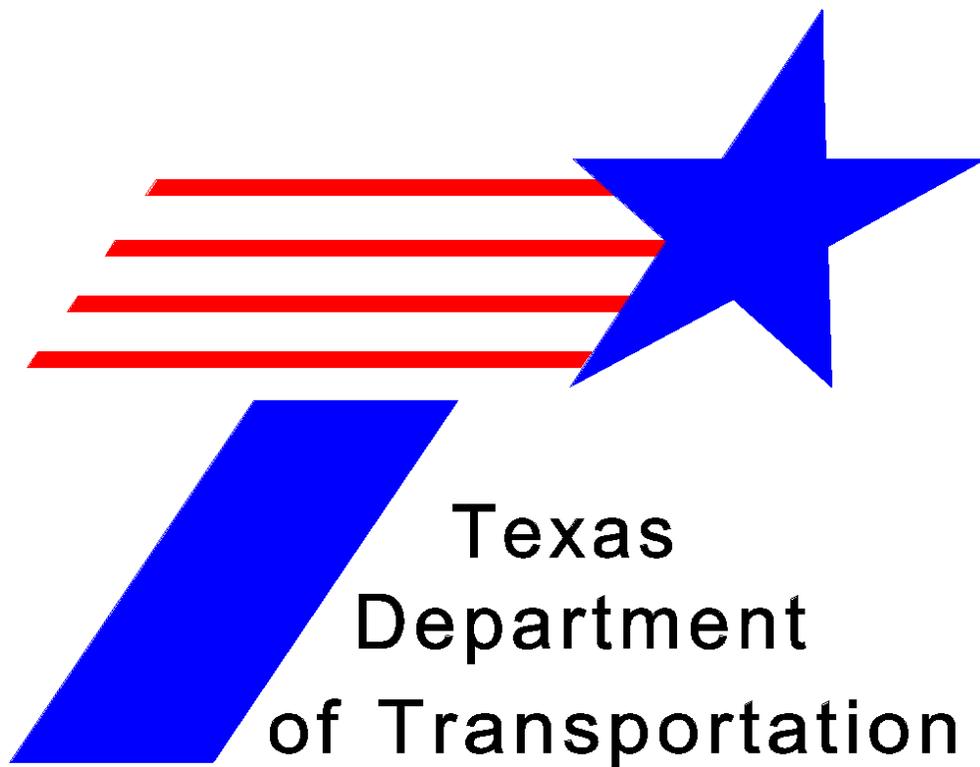


# Project Development Process Manual



Texas  
Department  
of Transportation

Revised July 2014

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## **Manual Notice 2014-1**

**From:** Gregg A. Freeby, P.E.

**Manual:** *Project Development Process Manual*

**Effective Date:** July 01, 2014

### **Purpose**

The manual is being revised to reflect a change made in the Roadway Design Manual.

### **Contents**

Page 2-59, **Pertinent Project Types**, the following bullet was added:

- ◆ A VE Study is not required on design-build projects. If the Project Manager chooses to conduct a study, this should be performed prior to the release of the Request for Proposal (RFP).

### **Contact**

Questions can be directed to Rory Meza of the Roadway Design Section of the Design Division at (512) 416-2678 or [Rory.Meza@TxDOT.gov](mailto:Rory.Meza@TxDOT.gov).

### **Archives**

Past manual notices are available in a [pdf archive](#).

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# Preface

## Non-discrimination

TxDOT policy is to ensure that no person in the United States of America shall on the grounds of race, color, national origin, sex, age or disability be excluded from the participation in, be denied the benefits of or otherwise be subjected to discrimination under any of our programs or activities.

## Overview

Consider the Project Development Process Manual as a guide:

- ◆ The manual details almost 200 tasks, or major steps, involved in developing a transportation project from identifying the project need to construction letting.
- ◆ Each task is described in a task summary. The task summaries form the majority of the manual's text. Tasks are grouped together into "sections" and "subsections."
- ◆ For the manual to cover many project types and complexity levels, almost every potential task is included. Use judgment in determining which task applies to a specific project.
- ◆ Each task summary refers to a responsible party and may also describe critical sequencing. Use judgment with this information since projects may have unique staffing and sequencing requirements.
- ◆ Many topics covered cannot be completely described. Use reference materials as appropriate.

## Organization of Information

The project development process is broken into six chapters:

1. Planning and Programming
2. Preliminary Design
3. Environmental
4. Right of way and Utilities
5. PS&E Development
6. Letting

To associate tasks into groups and show sequencing between task groups, the following organizational system is used:

- ◆ **Chapter.** Example: PS&E Development
- ◆ **Section.** Example: Begin detailed design

- 
- ◆ **Subsection** (optional). Example: Traffic control
  - ◆ **Task**. Example: Plan sequence of construction

The illustration below is a screen shot of how this information is displayed in the online manual table of contents.

▼ **5. PS&E Development**

▶ **1. Design Conference**

▼ **2. Begin Detailed Design**

**Overview**

**Traffic Control**

### Links

**Table of Contents Links** - Task summaries may be accessed directly through task summary titles listed in the table of contents of the Project Development Process Manual – the titles listed are online links to task summaries.

**Links to text within this manual** - Each section summary lists titles of task summaries. These titles are online links to only task summaries within this manual. Task summaries contain links to related information within the *Project Development Process Manual*.

**Links to text in other manuals** - Task summaries also contain links to related information in other TxDOT online manuals and the *TxDOT Glossary*. The summaries also give references and links to resource material by TxDOT and others.

### Flow Chart

A flow [chart](#) of the entire project development process can be downloaded in MicroSoft→ Excel format for printing or plotting.

The flow chart shows six rows of the chapters arranged relative to a time line. Each chapter row contains a sequence of sections and subsections.

### Functions

The *Project Development Process Manual*:

- 
- ◆ is a technical manual that covers the “who”, “what”, and “when” of the project development process.
  - ◆ provides references and online links to the procedural (“how to”) information contained in TxDOT procedures manuals.
  - ◆ is written primarily for TxDOT personnel.
  - ◆ describes “tasks” or steps involved in developing a transportation construction project - from inception to letting.
  - ◆ provides very basic information on a broad range of topics, written in a simple manner, for users with varying experience levels and specialty areas.

## Benefits

The *Project Development Process Manual* should:

- ◆ help prevent project delays by clearly showing the sequence of project tasks.
- ◆ enable project staff to perform a task only once and at the right time.
- ◆ give experienced project managers a quick reminder list of tasks.
- ◆ reduce learning time for employees assuming new responsibilities.
- ◆ improve communication and understanding between TxDOT districts, divisions, and the consultant community, by providing a clear and consistent definition of the process and its component tasks.
- ◆ make it easier to prepare project schedules and scopes by offering defined work items, terminology, and sequencing.
- ◆ promote overall understanding between staff, often working in specialized areas, on how their work relates to work by others.
- ◆ give an appreciation for each other’s diverse work responsibilities.
- ◆ enable improving the process by documenting its current arrangement.

## Comments

To submit comments or suggested changes to this manual, please complete the Manual [Comment Form](#).

# Chapter 1

## Planning and Programming

### Contents:

- Section 1 — Needs Identification
- Section 2 — Project Authorization
- Section 3 — Compliance with Planning Requirements
- Section 4 — Study Requirements Determination
- Section 5 — Construction Funding Identification

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## Section 1

### Needs Identification

#### Overview

This section discusses the tasks of identifying and documenting the need for a project. The need for a project may be identified in many ways, including suggestions from maintenance supervisors, area engineers, district staff, local elected officials, developers, and the traveling public. Once a project is suggested, research should be conducted to prioritize the need for one project relative to others competing for limited funds.

This section includes the following tasks listed in chronological order.

1000. [Identify project need and scope](#)

1010. [Perform site visit](#)

#### 1000: Identify project need and scope

**Description.** Many factors are considered in determining project need including accident frequency and severity, pavement condition, bridge condition, and conformance with current geometric standards. The need for a project may be identified in the following ways:

- ◆ Projects may be suggested by maintenance supervisors, area office staff, district staff, local officials, developers, or the traveling public.
- ◆ For urban projects, particularly capacity improvements, the need for a project may be determined from traffic modeling of future travel demands. This data may be requested from the Transportation Planning and Programming (TPP) Division through the Director of Transportation Planning and Development or, in some cases, from local governmental entities. The project should be evaluated for compliance with planning documents. (See [1300](#): Evaluate compliance with planning documents).

For some specific urban projects, the development process may also arise from a need for a sustainable street and transit network associated with the potential project in the context of desired land uses and urban design established in regional plans, comprehensive plans, neighborhood plans, other local plans, special district plans, relevant public-private partnerships or economic development plans. While not indicated directly in the project development process flow chart, these plans may indicate that the Needs Identification step should be revisited.

- ◆ The need for rural [added capacity](#) projects may be identified through a trend analysis and forecasted growth data obtained from TPP through the Director of Transportation Planning and Development.

- 
- ◆ Area Engineers generally determine rehabilitation needs for their areas in consultation with maintenance supervisors and local officials.
  - ◆ Off-system projects are generally identified through statewide ranking formulas and through consultation with local officials.
  - ◆ Public meetings may generate comments on area-wide transportation needs.
  - ◆ A review of traffic accident (or crash) information may alert the department to needed improvements.
  - ◆ Needs may be identified through the Pavement Management Information System or the Wet Weather Accident Reduction Program.
  - ◆ Studies from adjacent projects (see [1310](#): Identify and review related studies) may indicate needs in other areas.

