TxDOT utility coordinator of adjustment completion.

Submit As-Built Documentation

This activity involves submitting as-built documentation to TxDOT. TxDOT requires utility owners to submit as-builts after a utility adjustment is complete. Examples for appropriate as-built documentation are available from the Right of Way Division.

Activity participant responsibilities:

- TxDOT Right of Way Division
  - Request as-built documentation if not included in the final bill, as applicable.
  - Provide sample as-built documentation to utility owners if requested by utility owner.

- TxDOT utility coordinator
  - Remind utility owners about the requirement for as-built documentation when submitting the final bill.
  - Request as-built documentation if not included in the final bill, as applicable.
  - Provide sample as-built documentation to utility owners if requested by utility owner.

- Utility owner
  - Provide as-built documentation along with final bill.

Request and Receive Reimbursement for Eligible Utility Adjustment Costs

This activity involves TxDOT reimbursing utility owners for eligible utility adjustment costs. It includes coordinating with TxDOT to ensure that bills are prepared and submitted in a format that is compatible with the approved estimate in the utility agreement assembly. The bill must provide sufficient detail for analysis and documentation and should follow the order of items in the estimate as closely as possible. The totals for labor, overhead, construction cost, travel, transportation, equipment, materials, supplies, or other services should be shown in a manner that enables a comparison of the bill with the approved estimate.

All bills should include the approved eligibility ratio, appropriate credits, mailing information for payment delivery, and other supporting documentation as needed. A variety of payment methods are available, including monthly partial payments, a pre-approved lump-sum payment, or a single final payment upon completion of work. TxDOT can provide partial payments as frequently as each month, in an amount not exceeding 80 percent of the approved estimated cost of work completed to date. A lump-sum payment usually corresponds to the amount stated in the approved utility adjustment assembly and is not subject to audit. Frequently, TxDOT reimburses utility owners with a single payment after the utility owner submits a final billing upon completing the work. TxDOT usually pays 90 percent of the bill immediately and retains 10 percent until completion of a TxDOT audit. The utility owner should provide the final bill within one year following completion of the utility work. Otherwise, previous payments may be considered final or the utility owner may need to make a direct claim to the Texas legislature.

TxDOT reimburses utility owners directly for eligible utility adjustment costs, except in situations where an LPA coordinates utility adjustments, in which case TxDOT reimburses the LPA after the LPA has reimbursed the utility owner.

Activity participant responsibilities:

- TxDOT utility coordinator
  - Determine responsible party for utility reimbursements.
  - Provide documentation utility owners, including sample billings as needed.
  - Send billing information to the region or the Right of Way Division, as appropriate.
  - Review utility bills, determine eligible items, and determine actual reimbursement amount, if applicable.

- Utility owner
  - Provide billing and adequate supporting documentation for partial and/or final bills in a timely manner.

IMPLEMENTATION PLAN

The researchers recommend the following major steps to implement the updated utility process at TxDOT:

- Identify leaders for the implementation and assemble an implementation team. The researchers anticipate the Right of Way Division to be the main champion and office of primary responsibility for the implementation. However, the implementation team should also include representatives of other divisions as well as regions and districts.

- Schedule a series of workshops throughout the state to disseminate the updated utility process. Potential participants in these events include TxDOT officials at different levels (e.g., division staff, utility coordinators, project managers, design engineers, construction inspectors, and area engineers), utility owners, consultants (including transportation consultants and utility consultants), and contractors (both highway and utility contractors).

- Update the *ROW Utility Manual* (*4*) by inserting and/or replacing content from the previous sections. The current version of the utility manual includes 12 chapters and an appendix. The researchers anticipate major changes to Chapter 2 (TxDOT-Utility Cooperative Management Process and Subprocess), Chapter 4 (Preliminary Planning), and Chapter 8 (Procedures for Utility Adjustments), as well as relatively minor changes to other chapters to ensure consistency with the changes in Chapters 2, 4, and 8. Most of the changes will be in Chapter 2, including a change in chapter title (because a distinction between process and subprocess is no longer necessary) and fundamental changes in chapter content to reflect the updated utility process described in the previous sections. At this point, the researchers do not foresee the need to make changes to statutes or Texas Administrative Code rules.

- Update the *PS&E Preparation Manual* (*16*) to reflect changes made to the *ROW Utility Manual*.

- Update the *Project Development Process Manual* (*12*) to reflect the updated process included in the previous sections. The researchers are aware of several initiatives at the department, which might have bearing on the decision to update the *Project Development Process Manual*, including the P6 and modernization initiatives.

- Monitor the implementation of the strategy by conducting acceptability surveys at various intervals, e.g., every six months or every year for the first three years of implementation. TxDOT should use the feedback received from these surveys to fine-tune the utility process at the department.

Anticipated benefits that TxDOT would realize by implementing the strategy include the following:

- Modern and user-friendly representation of the utility process. The updated utility process relies on clear, easy-to-follow graphical representations of the process complemented by summarized descriptions of critical activities. The updated process eliminates the use of cumbersome process/subprocess diagrams and activity descriptions that make understanding of the utility process difficult.

- Activities and activity descriptions corresponding to the process that districts actually use. A primary motivation for the development of the updated utility process was to correct inaccuracies or deficiencies in the current documentation as well as insert activities that are part of the actual practice or that are perceived to be improvements or optimizations of the current practice.

- Encourage an earlier, more effective participation by utility owners in the project development process by providing information that they are more likely to understand, appreciate, and follow.

Potential impediments that might hinder the successful implementation of the strategy include the following:

- Users might decide to ignore the updated utility process in favor of existing practices they perceive to be more efficient or more cost-effective. Although the updated process described here is certainly subject to improvements and optimization, its development was motivated by the realization that the current utility process did not encourage the participation of utility owners in the project development process. Users will increase their acceptability of the updated utility process as they find that stakeholders increase their knowledge and understanding of the process and, just as importantly, utility owner participation in the project development process improves.

- Staffing and financial resources required for changing the associated practices. Although the modernized utility process is not a dramatic change to the utility process at TxDOT, any changes to practices require more or less staffing and financial commitment. In this case, stakeholders need to commit resources on relevant staff training, acquisition of

related documentation and other training materials, and potentially less smooth utility coordination during the early stages of the transition.

- TxDOT might not have the necessary tools to implement the strategy. To implement the strategy, it will be necessary to update the *ROW Utility Manual* and other manuals, conduct a series of workshops throughout the state to disseminate the updated utility process, and monitor the degree to which the strategy implementation is successful.

The researchers also identified the following criteria or performance measures to evaluate the effectiveness of the implementation of this strategy:

- Degree of acceptability by district utility officials and utility owners.
- Number of utility agreements started or completed by 30-percent, 60-percent, 90-percent, and 100-percent design.
- Number of utility adjustments started or completed by 30-percent, 60-percent, 90-percent, and 100-percent design.
- Reduction in the number of, and dollar amount associated with, unnecessary utility adjustments.
- Reduction in the number of, and dollar amount associated with, utility-related change orders or claims.

CHAPTER 3. UTILITY CONFLICT MATRIX APPROACH

INTRODUCTION

Utility-related activities in the project development process involve the production and exchange of enormous amounts of data and supporting documents, including schematics, design files, agreements, and certifications. A critical component of this process is how to document and manage utility conflicts—and utility conflict data—effectively. Utility conflict tables, also known as utility conflict matrices (UCMs) or utility conflict lists, enable users to organize and track utility conflict data. In practice, these tables or matrices support a wide range of related processes, including utility conflict analyses, utility agreement development, construction letting, as well as utility adjustment scheduling, billings, and payments.

Practices involving the use of UCMs vary widely throughout the country, not just among states but also within states. As part of the Strategic Highway Research Program (SHRP) 2 Research Project R15-B "Identification of Utility Conflicts and Solutions," TTI researchers conducted research to review the state-of-the-practice around the country, identify recommendations for best practices, develop and test a prototype UCM concept, and develop training materials and implementation guidelines (*23*). More specifically, the research resulted in the following products:

- **Product 1: Compact, standalone UCM spreadsheet**. This is a standalone product in Microsoft Excel® format, which includes a main utility conflict table and a supporting worksheet to analyze utility conflict resolution strategies. The spreadsheet is an easy-to-use, easy-to-implement UCM that uses data elements from 26 UCMs the researchers received from around the country (including TxDOT). This UCM could help TxDOT standardize the management of utility conflicts.

- **Product 2: Utility conflict data model and database**. This standalone product is a scalable UCM representation that facilitates managing utility conflicts in a database environment. To facilitate implementation, the researchers used industry-standard protocols for the development of the data model (including a logical model, a physical model, and a data dictionary). The data model is in CA Technologies' ERwin™ Data Modeler™ format, which can be easily exported to formats such as Oracle® and Microsoft SQL Server®. The data model was tested using sample utility conflict tables from across the country.

  Two implementation scenarios are possible with the data model and database:

  - Microsoft Access® database. In this case, the implementation would be standalone and would enable the production of reports that replicate a wide range of UCMs, including the compact, standalone UCM and all samples received from TxDOT districts.
  - Enterprise solution. In this case, the implementation would be an enterprise-level, web-based solution that provides considerable functionality for the management of utility conflicts.

- **Product 3: UCM training course and course materials**. This product is a one-day training course that provides an overview of utility conflict issues and use of the UCM. The course is divided into six lessons, designed for a total of seven hours and 15 minutes of instruction, from 8:30 AM to 3:45 PM. The seminar provides ample opportunities for participant interaction and enables the instructor to adjust session and lesson start times and durations, depending on the audience and the level of participant engagement in the discussions.

The standalone Excel UCM template (i.e., Product 1) and the one-day UCM training course (i.e., Product 3) are what could be called "low-hanging fruits." These two products are ready for implementation, and the corresponding implementation cost is low. By comparison, the UCM data model and database representation (i.e., Product 2), while ready for implementation, would require selecting a system platform and developing graphical user interfaces to enable users to interact with the database. Depending on the level of implementation of this product (e.g., standalone Microsoft Access database versus an enterprise web-based system), the implementation cost and horizon could vary substantially.

In reality, each implementation product and option carries with it a different expectation of value potential as well as a different expectation of cost. Both value and cost could vary drastically from agency to agency. However, in most cases, it may be possible to conceptualize the relationship between value and cost for each implementation by using the matrix in Table 1.

TxDOT uses UCMs extensively. However, practices vary widely throughout the state, both with respect to UCM structure, style, and content, as well as procedures and protocols surrounding the use of the UCMs. As part of project SHRP 2 R15-B, the researchers received several sample UCMs from TxDOT districts, which they then used as input to develop the research deliverables described above.

STANDALONE UCM

The researchers analyzed the 26 sample tables from around the country, including TxDOT. They developed a composite list of data items by first ranking data items according to frequency of use in the sample documents, then frequency reported in the survey, and finally by combining these two rankings. After reviewing the results of the sample documentation analysis, the results of the survey analysis, and the combined data item ranking, the researchers developed a standalone UCM (Figure 11). Key requirements in determining which data items to include in the UCM were UCM compactness and efficiency with respect to time and resources needed to populate, update, and maintain the UCM. The researchers also developed a cost analysis spreadsheet to track cost estimates related to utility conflict resolution alternatives at various stages of the project development process (Figure 12).

Table 1. Anticipated Value and Implementation Cost of SHRP 2 R15-B Products.

Implementation Product	Value [1]	Cost [2]	Comment
Product 1 (standalone UCM in Excel format)	20	$	Very low implementation cost. By itself (i.e., just a utility conflict table or matrix), the product value is low because it does not fully support the relationship between the matrix and the process to manage utility conflicts. To maximize its potential, business processes might need to be modernized to support a UCM approach. Training is necessary to facilitate and encourage its implementation.
Product 3 (UCM training course)	40	$$	High value under the assumption that opportunity to participate in the training is widespread and training is provided systematically. UCM training should be provided regardless of implementation of the other products. Realistically, training will be needed to facilitate the implementation of the other products.
Product 2 (standalone database implementation in Access format)	50	$$$	Low to medium implementation cost. The value is higher than the standalone UCM in Excel format because the UCM is one of the queries or reports from the database. However, by itself (i.e., just a data model or database without forms or graphical user interfaces), the product value is relatively low. Successful implementation would require development of user interfaces to use the database effectively. To maximize its potential, business processes might need to be modernized to support a UCM approach. Training is necessary to facilitate and encourage its implementation.
Product 2 (enterprise-level implementation)	80	$$$$	High implementation cost. By itself, the product value is high, particularly if system interfaces are designed and implemented so that users are encouraged (or required) to follow a systematic UCM approach. High levels of standardization and automation are possible, which would translate to modernization of business processes. Training is necessary to facilitate and encourage its implementation.

Notes:
[1] Value: Subjective measure of the product's potential to assist an agency in managing utility conflicts effectively. The value scale is 1 (lowest) to 100 (highest).
[2] Cost: Subjective measure of the anticipated cost to implement a product at a transportation agency. The cost scale is $(lowest) to $$$$ (highest).

The researchers developed the standalone UCM in Microsoft Excel format. For convenience, the Excel UCM version includes four worksheets: the main UCM, the cost estimate analysis, column or field definitions, and drop-down lists to standardize the population of certain columns in the main UCM.

The standalone UCM could be used in various ways to support the utility conflict management process. In its simplest manner, the UCM (Figure 11) could provide a simple, convenient mechanism to list all utility conflicts associated with a project. However, for maximum benefit, the UCM could be used in conjunction with the alternative conflict resolution subsheet (Figure 12) to identify, document, and track optimum utility conflict resolution strategies.

A generalized process for using the standalone UCM is as follows:

- Identify and list all potential conflicts in a project. This activity is continuous throughout the utility conflict management process. Use a separate line for each utility facility that may be in conflict at the same location. For example, for a conflict location that involves a water line and a gas line, create one record for the water line and a second record for the gas line. Assign a unique utility conflict ID to each record.

- Complete the UCM up to the column that identifies the type of utility investigation needed.

- For each conflict, determine the type of utility investigation needed.

- Collect utility data at the appropriate quality level (QLD, QLC, QLB, or QLA).

- For QLA data, add the test hole number associated with the utility conflict(s) in question.

- Analyze potential conflict resolution strategies for each utility conflict record. If the available information is not sufficient to make a determination, it may be necessary to collect additional data. In this case, use the Recommended Action or Resolution column to document the need for additional data collection.

- Use the conflict resolution subsheet to analyze and document advantages, disadvantages, costs, feasibility, and decision of each alternative resolution considered.

- For the selected conflict resolution strategy, complete the Recommended Action or Resolution, Estimated Resolution Date, and Resolution Status cells in the UCM. This activity is iterative.

- Populate the control fields (name and date) at the top of the UCM.

- Create a historical record of UCM changes by saving the UCM under a different file name each time the information in the table changes.

Utility Conflict Matrix

Project Owner: _____
Project No. : _____
Project Description: _____
Highway or Route: _____

Utility Conflict Matrix Developed/Revised By: _____
Date: _____
Reviewed By: _____
Date: _____

Note: Use Cost Estimate Analysis subsheet for analysis of alternatives

Utility Owner and/or Contact Name	Conflict ID	Drawing or Sheet No.	Utility Type	Size and/or Material	Utility Conflict Description	Start Station	Start Offset	End Station	End Offset	Utility Investigation Level Needed	Test Hole	Recommended Action or Resolution	Estimated Resolution Date	Resolution Status

Figure 11. Standalone UCM.