**Pertinent Project Types.** All projects.

**Responsible Party.** District staff

**Sub-tasks.**

- ◆ Gather information on pavement conditions from the district Pavement Engineer.
- ◆ For bridges, coordinate with bridge planning engineers in the Project Development Section of the Bridge Division.
- ◆ Review Transportation Improvement Program (TIP) meeting minutes.
- ◆ Identify community concerns and critical issues. In urban areas, this includes coordinating with the MPO. In some areas, coordination with Municipal Urban Planning Organizations, Neighborhood Land Use Planning Groups, etc. may be appropriate.
- ◆ In urban areas, evaluate compatibility of the project with the MTP.
- ◆ Consider the need for multimodal alternatives and intermodal connections (see [1450](#): Identify multimodal alternatives and intermodal connections) and coordinate with other disciplines (e.g. planner, landscape architect).
- ◆ Consider the impacts of freight transportation and freight movement patterns.
- ◆ Review existing geometrics and compare to current rehabilitation and reconstruction design criteria.
- ◆ Consider the need for control of access.
- ◆ Evaluate conversion of two-way frontage roads to one-way operation. Refer to the *Roadway Design Manual* Chapter 3, Section 6, “[Conversion of Frontage Roads from Two-way to One-way Operation](#)”.
- ◆ Review traffic accident information to identify locations having a high incidence of traffic accidents (relative statewide incidence) for potential projects. Refer to the *Highway Safety*

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*Improvement Program Manual*, [Obtaining Crash Data](#) for information on how to obtain and analyze traffic accident information. Assistance in obtaining or reviewing traffic accident information is available from the Traffic Operations Division (TRF).

- ◆ Include curb ramp construction on any project that includes the construction of new curb.
- ◆ [1300](#): Evaluate compliance with planning documents.
- ◆ Prepare a draft purpose and need statement, (see [3240](#): Prepare “Purpose and Need” statement) it likely will be required, later on, as part of an environmental document.

**Critical Sequencing.** Needs identification should be done as the first step in the project development process.

**Resource Material.**

- ◆ TxDOT [Bridge Project Development Manual](#)
- ◆ TxDOT *Highway Safety Improvement Program Manual*, [Obtaining Crash Data](#).

### 1010: Perform site visit

**Description.** Site visits should be performed to properly assess project needs and, later, to adequately design a project. Although maps or aerial photography may exist and may give an overview of a project area, a site visit is essential to obtain a complete understanding of the project area. The purpose of the visit should be to identify needed improvements and physical/environmental constraints.

**Pertinent Project Types.** All projects.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Gather pertinent plans, maps, and reference material to use as guides in locating existing features.
- ◆ Gather information on governmental jurisdiction boundaries such as cities, counties, utility districts, and water reservoir areas.
- ◆ Visit project site with others having relevant knowledge - such as the drainage engineer, structural engineer, traffic engineer, biologist/botanist and other environmental staff.
- ◆ Take notes, photographs, and/or videotape of the project area and key project issues. Make notes on the presence of any utilities, development adjacent to the right of way, overall terrain, etc.

**Helpful Suggestions.** The following suggestions are offered to make the visit to the site more productive:

- 
- ◆ Input from an environmental specialist, while at the site, can be useful in determining environmental constraints. For more information on obtaining environmental data, refer to the TxDOT *Environmental Manual*, Chapter 2, [Preliminary Survey](#).
  - ◆ For visiting remote, off-road sites, consider using portable Global Positioning System (GPS) devices to determine locations.
  - ◆ Use a measuring wheel or tape to check as-built dimensions.
  - ◆ If videotaping the area, include appropriate verbal comments describing areas being videotaped such as road signs or other small, delineating features that may be difficult to see on a video image. Be sure to drive and tape the project in both directions. Consider calling out odometer readings to establish relative locations on a large project. Review part of the tape as a check before leaving the site.
  - ◆ Photos of stream areas can be especially useful, later, in determining roughness coefficients used in hydraulic calculations and in determining high water marks.
  - ◆ In collecting data for preliminary design, look for the following features:
    - Potential project constraints (e.g., major utilities, wetlands, parks, historic structures, potential hazardous materials, floodplains, cemeteries, cultural facilities.)
    - utility markers
    - flood-prone areas
    - clear zone or right of way encroachments
    - significant trees to preserve
    - possibly contaminated areas
    - intersection geometry.

Critical Sequencing. A right of entry (see [2150](#); Obtain right of entry) or other written evidence of permission must always be obtained before entering private property.

**Resource Material.** TxDOT [Hydraulic Design Manual](#).

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## Section 2

### Project Authorization

#### Overview

All projects must be approved by the Texas Transportation Commission, either by inclusion in the Unified Transportation Program (UTP) or through a project specific minute order, before beginning project development. Projects are authorized as either a Feasibility Study, or one of three levels of authority - PLAN, DEVELOP or CONSTRUCT, as described in the [Transportation Programming and Scheduling Manual](#). To obtain PLAN authority for a project, submit a request to the director of the Transportation Planning and Programming Division.

This section includes the following tasks listed in chronological order.

- 1200. [Prepare cost estimate](#)
- 1230. [Obtain approval of PLAN authority.](#)
- 1235. [Obtain project specific minute order, if required](#)

#### 1200: Prepare cost estimate

**Description.** To obtain adequate funding for a project, prepare construction cost estimate and separate right of way (ROW) cost estimate, and enter the estimates into the Design and Construction Information System ([DCIS](#)). It is important for this information to be correct in DCIS so that the Project funding data will be correct in the Financial Information Management Systems (FIMS).

It is important to clearly define the project scope when a project is first considered for programming. An accurate scope of work ensures the design addresses the project purpose and need and is also needed to develop a high-quality preliminary cost estimate. Some issues that should be considered when developing the scope are:

1. Type of work proposed (2R, 3R or 4R)
2. Proposed typical section
3. For existing geometry - meets appropriate design criteria or consider realignment
4. Specify safety improvements indicated by accident analysis
5. Existing and proposed pavement

6. Bridges (size and complexity) (see ‘Considerations for Estimating Cost of Bridge Projects’ on the Bridge Project Development intranet page)
7. Earthwork and retaining walls or sloped embankments
8. Drainage issues and possible solutions
9. Accessibility improvements and/or sidewalks and/or bicycle facilities
10. Potential environmental issues and mitigation
11. Traffic control plans including detours
12. Specialized designs and technology incentives

Reasonable and accurate cost estimating, and intermittent updating of these costs, helps maintain public confidence and trust throughout the life of a project. When a project cost estimate escalates, it impacts the funding for other needed projects and requires that the department has a record to explain the reason for rising estimated costs.

The [Annual Scope and Estimate Documentation](#) form and related information is available on the FIN intranet site.

The Advance Planning Risk Analysis (APRA) [tool](#) developed under TxDOT research project 0-5478 offers a method to measure project scope definition for completeness and identify potential risks early in the project. With this tool, users identify the critical elements of the project scope across all disciplines. This tool is suggested for use throughout the project’s life cycle and is referenced at several key stages in this manual. The APRA User Guide is available [here](#).

An AASHTO cost estimating program, Estimator<sup>®</sup>, is available for preparing estimates on a personal computer. Check with your automation administrator for access to the program. Estimator<sup>®</sup> requires a ‘catalog’ of bid items and bid prices. The latest [catalogs](#) are posted on the TxDOT Internet website. For more information on Estimator<sup>®</sup>, refer to the *PS&E Preparation Manual*, Chapter 4, Section 2, [Estimator<sup>®</sup> Software](#) or contact the Field Coordination Section of the Design Division.

**Pertinent Project Types.** All projects.

**Responsible Party.** Director of Transportation Planning and Development

**Sub-tasks.**

- ◆ Obtain design information about the project, such as: project length, proposed bridges and major drainage structures, proposed typical sections, expected pavement structure, and required ROW widths.

- 
- ◆ Include significant traffic control/detour costs.
  - ◆ Research major costs likely because of environmental protection/mitigation measures.
  - ◆ Although not included in the construction estimate, research major costs associated with utility adjustments/relocations because they are ultimately paid for by the public.
  - ◆ For programming estimates, note project items to be paid for by others (e.g., sidewalk to be paid for by city), and write down assumptions for future reference (e.g., project does not include illumination).
  - ◆ Obtain recent unit bid prices for similar projects from TxDOT sources including TxDOT's Internet and Intranet (crossroads) sites. Unit bid prices shown at these sites are updated every month by the Construction Division. Using accurate bid prices is very important to calculating a reasonable estimate.
  - ◆ Prepare the construction cost estimate in a chart with column headings in order of: Bid Item Number, Item Description, Unit (of measure), Quantity, and Price. In a programming estimate, bid item numbers are optional - but still helpful.
  - ◆ Add additional costs in the range of 10% to 20% for miscellaneous, minor items such as erosion control measures, striping, pavement markings and signs.
  - ◆ Include approximately 6% to 11% for engineering and contingencies to arrive at an estimated total cost.
  - ◆ Prepare a separate right of way cost estimate, including [eligible utility adjustment](#) costs. ROW project limits should be the same as the construction project limits for the corresponding project.
  - ◆ Review cost estimates with project manager or other staff knowledgeable about the project.
  - ◆ Enter the construction and ROW cost estimates into DCIS. Refer to the [DCIS User Manual](#).

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**Helpful Suggestions.**

- ◆ A listing of 8-character bid item numbers, brief item descriptions, and units of measure are contained in the Universal Spec File (USF). The USF is available on ROSCOE and at the TxDOT Internet website.
- ◆ Detailed descriptions of work (and/or materials) included in bid items are available in TxDOT's "spec book" - the *Standard Specifications For Construction and Maintenance of Highways, Streets, and Bridges* and in TxDOT's Special Specifications (available through ROSCOE). Bid item numbers will correspond to standard specification item numbers and special specification item numbers.
- ◆ Relocating major utilities (e.g., fiber optic lines) or providing environmental mitigation measures (e.g., filtration basins) can be major project costs that usually can be identified early with minimal effort and making a field visit.
- ◆ As a rough check, compare the estimate to cost per mile for similar projects in the area.
- ◆ It is better to slightly overestimate than underestimate. Generally, a preliminary estimate is considered reasonable if, later, it is found to be within +/- ten percent of the final cost estimate.
- ◆ Do not prepare overly high estimates because they will tie up funds that could be allocated to other projects.