Utility Conflict Resolution Alternatives

Cost Estimate Analysis

Project Owner: _____

Project No. : _____

Project Description: _____

Highway or Route: _____

Utility Conflict: _____

Utility Owner: _____

Utility Type: _____

Size and/or Material: _____

Project Phase: _____

Cost Estimate Analysis Developed/Revised By _____

Date _____

Reviewed By _____

Date _____

Alternative Number	Alternative Description	Alternative Advantage	Alternative Disadvantage	Responsible Party	Engineering Cost (Utility)	Direct Cost (Utility)	Engineering Cost (DOT)	Direct Cost (DOT)	Total Cost	Feasibility	Decision

Figure 12. Standalone UCM, Cost Estimate Analysis for Utility Conflict Resolution Alternatives.

Figure 13 through Figure 20 provide an example that illustrates a potential use of the standalone UCM in the form of stages for managing utility conflicts, depending on the level of utility data collection and corresponding impact analysis needed. As a reference, Figure 13 provides a view of the utility data collection and impact assessment activities in the project development process (see Modernization of the Utility Process for additional information). Figure 13 includes the following four stages:

- **Stage 1 – Preliminary Utility Investigation**. This stage corresponds to the beginning of the process when potential utility conflicts are identified for the first time. Figure 14 shows the UCM at a point where potential utility conflicts are identified and the need for additional data collection is identified. In this example, the utility coordinator found three potential conflicts in connection with an electric transmission tower, transmission lines, and some evidence of an underground electric conduit. The UCM includes a record for each potential conflict. At this point, the owner, material, size, and location of the underground conduit are unknown, hence the recommendation to collect QLC data. Compared to the underground conduit, the transmission tower is above ground, and the utility coordinator has more information such as material and location. However, there is no contact information available for any of the utility conflicts.

- **Stage 2 – Survey of Visible Utility Appurtenances**. This stage corresponds to the part of the process (typically at the end of the preliminary design phase or beginning of the design phase) when TxDOT collects detailed survey data, including visible utility appurtenances. Figure 15 shows the UCM at a point when the utility coordinator has confirmed the utility owner and contact information for each utility conflict. Known utility facilities have been plotted on design drawings, so the utility coordinator has added a drawing or sheet number for each conflict. The utility coordinator has information about the approximate location of the underground conduit, but has determined that more data are needed to confirm the utility conflict, as shown in column "Recommended Action or Resolution." In column "Utility Investigation Level Needed," the utility coordinator changed the entry from QLC to QLB. The other two utility conflicts do not need additional data collection, and data can be forwarded to the utility owner to request cost estimates and arrange a meeting to discuss potential resolution strategies. Finally, the resolution status provided in the last column has been changed to "Utility owner informed of utility conflict."

  Figure 16 illustrates the use of the cost estimate analysis subsheet to evaluate different alternatives for the resolution of the transmission tower conflict (which according to Figure 15, has been confirmed and needs resolution). Ideally, the utility owner should prepare this cost estimate analysis in coordination with TxDOT. In this example, three potential alternatives have been identified to resolve the transmission tower conflict: relocate the tower, modify the highway design, and protect the tower in place. At the point shown in Figure 16, the parties have not finalized the analysis.

- **Stage 3 – Utility Investigation Using Geophysical Methods**. This stage corresponds to the part of the process when TxDOT uses geophysical methods to collect more detailed information about the location of underground utility facilities. As shown in Figure 17,

the utility impact analysis found that the conflict with the underground conduit requires exposing the utility facility (i.e., QLA data collection level) to gather information about the precise depth of the conduit. For the other two utility conflicts, a resolution strategy was selected, as shown in the updated resolution status, along with an estimated resolution date.

Figure 18 provides an update of the cost estimate analysis for the transmission tower conflict, indicating that the selected resolution strategy is to relocate the transmission tower. The table also shows that the resolution was obtained when the transportation project was between 30- and 60-percent design. For the analysis, the utility owner developed a cost estimate for Alternative 1, and the TxDOT designer developed a cost estimate for Alternative 2. Alternative 3 was ruled out in the previous meeting, so a cost estimate was not necessary. Although the cost for Alternative 1 was higher than that for Alternative 2, the latter was determined to be unfeasible.

- **Stage 4 – Utility Investigation by Exposing Utility Facilities**. This stage corresponds to the part of the process when TxDOT has exposed and surveyed underground utility installations at specific locations to gather information about their precise depth. Notice in Figure 19 that the updated UCM shows the number of the test hole used to confirm the depth of the underground conduit. Following this assessment, TxDOT and the utility owner considered alternative resolution strategies, decided to adjust the facility, and determined an estimated resolution date. The table also shows the updated status associated with the two other conflicts.

Notice in Figure 13 that, as soon as a determination has been made that a utility adjustment is necessary (which can happen after the utility conflict assessment at each of the stages), the next step is to communicate the results of the analysis to the utility owner and proceed with the utility adjustment process. The Modernization of the Utility Process section provides additional information about this process. At the conclusion of the process, the UCM is updated one last time to indicate the utility conflict has been resolved (Figure 20).

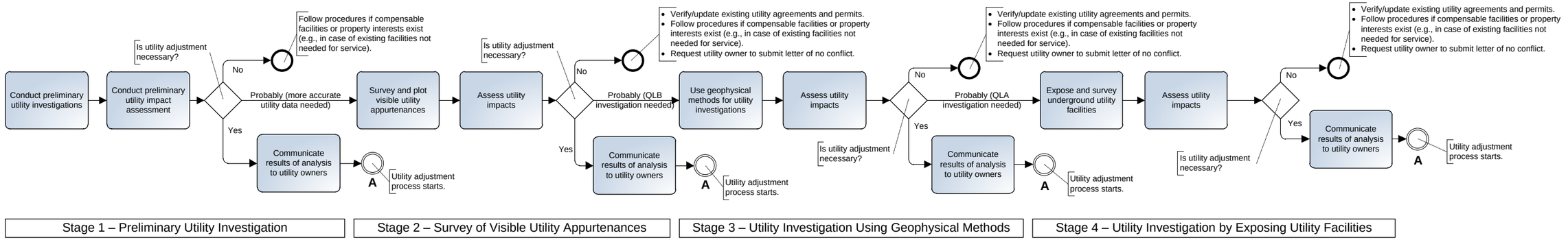


Figure 13. Utility Data Collection and Impact Assessment Activities.

Utility Conflict Matrix

Project Owner: TxDOT
Project No. : 999-80-4455
Project Description: IH 10 from Gelhorn to Mercury Drive
Highway or Route: IH 10

Utility Conflict Matrix Developed/Revised By: John Doe
Date: 1/1/2012
Reviewed By:
Date:

Note: Use Cost Estimate Analysis subsheet for analysis of alternatives

Utility Owner and/or Contact Name	Conflict ID	Drawing or Sheet No.	Utility Type	Size and/or Material	Utility Conflict Description	Start Station	Start Offset	End Station	End Offset	Utility Investigation Level Needed	Test Hole	Recommended Action or Resolution	Estimated Resolution Date	Resolution Status
Unknown	1		Electric		Evidence of underground utility conduit.					QLC		Collect more data to confirm conflict and identify owner.		Utility conflict created
Centerpoint Energy	2		Electric	100', steel	Transmission tower may be in conflict with highway.	115+50	30	115+50	30	QLD		Identify utility owner.		Utility conflict created
Unknown	3		Electric	Steel	Transmission lines may fail minimum clearance requirments.	114+00	0	114+00	0	QLC		Identify utility owner.		Utility conflict created

Figure 14. Stage 1 – UCM at the Beginning of the Preliminary Utility Investigation.

Utility Conflict Matrix

Project Owner: TxDOT
Project No. : 999-80-4455
Project Description: IH 10 from Gelhorn to Mercury Drive
Highway or Route: IH 10

Note: Use Cost Estimate Analysis subsheet for analysis of alternatives

Utility Conflict Matrix Developed/Revised By: John Doe
Date: 1/1/2012
Reviewed By: John Doe
Date: 1/14/2012

Utility Owner and/or Contact Name	Conflict ID	Drawing or Sheet No.	Utility Type	Size and/or Material	Utility Conflict Description	Start Station	Start Offset	End Station	End Offset	Utility Investigation Level Needed	Test Hole	Recommended Action or Resolution	Estimated Resolution Date	Resolution Status
City Electric Services Tina Miller tmiller@ces.com 555-999-8887	1	4	Electric	18"	Underground utility conduit in potential conflict with highway.	110+00	40	140+00	40	QLB		Collect more data to confirm conflict.		Utility owner informed of utility conflict
Centerpoint Energy James Smith jsmith@cpe.com 555-999-9999	2	8	Electric	100', steel	Transmission tower may be in conflict with highway.	115+50	30	115+50	30	QLD		Send UCM and Cost Estimate Analysis. Meet with utility owner and designer to discuss potential resolution strategy.		Utility owner informed of utility conflict
Centerpoint Energy James Smith jsmith@cpe.com 555-999-9999	3	7	Electric	Steel	Transmission lines fail minimum clearance requirments.	114+00	0	114+00	0	QLC		Send UCM and Cost Estimate Analysis. Meet with utility owner and designer to discuss potential resolution strategy.		Utility owner informed of utility conflict

Figure 15. Stage 2 – UCM after Surveying and Plotting Visible Utility Appurtenances.

Utility Conflict Resolution Alternatives

Cost Estimate Analysis

Project Owner: TxDOT
Project No. : 999-80-4455
Project Description: IH 10 from Gelhorn to Mercury Drive
Highway or Route: IH 10

Cost Estimate Analysis Developed/Revised By John Doe
Date 1/14/2012
Reviewed By
Date

Utility Conflict: Transmission tower may be in conflict with highway.
Utility Owner: Centerpoint Energy
Utility Type: Electric
Size and/or Material: 100' steel
Project Phase: 0-30% detailed design

Alternative Number	Alternative Description	Alternative Advantage	Alternative Disadvantage	Responsible Party	Engineering Cost (Utility)	Direct Cost (Utility)	Engineering Cost (DOT)	Direct Cost (DOT)	Total Cost	Feasibility	Decision
1	Relocate transmission tower.	No design change required.	High cost to utility.	Utility						Yes	Under Review
2	Change highway design to accommodate tower.	Tower can remain in place.	High cost to redesign, potential impact on right of way acquisition.	DOT						No	Under Review
3	Protect tower in place.	Tower can remain in place, no design change required.	Potential safety hazard.	Utility and DOT						No	Rejected

Figure 16. Stage 2 – Cost Estimate Analysis for the Transmission TowerConflict.

Utility Conflict Matrix

Project Owner: TxDOT
Project No. : 999-80-4455
Project Description: IH 10 from Gelhorn to Mercury Drive
Highway or Route: IH 10

Utility Conflict Matrix Developed/Revised By: John Doe
Date: 1/1/2012
Reviewed By: John Doe
Date: 2/1/2012

Note: Use Cost Estimate Analysis subsheet for analysis of alternatives

Utility Owner and/or Contact Name	Conflict ID	Drawing or Sheet No.	Utility Type	Size and/or Material	Utility Conflict Description	Start Station	Start Offset	End Station	End Offset	Utility Investigation Level Needed	Test Hole	Recommended Action or Resolution	Estimated Resolution Date	Resolution Status
City Electric Services Tina Miller tmiller@ces.com 555-999-8887	1	4	Electric	18"	Underground utility conduit in potential conflict with highway.	110+00	40	140+00	40	QLA		Collect more data to confirm conflict and identify owner.		Utility owner informed of utility conflict
Centerpoint Energy James Smith jsmith@cpe.com 555-999-9999	2	8	Electric	100', steel	Transmission tower may be in conflict with highway.	115+50	30	115+50	30	QLD		Adjust facility as discussed during coordination meeting.	3/1/2012	Utility conflict resolution strategy selected
Centerpoint Energy James Smith jsmith@cpe.com 555-999-9999	3	7	Electric	Steel	Transmission lines fail minimum clearance requirments.	114+00	0	114+00	0	QLC		Adjust facility as discussed during coordination meeting.	5/1/2012	Utility conflict resolution strategy selected

Figure 17. Stage 3 – UCM after Using Geophysical Methods to Collect Data about Underground Conduit.

Utility Conflict Resolution Alternatives

Cost Estimate Analysis

Project Owner: TxDOT
Project No. : 999-80-4455
Project Description: IH 10 from Gelhorn to Mercury Drive
Highway or Route: IH 10

Cost Estimate Analysis Developed/Revised By John Doe
Date 1/14/2012
Reviewed By John Doe
Date 2/1/2012

Utility Conflict: Transmission tower may be in conflict with highway.
Utility Owner: Centerpoint Energy
Utility Type: Electric
Size and/or Material: 100' steel
Project Phase: 30-60% detailed design

Alternative Number	Alternative Description	Alternative Advantage	Alternative Disadvantage	Responsible Party	Engineering Cost (Utility)	Direct Cost (Utility)	Engineering Cost (DOT)	Direct Cost (DOT)	Total Cost	Feasibility	Decision
1	Relocate transmission tower.	No design change required.	High cost to utility.	Utility	$ 50,000.00	$ 900,000.00	$ -	$ -	$ 950,000.00	Yes	Selected
2	Change highway design to accommodate tower.	Tower can remain in place.	High cost to redesign, potential impact on right of way acquisition.	DOT	$ -	$ -	$ 150,000.00	$ -	$ 150,000.00	No	Rejected
3	Protect tower in place.	Tower can remain in place, no design change required.	Potential safety hazard.	Utility and DOT						No	Rejected

Figure 18. Stage 3 – Updated Cost Estimate Analysis for the Transmission Tower Conflict.

Utility Conflict Matrix

Project Owner: TxDOT
Project No. : 999-80-4455
Project Description: IH 10 from Gelhorn to Mercury Drive
Highway or Route: IH 10

Utility Conflict Matrix Developed/Revised By: John Doe
Date: 1/1/2012
Reviewed By: John Doe
Date: 3/14/2012

Note: Use Cost Estimate Analysis subsheet for analysis of alternatives

Utility Owner and/or Contact Name	Conflict ID	Drawing or Sheet No.	Utility Type	Size and/or Material	Utility Conflict Description	Start Station	Start Offset	End Station	End Offset	Utility Investigation Level Needed	Test Hole	Recommended Action or Resolution	Estimated Resolution Date	Resolution Status
City Electric Services Tina Miller tmiller@ces.com 555-999-8887	1	4	Electric	18"	Underground utility conduit in potential conflict with highway.	110+00	40	140+00	40	QLA	10	Adjust facility as discussed during coordination meeting.	5/1/2012	Utility conflict resolution strategy selected
Centerpoint Energy James Smith jsmith@cpe.com 555-999-9999	2	8	Electric	100', steel	Transmission tower may be in conflict with highway.	115+50	30	115+50	30	QLD		None	3/1/2012	Utility conflict resolved
Centerpoint Energy James Smith jsmith@cpe.com 555-999-9999	3	7	Electric	Steel	Transmission lines fail minimum clearance requirments.	114+00	0	114+00	0	QLC		Adjust facility as discussed during coordination meeting.	5/1/2012	Utility conflict resolution strategy selected

Figure 19. Stage 4 – UCM after Exposing Underground Conduit (QLA Data Collection).

Utility Conflict Matrix

Project Owner: TxDOT
Project No. : 999-80-4455
Project Description: IH 10 from Gelhorn to Mercury Drive
Highway or Route: IH 10

Note: Use Cost Estimate Analysis subsheet for analysis of alternatives

Utility Conflict Matrix Developed/Revised By: John Doe
Date: 1/1/2012
Reviewed By: John Doe
Date: 6/1/2012

Utility Owner and/or Contact Name	Conflict ID	Drawing or Sheet No.	Utility Type	Size and/or Material	Utility Conflict Description	Start Station	Start Offset	End Station	End Offset	Utility Investigation Level Needed	Test Hole	Recommended Action or Resolution	Estimated Resolution Date	Resolution Status
City Electric Services Tina Miller tmiller@ces.com 555-999-8887	1	4	Electric	18"	Underground utility conduit in potential conflict with highway.	110+00	40	140+00	40	QLA	10	None.	5/1/2012	Utility conflict resolved
Centerpoint Energy James Smith jsmith@cpe.com 555-999-9999	2	8	Electric	100', steel	Transmission tower may be in conflict with highway.	115+50	30	115+50	30	QLD		None	3/1/2012	Utility conflict resolved
Centerpoint Energy James Smith jsmith@cpe.com 555-999-9999	3	7	Electric	Steel	Transmission lines fail minimum clearance requirments.	114+00	0	114+00	0	QLC		None.	5/1/2012	Utility conflict resolved

Figure 20. UCM after Resolving All Utility Conflicts.

UTILITY CONFLICT DATABASE

To support a utility conflict database, the researchers developed a utility conflict data model using six first-level (or core) topics or data objects: utility conflict, utility facility, utility agreement, document, project, and user (Figure 21). Each of these data objects represents a real-world object or concept that can be characterized using a set of relevant tables and attributes. It is also possible to define relationships between those objects.

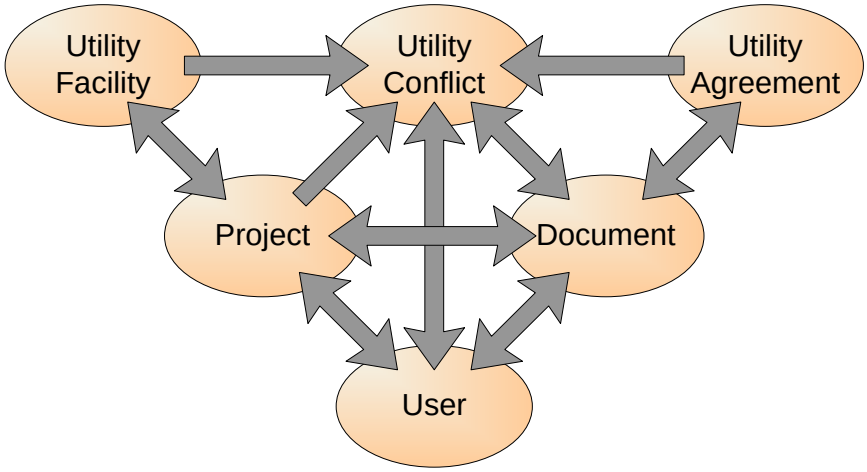


Figure 21. Conceptual Model for the Management of Utility Conflicts.

Based on the conceptual model depicted in Figure 21, the researchers developed a logical data model in ERwin consisting of approximately 115 separate entities and numerous relationships. The researchers also produced a prototype physical database in Microsoft Access based on the logical data model. The name of the prototype application was Utility Conflict Database (UCD). The researchers tested the UCM data model by populating the Access database using data from sample documents that the states provided and then fine-tuning the data model as needed. The researchers also developed queries and reports to replicate the standalone UCM (Figure 11) as well as a sample of UCMs from around the country.

UCM TRAINING COURSE

The researchers structured a lesson plan and developed training materials to assist with the process to disseminate the research findings. The UCM training course is designed for seven hours of instruction, from 8:30 AM to 3:45 PM, including direct instructor contact and breaks. However, instructors can adjust session and lesson start times and durations, depending on the audience and the level of participant engagement in the discussions. An integral component of the training materials is the use of actual sample project data to illustrate UCM concepts and procedures. The one-day UCM training course is divided into the following six lessons:

AM Session:

- Lesson 1: Introductions and Seminar Overview (30 minutes)
- Lesson 2: Utility Conflict Concepts and SHRP 2 R15-B Research Findings (75 minutes)
- Lesson 3: Utility Conflict Identification and Management (75 minutes)

PM Session:

- Lesson 4: Hands-On Utility Conflict Management Exercise (90 minutes)
- Lesson 5: Use of Database Approach to Manage Utility Conflicts (45 minutes)
- Lesson 6: Wrap-Up (15 minutes)

IMPLEMENTATION PLAN

There are several possible avenues that TxDOT could consider for implementation of the SHRP 2 R15-B research. The UCM training course is somewhat independent of the other research products and should be implemented, regardless of whether those other products are implemented. The other three products (i.e., the standalone UCM spreadsheet, the standalone Access database, and the enterprise solution) could be implemented separately, in parallel, or sequentially (with some constraints). TxDOT could also decide to follow different strategies at different districts (e.g., implementing the standalone UCM spreadsheet at some districts and implementing the standalone database at other districts) while, at the same time, starting the planning work to implement the enterprise solution statewide.

The researchers recommend the following activities to implement a systematic use of the UCM approach at TxDOT:

- Implementation team:
    - **Assemble TxDOT implementation task force**. TxDOT should assemble a task force to supervise and lead the implementation of the research products.
    - **Conduct training session with task force**. The researchers should provide a shortened version of the one-day UCM training course with the implementation task force to familiarize the team with the details of the research products and aid the team with the determination of the best implementation plan.
    - **Agree on implementation plan**. Before implementation begins, the task force should agree on an implementation plan. This plan should define, as a minimum, which research products should be implemented and in what sequence, as well as what districts should be involved in the implementation. In addition, the plan should outline the strategy to provide UCM training, including location, frequency, and participant groups.

- **Establish progress milestones, targets, responsibilities, and funding**. The task force should establish major implementation milestones, target dates, responsibilities, and estimated needs for funding. In addition, the task force should get a commitment from TxDOT administration for the proposed plan, which might include one or more meetings and presentations of the plan with TxDOT administrators.

- **Update relevant manuals**. The implementation team should play a strong role in updating the *ROW Utility Manual* (*4*), the *Project Development Process Manual* (*12*), and the *PS&E Preparation Manual* (*16*). Almost all the content would be new because these manuals currently do not address utility conflicts. At this point, the researchers do not foresee the need to make changes to statutes or Texas Administrative Code rules.

- UCM training course:

  - **Conduct UCM training courses at selected districts or regions**. Plans for providing UCM training at districts and/or regions should be developed. Trainers who are selected for this task should have a thorough knowledge of utility coordination and utility conflict management topics, as well as how the interaction between utility activities and other project development process components.

  - **Transition UCM training course to long-term training mechanism**. TxDOT should evaluate options to transition the UCM training course to a long-term training mechanism within the department to ensure training is available to TxDOT employees, utility owner staff, contractors, and consultants. Ideally, the UCM training course would become part of the regular catalog of courses offered at TxDOT.

- Standalone UCM spreadsheet:

  - **Select district implementation leaders**. For the successful implementaion of the standalone UCM, it will be critical to identify one or more implementation leaders at the district level. These leaders will be responsible for carrying out the implementation plan relative to the standalone UCM spreadsheet, and will have the responsibility to provide local feedback and insight into the overall implementation. Examples of potential feedback could include recommendations to modify or update the standard UCM to make sure the UCM template reflects district needs effectively.

  - **Conduct and monitor implementation**. District implementation leaders should monitor district implementation and provide feedback to the implementation team and task force on a regular basis.

- Standalone UCM Access database:

  - **Select districts and district implementation leaders**. This task involves selecting districts where the standalone UCM Access database will be deployed either in

preparation for statewide implementation or as a transition to an enterprise solution (see section below). District implementation leaders will be responsible for carrying out the implementation plan relative to the standalone UCM Access database, and will have the responsibility to provide local feedback and insight into the overall implementation. Examples of potential feedback could include recommendations to modify or update UCM queries and forms.

- **Identify user and system needs**. District implementation leaders should develop a plan to identify and document user and system needs, and then work with a district developer to implement those requirements. There should be coordination among all districts involved in the implementation to ensure that queries, forms, and reports are as standardized as possible.

- **Develop and test user interfaces**. Based on the user and system requirements identified in the previous task, the district implementation leader should work with a district developer to develop and test the necessary user interfaces.

- **Conduct and monitor implementation**. District implementation leaders should monitor district implementation and provide feedback to the implementation team and task force on a regular basis.

- Enterprise-level UCM solution:

  - **Develop detailed implementation plan**. Implementation of an enterprise-level UCM solution is more complex than for the other implementation products. The implementation team should develop a detailed plan that addresses issues such as the following:

    - Expected use in the current business process.
    - Level of access by expected database users.
    - Expected linkage to existing systems.
    - Need for user interfaces and forms.
    - Need for data access over networks.
    - Data storage expectations and requirements.
    - Data safety requirements.
    - Other expected outcomes of the implementation.

    This plan should conform to existing standards and specifications for the development and implementation of information technology (IT) applications.

  - **Identify user and system needs**. The implementation team should develop a plan to identify and document user and system needs, and then work with a developer to implement those requirements. There should be coordination among districts to ensure that user interfaces as well as queries, forms, and reports are standardized and address district, region, and division needs.

- **Develop and test user interfaces**. Based on the user and system requirements identified in the previous task, the developer should develop and test the necessary user interfaces.

- **Conduct and monitor implementation**. The implementation team and the developer should monitor the implementation process and identify areas where user interfaces might changes or improvements.

The researchers conducted a comprehensive analysis of impediments that might hinder the successful implementation of the SHRP 2 R15-B research findings nationwide. Impediments that might be relevant at TxDOT include the following:

- Technical challenges:

  - Different districts within TxDOT might already use UCMs that contain different data elements from those included in the Product 1 UCM. This issue is not critical because, although the table contains 25 data elements, the data model and prototype database include more than 140 data elements from which a suitable set could be selected and integrated into a UCM that addresses the need of TxDOT. It is worth noting that deciding to implement a UCM protocol consistently and thoroughly is more important than which individual data elements to include in a UCM.

  - TxDOT's computer systems might contain different data elements from those included in the Product 1 UCM. This issue is not critical because many of the tables in the prototype utility conflict database, particularly those tables that provide "connections" to other business processes, are actually placeholders that could be easily replaced with actual table names that TxDOT already uses.

  - TxDOT does not collect utility data systematically on all projects. Although important from the standpoint of collecting quality utility data, this issue is not critical for implementing a UCM approach. The reason is that none of the data elements in the UCM is mandatory. As a result, TxDOT could decide to leave those fields blank and/or remove them from the report. Not collecting quality utility data increases the level of risk for a project owner, but this increased level of risk does not invalidate the use of a UCM approach for managing conflicts. In fact, the department could use a UCM approach over time to help document the impact of not collecting quality utility data.

- Policy and economic challenges:

  - TxDOT might not have the financial resources to implement the research findings. This is an important issue, particularly at a time when TxDOT is facing severe budgetary constraints. The three main products of the research require different financial commitment levels for their implementation. Product 1 is perhaps the most affordable product: it would simply imply requiring the use of a standardized UCM. Dissemination of the training materials would be a low-cost solution as well, although

additional cost factors would include resources to train the instructor, resources to compensate the instructor, and resources to cover the time for TxDOT staff to participate in the training. The cost to implement Product 2 would be relatively low if TxDOT decides to implement the standalone database. However, the downside could be lack of standardization and automation. The implementation cost for an enterprise-level system would be initially higher, but savings could be realized in the long term in terms of adaptability, scalability, avoidance of redundant data entry, data access, data sharing, and data security.

- TxDOT project managers or districts might not perceive tangible economic benefits from implementing a UCM approach. This is an important issue, for which an obvious counter strategy is to document and disseminate lessons learned from study cases in which UCM approaches are used. Realistically, documenting and disseminating lessons learned is not sufficient. Not managing utility conflicts effectively increases the level of risk for a project owner, which in turn can have significant negative economic repercussions. However, the compartmentalized structure of the TxDOT project development process, with handoffs at critical milestones such as beginning of design, letting, and construction, hinders accountability and internalization of risks. Strategies to address this issue in the context of this research include using UCMs with control dates (to ensure the UCM is a living document), and start using UCMs early in the project development process, i.e., at the beginning of the preliminary design phase.

- Project managers might decide not to use (or to stop using) a UCM approach because of the perception that total project costs for the agency will increase if the frequency of situations increases in which a design change is favored over a utility adjustment, effectively reducing the need for utility adjustments for which utility owners must pay. This is an important issue, which is related to TxDOT's internalization of costs. Ultimately, tax payers pay for all public works within the Texas right of way, either in the form of taxes or utility rates. Notwithstanding the need to evaluate each utility conflict on its own, evaluating total project costs and their implications should be addressed at the appropriate agency level, including the executive level. Communications and negotiations with utility owners might be warranted to identify strategies and solutions that work for both parties.

- TxDOT might not use the UCM approach consistently throughout the project development process. For example, a project manager might use a UCM to identify and manage utility conflicts during the design phase, but the PS&E assembly might not include a utility certification listing all pending utility adjustments. In a similar situation, the utility certification might provide a simple list of pending utility adjustments, but not include additional critical information that the agency has already compiled in a UCM (and that prospective bidders would need to prepare proposals properly reflecting the level of risk with which they are willing to work).

Criteria or performance measure elements to evaluate the effectiveness of the implementation of the research products include the following:

- Number of TxDOT officials, by function category (e.g., utility coordination, preliminary design, design) who have attended a UCM training course.
- Reduction in the number of, and dollar amount associated with, unnecessary utility adjustments.
- Reduction in the number of, and dollar amount associated with, utility-related change orders or claims.

CHAPTER 4. STREAMLINING AND STANDARDIZATION OF UTILITY COST DATA SUBMISSIONS

INTRODUCTION

The preparation and submission of utility adjustment cost data is one of the most common areas of complaint among utility owners and TxDOT officials. Utility owners who participated in meetings and workshops indicated that the current utility cost estimation and submission process is a burden, requiring a significant amount of time, effort, and financial resources on their part. In their opinion, TxDOT needs to introduce urgent changes to make the current process less costly and more expedited. At the same time, TxDOT officials highlighted that utility owners are frequently not forthcoming in the amount and detail of information they need to provide, requiring a considerable amount of time, effort, and resources to process and review the information, resulting in additional project costs and delays. Clearly, there is a need to improve the process.

Issues related to the preparation and submission of utility cost data include, but are not limited to, the following (see Report 0-6624-1 for additional information [*10*]):

- Utility reimbursement practices vary from district to district.
- Utility owners handle cost data in a variety of ways, which means costs may be broken down and submitted in different formats.
- Current procedures require billings to match the estimate. However, actual bids for utility work are often different from what utility owners submitted originally for the utility agreement.
- Utility owners complained about documentation requirements associated with partial payments.
- Final billings are frequently submitted years after the adjustment was completed in the field. In other cases, utility owners do not submit final billings at all.
- Utility owners complained that current requirements for the submission of cost estimates, as described in the manual, are difficult to understand and follow.

Many of these issues have been documented in the past. For example, research project 0-4998 explored the feasibility of a unit cost approach for estimating and submitting utility cost data (*26*, *27*, *28*). Project 0-4998 provided a comprehensive depiction of the current practice and developed a prototype methodology to estimate and manage utility cost data using a unit cost approach. The research also included a comprehensive review of utility specifications and provisions, highlighted the need to develop robust utility construction specifications and the need to differentiate between payable items and subsidiary items, and developed a prototype framework for those specifications.

UTILITY ADJUSTMENT COST ESTIMATES AND BILLINGS

Cost Categories

Utility owners have to prepare cost estimates broken down into the following cost categories (although quantities and unit costs are also acceptable) (*4*):

- **Materials and supplies**. This category should be shown by items and price. Factors included in the utility's overhead must be clearly identified.

- **Labor**. This category includes anticipated wages and salaries, either actual rates per hour or average rates on the amount paid to individuals under the agreement, including supervisory labor, preparation of plans, and estimate and agreement documents. Overhead included in unit cost for labor must be detailed separately. Charges and expenses must conform to similar charges incurred in the utility's normal operation.

- **Overhead**. Payroll additives should be shown individually to ensure eligibility. Common ineligible costs include advertising, interest on borrowed funds, research, income taxes, fines, and personal expenses such as entertainment.