**Resource Material.**

- ◆ For bridge cost estimating information, refer to the TxDOT [Bridge Project Development Manual](#).
- ◆ For information on entering cost estimate data into DCIS, refer to the TxDOT the [DCIS User Manual](#).
- ◆ *PS&E Preparation Manual*, Chapter 4, [Section 2](#).
- ◆ A source of cost estimating information for transit projects, including HOV lanes, is the [American Public Transportation Association](#) (APTA).
- ◆ [Finance \(FIN\) Intranet site](#) for information on scoping and estimating projects.

**1230: Obtain approval of PLAN authority**

**Description.** The Transportation Planning and Programming Division (TPP) authorizes projects for TxDOT's PLAN authority status. PLAN authority permits the conduct of advanced planning, preliminary design, environmental studies, right of way determination, route studies, and public involvement activities.

- ◆ To obtain PLAN authority, send request to the director of the Transportation Planning and Programming Division.

- ◆ With PLAN authority, work should proceed to complete right of way maps and identify necessary environmental permits, clearances and coordination.

**Pertinent Project Types.** Projects in the following UTP categories:

- ◆ Category 2 - Metropolitan Area (TMA) Corridor Projects;
- ◆ Category 3 - Urban Area (non-TMA) Corridor Projects; and
- ◆ Category 4 - Statewide Connectivity Corridor Projects.

**Responsible parties.** Director of Transportation Planning and Development.

**Helpful suggestions.**

- ◆ At this time, the programming and scheduling manager should obtain a valid TxDOT control-section-job (CSJ) number from TPP for project development. A 900 series job number means that the project is not authorized for project development work, and the programming and scheduling manager should contact TPP to resolve the situation.
- ◆ PLAN authority is controlled by TPP because these projects are not officially part of the UTP.
- ◆ When approved for PLAN authority, the district should verify that the project fund authorization has been properly set up in the Financial Information Management System (FIMS). Contact the district accounting office for assistance. This generally includes function codes 102- 150. The project should be set up in FIMS before proceeding with any work.

**Resource Material.** [\*TxDOT Transportation Programming and Scheduling Manual\*](#).

### 1235: Obtain project specific minute order, if required

**Description.** A [minute order \(MO\)](#) for project authorization is requested by district staff through the Transportation Planning and Programming Division (TPP).

An MO is needed in the following situations:

- ◆ **Project authorization.** An MO is needed if a project is not authorized in the current Unified Transportation Program (UTP) or in a Bank Balance Allocation Program.
- ◆ **Control of access.** All projects are assumed to be non-controlled access unless the district sends a request to TPP for an MO to be passed designating the facility, or a portion of the facility, as controlled access under Transportation Code, §203.031 (HB 179, 55<sup>th</sup> Legislature, 1957.) The control of access line on schematics, ROW maps and plans should be coincident with the back of curb or property (ROW) line and clearly depicts the locations where access to the highway is denied.
- ◆ **Route designation.** If the project is on new location, the district may want to request route designation in the same MO.

- ◆ **Donations.** A MO is needed for accepting donations, such as right of way.
- ◆ **Authority to contract.** For TxDOT, the authority to contract for the project is in the form of a MO. The MO may be a specific MO authorizing a project.

**Pertinent Project Types.** All projects.

**Responsible Party.** Director of Transportation Planning and Development

**Helpful Suggestions.**

- ◆ Assistance with minute orders is available from TPP.
- ◆ Copies of minute orders are available from the Texas Transportation Commission Minute Clerk.

**Critical Sequencing.** Obtain project authorization before starting project development or executing an agreement with outside entities.

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## Section 3

### Compliance with Planning Requirements

#### Overview

This section involves integrating project planning with various local, regional and statewide plans. As part of that integrated planning, applicable requirements are determined and complied with.

This section includes the following tasks. The tasks are listed in approximate chronological order but may be performed concurrently in some cases.

- 1300. [Evaluate compliance with planning documents](#)
- 1310. [Identify and review related studies](#)
- 1330. [Identify area/regional goals and plans](#)
- 1350. [Identify corridor plan development needs](#)
- 1360. [Partnership plan review/coordination](#)
- 1370. [Identify funding alternative/feasibility - economics, value capture, sustainability](#)
- 1380. [Institutionalization of coordination/partnerships in project development](#)

#### 1300: Evaluate compliance with planning documents

**Description.** After preparing a purpose and need statement (see [3240](#): Prepare “Purpose and Need” statement), the project manager assesses the following situations:

1. Whether the proposed project follows the policy and mandates of the [Texas Transportation Plan](#).
2. Whether the project is consistent with regional and local transportation plans and other related local plans.

**Pertinent Project Types.** New construction, reconstruction, and rehabilitation projects.

**Responsible Party.** Director of Transportation Planning and Development

#### Sub-tasks.

- ◆ Review Texas Transportation Plan, Metropolitan Transportation Plan (MTP), and local master street plans and networks.

- ◆ Review Metropolitan Planning Organization’s (MPO’s) Transportation Improvement Plan (TIP) and projects selected by the district.
- ◆ Consult with district coordinators and local planning staffs for other modes, and assess need to incorporate design features to accommodate other modes (e.g., transit, pedestrian, bike, port, railroad, aviation).
- ◆ For projects along the Gulf Coast, consult the State's Coastal Zone Management Plan for project development considerations.
- ◆ Work with the district planning staff to coordinate with the MPO and other planning entities.

### **Critical Sequencing.**

- ◆ Delays may occur without proper coordination with the MPO and other stakeholders.
- ◆ The project must be listed in the Statewide Transportation Improvement Program (STIP) before any federal transportation funds can be used.

### **Resource Material.**

- ◆ TxDOT [\*Transportation Planning Manual\*](#)
- ◆ [Texas Transportation Plan](#)
- ◆ Public Transportation in Texas - Profiles and Projections
- ◆ Coastal Zone Management Plan (for projects along the Gulf coast)
- ◆ Regional Plans: Economic or Transportation/Highway - available from the Texas Review and Comment System (TRACS)
- ◆ Metropolitan Transportation Plan - available from the MPO in urban areas
- ◆ City plans including: comprehensive plan; regional transit plans; transit-oriented development (TOD) plans; other land use plans; economic/commercial development plans; street or transportation plans; neighborhood plans; and bicyclist/pedestrian plans; greenway/trails plans; and Tax Increment Reinvestment Zone (TIRZ) project plans or other similar plans for other value capture districts.

## **1310: Identify and review related studies**

**Description.** Related studies may provide information for planning a project and assessing the relationship between a specific project and neighboring projects. Obtaining and reviewing these studies gives a broader perspective of regional needs.

Types of related studies include:

- ◆ Feasibility study
- ◆ Route study

- ◆ Toll road study
- ◆ Corridor study
- ◆ Subarea study
- ◆ Major Investment Study (MIS)/environmental documentation
- ◆ Value engineering study
- ◆ Similar studies that propose transportation capital investments.

**Pertinent Project Types.** New construction and reconstruction projects.

**Responsible Party.** Director of Transportation Planning and Development

**Helpful Suggestions.** Coordinate and consult with the Transportation Planning and Programming Division. Check with city, county, MPO, transit or special authority, and recognized neighborhood planning organizations for plans or studies in the affected area.

**Critical Sequencing.** This task should occur before preliminary design.

**Resource Material.** TxDOT [Transportation Planning Manual](#)

### 1330: Identify area/regional goals and plans

**Description.** Coordination with other entities and other areas of expertise is important to ensure that projects compliment the surrounding community or local area. This early coordination is important since the transportation corridor may be only one component of the long term local objectives.

One method being used to coordinate efforts between entities is the consideration of Context Sensitive Solutions (CSS) principles to help establish the regional, local and neighborhood vision or long term objectives. While not applicable to all project types (i.e., restoration, preventive maintenance, etc.), CSS principles can result in compatibility between the transportation facility and its surroundings so that the two are mutually supportive. Transportation and development projects may be better accomplished in a joint development or well coordinated process that will meet the objectives of multiple stakeholders.

For example, local entities may wish to encourage certain development, preserve, change or sustain the character of a specific area of the community or set future sustainable development for an entire transportation corridor or area network.

More than just providing CSS principles for an individual project or corridor, this concept promotes the establishment of public and private partnerships that can support the project by (1) bringing together the future revenue streams with costs in order to provide funding for operation and maintenance, (2) creating funding for future projects; and (3) optimize return on public resources such as

local tax bases. The establishment of these long term relationships that consider transportation projects in the context of regional or local overall objectives can be a significant future benefit.

The Institute of Transportation Engineers (ITE) and the Congress for the New Urbanism (CNU) have developed a proposed recommended practice document describing the use of CSS community process principles and context sensitive design for streets, intersections, and networks, providing design flexibility in project development. This ITE publication, *Context Sensitive Solutions in Design Major Urban Thoroughfares for Walkable Communities*, 2005, looks at the project development process in terms of describing a transportation project as one part of the community of stakeholder's overall objectives for an area. Again, while not applicable to all project types, a companion document, *Context-Sensitive Design Around the Country*, Transportation Research Board, 2004, offers many examples of this approach to project development including urban and rural environments. These resources and the resource material listed provide guidance for developing cooperative partnerships and using the CSS process.

Possible outcomes in considering the CSS principles and partnerships include:

- ◆ Long-range vision for the community and project
- ◆ Community values and issues
- ◆ Supporting data
- ◆ Community and agency priorities
- ◆ Development of interdisciplinary teams
- ◆ Education of stakeholders regarding issues, process, and constraints
- ◆ Establishing planning process, which identifies decision points and stakeholder roles and responsibilities
- ◆ Identification of design flexibility within the project development process.