- **Transportation**. This category includes transportation, meal, and lodging expenses that a utility company's workforces incur in remote areas.

- **Equipment**. Equipment and rental costs include equipment type, size, and actual rate. TxDOT does not allow the use of published rates in place of actual rates. If equipment is charged as a percentage of another cost, a statement should outline that basis. Charges should reflect the utility owner's normal accounting procedures.

- **Traffic control**. This category includes signs, markings, barricades, safety equipment, and clear zone protective devices.

- **Right of way**. This category includes the costs associated with the acquisition of interest in land. Costs for replacement right of way may include salaries and expenses of employees engaged in valuation and negotiation of right of way, independent fee appraisers, recording costs, and other costs incidental to land acquisition, broken down as separate line items.

- **Salvage, abandoned facilities, and removal of materials**. This category includes salvage value, accrued depreciation, if applicable, including materials removed, restocked, and sold as scrap.

- **Credits**. This category includes elective betterments, and capital improvements (switching stations, power substations, and so on). TxDOT allows reimbursement of capital improvements in some cases, but only the most economical method of adjustment. Therefore, the estimate must list major items of materials and capital improvement credits. This estimate should include accrued depreciation for replaced facilities.

However, depreciation should not be included if facilities are only adjusted but not replaced based on the utility's depreciation schedule.

- **Betterments**. The betterments category should distinguish between either elective or forced, i.e., non-elective, betterments. Only forced betterments are usually reimbursable.

Of these cost categories, materials and supplies, labor, overhead, transportation, and equipment are direct utility adjustment costs. Traffic control and right of way could also be considered direct cost components, but it is common to treat these categories as separate items to facilitate analysis and cost comparisons. Salvage, abandoned facilities, and removal of materials; credits; and betterments are usually handled separately.

Elective Betterment Credit

Utility adjustments frequently involve facility upgrades. A forced upgrade (or non-elective betterment) is attributable to the highway construction and not solely for the benefit or at the election of the utility, e.g., if a utility owner needs to upgrade the utility line material to conform to current local codes or industry standards. In contrast, an elective upgrade (or elective betterment) is solely for the benefit and at the election of the utility, e.g., if a utility decides to increase the capacity of its relocated utility line to service an increase in demand. To determine the reimbursable portion of a utility adjustment with elective betterments, TxDOT calculates an elective betterment credit as:

$$Elective\ Betterment\ Credit = \frac{Betterment\ Included\ Estimate - Replacement\ Estimate}{Betterment\ Included\ Estimate}$$

This elective betterment credit represents the portion of the eligible relocation cost that TxDOT deducts to determine the total reimbursable amount. If a utility agreement includes betterments, TxDOT requires the utility to submit two estimates: one that shows costs of the better facility to be constructed, and another that shows the cost of an in-kind replacement. These two cost estimates provide the basis for an elective betterment credit, which TxDOT applies during the billing process to provide an estimate of the actual betterment amount.

A fundamental assumption behind this procedure is that any relative variation from original utility adjustment cost estimate to final utility adjustment cost is the same as the corresponding relative variation from betterment cost estimate to final betterment cost. Strictly speaking, the two relative variations could be different. However, under normal circumstances it is reasonable to assume that there is a good correlation between utility adjustment cost estimates and betterment cost estimates that carries through construction and billing. For example, if the cost estimate of a utility adjustment is $100,000 for in-kind replacement and $130,000 for betterment-included replacement, the estimated betterment amount is $30,000 and the elective betterment credit is 0.231. If the final bill associated with the utility adjustment is $150,000, TxDOT does not deduct $30,000 from this amount. Instead, TxDOT deducts $34,615 (i.e., 23.1 percent of $150,000) and reimburses $115,385 to the utility owner.

Accrued Depreciation

For major utility facilities such as buildings, pumping stations, plants, and similar operational units, credit must be deducted for accrued depreciation as follows:

$$Accrued\ Depreciation = \frac{Original\ Cost\ of\ Facility \times Actual\ Length\ of\ Service}{Total\ Life\ Expectancy}$$

Eligibility Ratio

If it is necessary to adjust a utility facility located in part on the state right of way and in part on land where the utility owner has a property interest, usually adjacent to the state right of way, only the portion where the utility owner has a property interest in the land is eligible for cost reimbursement. In general, TxDOT determines eligibility by measuring proportional property rights along the centerline of the existing utility facility as follows:

$$Eligibility\ Ratio = \frac{Property\ Interest\ Held\ within\ Proposed\ Highway\ Right\ of\ Way}{Total\ Highway\ Right\ of\ Way\ Occupied\ by\ Utility\ Facility}$$

If there are multiple adjustments at different locations within one project, a composite eligibility ratio (CER) is determined as follows:

$$CER = \frac{\sum_{i=1}^{n} Adjustment\ Cost_i \times Eligibility\ Ratio_i}{\sum_{i=1}^{n} Adjustment\ Cost_i}$$

where

$Adjustment\ Cost_i$ = Adjustment cost associated with location i.
$Eligibility\ Ratio_i$ = Eligibility ratio associated with location i.
n = Number of locations.

TxDOT uses the eligibility ratio to determine the percentage of the total utility adjustment cost reimbursable to a utility on property interest grounds.

Final Bill

Following the utility adjustment, utility owners should submit a final bill. In practice, the final bill includes a total amount that might differ from the original estimate. If the utility adjustment includes betterments and/or an eligibility ratio applies, the betterment and eligibility ratios determined in the estimate apply to the final bill. The betterment ratio applies before deducting accrued depreciation and salvage values.

Sample Utility Adjustment Cost Estimate

As an illustration of the process to determine utility adjustment costs and reimbursement eligibility, Figure 22 shows a sample estimate calculation for a hypothetical utility adjustment that includes both betterments and eligibility. In the example, it is necessary to adjust a 4-inch water main and a 6-inch gravity sewer main. Both facilities are located partly on state right of way (1,200 feet) and partly on a private easement (4,800 feet) with a total estimated length of 6,000 feet. The utility owner would like to upgrade the diameter of the water line to 12 inches. To adjust the lines, the utility owner needs to acquire a new easement on private property. Further, the meters used in the original installation no longer comply with local codes and need replacement with an upgraded version that is more expensive. The estimate assumes that mobilization and traffic control costs are included as subsidiary items in the bids for the installation of the water and sewer mains. To calculate the amount eligible for state participation, the utility owner submits an in-kind estimate and a betterment estimate, along with information of the existing utility's location on public and private right of way. Only the portion of the facility located on the private easement (4,800 feet) is eligible for reimbursement.

As a final note, there are different requirements for lump-sum agreements and actual cost agreements. Although no federal limit exists for lump-sum agreements, TxDOT limits these contracts to $100,000, unless the Right of Way Division approves otherwise. A lump-sum contract requires a detailed estimate but no billing itemization and no audit following receipt of the final bill. By comparison, actual cost contracts require detailed estimates and detailed itemized billings. In addition, upon receipt of the final bill, TxDOT retains 10 percent of the final bill pending completion of a TxDOT audit. TxDOT can also reduce reimbursements if the adjustment is delayed because of circumstances under the control of the utility owner. Section 203.094 of the Texas Transportation Code specifies that for each 30-day period or portion of a 30-day period, TxDOT may reduce the reimbursement to the utility owner by 10 percent (*29*).

Betterment-Included Estimate

Alpha Construction Co.		
6,000 feet of 12-inch Water Main	$335,000	
6,000 feet of 6-inch Sewer Main	$66,700	
Forced Betterment	$16,300	
Beta Inc. Engineering Total Fee	$15,000	
Gamma Surveying Ltd. Fee	$2,500	
Easement Acquisition Cost	$4,500	$440,000

In-Kind Replacement Estimate

Alpha Construction Co.		
6,000 feet of 4-inch Water Main	$207,000	
6,000 feet of 6-inch Sewer Main	$66,700	
Forced Betterment	$16,300	
Beta Inc. Engineering Total Fee	$11,000	
Gamma Surveying Ltd. Fee	$2,500	
Easement Acquisition Cost	$4,500	$308,000

Betterment Amount		$132,000
Elective Betterment Credit:	$\$132{,}000/\$440{,}000 = 0.3000$	
Accrued Depreciation Credit	$0	
Salvage Credit	$0	

Current Installation Right of Way Summary:

Sheet No.	State Right of Way	Private Right of Way	Unit
D-1	200	1,300	feet
D-2	100	1,000	feet
D-3	400	1,100	feet
D-4	500	1,400	feet
Total	**1,200**	**4,800**	**feet**

Total ROW:	6,000 feet	
Eligibility Ratio:	$4{,}800/6{,}000 = 0.8000$	
Amount eligible for state cost participation:	$\$308{,}000 \times 0.8000$	$246,400

Figure 22. Sample Utility Adjustment Cost Estimate.

UPDATED FRAMEWORK FOR DEVELOPING UTILITY COST ESTIMATES

Implementing an updated framework for the development of utility adjustment cost estimates with the goal to address limitations in the current process would have the following benefits:

- Support for the development of utility adjustment cost estimates at various stages in the utility adjustment process.

- Reduction in the level of uncertainty and risk for managing utility adjustments at TxDOT.

- More effective, less contentious relationship between TxDOT and utility owners.

- Support for federal and state laws and regulations concerning utility reimbursement requirements. As mentioned, requirements in 23 Code of Federal Regulations (CFR) 645.117 for alternative methods to estimate and reimburse utility adjustment expenditures include the following:

    - Must be founded on generally accepted industry practices and be reasonably supported by recent actual expenditures.
    - If using unit costs, develop unit costs periodically and support those costs annually by a maintained database of adjustment expenses.
    - Take into account the following factors: direct labor costs, labor surcharges, overhead and indirect construction costs, material and supply costs, equipment costs, and transportation costs.
    - Maintain adequate accountability for federal expenditures.
    - Obtain FHWA concurrence for any costing method used other than actual costs.

- More effective coordination with the highway project development and delivery process, e.g., for the determination of total project costs and the production of utility cost estimates when the highway contract includes utility adjustments.

Prototype Utility Cost Estimate Methodology

Most utility agreements at TxDOT follow the traditional cost category-based approach. It is possible that a substantial number of utility owners do not currently use construction unit costs as part of their business operations. However, it is perhaps more reasonable to assume that utility owners submit cost data using the traditional cost category-based approach because the *ROW Utility Manual* encourages the use of the traditional approach (*4*). The *ROW Utility Manual* does indicate that utilities may use construction unit costs, but it does not provide examples on how to submit cost data submissions using a construction cost unit cost methodology. The overall message throughout the manual is that utility owners need to structure cost data in a format that, in the end, is inconsistent with construction unit cost approaches.

One way to address this issue is by requiring utility owners to submit utility cost data in ways that facilitate the exchange of information and trend analysis. The most expedited strategy to accomplish this goal is by requiring utility cost data submissions in such a way that it should be possible to easily translate *cost category-based* information to *construction unit cost-based* information (and vice versa).

To illustrate this process, Figure 23a shows a cost estimate disaggregated by items and cost categories. Figure 23b shows a cost estimate disaggregated by items, quantities, and unit costs. For simplicity, Figure 23a shows only five categories (materials, labor, overhead, transportation, and equipment), although additional cost categories could be added.

(a) Preparation of cost estimates using cost categories

Item	**Cost Category**					**Total**
	Materials	**Labor**	**Overhead**	**Transportation**	**Equipment**	
1	M_1	L_1	O_1	T_1	E_1	$\mathbf{C_1}$
2	M_2	L_2	O_2	T_2	E_2	$\mathbf{C_2}$
3	M_3	L_3	O_3	T_3	E_3	$\mathbf{C_3}$
4	M_4	L_4	O_4	T_4	E_4	$\mathbf{C_4}$
5	M_5	L_5	O_5	T_5	E_5	$\mathbf{C_5}$
Total	**M**	**L**	**O**	**T**	**E**	$\mathbf{C_T}$

(b) Preparation of cost estimates using unit costs

Item	**Quantity**	**Unit Cost**	**Total**
1	Q_1	u_1	$\mathbf{C_1}$
2	Q_2	u_2	$\mathbf{C_2}$
3	Q_3	u_3	$\mathbf{C_3}$
4	Q_4	u_4	$\mathbf{C_4}$
5	Q_5	u_5	$\mathbf{C_5}$
Total			$\mathbf{C_T}$

Figure 23. Comparison of Costs between Construction Unit Costs and Cost Categories.

In Figure 23a, the total cost C_T is given by:

$$C_T = M + L + O + T + E$$

where M, L, O, T, and E are total material, labor, overhead, transportation, and equipment category costs, respectively. Disaggregating the project into n work items results in:

$$C_T = \sum_{i=1}^{n} C_i = \sum_{i=1}^{n} (M_i + L_i + O_i + T_i + E_i)$$

where M_i, L_i, O_i, T_i, and E_i are total material, labor, overhead, transportation, and equipment category costs, respectively, for each work item.

In Figure 23b, the total cost C_T is given by:

$$C_T = \sum_{i=1}^{n} C_i = \sum_{i=1}^{n} (Q_i \times u_i)$$

where Q_i and u_i represent the quantity and unit cost for each work item i, respectively.

If there is an appropriate mapping between cost categories and unit costs, it should be possible to express C_T using either cost categories or construction unit costs. In this case,

$$C_T = \sum_{i=1}^{n} C_i = \sum_{i=1}^{n} (M_i + L_i + O_i + T_i + E_i) = \sum_{i=1}^{n} (Q_i \times u_i)$$

and it is possible to express u_i as:

$$u_i = m_i + l_i + o_i + t_i + e_i$$

where m_i, l_i, o_i, t_i, and e_i represent decomposed material, labor, overhead, transportation, and equipment unit costs, respectively, for each work item i (*30*).

It is not always possible or practical to map certain cost categories to work items, nor is it always practical to use a unit decomposition approach. Examples include engineering fees and right of way acquisition. In this case, it is advisable to treat those categories as separate items. In other cases, it may be possible to map cost categories to work items through the application of joint cost allocation methods (*30*).

A critical cost element that is frequently ignored is related to contingencies. In general, contingencies tend to decrease throughout the project development process. As a result, there is a progression of milestones where the methodology to produce utility adjustment costs could change depending on the information available. Although each particular utility adjustment is different, Figure 24 provides a roadmap for the production of utility cost estimates that takes into consideration both pre-contract contingencies and post-contract contingencies at different phases in the utility adjustment process. The percentages shown in Figure 24 correspond to contingency levels that are commonly used in the highway construction industry.

		Utility Adjustment Phase				
		Planning and Programming (Highway Project)	Preliminary Design (Highway Project)	Utility Adjustment Design	Utility Adjustment Letting/Contract	Utility Adustment
		Utility Adjustment Cost Estimate Source				
		% of highway cost. Historical data.	% of highway cost. Historical data. High-level quantities and historical unit costs.	Disaggregated cost categories and components. Lump sum estimates. Outstanding plan quantities and estimated/historical unit costs.	Disaggregated cost categories and components. Lump sum bids. Outstanding plan quantities and bid unit prices.	Actual disaggregated cost categories and components. Lump sum amounts. Final quantities and locked-in unit prices.
		Utility Pre-Contract / Post-Contract Contingency Levels				
Highway Project Phase	Planning and Programming	40% / 10%	40% / 10%			
	Preliminary Design	40% / 10%	40% / 10%	0-25% / 10%	0% / 10%	
	30% Design			0-25% / 10%	0% / 10%	
	60% Design			0-25% / 10%	0% / 10%	0% / 0%
	90% Design			0-25% / 10%	0% / 10%	0% / 0%
	100% Design			0-25% / 10%	0% / 10%	0% / 0%
	Letting				0% / 10%	0% / 0%
	Construction					0% / 0%

Figure 24. General Progression of Procedures to Estimate Utility Adjustment Costs.