Consult the following possible partners/stakeholders:

- ◆ municipal departments
- ◆ chambers of commerce and regional economic development organizations
- ◆ professional and non-profit local organization chapters
- ◆ Councils of Government (COGs)
- ◆ community leaders
- ◆ adjacent property and business owners
- ◆ developers
- ◆ redevelopment and community development agencies
- ◆ economic development agencies

- 
- ◆ transit authorities
  - ◆ special authorities and improvement districts
  - ◆ school districts
  - ◆ public utilities
  - ◆ public housing
  - ◆ rural areas' Texas Review and Comment System (TRACS) agency
  - ◆ railroads, ports/harbors, bus companies
  - ◆ regional transit authorities and rail districts.

Usually, the following district staff have established contacts with local entities:

- ◆ director of transportation planning and development
- ◆ community development and planning directors
- ◆ advanced project development engineer
- ◆ area engineer
- ◆ public transportation coordinator
- ◆ bicycle coordinator
- ◆ pedestrian coordinator
- ◆ planner
- ◆ public information officer.

The following divisions may be contacted:

- ◆ Aviation Division for project development within airport property and interface issues
- ◆ Multimodal Section of the Transportation Planning and Programming Division (TPP) for water, rail freight, and ports issues
- ◆ Public Transportation Division.

**Pertinent Project Types.** All projects except preventive maintenance and restoration projects.

**Responsible Party.** Director of Transportation Planning and Development

**Sub-tasks.**

- ◆ Identify stakeholders in project area.
- ◆ Coordinate CSS workshop for partners/stakeholders to establish area/project visions, goals, objectives, issues, and opportunities.
- ◆ Establish contacts and/or teams for ongoing feedback and to move project issues forward.

- ◆ Participate in related workshops sponsored by project stakeholders.

**Resource Material.**

- ◆ Federal Highway Administration, *Flexibility in Highway Design*, 1997
- ◆ Transportation Research Board, NCHRP Report 480: *A Guide to Best Practices for Achieving Context Sensitive Solutions*, 2002
- ◆ American Association of State Highway Officials, *A Guide for Achieving Flexibility in Highway Design*, 2004
- ◆ Institute of Transportation Engineers, Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities, *An ITE Proposed Recommended Practice*, 2005, as amended
- ◆ Transportation Research Board, *Context-Sensitive Design Around the Country*, Circular EC067, July 2004.

**1350: Identify corridor plan development needs**

**Description.** Network and corridor planning is an early opportunity to establish a framework for integrating specific urban thoroughfare projects into a local area's overall objectives. This represents an early opportunity to bring public and private stakeholders together to discuss the transportation project. This helps to expedite the project development process by identifying and addressing key issues, opportunities, and community objectives early rather than for the first time during the planning and design of the individual roadway project.

This integrated network and corridor planning process can:

- ◆ Determine the relationships and needs for both mobility and land uses along the corridor and in the area.
- ◆ Determine how decisions for individual thoroughfare segments affect the corridor and the transportation network as a whole.
- ◆ Establish objectives, operational concepts, context-based functions, performance measures and thresholds, transect- or context-zones, land uses, access control and functional classification for an entire network or corridor, which can be applied to individual thoroughfare segments in project development.
- ◆ Allow for policy, social and public discussion of debate on issues that impact a broader area than an individual thoroughfare segment.
- ◆ Bring to light additional related studies that may provide information for planning a project and assessing the relationship between a specific transportation project and neighboring community projects. Obtaining and reviewing these studies can give a broader perspective of network and corridor needs. Types of related studies include: feasibility study, route study, toll

road study, corridor study, major investment study (MIS), market study, fiscal impact study, value capture study, environmental documentation, and value engineering study.

**Pertinent Project Types.** New construction, reconstruction, and some rehabilitation projects.

**Responsible Party.** Director of Transportation Planning and Development and Project Managers

**Subtasks.**

- ◆ Coordinate this work with district staff and divisions listed in Section [1330](#).
- ◆ Review local planning documents.
- ◆ Review any speciality municipal plans for study area.
- ◆ Review special purpose studies (for example, study to create economic development area around major terminal or TOD).
- ◆ Review Public Transportation in Texas - Profiles and Projections.
- ◆ Review other specialty plans, as appropriate (e.g., water/wastewater, other utility, aviation, railroads, ports).
- ◆ While obtaining plans, inquire from the agency whether they can advise of other relevant plans or agencies to contact.
- ◆ Meet with regional and local agency staff and discuss area objectives together with the need to bring stakeholders into the process.
- ◆ Assess corridor mobility and land use opportunities, needs, issues, objectives, and existing plans and, with stakeholders, determine which ones should be considered or developed further.

**Helpful Suggestions.** Coordinate and consult with the Transportation Planning and Programming Division. Meet with city, county, COG department managers, and other public or private stakeholders to obtain input and published plans or information.

**Critical Sequencing.**

- ◆ Obtain local plans early because project planning by public and private local entities may affect transportation project planning.
- ◆ This task should occur before preliminary design.

**Resource Material.**

- ◆ TxDOT [Transportation Planning Manual](#)
- ◆ Municipal plans (comprehensive land use, transportation, housing, redevelopment, water/wastewater)
- ◆ City, county and MPO transportation plans and projections: street, transit, pedestrian and bicycle, aviation, freight or transportation plan

- ◆ Local economic development plans or value capture scenarios
- ◆ TRACS regional plans
- ◆ Chamber of Commerce, regional economic development organization, or regional visioning publication
- ◆ Councils of Government/MPO.

### 1360: Partnership Plan Review/Coordination

**Description.** As the planning process at this point begins to move the project from the planning process toward the initial stages of design development, coordination of the partnerships that have been established become critical. The stakeholders have to make solid and supported commitments to the project effort at this point. The expected outcomes of this step include commitments for:

- ◆ Joint/coordinated progress toward transportation improvement concepts and plans for land use enhancements and development.
- ◆ Innovative solutions that meet project needs, reflect community values, and enhance resources.
- ◆ Compatibility and support of the transportation improvement within its context of the surrounding area and activities.
- ◆ Expedited approval of the project through early and consistent stakeholder involvement.
- ◆ Agreement on the relationship between sustainable land uses/urban design and the transportation system.
- ◆ Agreement on multi-modality potential including vehicular, transit, pedestrian, bicycle and green infrastructure such as trails.
- ◆ Agreement on the travel demand forecasts and network functionality for various modes of travel that will guide the project development process.
- ◆ Identification of any performance measures, sustainability goals or milestones that will be used in project development.
- ◆ Application of CSS, design flexibility and documentation of design decisions (see [2000](#): Conduct Design Concept Conference, Design Summary Report (DSR)).
- ◆ Commitment for continuation of stakeholder input throughout the design of the project.
- ◆ Assurance that commitments made in the planning process are honored through construction.

**Pertinent Project Types.** All projects except preventative maintenance and restoration projects.

**Responsible Party.** Director of Transportation Planning and Development and Project Managers

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**1370. Identify funding alternative/feasibility - economics, value capture, sustainability**

**Description.** As part of the partnership coordination, the transportation project development process considers the effects of financial decisions on costs, liability risks and operations and maintenance. Application of CSS partnerships/principles and design flexibility can affect these funding considerations in specific project applications.

Depending on the type and timing of the project, the stakeholders may need to consider a range of alternatives to traditional transportation funding. These alternative funding sources can provide a broader approach to project development and offer opportunities within corridors beyond just the transportation facility itself.

Some non-traditional funding and resource considerations include:

- ◆ Economic development potential
- ◆ Value capture through public improvement districts, tax increment reinvestments zones and other special district or public-private agreements
- ◆ Transportation reinvestment zones
- ◆ Public improvement districts
- ◆ Private funding or donation
- ◆ Bonding capacity
- ◆ Comprehensive development agreements
- ◆ Pass-through financing and other cost recapture approaches
- ◆ Consideration of savings from long-term project and resource sustainability.

**Pertinent Project Types.** All projects except preventative maintenance and restoration projects.

**Responsible Party.** Director of Transportation Planning and Development and Project Managers

**Subtasks.**

- ◆ Identify potential funding sources and partners as appropriate (local government entities, other public agencies, adjacent property owners, other private sources, etc.).
- ◆ Consider advantages, disadvantages, and necessary actions to make the best options viable.
- ◆ Identify appropriate agreements to facilitate long-term sustainability of the project and its context by supporting and tracking future capital investment, debt service, credit enhancements as well as operation and maintenance.

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**1380. Institutionalization of Coordination/Partnerships in Project Development**

**Description.** The institutionalization of coordination/partnerships developed early in the project development process is necessary if it is to be sustained through the project planning phase, the development phase and the construction phase. Even at the individual project level, unless these partnerships are actively involved, the likelihood of a successful project that meets as many objectives as possible within the local context can be significantly reduced. Further, and perhaps more importantly, the partnerships created should be maintained for future development beyond simply the immediate project, corridor or area transportation network.

There are several ways to assist in maintaining these partnerships and coordinating these efforts. For example, a Metropolitan Planning Organization (MPO) is required for each urbanized area with a population of 50,000 or more. The MPO's Metropolitan Transportation Plan (MTP) is a long-range plan that identifies transportation facilities functioning as an integrated transportation system. Early project planning and development must be coordinated with applicable MTP's.

The public involvement process (see [3010](#): Determine public involvement needs) is an additional activity requiring coordination with the MPO. An MPO may have its own specific public involvement requirements.

Different vehicles for sustaining these partnerships may function better in different circumstances. These partnerships and project coordination can result in:

- ◆ Better identification of community transportation, land use, development, activity centers, and other context issues that provide future direction.
- ◆ Identification of public and private stakeholders priorities.
- ◆ Development and coordination of interagency multidisciplinary teams.
- ◆ Regular communication among stakeholders.
- ◆ Better educational outreach and transparency for agencies involved in project development.
- ◆ A pattern for future coordination of transportation issues within established community contexts.
- ◆ Identification of design issues, area planning goals, environmental process coordination, and/or construction phasing.
- ◆ Feedback on individual projects through construction as well as future coordination efforts.

**Pertinent Project Types.** Projects or facilities contained in the MTP.

**Responsible Party.** Director of Transportation Planning and Development and Regional/Local Agency Planning Directors

**Helpful Suggestions.** Coordinate with the district and local agency planning staff.

**Resource Material.** TxDOT [Transportation Planning Manual](#)

**Subtasks.**

- ◆ For individual corridors or projects, review each task in [Section 3](#) to ensure that any later task revisions are still appropriate. This review process may necessitate revision of conclusions about the Project Need and Scope. This feedback loop will insure that issues are not overlooked so that the project will (1) support community sustainability and economic development goals, and (2) allow for project development to stay on schedule.
- ◆ Maintain regular involvement and communication among stakeholders.

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## Section 4

### Study Requirements Determination

#### Overview

This section includes information on determining the project's scope and addressing regional, state and federal requirements. Federal and State requirements, along with Texas Transportation Commission policies, affect project development.

This section includes the following tasks that may be performed concurrently.

- 1400. [Review scope, cost, and staff requirements of project development](#)
- 1410. [Determine need for feasibility \(route/corridor\) study](#)
- 1420. [Determine if Statewide Implementation Plan requirements apply](#)
- 1430. [Obtain traffic data](#)
- 1440. [Determine need for Major Investment Study](#)
- 1450. [Identify multimodal alternatives and intermodal connections](#)
- 1460. [Determine conformity with Congestion Management Process requirements](#)
- 1480. [Evaluate inclusion of High Occupancy Vehicle/High Occupancy Toll lanes](#)
- 1490. [Evaluate inclusion of tollways](#)
- 1500. [Evaluate railroad corridor preservation](#)

#### 1400: Review scope, cost, and staff requirements of project development

**Description.** The scope of the project should be reviewed to determine specific work tasks that will be needed. Refer to the scope discussion contained in Task [1200](#): Prepare Cost Estimate.

The Advance Planning Risk Analysis (APRA) tool developed under TxDOT research project 0-5478 offers a method to measure project scope definition for completeness and identify potential risks early in the project. With this tool, users identify the critical elements of the project scope across all disciplines. A high level assessment of the project is recommended at this stage of project development. The APRA tool and the User Guide is available [here](#).

A project work schedule should be developed manually or with the aid of various software programs to identify the critical path. The schedule describes work tasks, estimated task durations, and

responsible parties. The schedule helps approximate the project completion date and determine time requirements of staff. It may be revised as necessary.

Staff requirements should be assessed several months before beginning each of the following work phases:

- ◆ preliminary engineering
- ◆ environmental studies and documentation
- ◆ right of way acquisition
- ◆ PS&E preparation.

Consultant services (see the [DES615 Consultant Management and Administration Class Manual](#) for more information) may be used when TxDOT does not have the necessary resources. Consultant selection should be done according to the Consultant Selection Process adopted by the Texas Transportation Commission.

**Pertinent Project Types.** All projects except preventive maintenance.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ When using in-house staff, select the project development team. This requires careful coordination of work assignments with various supervisors for multi-disciplined projects.
- ◆ When using consultant services, select a TxDOT project manager to manage the consultant contract.
- ◆ When using consultant services for right of way (ROW) acquisition:
  - Prepare a work authorization to a statewide ROW acquisition provider contract. Contact the Right of Way division for more information.
  - The district right of way administrator manages the consultant contract.

**Critical Sequencing.** The need to out source work should be identified early because the consultant selection process can take several months.

**Resource Material.**

- ◆ TxDOT [Contract Management Manual](#)
- ◆ TxDOT *Standard Specifications for Right of Way Acquisition*
- ◆ [23 CFR 172](#)
- ◆ [43 TAC §§ 9.30 - 9.43](#).

**1410: Determine need for feasibility (route/corridor) study**

**Description.** A feasibility study addresses possible alternatives when the solution is unknown. The study may show that the project is not economically justifiable - or that it has so many environmental impacts that it is not viable. Early determination of such a finding will avoid unnecessary expenditure of funds on preliminary engineering and related costs. A feasibility study may include studying potential transportation corridors and/or routes within a corridor.

Districts should submit written requests for feasibility study authorization [FEAS] to the director of the Transportation Planning and Programming Division.

**Pertinent Project Types.** A feasibility study may be done at the district's discretion. A district may want to perform a feasibility study in the following situations:

- ◆ the project is outside the MPO's jurisdiction
- ◆ the project may involve a major investment of funds
- ◆ the solution is unknown
- ◆ there are major environmental concerns
- ◆ consensus of general public and property owners along the route has not been developed, or
- ◆ as directed by the Texas Transportation Commission.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Consult with the district environmental coordinator.
- ◆ Determine if the project is in a "rural" or "urban" area.
- ◆ The usual steps of performing a feasibility study are summarized as follows:
  - Determine broad route requirements (e.g., type of highway or transportation mode needed, control points).
  - Select corridors and identify major alternatives.
  - Examine planning reports and conduct preliminary surveys to gather information on population densities and trends in land use development, travel patterns, travel trends, economic, social and environmental conditions that should be considered in selecting alternate corridor/route locations.
  - Prepare a preliminary plan drawing/map.
  - If needed, generate profile layouts for each alternative route so that cost estimates can be made and construction feasibility can be tested.
  - Conduct public involvement for study, as required.

**Helpful Suggestions.**

- ◆ When preparing a feasibility study, cover the following areas:
  - The purpose of, and need for, a project
  - Conformance with the Texas Transportation Plan (see [1300](#): Evaluate compliance with planning documents)
  - Description of the limits of the study area. If corridors are being considered as part of the study, the corridor should be large enough to accommodate route alternatives, design alternatives, detours, utility relocations, and possible construction staging areas. (e.g., equipment site, borrow/waste areas).
  - Social (e.g., a demographic profile), economic, and environmental features. Existing land use and environmental features have impacts on a feasibility study and may include: historical buildings, trees, endangered species, noise, wetlands, lakes, buried fuel tanks, and hazardous waste sites.
  - Level of community support
  - Cost effectiveness
  - Safety issues
  - Level of service analysis (see [2310](#): Perform preliminary Level of service analysis)
  - Comparison of different routes, or corridors, and/or design alternatives. The “no-build” alternative must always be considered.
  - Existing transportation systems in the study area should be analyzed and described.
  - Recommendations.

**Critical Sequencing.** This task should be done after identifying the need for a transportation improvement and before spending funds on preliminary design.

**Resource Material.**

- ◆ TxDOT [Environmental Manual](#)
- ◆ TxDOT [Transportation Programming and Scheduling Manual](#).

**1420: Determine if Statewide Implementation Plan requirements apply**

**Description.** Statewide Implementation Plan (SIP) requirements apply to the state's [non-attainment areas](#) listed in the *Environmental Manual*, [Chapter 2, Section 5](#).

The Clean Air Act Amendments require each state having an urban area in non-attainment for air quality to develop a SIP that outlines a series of steps over time to improve air quality. These include mobile source plans affecting transportation planning and programming. In Texas, the Texas Natural Resource Conservation Commission (TNRCC) is responsible for air quality planning and has an interface with TxDOT on all transportation planning and programming in areas that

are in non-attainment for pollutants. These pollutants include particulates, carbon monoxide, ozone, volatile organic compounds (VOC), and nitrous oxides (NO<sub>x</sub>).

In non-attainment areas, the Metropolitan Planning Organization (MPO) must have a Metropolitan Transportation Plan (MTP) and Transportation Improvement Program (TIP) in conformance with the SIP. Proposed projects must be in a conforming MTP to be eligible for funding. The project manager should verify that the proposed project is included in the current, conforming TIP.

**Pertinent Project Types.** [Added capacity projects](#) in MPO non-attainment areas.

**Responsible Party.** Project manager

**Helpful Suggestions.**

- ◆ Contact the District Transportation Planning and Development section to determine the MPO's compliance for MTP, TIP, and federal certification.
- ◆ Consult the Statewide Transportation Improvement Program (STIP) to determine whether it includes the project. If it is not in the STIP, work early with the MPO to amend the local TIP and allow time for the re-determination of air quality conformity.
- ◆ The Transportation Systems Planning Section of the Transportation Planning and Programming Division is available for assistance.
- ◆ If the project is not in the STIP, the process to amend the STIP and determine air quality conformity is time-consuming.

**Authority Requirements.** [30 TAC §114.260](#)

**Resource Material.**

- ◆ TxDOT [Transportation Planning Manual](#).
- ◆ Metropolitan Transportation Plan
- ◆ Transportation Improvement Program.

**1430: Obtain traffic data**

**Description.** The design of a new transportation facility is based on future traffic projections. Planning level traffic data (based on either historical trend analysis or a travel demand model) is used to quantify estimated facility demand and level of service. Design traffic, which is a refinement of planning level traffic data, provides:

- ◆ existing and projected [annual average daily traffic \(AADT\)](#)
- ◆ [directional design hour volumes \(DDHV\)](#)
- ◆ [directional distribution factors](#)

- ◆ percent truck volumes.

Traffic data is collected annually and published in an annual report in various forms such as maps, reports and electronic files. Electronic files are available from ROSCOE which contain a Roadway Information System (RIS) (See the [Transportation Planning Manual](#)). To obtain this data, one needs the control-section number and beginning and ending mile points.

Data gathered locally, or at district level, for use in project development must be reviewed by the Traffic Analysis Section of the Transportation Planning and Programming (TPP) Division.