Prototype Utility Cost Estimate Submission Forms

To assist in the process of submitting standardized utility cost estimates, the researchers prepared a prototype Microsoft Excel-based template with four integrated worksheets, as follows:

- **Items**. This worksheet enables utility owners to add a list of items. These items represent logical divisions of work and are consistent with the definition of items in Figure 23 and subsequent formulations. Ideally, the list of items should be the result of cooperation between the utility owner and TxDOT to ensure a utility adjustment project is divided into manageable pieces of work that facilitate the development of reliable cost estimates and monitoring of construction activities in the field. A useful strategy to achieve this goal is to use construction specifications as a tool to define items. In many cases, the utility owner already has a set of construction specifications (either standard or special) that could be used for that purpose. Alternatively, a suitable construction specification might be available at TxDOT or from an external source.

- **Unit Cost Analysis**. This worksheet enables utility owners to provide utility cost data using a unit cost approach. With this approach, users load the list of items from the Items worksheet and provide unit, quantity, and unit cost data for each item. The worksheet automatically calculates the total cost for each item and for the entire project.

- **Item Disaggregation Analysis**. This worksheet enables utility owners to provide utility cost data using a cost category approach. With this approach, users load the list of items from the Items worksheet and provide disaggregated cost component information for each item according to one or more of the following cost categories: materials and supplies, labor, overhead, and transportation and equipment. For each component, users provide unit, quantity, and unit rate (or unit price). The worksheet automatically calculates the total cost for each component, for each item, and for the entire project.

- **Cost Category Summary**. This worksheet enables utility owners to prepare a summary tabulation of the cost items provided in the Item Disaggregation Analysis worksheet. All cost data elements come from this worksheet, which means that users do not need to enter any data manually.

It is worth noting that the Unit Cost Analysis worksheet is not mandatory because utility owners have the option to use a cost category approach to develop cost estimates. However, if users also provide cost category data, the Unit Cost Analysis worksheet enables users to validate unit cost data by importing total dollar amounts per item from the Item Disaggregation Analysis worksheet and by developing a separate "validated" unit cost estimate. Likewise, the Item Disaggregation Analysis worksheet is not mandatory because utility owners have the option to use a unit cost approach to develop cost estimates. However, if users also provide unit cost data, the Item Disaggregation Analysis worksheet enables users to import total dollar amounts per item from the Unit Cost Analysis worksheet.

As an illustration, Figure 25 shows items associated with the adjustment of a water main. In this case, the utility owner provided quantities and unit costs for each item, which enabled the use of the Unit Cost Analysis Worksheet directly (Figure 26). Each item in the table corresponds to a construction item in the field (with the exception of engineering fees, for which the utility owner provided a separate tabulation disaggregating engineering charges into seven categories and travel. For illustration purposes, Figure 26 shows the quantities and units used for each of these categories.

Figure 27 shows items associated with the adjustment of an electric transmission line. In this case, the utility owner did not provide quantities and unit costs for each item. Instead, the utility owner provided disaggregated cost data for each item by cost category, which made it necessary to use the Item Disaggregation Analysis worksheet (Figure 28). Figure 29 shows a summary of category costs by using the Cost Category Summary worksheet.

It is worth noting that for the electric transmission line example, the utility owner provided a highly disaggregated list of materials for the pole assemblies (down to the quantity and unit cost for each individual bolt, nut, rod, and so on), but did not indicate which components were associated with each type of pole (90-ft versus 95-ft). For simplicity, Figure 28 shows the total dollar amount for these materials equally divided by two for each type of pole. Similar considerations apply to other cost categories, where the utility owner provided total costs but did not disaggregate them by type of pole (90 ft versus 95 ft).

Remove All Items

+	-	Item No.	Group/Item Name	Item Description
			General	
		1	Mobilization, bonds, and insurance	
			Earth Work	
		2	Clear and grub ROW	
		3	Crushed rock for trench stabilization	
			Lines, Pipes, and Other Linear Features	
		4	Remove and dispose of existing water line	
		5	18" DIP water line with polywrap	
		6	30" Steel casing with 18" carrier pipe by dry bore	
		7	30" Steel casing with 18" carrier pipe by open cut	
		8	Trench protection	
			Appurtenances	
		9	Remove air release valve, manhole, and appurtenar	
		10	Install air release manhole	
		11	18" gate valves	
		12	Ductile iron fittings	
		13	Ties into existing 18" water line	
		14	Water line marker	
			Other	
		15	Silt fence	
		16	Seeding areas disturbed by construction	
		101	Engineering - principal	
		102	Engineering - project manager	
		103	Engineering - design technician	
		104	Engineering - survey field party	
		105	Engineering - project assistant	
		106	Engineering - secretary	
		107	Engineering - project representative	
		108	Travel	

Figure 25. Example 1 (Water Main Adjustment) – Items Worksheet.

Get Items | Update Items | Validate Unit Costs

Item No.	Item Name	Unit	Quantity	Unit Cost ($/unit)	Amount ($)	Imported Amount ($)	Validated Unit Cost ($)
1	Mobilization, bonds, and insurance	LS	1	$ 20,085.00	**$ 20,085.00**		$ -
2	Clear and grub ROW	STA	17	$ 600.00	**$ 10,200.00**		$ -
3	Crushed rock for trench stabilization	CY	200	$ 40.00	**$ 8,000.00**		$ -
4	Remove and dispose of existing water line	LF	730	$ 15.00	**$ 10,950.00**		$ -
5	18" DIP water line with polywrap	LF	1120	$ 75.00	**$ 84,000.00**		$ -
6	30" Steel casing with 18" carrier pipe by dry bore	LF	110	$ 400.00	**$ 44,000.00**		$ -
7	30" Steel casing with 18" carrier pipe by open cut	LF	790	$ 275.00	**$ 217,250.00**		$ -
8	Trench protection	LF	1910	$ 1.50	**$ 2,865.00**		$ -
9	Remove air release valve, manhole, and appurtenar	EA	1	$ 1,000.00	**$ 1,000.00**		$ -
10	Install air release manhole	EA	1	$ 4,000.00	**$ 4,000.00**		$ -
11	18" gate valves	EA	2	$ 10,000.00	**$ 20,000.00**		$ -
12	Ductile iron fittings	LB	4000	$ 5.00	**$ 20,000.00**		$ -
13	Ties into existing 18" water line	EA	2	$ 5,000.00	**$ 10,000.00**		$ -
14	Water line marker	EA	7	$ 250.00	**$ 1,750.00**		$ -
15	Silt fence	LF	700	$ 3.50	**$ 2,450.00**		$ -
16	Seeding areas disturbed by construction	AC	0.75	$ 600.00	**$ 450.00**		$ -
101	Engineering - principal	HR	4	$ 145.00	**$ 580.00**		$ -
102	Engineering - project manager	HR	104	$ 110.00	**$ 11,440.00**		$ -
103	Engineering - design technician	HR	98	$ 60.00	**$ 5,880.00**		$ -
104	Engineering - survey field party	HR	28	$ 90.00	**$ 2,520.00**		$ -
105	Engineering - project assistant	HR	16	$ 55.00	**$ 880.00**		$ -
106	Engineering - secretary	HR	55	$ 40.00	**$ 2,200.00**		$ -
107	Engineering - project representative	HR	181	$ 55.00	**$ 9,955.00**		$ -
108	Travel	MI	180	$ 0.58	**$ 104.40**		$ -
Total					**$ 490,559.40**	$ -	$ -

Figure 26. Example 1 (Water Main Adjustment) – Unit Cost Analysis Worksheet.

Remove All Items

+	-	Item No.	Group/Item Name	Item Description
			General	
		1	138 kV pole assembly (90 ft.)	
		2	138 kV pole assembly (95 ft.)	
			Earth Work	
			Lines, Pipes, and Other Linear Features	
			Appurtenances	
			Other	
		3	Contract labor, engineering	
		4	Environmental study and surveying	
		5	Inspection services	

Figure 27. Example 2 (Transmission Line Adjustment) – Items Worksheet.

Get Items | Update Items | Calculate Total | Import Amounts

Item	+	-	Component	Item/Component Name	Cost Category	Unit	Quantity	Rate or Unit Price ($/unit)	Amount ($)	Imported Amount ($)
1				**138 kV pole assembly (90 ft.)**					**$ 79,360.41**	
			1	Pole, concrete, 90 ft., H-frame str.	Materials and Supplies	EA	4	$ 5,000.00	$ 20,000.00	
			2	Materials (per list)	Materials and Supplies	EA	1	$ 3,434.91	$ 3,434.91	
			3	Purchasing and stores	Materials and Supplies	EA	1	$ 679.50	$ 679.50	
			4	Non-contract labor regular time	Labor	HR	41.5	$ 28.00	$ 1,162.00	
			5	Non-contract labor overtime time	Labor	HR	6	$ 42.00	$ 252.00	
			6	Non-productive time clearing	Labor	EA	1	$ 187.50	$ 187.50	
			7	Employment benefit loading	Overhead	EA	1	$ 70.50	$ 70.50	
			8	Retirement plan loading	Overhead	EA	1	$ 50.00	$ 50.00	
			9	Payroll taxes	Overhead	EA	1	$ 624.50	$ 624.50	
			10	Other employee benefit loading	Overhead	EA	1	$ 25.00	$ 25.00	
			11	Construction contract labor	Labor	HR	586.5	$ 80.00	$ 46,920.00	
			12	Construction overhead	Overhead	EA	1	$ 5,728.50	$ 5,728.50	
			13	Transportation	Transportation and Equipm	EA	1	$ 226.00	$ 226.00	
2				**138 kV pole assembly (95 ft.)**					**$ 79,360.41**	
			1	Pole, concrete, 95 ft., H-frame str.	Materials and Supplies	EA	4	$ 5,000.00	$ 20,000.00	
			2	Materials (per list)	Materials and Supplies	EA	1	$ 3,434.91	$ 3,434.91	
			3	Purchasing and stores	Materials and Supplies	EA	1	$ 679.50	$ 679.50	
			4	Non-contract labor regular time	Labor	HR	41.5	$ 28.00	$ 1,162.00	
			5	Non-contract labor overtime time	Labor	HR	6	$ 42.00	$ 252.00	
			6	Non-productive time clearing	Labor	EA	1	$ 187.50	$ 187.50	
			7	Employment benefit loading	Overhead	EA	1	$ 70.50	$ 70.50	
			8	Retirement plan loading	Overhead	EA	1	$ 50.00	$ 50.00	
			9	Payroll taxes	Overhead	EA	1	$ 624.50	$ 624.50	
			10	Other employee benefit loading	Overhead	EA	1	$ 25.00	$ 25.00	
			11	Construction contract labor	Labor	HR	586.5	$ 80.00	$ 46,920.00	
			12	Construction overhead	Overhead	EA	1	$ 5,728.50	$ 5,728.50	
			13	Transportation	Transportation and Equipm	EA	1	$ 226.00	$ 226.00	
3				**Contract labor, engineering**					**$ 30,024.00**	
			1	Contract labor, engineering	Labor	HR	417	$ 72.00	$ 30,024.00	
4				**Environmental study and surveying**					**$ 7,418.00**	
			1	Environmental study	Labor	HR	38	$ 65.00	$ 2,470.00	
			2	Surveying - registered surveyor	Labor	HR	3	$ 73.00	$ 219.00	
			3	Surveying - AutoCAD services	Labor	HR	13	$ 63.00	$ 819.00	
			4	Surveying - three man field crew	Labor	HR	46	$ 85.00	$ 3,910.00	
5				**Inspection services**					**$ 6,656.00**	
			1	Inspection services	Labor	HR	128	$ 52.00	$ 6,656.00	
Total									**$ 202,818.82**	

Figure 28. Example 2 (Transmission Line Adjustment) – Item Disaggregation Analysis Worksheet.

Get Items and Category Costs

Item No.	Item Name	Cost Category				Total
		Materials and Supplies	Labor	Overhead	Transportation and Equipment	
1	138 kV pole assembly (90 ft.)	$ 24,114.41	$ 48,521.50	$ 6,498.50	$ 226.00	**$ 79,360.41**
2	138 kV pole assembly (95 ft.)	$ 24,114.41	$ 48,521.50	$ 6,498.50	$ 226.00	**$ 79,360.41**
3	Contract labor, engineering	$ -	$ 30,024.00	$ -	$ -	**$ 30,024.00**
4	Environmental study and surveying	$ -	$ 7,418.00	$ -	$ -	**$ 7,418.00**
5	Inspection services	$ -	$ 6,656.00	$ -	$ -	**$ 6,656.00**
Total		**$ 48,228.82**	**$ 141,141.00**	**$ 12,997.00**	**$ 452.00**	**$ 202,818.82**

Figure 29. Example 2 (Transmission Line Adjustment) – Cost Category Summary Worksheet.

Prototype Utility Installation Construction Specifications

As part of research project 0-4998, the researchers developed a prototype framework for utility relocation construction specifications at TxDOT, specifically dealing with water, sanitary sewer, electric, and communication installations. The framework describes a cost accounting structure that facilitates cost comparisons among similar bid items on different projects, and includes work items commonly required in the installation of water and sanitary sewer lines.

The framework uses tables that summarize the main characteristics of proposed new or modified standard specifications and includes a listing of pay items, subsidiary items, and corresponding measurement units. The framework also includes specification requirements. The classification of subsidiary and bid items relied on a review of existing classifications in the 2004 TxDOT standard specifications (*31*), 1993 and 2004 special specifications (*31*), and several specifications from local jurisdictions in Texas. When possible, the framework maintained existing cost classifications. In some instances, the researchers recommended changes to existing cost classifications to better facilitate "apples-to-apples" unit cost comparisons. For example, the framework recommended modifications to current Items 400 and 401 to clarify the use of excavated trench material as backfill versus other forms of backfill such as select backfill or flowable backfill.

A key observation from the 0-4998 research project was that, in order to develop a robust framework for utility specifications, a fundamental prerequisite was to have clarity with respect to what cost elements to include in the specifications. The reason is that bidders look at the cost elements (both bid items and subsidiary items) to determine the cost structure they need to put in place to submit a winning bid. Another key observation was that, in order to ensure consistency and compatibility with TxDOT's highway construction practices, it would be highly advisable for utility specifications at TxDOT to follow the same structure as the standard TxDOT roadway construction specifications. Consistency and compatibility would also enable meaningful cost comparisons, particularly critical in situations in which it is necessary to compare similar items, which are handled using different contracting mechanisms (e.g., utility agreements versus highway contracts).

In light of these two key observations, the researchers created a general framework for the development of utility specifications at TxDOT that mimics all the components of a typical highway construction specification. They developed templates for a wide range of utility specifications, including water, sanitary sewer, electric, and communication installations. As an illustration, Table 2 shows the proposed template for the installation of ground boxes. The generic template is a proposed modification to TxDOT's Form 1814. For each specification, the research team also prepared a set of specification requirements, which could be used to develop the full construction specification following the 2004 TxDOT specification standard.

Table 2. Proposed Specification: Ground Boxes.

Specification Number	XXXX
Specification Title	Ground boxes
Description	Furnish and install ground boxes (such as handholes, junction boxes, pull boxes, splice enclosures, pedestals, or other similar boxes) used for communication or electric installations.
Previous Specifications	2004 Special Specification 6155, "Communications Ground Box" 2004 Special Specification 6513, "Concrete Ground Boxes" 2004 Special Specification 6539, "Communications Ground Box" 1993 Special Specification 1383, "Communications Ground Box" 1993 Special Specification 6566, "Ground Box for Surveillance, Communication, and Control (SC&C)" 2004 Item 624, "Ground Boxes." DMS-11070, "Ground Boxes."
Proposed Changes	Create new specification for ground boxes.
Comment	Existing Item 624, "Ground Boxes," covers electrical ground boxes, but not communication ground boxes or pedestals. The proposed specification is broader in scope.

Bid Item	**Measurement Unit**
Ground Box (several materials) (several sizes)	Each
Pedestal (several sizes)	Each
Note to Specification Writer: Add other pay items as indicated on the plans or as required by this specification.	

Subsidiary Item (if specified)	**Referenced Item**	**Subsidiary to**
Structural Excavation	400	Ground Box Installation
Backfill	400	Ground Box Installation
Testing		Ground Box Installation
Seals		Ground Box Installation
Lid		Ground Box Installation
Note to Specification Writer: Add other subsidiary items as indicated on the plans or as required by this specification.		

The specification requirements for ground boxes are as follows:

XXXX.1. Description. Furnish and install ground boxes (such as handholes, junction boxes, pull boxes, splice enclosures, pedestals, or other similar boxes) used for communication or electric installations. ***Note to Specification Writer***: Include appropriate references to definitions from Table 3 to facilitate the understanding of basic specification concepts.

XXXX.2. Materials. ***Note to Specification Writer***: The material standards listed here may not be applicable for every installation.

A. General Standards and Rules. Applicable standards and rules include the following:

- ANSI/NEMA FB 1, "Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable"
- ANSI/SCTE 77, "Specification for Underground Enclosure Integrity"
- ASTM C858, "Standard Specification for Underground Precast Concrete Utility Structures"
- ASTM C857, "Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures"
- National Electrical Safety Code
- RUS 345, "REA Specification for Filled Splice Closures"
- RUS 1753F-150, "Specifications and Drawings for Construction of Direct Buried Plant, RUS Form 515a"
- RUS 1753F-151, "Specifications and Drawings for Construction of Underground Plant, RUS Form 515b"
- RUS 1753F-302, "Specifications for Outside Plant Housings and Serving Area Interface Systems"

B. Precast Boxes. Provide ground boxes from manufacturers pre-qualified by the Department. The Traffic Operations Division maintains a list of pre-qualified box manufacturers.

C. Cast-in-Place Boxes. Construct cast-in-place concrete boxes and aprons in accordance with Item 420, "Concrete Structures," Item 421, "Hydraulic Cement Concrete," and Item 440, "Reinforcing Steel."

D. Labels. Label covers in accordance with DMS-11070, "Ground Boxes," as shown on the plans, or as approved by the Engineer.

E. Seals. Provide watertight seals as shown on the plans.

F. Nonmetallic Box Detection Method. Provide a method approved by the Engineer or as shown on the plans for detecting nonmetallic boxes.

G. Inspections. Provide facilities and access to allow for inspection. Provide access for inspection of ground boxes at the project site before and during installation.

H. Rejections.

1. List causes for rejection of individual boxes, including fractures, cracks, and misalignments.
2. Allow access for the marking of rejected boxes. The Engineer will plainly mark rejected boxes by painting colored spots. Remove the rejected boxes from the project and replace with boxes meeting the requirements of this item.

I. Bedding Material. Furnish bedding in accordance with Item 400, "Excavation and Backfill for Structures."

J. Backfill Material. Furnish conventional backfill material in accordance with Item 400, "Excavation and Backfill for Structures," or select backfill in accordance with Special Specification XXXX, "Select Backfill for Structures," as specified on the plans.

XXXX.3. Construction.

A. Excavation, Shaping, Bedding, and Backfill. Excavate, shape, bed, and backfill in accordance with Item 400, "Excavation and Backfill for Structures," and Special Specification XXXX, "Select Backfill for Structures," except as described below:

1. Excavate the trench to a depth of 6 inches below the bottom of the ground box.
2. Protect adjacent property and infrastructure in accordance with Item 402, "Trench Excavation Protection," if excavation is deeper than five feet.

B. Installing Box.

1. **Standards**. Applicable standards include the following:

- ASTM C891, "Standard Practice for Installation of Underground Precast Concrete Utility Structures"
- IEEE 776, "Recommended Practice for Inductive Coordination of Electric Supply and Communication Lines"
- RUS 1753F-302, "Specifications for Outside Plant Housings and Serving Area Interface Systems"

2. **General**.

- Except for pedestals, install ground box to ensure it is flush with the final grade, as indicated on the plans, or as approved by the Engineer. Ensure the horizontal and vertical alignment is in accordance with TAC Title 43, Part 1, Chapter 21, Subchapter C.
- Request prior approval from the Engineer for any deviations in alignment that may be necessary due to obstructions or other design constraints not shown on the plans.

- Unless the Engineer specifies a more stringent requirement, do not exceed a maximum tolerance with respect to approved plans of 0.5 foot (horizontal) and 0.1 foot (vertical). Note to Specification Writer: The *TxDOT Survey Manual* and the *TSPS Manual of Practice for Land Surveying in Texas* provide additional information regarding construction surveying horizontal and accuracy requirements. Notice that these construction tolerances are not the same as tolerances used for design surveying.
- For any box, measure and record the "as-built" horizontal and vertical location of the center point of the box cover on the on-site recorded plans. Provide as-built plans or certified as-installed construction plans in accordance with TAC Title 43, Part 1, Chapter 21, Subchapter C.

XXXX.4. Measurement. This Item will be measured by each ground box or pedestal installed and complete in place.

XXXX.5. Payment. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Ground Box" of the material and size specified or "Pedestal" of the size specified (see Table 2). All other items are considered subsidiary.

IMPLEMENTATION PLAN

The researchers recommend the following major steps to implement the strategy:

- Select a sample district to pilot the use of the Excel-based template for the submission of utility cost data estimates by utility owners. The pilot test would likely involve one or more projects and include monitoring how users react to the various components of the template. Based on user feedback, an updated version of the template might be developed, as needed.

- Develop and pilot a two-day training course on the preparation of utility cost estimates. Stakeholders would include TxDOT officials, consultants (both highway and utility), and utility representatives.

- Capture feedback from districts and update the *ROW Utility Manual* to reflect the updated, streamlined process to prepare and submit utility cost estimates.

- Standardize the preparation and submission of utility cost estimates throughout the state based on the experience gathered with the pilot implementation above.

Potential impediments that might hinder the successful implementation of the strategy include the following:

- Users might decide to ignore the updated utility cost estimation methodology and tool in favor of existing procedures they have used for years. Although the updated process

described here is subject to improvements and optimization, its development was motivated by the realization that the current process is not only contentious but also discourages the participation of utility owners in the project development process. Users will increase their acceptability of the updated methodology and tool as they find that its use results in more effective utility adjustment coordination practices.

- Utility owners might be reluctant to use the updated utility cost estimation methodology and tool out of concern that TxDOT might be forcing an accounting method that is inconsistent with their current practices. In reality, the updated methodology and tool are consistent with existing requirements in the *ROW Utility Manual*, except that utility cost data presentation and submission requirements would be standardized to facilitate processing, analysis, and documentation. A strategy for dealing with this type of concern would be to schedule workshops in which the updated methodology and tool are demonstrated with easy-to-understand examples, and district and division officials are available to answer questions from utility owners.

- TxDOT might not have the necessary resources to implement the strategy. To do this, it will be necessary to update the *ROW Utility Manual*, conduct a series of workshops throughout the state to disseminate the updated methodology, and monitor the degree to which the strategy implementation is successful.

The researchers have identified the following criteria or performance measure elements to evaluate the effectiveness of the implementation of this strategy:

- Number of projects that use the updated utility cost data submission procedures.
- Reduction in the amount of time needed to prepare and execute utility agreements.
- Reduction in the number of, and dollar amount associated with, utility-related change orders or claims.
- Comparison between utility agreement and final billing amounts.

CHAPTER 5. CORE SKILL TRAINING ON UTILITY TOPICS

INTRODUCTION

The need for training of staff involved in utility-related activities in the project development and delivery process was a common theme during discussions with various TxDOT district staff, utility owners, and other stakeholders. Training needs are not limited to staff who normally interact with utility owners, e.g., utility coordinators and right of way agents, but extend to staff whose work is likely to be affected by utility issues, such as project managers, design engineers, area engineers, and even planners. The need for training needs also extends to highway and utility consultants and contractors.

Providing adequate training on utility topics is recognized as a best practice for improving the response and participation of utility owners in the project development process. Based on the various discussions with stakeholders during the research as well as a review of practices both at the state and national levels, the researchers developed a summary of training needs in utility-related topics at TxDOT, as follows:

- **Training for TxDOT utility coordinators**. Utility coordinators face an increasing set of challenges. For example, regionalization and the One DOT initiative are forcing staff to become well-versed in a wide range of topics and assist with projects at many different geographic locations. Standardization of procedures will become the norm, and utility coordinators will need to adapt to this new reality. Utility coordinators will need to become more knowledgeable of the entire project development process and how to manage utility conflicts effectively. However, at some districts, utility coordinators do not actively participate in the project development process until the design phase. Even then, their involvement is limited to providing information on potential utility conflicts at specific project locations.

- **Training needs for TxDOT design engineers on utility coordination issues**. Currently, some TxDOT districts provide ad-hoc utility coordination training sessions for utility coordinators and interested design engineers. These sessions are usually project-specific and voluntary (some TxDOT engineers acknowledged not having attended any such training). There is a need for formal training for TxDOT design engineers on the entire utility coordination process. This training would address topics such as communications with utility coordinators and utility owners, utility adjustment design and construction challenges, utility project development process, utility adjustment cost estimates, and methods for designing around utility conflicts. This training would enable design engineers to become more sensitive to the short-term and long-term impacts of utility conflicts in the project development and delivery process. It would also foster more effective communications with utility owners.

- **Training for other TxDOT staff**. Other staff involved in the project development process would require training to provide the necessary knowledge base to improve communication and coordination with utility owners. These include TxDOT division and region staff, project managers, area engineers, and construction inspectors.

- **Training for utility owner staff on transportation project development topics**. There is a need to provide training for utility owner staff on critical issues that affect the relationship between utility owners and TxDOT. During the various discussions with stakeholders, the researchers noted that utility owner representatives lack understanding of basic transportation project development and delivery concepts. This lack of understanding is similar as that in connection with the development of utility projects by transportation officials. Training for utility owners should vary according to the level and type of interaction with TxDOT. For example, training for managerial or executive level staff would focus on a high-level depiction of the transportation project development process as well as budgeting and financial matters. Training for design and construction staff would focus on more detailed project-level topics, including data collection and exchange, utility conflict analysis and resolution, coordination meetings, construction schedules, and inspection coordination.

- **Training for consultants and contractors**. Highway and utility consultants and contractors would benefit enormously from participating in critical, highly targeted utility-related training opportunities. TxDOT and utility owners should make every effort to make those opportunities available to their consultants and contractors. Private sector participation in the development and delivery of projects, both at TxDOT and in the utility industry, is increasing. A common theme during the various discussions with stakeholders was that TxDOT and utility officials have become in essence contract managers because their agencies' own forces conduct very little design or construction work. This situation highlights the need to provide adequate training opportunities to consultants and contractors in critical areas.

CORE SKILL REQUIREMENTS

The researchers identified several categories where the need for training opportunities to address the needs of stakeholders in the area of utility coordination was the greatest. Within each category, the researchers identified specific core skills that could serve as the foundation for proposed training courses or modules and identified a basic set of requirements for different levels of instruction. For each level of instruction, the researchers estimated the minimum number of training hours required to provide a basic level of understanding of the topic under consideration. Table 3 summarizes the various categories, core skills, brief course description, and a preliminary assessment of the minimum number of training hours for each stakeholder group.

The following sections provide a summary of instruction content associated with each course or module and corresponding level of instruction. This summary could provide the foundation for a detailed set of course or module content requirements based on which actual courses or modules could be developed. An example of typical course implementation requirements is the set of implementation lessons that TTI researchers developed for a one-day utility conflict course as part of the SHRP 2 Research Project R15-B "Identification of Utility Conflict and Solutions" (*23*). The Utility Conflict Management section includes a copy of the lesson plan developed for that course.

Table 3. Utility Area Core Skill Training Matrix.

Category	Course or Module	Description	Level of Training Needs (Hours) for Each Stakeholder Group													
			TxDOT						Utility Owner			Consultant			Contractor	
			Right of Way Division Staff	Utility Coordinators	Project Managers	Design Engineers	Construction Inspectors	Area Engineers	Executive Level	Staff/Design	Field Staff	Transportation	Utility Coordination	Utility Investigations	Highway	Utility
TxDOT Project Development Process	TxDOT Project Development and Delivery Process	Different phases of the project development and delivery process, including activities under each phase. The course provides special emphasis on utility-related activities.	16+	8–16	16+	16+	5–8	16+	1–4	5–8	1–4	16+	8–16	8–16	8–16	1–4
	TxDOT Design Plans and Specifications	Elements in a typical highway project design plan, including plans, profiles, and the process to assemble project files. The course includes a discussion of factors that affect unit prices.	1–4	8–16	8–16	8–16	8–16	8–16	1–4	5–8	5–8	8–16	8–16	8–16	8–16	8–16
Utility Process from a Utility Owner's Perspective	Utility Project Development and Delivery Process	Description of how utility owners develop and execute projects, including utility adjustments associated with highway projects. This course addresses different types of utility projects, including oil and gas, water and sewer, electric, and communications.	8–16	8–16	5–8	8–16	5–8	8–16	n/a	n/a	n/a	8–16	8–16	8–16	5–8	n/a
	Utility Design Plans and Specifications	Understanding of utility facility location maps and construction plans.	5–8	16+	5–8	8–16	8–16	8–16	n/a	n/a	n/a	8–16	8–16	8–16	5–8	n/a
Utility Coordination	Federal and State Laws and Regulations	Understanding of federal and state laws and regulations that affect project development and utility adjustments and accommodation.	8–16	8–16	8–16	5–8	5–8	5–8	5–8	5–8	5–8	8–16	8–16	5–8	8–16	1–4
	Utility Coordination Process	Principles and best practices of utility coordination, with an emphasis on early communication and coordination.	8–16	8–16	8–16	8–16	1–4	8–16	1–4	8–16	1–4	8–16	8–16	5–8	5–8	5–8
	Memoranda of Understanding	The purpose of MOUs and how to use them to facilitate communication, coordination, and cooperation between TxDOT and utility owners.	5–8	5–8	5–8	1–4	1–4	1–4	5–8	5–8	1–4	1–4	1–4	1–4	n/a	n/a
	Utility Investigations	State of the practice in utility investigation techniques and analysis of their potential use to assist in the identification and management of utility conflicts.	5–8	8–16	5–8	8–16	1–4	1–4	1–4	5–8	1–4	8–16	8–16	N/A	5–8	8–16
	Utility Conflict Management	Identification, management and resolution of utility conflicts during the project development and delivery process.	5–8	5–8	5–8	5–8	5–8	5–8	1–4	1–4	1–4	5–8	5–8	5–8	5–8	5–8
	Utility Adjustment Cost Estimates	Components of utility cost estimates, accounting methods, TxDOT requirements, and challenges associated with cost estimation.	8–16	8–16	8–16	8–16	1–4	5–8	5–8	8–16	1–4	8–16	8–16	1–4	1–4	1–4
	Utility Agreement Assemblies	Items included in the utility agreement assembly, requirements, and challenges of putting the agreement together.	5–8	16+	5–8	5–8	5–8	5–8	1–4	16+	5–8	5–8	8-16	1–4	1–4	1–4
	Using ROWIS to Manage Utility Adjustments	Use of ROWIS to create and manage records in connection with utility adjustments. The course also covers the use of ROWIS to generate reports to assist in the utility coordination process.	5–8	5–8	1–4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Utility Permitting	Preparation, Submission, and Review of Utility Permits	Requirements for the submission, review, approval, and management of utility permit applications; training on the use of the UIR system.	5–8	5–8	5–8	5–8	5–8	5–8	1–4	5–8	1–4	5–8	5–8	1–4	1–4	1–4

TxDOT Project Development Process

TxDOT Project Development and Delivery Process

This course provides an overview of the typical project development and delivery process of TxDOT highway projects. The scope of the course focuses on major phases and activities of project development and delivery, from initial project need identification during planning and programming to construction. The course provides special emphasis on the role of utility coordination on the overall project development process.