The following information is available from TPP:

- ◆ Annual District Traffic maps (see the [Transportation Planning Manual](#)) show Annual Average Daily Traffic (AADT) on the state highway system. The AADT data is adjusted for trucks and seasonal variation.
- ◆ Annual Automatic Traffic Recorders (ATR) Report (see the [Transportation Planning Manual](#)) contains traffic volume data 24-hours per day and 365 days per year.
- ◆ Annual Vehicle Classification Report (see the [Transportation Planning Manual](#)) gives percentages of trucks and other vehicles using a roadway.
- ◆ Maps showing county road/urban saturation counts (see the [Transportation Planning Manual](#)).
- ◆ Individual traffic forecasts and existing traffic counts requested by districts.

**Pertinent Project Types.** All projects except preventive maintenance.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Acquire, assemble, and review available traffic data.
- ◆ In urban areas, review travel demand model assignments.
- ◆ Identify new connecting roads or special traffic generators such as major shopping centers or new residential subdivisions.
- ◆ Determine if traffic data exists at the city, county, Metropolitan Planning Organization, and district level, such as traffic counts for signal warrants. Request TPP review and approval of this data if it will be used in project development.
- ◆ Request traffic data from TPP (see the [Transportation Planning Manual](#)).

**Helpful Suggestions.**

- ◆ Contact the District Transportation Planning and Development section for assistance with obtaining traffic data.
- ◆ Contact the TPP Traffic Analysis Section for additional assistance.
- ◆ Electronic copies of [saturation count](#) and district maps are available through the Director of Transportation Planning and Development.

**Critical Sequencing.** Traffic data will be needed before beginning preliminary design.

**Resource Material.**

- ◆ TxDOT [Traffic Data and Analysis Manual](#)
- ◆ District traffic maps
- ◆ [NCHRP Report 255](#) - Highway Traffic Data for Urbanized Area Project Planning and Design
- ◆ *Traffic Load Forecasting for Pavement Design* - [TTI Research Report 1235-1](#)
- ◆ *The State-of-the-Practice in Forecasting Turning Flows* - [TTI Research Report 1235-11](#).

**1440: Determine need for Major Investment Study**

**Description.** When a district desires to develop a project in a Metropolitan Planning Organization (MPO) area, a collaborative meeting among stakeholders should be held to determine whether a [Major Investment Study \(MIS\)](#) will be performed. The MIS considers all modes of travel and alternate routes, refines the long range plan, and determines a recommended design concept and scope.

The MIS process includes significant public input in the following activities:

- ◆ defining purpose and need
- ◆ commenting on the long and short list of alternatives
- ◆ and, selecting the preferred project scope and definition.

The selected project scope and definition must be incorporated in the area's financially constrained Transportation Improvement Program (see [1640](#): Place project in Transportation Improvement Program (TIP)) and must meet conformity requirements (see [1420](#): Determine if Statewide Implementation Plan requirements apply) in non-attainment areas.

An MIS must always be listed in the Unified Planning Work Program (UPWP) and Metropolitan Transportation Plan (MTP).

**Pertinent Project Types.** [Added capacity projects](#) determined with the MPO, TxDOT and others as needing a MIS.

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**Responsible Party.** Director of Transportation Planning and Development

**Helpful Suggestions.**

- ◆ A collaborative meeting of stakeholders should be held to determine which entity will take the lead in performing an MIS.
- ◆ The MIS process does not delineate the range of alternatives. The process simply requires that all stakeholders meet and reach an agreement on the nature of these alternatives.
- ◆ For information on conducting an MIS, refer to the *Transportation Planning Manual*, Chapter 5, [Section 9](#), Major Investment Studies.

**Critical Sequencing.** The MIS is conducted before preparing a schematic.

**Authority Requirements.** [23 CFR §450.318](#)

**Resource Material.**

- ◆ TxDOT *Transportation Planning Manual*, Chapter 5, Section 9, [Major Investment Studies](#)
- ◆ Metropolitan Transportation Plan and its components (available from the MPO in urban areas)
- ◆ MPO Public Involvement Plan
- ◆ City plans: comprehensive plan; land use; street, transit, pedestrian and bicycle or transportation plan
- ◆ The *Texas MIS Process Guidelines*; January 1997; Prepared for TxDOT by TTI-Texas A&M
- ◆ *FHWA Involving Citizens in Metropolitan Region Transportation Planning*; 1977
- ◆ *FHWA Innovations in Public Involvement for Transportation Planning*; January 1994
- ◆ *USDOT MIS Desk Reference*; August 1996
- ◆ *AASHTO and USDOT Guidance on Major Investment Studies*; August 19, 1994.

#### **1450: Identify multimodal alternatives and intermodal connections**

**Description.** When a district begins to address a mobility need, it has a range of multimodal alternatives (highway, street, transit, bicycle and pedestrian) it can use. For more information on multimodal planning refer to the [Transportation Multimodal Systems Manual](#). Consider provisions for pedestrians and bicyclists on all projects.

**Pertinent Project Types.** New location, reconstruction and rehabilitation projects.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Review Metropolitan Transportation Plan (MTP).
- ◆ Review any municipal plans, including existing neighborhood plans affected in study area, and document any reviews made.
- ◆ Review special purpose studies (e.g., studies on making an area into an intermodal hub or expanding a port).
- ◆ Assess the need to accommodate multiple modes (see the *Transportation Multimodal Systems Manual*) in developing alternatives by coordinating with district experts on those topics. These modes may include transit, pedestrian, bike, high occupancy vehicles, single occupant vehicles, port, railroad, aviation and freight.
- ◆ Consider providing sidewalks as part of the project. Refer to the *Roadway Design Manual*, Chapter 2, Section 6, [“Sidewalks and Pedestrian Elements”](#) for important factors to consider.
- ◆ Evaluate transit corridors for needed pedestrian and accessibility improvements.
- ◆ Implement public involvement, as needed.
- ◆ Develop evaluation framework for comparing modes.
- ◆ Analyze and compare alternatives.
- ◆ Identify preferred alternative.
- ◆ Amend the Metropolitan Planning Organization’s (MPO’s) MTP and Transportation Improvement Program (TIP), if warranted.
- ◆ If the area is non-attainment for air quality, the MPO and TxDOT will submit the project to the Texas Commission on Environmental Quality to determine compliance with the Statewide Implementation Plan (see [1420](#): Determine if Statewide Implementation Plan requirements apply) and, therefore, determine whether the area has a conforming plan and TIP.
- ◆ **Helpful Suggestions.** The following table depicts contacts for multimodal issues:

**Meeting Multimodal Needs**

Subject	For more information, contact:
bicyclist facilities	District bicycle coordinator
pedestrian facilities	district pedestrian coordinator
air/surface mobility issues	Aviation Division
waterway, rail, and seaport issues	Multimodal Section of TPP

**Resource Material.**

- ◆ Metropolitan Transportation Plan and its components (available from the MPO in urban areas)

- ◆ City plans: comprehensive plan; land use; street, transit, pedestrian and bicycle, aviation, port, rail, freight or transportation plan
- ◆ AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- ◆ *AASHTO Guide for the Development of Bicycle Facilities*
- ◆ TxDOT State Aviation Plan
- ◆ TxDOT State Transportation Plan.

#### **1460: Determine conformity with Congestion Management Process requirements**

**Description.** The requirements for a Congestion Management System (CMS) were replaced with a Congestion Management Process (CMP) by the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) in 2005. The CMP is a systematic process which provides information on multimodal transportation system performance and alternative strategies for alleviating congestion and enhancing mobility that can be reflected in the Metropolitan Transportation Plan (MTP) and the Transportation Improvement Program (TIP). A CMP includes methods to monitor and evaluate performance of the multimodal transportation system, identify and evaluate alternative actions, identify causes of congestion, assess and implement cost-effective actions, evaluate the efficiency and effectiveness of implemented actions, provide for data collection and system performance monitoring, and identify an implementation schedule, responsibilities and funding options.

Added capacity projects (except safety improvements or elimination of bottlenecks) in non-attainment areas may not be programmed for funding unless the project is addressed through a CMP.

Alternative strategies may include [Transportation Control Measures](#) (TCMs) which include [Transportation System Management](#) (TSM) or roadway system operational improvements and [Transportation Demand Management](#) (TDM).

The 1990 Clean Air Act Amendments require the Texas Commission on Environmental Quality (TCEQ) and Metropolitan Planning Organizations (MPO's) that are in [non-attainment areas](#) to include TCMs in the State Implementation Plan (SIP). The following is a list of examples of TCMs, subgrouped under TSM and TDM strategies:

##### TSM

- ◆ traffic signal improvement, signal synchronization
- ◆ intersection improvements
- ◆ pavement markings
- ◆ freeway bottleneck removal
- ◆ intelligent vehicle/highway system elements

- ◆ [high occupancy vehicle \(HOV\) lanes](#)
- ◆ [high occupancy/toll \(HOT\) lanes](#)
- ◆ access management
- ◆ bicycle and walking facilities
- ◆ incident detection/response
  - surveillance and response
  - motorist assistance program.

#### TDM

- ◆ employer trip reduction program (commute solutions such as carpools and vanpools, flexible work hours, compressed work weeks and telecommuting)
- ◆ carpool/vanpool program
- ◆ public transit system improvements (such as park and ride facilities)
- ◆ [congestion pricing](#)
- ◆ growth management.

For more information on congestion management, refer to the [Transportation Planning Manual](#)

**Pertinent Project Types.** Projects in [Transportation Management Areas](#) (TMAs) that meet criteria in the published MPO Congestion Management Process Plan. Examples include [added capacity projects](#), traffic signalization, arterial bottleneck elimination, and ITS projects.

**Responsible Party.** Director of Transportation Planning and Development

#### Sub-tasks.

- ◆ Review MPO's Congestion Management Process Plan.
- ◆ Review Metropolitan Transportation Plan (MTP).
- ◆ Review the Transportation Improvement Program (TIP).
- ◆ Review TCMs in SIP.
- ◆ Verify that the MPO has received its federal certification for the Metropolitan Planning Process.
- ◆ Evaluate congestion management/pricing. (See the [Transportation Planning Manual](#).)

#### Helpful Suggestions.

- ◆ In TMAs, especially those in non-attainment areas, coordinate with the district planning staff and MPO.

- ◆ Locally, consult the MTP and TIP to determine whether the project is on both. If it is not, work early with the MPO to amend the MTP and TIP, and allow time for the determination of air quality conformity - if required.

**Critical Sequencing.** In TMAs, the MPO coordination and CMP considerations may become critical because developing typical highway projects becomes subject to numerous conditions - air quality conformity, transportation demand and operational management strategies. All these affect project development and design.

**Authority Requirements.**

- ◆ [23 CFR Section 450.320](#)
- ◆ [23 CFR Section 500.109](#)
- ◆ Title 23 USC [Section 134](#).

**Resource Material.**

- ◆ TxDOT [Transportation Planning Manual](#)
- ◆ TxDOT [Environmental Manual](#)
- ◆ Metropolitan Transportation Plan
- ◆ Transportation Improvement Plan.

**1480: Evaluate inclusion of High Occupancy Vehicle/High Occupancy Toll lanes**

**Description.** Dedicated lanes such as [High Occupancy Vehicle](#) (HOV) and [High Occupancy Toll](#) (HOT) lanes should be evaluated for their ability to reduce congestion and encourage carpooling. For information on determining whether HOV/HOT lanes are desirable, refer to the TxDOT [Transportation Planning Manual](#).

**Pertinent Project Types.** HOV/HOT facilities are appropriate only in urban freeway corridors where significant traffic congestion is observed, or forecast, and where the feasibility of meeting demand by adding lanes is limited.

**Responsible Party.** District planner

**Helpful Suggestions.**

- ◆ Planning HOV and HOT facilities is best performed as a two-step process:
  - determine if general warrants for HOV and HOT exist, typically by affirming whether the levels of congestion and demand exist to support the need for any dedicated lane treatment.
  - identify and evaluate various physical and operational concepts that address this need; identify specific benefits, impacts and costs.

- ◆ Determining feasibility usually includes collaborative involvement from agencies and stakeholders such as Metropolitan Planning Organizations, transit service providers, city and county traffic departments, FHWA, FTA, and representatives from law enforcement agencies.
- ◆ Establishing operational policy is typically performed at the corridor level and may not be consistent between corridors in a region. All affected agency stakeholders should provide input in setting this policy.
- ◆ An operator/administrator may be solicited from outside TxDOT to manage the HOV or HOT lane. This agency may be the transit service provider, city, county, or tollway authority in the region. Terms for a Memorandum of Understanding (MOU) will be needed for this arrangement, and early identification of such an arrangement is desirable.
- ◆ Successful HOV projects have involved a public involvement and marketing effort, in parallel with planning and design activities, to gain and maintain project support. Once built, a new HOV facility may take more than a year to reach its potential for use.
- ◆ Assistance with HOV/HOT lane studies is available from the Transportation Management Section of the Traffic Operations Division.

#### **Resource Material.**

- ◆ TTI Managed Lanes website at <http://managed-lanes.tamu.edu>
- ◆ TxDOT [\*Traffic Data and Analysis Manual\*](#)
- ◆ TxDOT *Roadway Design Manual*, Chapter 3, Section 7, [Freeways with High Occupancy Vehicle Treatments](#)
- ◆ *Guide for the Design of High Occupancy Vehicle Facilities*; 1992; by the American Association of State Highway and Transportation Officials
- ◆ *HOV Systems Manual*; 1998; National Cooperative Highway Research Program, Transportation Research Board
- ◆ *Implementation Elements for Conversion of a General Purpose Freeway Lane into a High Occupancy (HOV) Lane*; 1997; Paper No. 970819; Texas Transportation Institute.

#### **1490: Evaluate inclusion of tollways**

**Description.** The design, construction, and operation of a major transportation facility require a significant commitment of federal, state and public funding. In some instances, private funding is also required. Because of limited available funding to develop non-toll facilities, major improvements can sometimes be completed faster by developing them as toll facilities.

Planning of major projects should investigate the tollway alternative. Current federal legislation also encourages the consideration of tollways in conjunction with high occupancy vehicle (HOV) facilities as a means of managing congestion in periods of peak demand ([congestion pricing](#)).

**Pertinent Project Types.** New construction and reconstruction projects having high traffic volumes.

**Responsible Party.** District planner

**Helpful Suggestions.** The Turnpike Authority Division (TTA), Regional Tollway Authorities (RTA), and Metropolitan Planning Organization may be contacted to assist in determining the viability of tolled options.

**Critical Sequencing.** The decision whether to include tolled facilities in the project should be made before beginning preliminary design.

### **1500: Evaluate railroad corridor preservation**

**Description.** Railroad corridors constitute a source of right of way for future improvements to the highway system. The corridor must first be identified as abandoned or under consideration of abandonment as verified by the Multimodal Section of the Transportation Planning and Programming (TPP) Division. If a transportation project can be foreseen within all or a portion of the railroad property, the affected districts should prepare a railroad corridor evaluation report recommending for or against corridor acquisition.

**Pertinent Project Types.** Projects with potential to utilize railroad corridors.

**Responsible Party.** Director of Transportation Planning and Development.

#### **Sub-tasks.**

- ◆ Inquire about corridor status.
- ◆ If rail line is in a metropolitan area, coordinate with the Metropolitan Planning Organization and the Metropolitan Transit Authority.
- ◆ Coordinate with any type of rail district that has jurisdiction in the area.
- ◆ Prepare railroad corridor evaluation report. (Consult TPP for further information)
- ◆ Obtain minute order through TPP.

#### **Helpful Suggestions.**

- ◆ Authorization of a minute order is conditional pending a satisfactory survey, appraisal, and environmental investigation.
- ◆ A title insurance policy should be obtained for corridor acquisition.

**Authority Requirements.** *Corridor Preservation Task Force Report*; 04/02/97; by TxDOT

#### **Resource Material.**

- ◆ TxDOT [Transportation Multimodal Systems Manual](#)
- ◆ TxDOT *Traffic Operations Manual*, [Railroad Operations Volume](#)
- ◆ TxDOT [Right of Way Collection](#).

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## Section 5

### Construction Funding Identification

#### Overview

This section discusses activities involved in identifying potential construction funding sources including state, federal, and outside sources. Outside sources could include local governmental entities, other public agencies, and private sources.

This section includes the following tasks. The tasks are listed in approximate chronological order but may be performed concurrently in some cases.

- 1600. [Identify potential design/construction funding](#)
- 1610. [Prepare and execute advance funding agreements](#)
- 1620. [Obtain DEVELOP authority](#)
- 1630. [Obtain CONSTRUCT authority](#)
- 1640. [Place project in Transportation Improvement Program \(TIP\)](#)
- 1650. [Develop Statewide Transportation Improvement Program \(STIP\)](#)
- 1670. [Place project in one-year letting schedule](#)

#### 1600: Identify potential design/construction funding

**Description.** The Unified Transportation Program (UTP) includes all multimodal projects for which the Texas Transportation Commission has authorized planning, development and construction activities during a ten-year period. Several categories of funds have been established to reflect the transportation programs (see the [Transportation Programming and Scheduling Manual](#)) outlined by federal and state legislation and commission policy.

The Commission authorizes projects in the UTP in two major documents - the Statewide Preservation Program (SPP) and the Statewide Mobility Program (SMP). Projects are authorized in the following ways:

- ◆ **Individual projects included in certain categories of work.** These projects are usually mobility projects that take significant time to develop, such as [added capacity](#) and new construction projects, and structures replacement and rehabilitation. These projects are reviewed and re-authorized annually.

- ◆ **Activities that reflect the Commission's intentions to address a specific improvement such as rehabilitation or preventive maintenance.** The program amounts for a particular program may be allocated to the districts by a formula - with eligible projects developed by the district on an as-needed basis within their allocation or bank balance.
- ◆ **Other programs such as safety, transit, or railroad signals.** The program amounts are allocated by the appropriate division and approved by the Commission.
- ◆ The Commission may also authorize a project with a project specific minute order. (See [1235](#): Obtain project specific minute order, if required).

Outside entities, including local governmental entities, other federal or state agencies, or private entities, may be required to participate in project development by providing funding. If the project is located in an [economically disadvantaged county](#), the county may request a reduction in their required participation amount. For more information, refer to the TxDOT [Transportation Planning Manual](#).

If a local government is unable to pay their required participation, they may request a loan from the [State Infrastructure Bank](#) (SIB) to finance their participation. For more information, contact the Finance Division.

**Pertinent project types.** All projects.

**Responsible party.** Director of Transportation Planning and Development

**Sub-tasks.**

- ◆ Enter project data into Design and Construction Information System (DCIS) using a 900 series job number. **WARNING:** A 900 series number means the project is not authorized for project development. After the Commission authorizes the project, TPP assigns a valid CSJ number. Once an advance funding agreement (see [1610](#): Prepare and execute advance funding agreement) is executed and a copy furnished to TPP, the project will be “opened” for charges to accrue.
- ◆ Check the FIMS project set up to be sure the project data in FIMS is correct.

**Authority Requirements.**

- ◆ [43 TAC §§ 15.51 - 15.56](#).

**Resource Material.** TxDOT [Transportation Programming and Scheduling Manual](#).

## 1610: Prepare and execute advance funding agreements

**Description.** Advance funding agreements (AFAs) are used when other entities participate in funding project development. Funding may be directed toward preliminary engineering, construction, right of way, utility relocation costs, maintenance or any other project expense. Generally, agree-

ments should only be executed with governmental entities except for certain work with utilities and railroads. TxDOT uses two payment methods: actual cost and fixed price as described in [43 TAC §15.52](#).