Instruction Level 1 (1 to 4 hours of training):

- Identify and describe the various phases of the project development process, such as planning and programming, preliminary design, design, letting, and construction.
- Identify and describe major activities within each of the phases of the project development process. Provide special emphasis on utility-related activities.
- Describe typical timelines and critical deadlines associated with phases and activities.

Instruction Level 2 (5 to 8 hours of training)

- All Instruction Level 1 course content.
- Describe different methods of delivery, including design-bid-build, design-build, and other forms of public-private partnerships.
- Use actual project information to illustrate the project development process from inception to construction.

Instruction Level 3 (8 to 16 hours of training):

- All Instruction Level 2 course content
- Explain in more detail critical activities that make up the project development process, with a focus on special topics of interest depending on the targeted audience.

Instruction Level 4 (16 or more hours of training):

- All Instruction Level 3 course content.
- Explain in more detail all the activities that make up the project development process, with a focus on design, letting, and construction.

This course could be the same as, or a revised version of, TxDOT course "Introduction to Highway Project Development" (code DES116), which is designed for 28 hours of instruction (*24*). As needed, the course could be modified to address utility coordination topics and issues for a wider audience that includes TxDOT employees, utility owners, consultants (transportation, utility coordination, utility investigations), and contractors (highway, utility).

TxDOT Design Plans and Specifications

This course provides a description of content, style, and requirements associated with typical TxDOT highway project design plans. Course participants include engineering staff, both at TxDOT and other organizations, such as utility owners, consultants, and contractors. For external entities, the purpose of the course is to expose participants to the process, structure, content, style, and other elements related to the production and management of highway project design plans. For utility stakeholders, the discussion includes typical challenges of designing around utility facilities and conflicts.

Instruction Level 1 (1 to 4 hours of training):

- Describe typical elements included in highway design plans, including plan, profile, cross sections, details, and notes.
- Describe the relationship between drawings and highway construction specifications and provisions.
- Identify the following elements on a typical design plan, including, but not limited to, drainage structures, right of way alignment, and easements.
- Describe the use of TxDOT design plan software and standards.

Instruction Level 2 (5 to 8 hours of training):

- All Instruction Level 1 course content.
- Discuss issues and challenges associated with developing design plans and issues that affect designing highway projects, such as data collection challenges, right of way challenges, and challenges related to utility conflicts.

Instruction Level 3 (8 to 16 hours of training):

- All Instruction Level 2 course content.
- Develop a set of design plans and documentation (including PS&E package) for a sample of projects.

This course could be the same as, or a revised version of, TxDOT course "PS&E Package" (code DES109), which is designed for 16 hours of instruction (*24*). As needed, the course could be modified to address utility coordination topics and issues for a wider audience that includes TxDOT employees, utility owners, consultants (transportation, utility coordination, utility investigations), and contractors (highway, utility).

Utility Process from a Utility Owner's Perspective

Utility Project Development and Delivery Process

This course provides an overview of the utility project development and delivery process, i.e., the process a utility owner uses to develop utility facilities (including utility adjustments associated with highway projects). Course participants include TxDOT officials, consultants, and contractors. The course illustrates the various phases in the development of utility projects, including planning, design, letting, and construction. The course also illustrates how utility owners react to, and participate in, the management of utility conflicts during highway projects. The course addresses unique characteristics and differences among different types of utility installations, e.g., water and sewer, oil and gas, electric, and communications.

Instruction Level 1 (1 to 4 hours of training):

- Describe major types of utility projects. The discussion addresses examples of different types of utility installations (both overhead and underground facilities), including water and sewer, oil and gas, electric, and communications.

Instruction Level 2 (5 to 8 hours of training)

- All Instruction Level 1 course content.
- Describe in detail how utility projects are developed from inception to construction, including a discussion of timelines and milestones.

Instruction Level 3 (8 to 16 hours of training):

- All Instruction Level 2 course content.
- Special topics that pertain to each major type of utility installations, e.g., construction specifications and cost estimates.
- Discuss processes to manage utility conflicts within transportation projects.
- Discuss partnerships, MOUs, and other opportunities for effective communication and coordination between TxDOT and utility owners.

Utility Design Plans and Specifications

This course provides a description of typical utility plans, particularly those used for utility facility adjustments associated with TxDOT highway projects. Course participants include TxDOT officials, consultants, and contractors. The course includes modules that specialize in the unique characteristics associated with different types of utility installations, e.g., water and sewer, oil and gas, electric, and communications.

Instruction Level 1 (1 to 4 hours of training):

- Identify major differences among typical plans for various utility types, such as water and sewer, oil and gas, electric, and communications.

Instruction Level 2 (5 to 8 hours of training)

- All Instruction Level 1 course content
- Identify symbology and other standards used to represent different types of utility facilities
- Identify methods to depict and manage conflicts with proposed highway projects.

Instruction Level 3 (8 to 16 hours of training):

- All Instruction Level 2 course content.
- Discuss special topics related to issues and challenges found during utility adjustments, including data collection issues, and construction specifications and cost estimates.

Utility Coordination

Federal and State Laws and Regulations

This course provides training on relevant laws and regulations related to the accommodation and adjustment of utility facilities on the state right of way. The training also covers relevant aspects related to right of way acquisition.

Instruction Level 1 (1 to 4 hours of training):

- Discuss federal laws and regulations, including, but not limited to, the following:
  - 23 U.S. Code (USC) 123 related to federal-aid projects.
  - 23 CFR 645 related to utility accommodation and adjustment issues.

- Discuss relevant state laws, including, but not limited to, the following:
  - Telephone Cooperative Act (Utility Code 162.002).
  - Water privileges (Local Government Code 402.102-105).
  - Water Supply or Sewer Service Corporations (Water Code 67.011).
  - Gas Distribution (Utility Code 181.022).
  - Gas, Electric Current and Power Corporations (Utility Code 181.004-005).

Instruction Level 2 (5 to 8 hours of training):

- All Instruction Level 1 course content.
- Discuss relevant state regulations, including, but not limited to, the following:
  - Utility Agreements (43 TAC 21) related to utility accommodation and adjustments.

Instruction Level 3 (8 to 16 hours of training)

- All Instruction Level 2 course content.
- Discuss other federal laws and regulations, including, but not limited to, the following:
  - Uniform Act (as codified in 42 USC 4601, et seq.).
  - 49 CFR 24, related to the Uniform Act.

Utility Coordination Process

This course addresses principles and best practices of utility coordination, with an emphasis on early communication and coordination. The course also includes a discussion about best practices in utility coordination from around the country.

Instruction Level 1 (1 to 4 hours of training):

- Provide an overview of the TxDOT project development process.
- Describe all the activities in the utility process at TxDOT.

Instruction Level 2 (5 to 8 hours of training):

- All Instruction Level 1 course content.
- Describe the role of different stakeholders in the utility process.
- Address utility cost estimates and preparation of utility agreement assemblies.

Instruction Level 3 (8 to 16 hours of training):

- All Instruction Level 2 course content.
- Discuss advanced topics on specific responsibilities of utility coordinators, including how to communicate effectively with other stakeholders both within the department and with external entities.
- Discuss issues and challenges related to utility coordination.
- Provide examples of best practices for utility coordination between state DOTs and utility owners from around the country.

Memoranda of Understanding

MOUs with the utility industry can foster an atmosphere of cooperation between the department and the industry. The course describes the process to develop, maintain, and use MOUs.

Instruction Level 1 (1 to 4 hours of training):

- Describe the purpose and use of MOUs.
- Provide examples of existing MOUs from around the country.

Instruction Level 2 (5 to 8 hours of training):

- All Instruction Level 1 course content.
- Describe the structure and content of an MOU.
- Describe how to set up an MOU and make it work.
- Identify challenges associated with setting up MOUs.

Utility Investigations

This course addresses the use of utility investigations to identify and characterize utility installations during the transportation project development process. The course describes the use of different quality levels of utility data collection (i.e., QLD, QLC, QLB, and QLA) and describes different technologies used to collect these data. It also covers costs and benefits associated with the use of utility investigations during project development.

Instruction Level 1 (1 to 4 hours of training):

- Define need and purpose of utility investigations during the project development process.
- Describe the different quality levels of utility investigation (i.e., QLD, QLC, QLB, and QLA).
- Discuss the ASCE/CI 38-02 Standard Guideline for the Collection and Depiction of Subsurface Utility Data Collection) (*25*).
- Identify typical timelines for collecting the various levels of utility data during the project development process.

Instruction Level 2 (5 to 8 hours of training)

- All Lesson 1 course content.
- Describe different technologies to collect utility facility data, including, but not limited to, the following:
  - Ground penetrating radar (GPR).
  - Electromagnetic imaging (EMI).
  - Arrays.
  - Terrain conductivity.
  - Magnetic methods.
  - Infrared thermography.

Instruction Level 3 (8 to 16 hours of training):

- All Lesson 2 course content.
- Provide an in-depth discussion and demonstration of utility data collection technologies.
- Discuss other relevant advanced topics.

Utility Conflict Management

The course describes the process to identify, manage, and resolve utility conflicts within the project development and delivery process. It describes the use of utility conflict matrices and software tools to assist in this process.

Instruction Level 1 (1 to 4 hours of training):

- Describe typical utility conflict management concepts and issues.
- Identify utility conflicts on typical design plans.
- Describe what a UCM is and how to use it.

Instruction Level 2 (5 to 8 hours of training):

- All Instruction Level 1 course content.
- Conduct group exercises to learn how to identify, manage, and resolve utility conflicts.
- Describe process to develop queries and reports.

The foundation for this course is the training materials developed as part of SHRP 2 research project SHRP 2 R15-B "Identification of Utility Conflict and Solutions" (*23*). The training materials include a lesson plan designed for a total of seven hours of instruction, from 8:30 AM to 3:45 PM, including direct instructor contact and breaks. The training materials use National Highway Institute (NHI) standards and templates.

The seminar provides ample opportunities for participant interaction and enables the instructor to adjust session and lesson start times and durations depending on the audience and the level of participant engagement in the discussions. Table 4 through Table 9 provide a more detailed description of the lesson plan. The one-day Utility Conflicts and Solutions seminar is divided into six lessons, as follows:

AM Session:

- Lesson 1: Introductions and Seminar Overview (30 minutes)
- Lesson 2: Utility Conflict Concepts and SHRP 2 R15-B Research Findings (75 minutes)
- Lesson 3: Utility Conflict Identification and Management (75 minutes)

PM Session:

- Lesson 4: Hands-On Utility Conflict Management Exercise (90 minutes)
- Lesson 5: Use of Database Approach to Manage Utility Conflicts (45 minutes)
- Lesson 6: Wrap-Up (15 minutes)

Table 4. Utility Conflict Management Lesson 1 Requirements.

Lesson Number:	**1**
Lesson Title:	**Introductions and Seminar Overview**
Topics:	• Introductions (both instructor and participants). • Overview of seminar objectives, outcomes, agenda, and reference materials. • Discussion of ground rules, sign-in-sheet, feedback forms, and other housekeeping items.
Instructional Method:	Activity 1: Instructor welcomes participants, introduces him/herself, and leads participants through introductions. Participants introduce themselves and provide a brief description of their role and experience in utility coordination, design, or other project development process matters. Activity 2: Instructor provides an overview of the seminar objectives, outcomes, agenda, and reference materials. Activity 3: Instructor discusses ground rules, sign-in sheet, feedback forms, and other housekeeping items as needed.
Instruction Day:	Day 1: 8:30 AM – 9:00 AM
Time Allocation:	• Activity 1: Introductions 15 minutes • Activity 2: Seminar overview 10 minutes • Activity 3: Housekeeping 5 minutes • Total Lesson 1 30 minutes Note: Depending on the seminar setting and the length of time actually spent on Lesson 1 activities, it might be possible to increase the time allocated to Lessons 2 or 3. In any case, for maximum effectiveness, it is not recommended to extend Lesson 3 beyond Noon.
Evaluation Plan:	• Instructor uses the instructor review form to take notes on the background, experience, and role of participants in utility coordination, design, or other project development process matters.
References:	• Seminar binder. • Lesson 1 PowerPoint file and handouts. • SHRP 2 R15-B research report.

Table 5. Utility Conflict Management Lesson 2 Requirements.

Lesson Number:	**2**
Lesson Title:	**Utility Conflict Concepts and SHRP 2 R15-B Research Findings**
Learning Outcomes:	• Understanding of relevant concepts related to the management of utility conflicts within the project development process. • Understanding of the findings of the SHRP 2 R15-B project.
Instructional Method:	Activity 1: Instructor uses PowerPoint slides to: • Describe typical utility conflict management concepts and issues. Activity 2: Instructor uses PowerPoint slides and printed UCM materials to: • Describe the purpose and main findings of the SHRP 2 R15-B project, with a focus on the standalone UCM and prototype Access database application. • Summarize trends and other information gathered through the online surveys and follow-up interviews. • Summarize process to develop standalone UCM. • Describe prototype UCM data model and Access database application. Activity 3: Questions and answers: • Instructor answers questions from participants. As needed, other participants participate in the discussion. • Depending on the seminar setting, instructor might choose to encourage questions from participants throughout the presentation instead of allocating 10 minutes at the end of the lesson for questions and answers.
Instruction Day:	Day 1: 9:00 AM – 10:15 AM
Time Allocation:	• Activity 1: Utility conflict concepts 25 minutes • Activity 2: SHRP 2 R15 (B) Research findings 40 minutes • Activity 3: Questions and answers 10 minutes • Total Lesson 2 75 minutes
Evaluation Plan:	• Instructor uses the instructor review form to summarize the type of questions and comments from participants. Depending on the setting, this activity might need to be completed after the seminar. • Participants use the participant feedback form to rate the effectiveness of the presentation.
References:	• Lesson 2 PowerPoint file and handouts. • Standalone and sample UCM printouts.

Table 6. Utility Conflict Management Lesson 3 Requirements.

Lesson Number:	**3**
Lesson Title:	**Utility Conflict Identification and Management**
Learning Outcomes:	• Understanding of process to develop and maintain a UCM using data from a sample project. • Understanding of the types of reporting options available when using a database representation of the UCM.
Instructional Method:	Activity 1: Instructor uses PowerPoint slides and sample materials to: • Demonstrate the process to identify utility conflicts using sample project drawings and associated information. • Describe structure and format of the prototype UCM and the process to populate and maintain the UCM using sample project data. Activity 2: Discussion, questions, and answers: • Instructor answers questions from participants. As needed, other participants participate in the discussion. • Instructor encourages participants to share and discuss real-world examples and/or the applicability of UCMs to real-world situations. • Depending on the seminar setting, instructor might choose to encourage questions and discussion from participants throughout Activity 1 instead of allocating 30 minutes at the end of the lesson for questions and answers.
Instruction Day:	Day 1: 10:30 AM – 11:45 PM
Time Allocation:	• Activity 1: Utility conflict management and use of UCM 45 minutes • Activity 2: Discussion, questions, and answers 30 minutes • Total Lesson 3 75 minutes
Evaluation Plan:	• Instructor uses the instructor review form to summarize the type of questions and comments from participants. Depending on the setting, this activity might need to be completed after the seminar. • Participants use the participant feedback form to rate the effectiveness of the presentation.
References:	• Lesson 3 PowerPoint file and handouts. • Sample UCM printouts, plan sheets, and test hole reports.

Table 7. Utility Conflict Management Lesson 4 Requirements.

Lesson Number:	**4**
Lesson Title:	**Hands-On Utility Conflict Management Exercise**
Learning Outcomes:	• Identification of utility conflicts on sample project design drawings. • Use of UCMs to manage utility conflicts.
Instructional Method:	Activity 1: Participants (individually or in groups depending on the setting) use sample project materials and blank UCM template to: • Identify as many utility conflicts as possible on sample project materials. • Transcribe utility conflict information into the UCM. Instructor uses PowerPoint presentation and other sample materials to: • Direct seminar participants during exercise. • Answer questions as needed. Activity 2: Instructor uses sample materials and feedback from individuals or groups to: • Display design drawings with all utility conflicts identified and the UCM completely filled out. • Lead a discussion with participants about the detection and management of utility conflicts using a UCM approach.
Instruction Day:	Day 1: 1:00 PM – 2:30 PM
Time Allocation:	• Activity 1: Individual/small group hands-on exercise 70 minutes • Activity 2: Discussion 20 minutes • Total Lesson 4 90 minutes
Evaluation Plan:	• Instructor uses the instructor review form to summarize the type of questions and comments from participants. Depending on the setting, this activity might need to be completed after the seminar. • Participants use the participant feedback form to rate the effectiveness of the presentation.
References:	• Lesson 4 PowerPoint file and handouts. • Sample UCM printouts, plan sheets, and test hole reports.

Table 8. Utility Conflict Management Lesson 5 Requirements.

Lesson Number:	**5**
Lesson Title:	**Use of Database Approach to Manage Utility Conflicts**
Learning Outcomes:	• Understanding of utility conflict data model capabilities. • Understanding of the process to develop customized queries and reports.
Instructional Method:	Activity 1: Instructor uses PowerPoint slides, prototype Access database, and sample materials to: • Describe data model structure and capabilities. • Describe data model connections with other DOT information systems. Activity 2: Instructor uses PowerPoint slides and sample materials to: • Describe how utility conflict data are stored into the database. • Illustrate the process to develop and run Access queries and reports. Activity 3: Instructor uses prototype Access database to demonstrate the use and capabilities of the UCM data model and database structure. Activity 4: Questions and answers: • Instructor answers questions from participants. As needed, other participants participate in the discussion. • Depending on the seminar setting, instructor might choose to encourage questions from participants throughout the presentation instead of allocating 10 minutes at the end of the lesson for questions and answers.
Instruction Day:	Day 1: 2:45 PM – 3:30 PM
Time Allocation:	• Activity 1: Data model structure 5 minutes • Activity 2: Use of Access database to manage utility conflicts 20 minutes • Activity 3: Access database demonstration 10 minutes • Activity 4: Questions and answers 10 minutes • Total Lesson 5 45 minutes
Evaluation Plan:	Participants' learning will be evaluated by their participation and questions.
References:	• Lesson 5 PowerPoint file and handouts. • Printed copies of the logical data model of the database. • Printed copies of sample database queries and reports.

Table 9. Utility Conflict Management Lesson 6 Requirements.

Lesson Number:	**6**
Lesson Title:	**Wrap-Up**
Topics:	• Instructor provides summary of seminar. • Instructor collects feedback forms.
Instructional Method:	Activity 1: Instructor summarizes the activities of the seminar, addresses any final questions of seminar participants, and provides some closing remarks. The instructor then collects the feedback forms provided by the seminar participants.
Instruction Day:	Day 1: 3:30 PM – 3:45 PM
Time Allocation:	• Activity 1: Final questions and closing remarks 15 minutes • Total Lesson 6 15 minutes
References:	• Participant feedback form.

Utility Adjustment Cost Estimates

The course provides guidance to utility owners and information to TxDOT staff on how to prepare utility adjustment cost estimates. The course describes rules, regulations, and policies; accounting methods; and methodologies to prepare cost estimates, including engineer's estimates, bid estimates, partial billings, and final billings.

Instruction Level 1 (1 to 4 hours of training):

- Provide an overview of federal and state regulations that pertain to the submission of utility adjustment cost estimates.
- Describe eligible and ineligible cost elements.
- Review TxDOT requirements for reimbursement.
- Describe typical accounting methods and procedures.
- Describe cost categories to include in utility adjustment cost estimates.

Instruction Level 2 (5 to 8 hours of training):

- All Instruction Level 1 course content
- Describe relationship between cost estimates and utility construction specifications.
- Conduct group and individual exercises to learn how to prepare cost estimates.

Instruction Level 3 (8 to 16 hours of training):

- All Instruction Level 2 course content.
- Discuss issues and challenges during the preparation of cost estimates.
- Other advanced topics.

Utility Agreement Assemblies

This course provides participants with an overview of the utility agreement assembly process. It describes the various components of a typical utility agreement assembly and identifies the use of an agreement assembly checklist.

Instruction Level 1 (1 to 4 hours of training):

- Provide an overview of the transportation project development process.
- Provide an overview of the utility adjustment process.
- Describes the major components of a typical utility agreement assembly, including forms and procedures.

Instruction Level 2 (5 to 8 hours of training)

- All Instruction Level 1 course content.
- Discuss procedures, challenges, and tips for each of the major components of a typical utility agreement assembly.
- Discuss responsibilities during the utility agreement development phase, as well as during the billing and payment phase, by each stakeholder, including the following:
  - Utility owner.
  - LPA.
  - Consultant.
  - TxDOT district.
  - TxDOT region.
  - Right of Way Division.
  - Audit Office/External Audit Section.

Using ROWIS to Manage Utility Adjustments

This course provides participants with an overview of how to use ROWIS to manage utility adjustments as part of the project development process. It describes the process to create and manage records of utility adjustments in ROWIS, as well as the process to generate queries and reports to assist in that process. TxDOT uses ROWIS to manage the acquisition of property interests. Reimbursable utility facilities are a special case of property interests that TxDOT needs to manage during the project development process.

Instruction Level 1 (1 to 4 hours of training):

- Provide an overview of ROWIS.
- Provide an overview of how to use ROWIS to manage reimbursable utility adjustments.

Instruction Level 2 (5 to 8 hours of training)

- All Instruction Level 1 course content.
- Provide examples on how to create and manage records of utility adjustments in ROWIS.
- Provide examples on how to generate reports that might be needed to assist with the utility adjustment process, e.g., status of pending utility agreements and status of right of way parcels needed for the project (which utility owners would need to schedule facility adjustments).

Utility Permitting

Preparation, Submission, and Review of Utility Permits

This course provides information on how to prepare, review, approve, and manage utility permits at TxDOT. TxDOT currently uses a web-based system called Utility Installation Review (UIR), which automates the submission, review, approval, construction, and archival of utility installation requests. The system enables users to submit and process installation requests online, including supporting documentation such as design and construction drawings. This course provides training on how to use UIR, both by utility owners and TxDOT officials.

Instruction Level 1 (1 to 4 hours of training):

- Define the legal framework governing utility permits in the state of Texas.
- Introduction and demonstration of the UIR system.

Instruction Level 2 (5 to 8 hours of training):

- All Instruction Level 1 course content.
- UIR data input requirements.
- Group and individual exercises on how to use the system.
- Checking for accuracy and consistency of data input in UIR.
- Describe process to run queries and reports.
- Common errors and troubleshooting when working with the UIR system.

IMPLEMENTATION PLAN

The researchers recommend the following major steps to implement the various training courses or modules identified in the previous section:

- Schedule one-day training courses to disseminate the systematic use of UCMs in the project development process. The one-day UCM training course, which was developed as part of project SHRP 2 R15-B, is ready for deployment. The course content could be easily customized to suit TxDOT needs, as needed.

- Develop and pilot a one-day training course or module to describe the updated utility process at TxDOT that was developed as part of the research.

- Develop and pilot a two-day training course on the preparation of utility cost estimates. This course would use as a central component the Excel-based template developed as part of the research, and would enable participants to learn how to develop cost estimates for a variety of project conditions.

- Develop and pilot other training courses following a systematic approach that includes conducting a survey of user needs and takes into consideration factors such as availability of existing courses that could be updated to address relevant utility issues and financial constraints.

Potential impediments that might hinder the successful implementation of the strategy include the following:

- **Financial constraints**. Developing and delivering training requires committing resources that might not be immediately available or that compete against other priorities. While significant, one way to address this challenge is by making the business case that investing in utility-related training can result in short-term and long-term benefits to the department in the form of more effective communication and coordination with utility owners, fewer delays, and fewer opportunities for cost overruns and utility-related change orders and claims.

- **Perception of benefits**. Some stakeholders might not be convinced that developing and delivering training on utility topics is worth the investment. For example, during meetings with stakeholders, some highway designers were skeptical as to the need to consider utility conflicts early during the preliminary design stage on the basis that most utility conflicts tend to be addressed at about 60-percent design or later. One way to address this issue would be by providing training (with examples) to project managers, planners, designers, and utility owners on the benefits that can be realized by considering utility conflicts early in the project development phase.

The researchers have identified the following criteria or performance measure elements to evaluate the effectiveness of the implementation of this strategy:

- Number of courses that TxDOT implements.
- Number of TxDOT officials, by function category (e.g., utility coordination, preliminary design, design) who attend training courses.
- Overall improvement in the utility coordination process and utility accommodation during the PDP process.
- Reduction in the number of, and dollar amount associated with, unnecessary utility adjustments.
- Reduction in the number of, and dollar amount associated with, utility-related change orders or claims.

REFERENCES

1. *A Policy on the Accommodation of Utilities within Freeway Right of Way*. American Association of State Highway and Transportation Officials, Washington, D.C., 2005.
2. *A Guide for Accommodating Utilities within Highway Right of Way*. American Association of State Highway and Transportation Officials, Washington, D.C., 2005.
3. 43 TAC 21. Texas Administrative Code, Title 43, Part 1, Chapter 21. http://info.sos.state.tx.us/pls/pub/readtac$ext.ViewTAC?tac_view=4&ti=43&pt=1&ch=21 Accessed August 15, 2012.
4. *ROW Utility Manual*. Texas Department of Transportation, Austin, Texas, February 2011. http://onlinemanuals.txdot.gov/txdotmanuals/utl/utl.pdf . Accessed April 26, 2012.
5. Texas Engineering Practice Act. Occupations Code, Title 6, Subtitle A, Chapter 1001, Engineers. http://www.statutes.legis.state.tx.us/Docs/OC/htm/OC.1001.htm. Accessed August 15, 2012.
6. 33 USC 1251 et seq. Clean Water Act. http://www.gpo.gov/fdsys/pkg/USCODE-2011-title33/html/USCODE-2011-title33-chap26.htm. Accessed August 15, 2012.
7. Americans with Disabilities Act of 1990, as Amended. Department of Justice, Washington, D.C., 2009. http://www.ada.gov/pubs/ada.htm. Accessed August 15, 2012.
8. R. Ellis and H. Thomas. The Root Causes of Delays in Highway Construction. 81st Annual Meeting of the Transportation Research Board, Washington, D.C., 2002.
9. Right of Way and Utilities Guidelines and Best Practices. Strategic Plan 4-4, Subcommittee on Right of Way and Utilities, AASHTO Standing Committee on Highways, Federal Highway Administration, Washington, D.C., 2004.
10. C. Quiroga, E. Kraus, Y. Li, and J. Le. *Optimizing the Response and Participation of Utility Owners in the Development of Transportation Projects*. Research Report FHWA/TX-12/ 0-6624-1. Texas Department of Transportation, Austin, Texas.
11. Business Process Model and Notation (BPMN). Object Management Group, January 2011. http://www.omg.org/spec/BPMN/2.0. Accessed August 15, 2011.
12. *Project Development Process Manual*. Texas Department of Transportation, Austin, Texas, June 2009. http://onlinemanuals.txdot.gov/txdotmanuals/pdp/index.htm. Accessed August 15, 2012.
13. *Transportation Planning Process Manual*. Texas Department of Transportation, Austin, Texas, September 2001. http://onlinemanuals.txdot.gov/txdotmanuals/prc/index.htm. Accessed August 15, 2012.
14. *Transportation Programming & Scheduling Manual*. Texas Department of Transportation, Austin, August 2012. http://onlinemanuals.txdot.gov/txdotmanuals/sch/index.htm. Accessed August 15, 2012.

15. *Environmental Manual*. Texas Department of Transportation, Austin, Texas, August 2004. http://onlinemanuals.txdot.gov/txdotmanuals/env/index.htm. Accessed August 15, 2012.

16. *PS&E Preparation Manual*. Texas Department of Transportation, Austin, Texas, May 2012. http://onlinemanuals.txdot.gov/txdotmanuals/pse/index.htm. Accessed August 15, 2012.

17. Context Sensitive Solutions. Federal Highway Administration, Washington, D.C., 2005. http://contextsensitivesolutions.org. Accessed August 15, 2012.

18. *Selected Studies in Transportation Law, Volume 2. Eminent Domain*. National Cooperative Highway Research Program, Transportation Research Board, Washington, D.C., 2009.

19. 42 USC 4601 and following. U.S. Code, Title 42, Chapter 61, Sections 4601 and following. http://uscode.house.gov/download/pls/42C61.txt. Accessed August 15, 2012.

20. 23 CFR 645. Code of Federal Regulations, Title 23, Part 645, Utilities. http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div5&view=text&node=23:1.0.1.7.26&idno=23. Accessed August 15, 2012.

21. Construction Contract Administration Manual. Texas Department of Transportation, Austin, Texas, June 2007.

22. Texas Manual on Uniform Traffic Control Devices. Texas Department of Transportation, Austin, Texas, December 2011. http://www.txdot.gov/txdot_library/publications/tmutcd.htm. Accessed August 15, 2012.

23. C. Quiroga, E. Kraus, P. Scott, T. Swafford, P. Meis, and G. Monday. *Identification of Utility Conflicts and Solutions*. SHRP 2 Report S2-R15B-RW-1. Project SHRP 2 R15-B, Strategic Highway Research Program, Transportation Research Board, Washington, D.C., 2012.

24. Course catalog on the Texas Department of Transportation Training and Professional Development website. http://www.dot.state.tx.us/hrd/tdp/ecatalog/catalogtoc.htm. Accessed August 15, 2012.

25. *Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data (38-02)*. American Society of Civil Engineers, Reston, Virginia, 2002.

26. C. Quiroga, S. Kranc, D. Ford, E. Kraus, and T. Taylor. *A Unit Cost and Construction Specification Framework for Utility Installations*. Report FHWA/TX-07/0-4998-1. Texas Department of Transportation, Austin, Texas, March 2007.

27. C. Quiroga, S. Kranc, D. Ford, E. Kraus, and T. Taylor. *Construction Specification Requirements for Water and Sanitary Sewer Installations*. Report FHWA/TX-07/0-4998-2. Texas Department of Transportation, Austin, Texas, March 2007.

28. C. Quiroga, D. Ford, T. Taylor, S. Kranc, E. Kraus, and E. Park. *Specification Framework for Communication Utilities and Estimation of Utility Adjustment Costs*. Report FHWA/TX-08/0-4998-3. Texas Department of Transportation, Austin, Texas, December 2007.

29. *Transportation Code, Chapter 203, Subchapter E, Relocation of Utility Facilities, Sections 203.092-203.0941*. http://www.statutes.legis.state.tx.us/Docs/TN/htm/TN.203.htm. Accessed August 15, 2012.

30. C. Hendrickson. *Project Management for Construction. Fundamental Concepts for Owners, Engineers, Architects and Builders*. Department of Civil and Environmental Engineering, Carnegie Mellon University, Pittsburgh, Pennsylvania, 1998. http://www.ce.cmu.edu/pmbook. Accessed August 15, 2012.

31. Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges. Texas Department of Transportation, Austin, Texas, 2004. http://www.dot.state.tx.us/business/specifications.htm. Accessed August 15, 2012.