Many local governments have signed the department's Master Advanced Funding Agreement (MAFA). This agreement contains all the standard clauses found in an AFA. Once a MAFA is signed, a Local Project Advance Funding Agreement (LPAFA) is used. The LPAFA is much shorter than a regular AFA.

NOTE: The term "escrow agreements" is no longer used because "escrow" implies a third party holding funds.

**Actual cost AFA.** The [actual cost advance funding agreement](#) is the most common of the AFAs. The fund amount is determined by a cost estimate. The actual cost AFA specifies the percentage of costs each entity will provide or the amount of money the State will contribute. TxDOT allows for either a single payment or incremental payments. The district must have TxDOT administration approval to use incremental payments. The AFA provides that the local government is responsible for any amount that will exceed the AFA's estimate. Any overpayment by the outside entity, after all cost and claims are paid, is returned to the entity or funds may be applied by the State to the local government's contractual obligations to the State under another AFA. If the scope of work, involving the outside entity, changes after the execution of the original AFA, the AFA must be amended.

**Fixed price AFA.** Funds provided by the outside entity may also come in the form of a [fixed sum](#). A fixed price AFA may be used if advance approval is obtained from the administration. The funds to be provided by the outside entity are fixed based on the engineer's estimate. Unlike actual cost AFAs, payment of additional funds or reimbursement of funds upon project completion is not applicable, except that the department pays for overruns and refunds underruns for the AFAs for Bridge Replacement or Rehabilitation Projects Off the State System.

The AFA must be executed and the funds must be provided to TxDOT before the required services are performed unless incremental payments are approved. Districts are responsible for negotiations and development of the AFA. The Contract Services Section of TxDOT's General Services Division (GSD-CSS) has developed contract forms and procedures associated with developing and processing AFAs.

Accurate estimates are essential for preparing AFAs. Local governments may not be able to afford the project at letting if an inaccurate, low estimate was used to determine participation amounts.

**Pertinent Project Types.** Projects containing outside funding participation.

**Responsible Party.** Director of Transportation Planning and Development.

**Sub-tasks.**

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AFA for Standard Transportation projects. The following related tasks should be performed for “standard” AFA projects (on-system projects that are voluntarily (no local match required) funded by others):

- ◆ Refer to the [AFA chapter](#) in TxDOT’s *Contract Management Manual* for standard projects.
- ◆ Prepare the agreement using the [AFA Manual](#).
- ◆ Send the AFA to the local entity for execution.
- ◆ The district engineer executes the AFA (if the district has accepted delegated responsibility).
- ◆ District sends a copy to the General Services Division’s [Contract Services](#) Section.
- ◆ Complete remaining sub-tasks listed below.

**Other projects.** For all other projects with legally required matching participation (i.e. required to match state and/or federal funds).

- ◆ Prepare a draft AFA.
- ◆ Send the AFA to the GSD-CSS for review and revision as needed.
- ◆ Send the revised AFA to the local entity for execution.
- ◆ Send the AFA (with partial execution - by local entity) to GSD-CSS or proper signatory (i.e. off-system bridge AFAs to BRG).
- ◆ Proper signatory executes the AFA for TxDOT.
- ◆ Proper signatory sends an original counterpart of the fully executed AFA to the district for return to the local government.
- ◆ Complete remaining sub-tasks listed below.

**Remaining sub-tasks.**

- ◆ Complete DCIS, CMCS, CIS, or FIMS input screens and reports relating to AFAs per GSD-CSS requirements.
- ◆ Track and collect funds on the date and in the amount described in the executed AFA.
- ◆ Send the first notice of financial clearance certification (status of funding collection) to the Contract Processing Unit of CST at least 30 days before bid opening. Use the form found on the GSD-CSS Intranet page under “[Standard Contracts](#).” Refer to [Chapter 7, Section 10](#), of the *Contract Management Manual* for more information.
- ◆ Send the second notice of financial clearance certification after bid opening but before Commission award of the project.

**Helpful Suggestions.**

- ◆ Start the AFA process as early as possible. The district should contact the outside entity as soon as it appears an AFA is required.

- ◆ The estimate should be accurate to allow the outside entity opportunity to budget for the project. This will help ensure that funds will be available when they are required.
- ◆ Entities may need additional time to schedule meetings (i.e. city council) necessary to accept AFA provisions and to transfer funds.
- ◆ GSD-CSS and the administering divisions are available to assist districts.
- ◆ The district is responsible for ensuring that all provisions of any agreement executed by the district engineer comply with all applicable laws, policies, and procedures.

**Critical Sequencing.** Execute AFAs at the beginning of project development to ensure that the responsibilities of each party are agreed to before incurring preliminary design costs.

**Authority Requirements.**

- ◆ [43 TAC §§ 15.50 - 15.56](#)
- ◆ TxDOT memo; 9/11/98 “Agreements with Private Entities”; from Charles W. Heald, Executive Director; to District Engineer

**Resource Material.**

- ◆ Advanced Funding Agreement chapter of the [Contract Management Manual](#) (available on the TxDOT Intranet only).
- ◆ Signature Authority chapter of the [Contract Management Manual](#) (available on the TxDOT Intranet only).
- ◆ Local Government Project Procedures (LGPP) available at <http://www.txdot.gov/business/governments/lgpp.htm>.

**1620: Obtain DEVELOP authority**

**Description.** DEVELOP authority permits the preparation of plans, specifications, and estimates (PS&Es), and right of way acquisition. With DEVELOP authorization, project plans should be substantially complete (i.e., geometric, structural, hydraulic, and pavement design approved by the various divisions, and a substantial amount of required right of way should be acquired. Refer to the TxDOT [Transportation Programming and Scheduling Manual](#) for more information.

**Pertinent Project Types.** Projects with PLAN authority.

**Helpful suggestions.**

**Responsible Party.** Transportation Planning and Programming Division in coordination with District Director of Transportation Planning and Development.

- ◆ The district programming and scheduling manager should update DCIS to show current cost estimates.
- ◆ In some categories, projects are ranked by cost effectiveness and costs compared to other projects. Cost effectiveness ranking is important for advancing a project to CONSTRUCT authority. (See [1630](#): Obtain CONSTRUCT authority).
- ◆ As right of way is acquired, a project's cost effectiveness ranking improves.

**Resource Material.**

- ◆ TxDOT [Transportation Programming and Scheduling Manual](#)
- ◆ TxDOT [DCIS User Manual](#).

**1630: Obtain CONSTRUCT authority**

**Description.** All phases of work are permitted for projects with CONSTRUCT authorization. Generally, projects with CONSTRUCT authority are the highest ranked projects that have proposed letting dates within the next four years, including the current year.

**Pertinent Project Types.** Projects with DEVELOP authority in project-specific programs and all allocation program projects.

**Responsible Party.** Transportation Planning and Programming Division (TPP)

**Sub-tasks.**

- ◆ TPP tracks the project status from DEVELOP to CONSTRUCT authority.
- ◆ District updates DCIS with construction and ROW cost estimates. Cost estimates affect the project's cost effectiveness, which in turn affects the project's ranking and prioritizing by TPP.
- ◆ TPP obtains Commission authorization for CONSTRUCT authority projects annually.

**Helpful Suggestions.** Projects are ranked by cost effectiveness and costs compared to other projects. As right of way is acquired, a project's cost effectiveness ranking improves.

**Authority Requirements.** TxDOT [Transportation Programming and Scheduling Manual](#)

**Resource Material.** The most current TxDOT [Unified Transportation Program](#)

**1640: Place project in Transportation Improvement Program (TIP)**

**Description.** The Transportation Improvement Program (TIP) is a central component of the transportation planning process. In areas with a Metropolitan Planning Organization (MPO), the TIP is developed by the MPO in cooperation with the state and local transit agencies. The TIP for rural areas is developed by the local TxDOT district in cooperation with local government entities. The TIP is a list of priority projects to be funded within a four-year period.

A new TIP must be developed, updated and approved at least every four years. Revisions to a currently approved TIP can be made on a quarterly basis. As part of the cooperative planning process, districts participate with their other MPO partners in developing and approving the TIP. All TIPs must be financially constrained and are merged into the Statewide Transportation Improvement Program (see [1650: Program \(STIP\) Develop Statewide Transportation Improvement](#)). Generally, a project's letting year is established as part of placing it in the TIP

**Pertinent Project Types.**

- ◆ Federal regulations require that projects proposing to use FHWA or FTA funds are shown in the TIP before project approval.
- ◆ Projects that will not use FHWA or FTA funds, but that will require approval by these agencies (such as new access to an interstate) should also be in the TIP.
- ◆ In [non-attainment areas](#), all regionally significant projects, regardless of funding (federal, state or local), must be in the TIP.
- ◆ In all areas, locally funded, regionally significant projects let in the previous fiscal year, should be listed in the Annual Project List provided to the FHWA/FTA at the end of the fiscal year for every year in the TIP/STIP.

**Responsible Party.** Director of Transportation Planning and Development

**Helpful Suggestions.**

- ◆ The TIP must be consistent with expected funding levels (i.e., it must be fiscally constrained).
- ◆ Before approval, there must be an opportunity for public comment.
- ◆ In non-attainment areas, the TIP and Metropolitan Transportation Plan (MTP) must be found to conform with the Statewide Implementation Plan (see [1420: Determine if Statewide Implementation Plan requirements apply](#)) by the MPO and US DOT (FHWA and FTA). The projects in the TIP must contribute to a reduction in emissions. A list of non-attainment areas is in the TxDOT *Environmental Manual* [Chapter 2, Section 5](#).

**Critical Sequencing.**

- ◆ All projects listed in the STIP must be included in a TIP and MTP (MTP only where applicable).
- ◆ Projects must be in the STIP before federal reimbursement of work will be authorized.

**Resource Material.** TxDOT [Transportation Programming and Scheduling Manual](#)

**1650: Develop Statewide Transportation Improvement Program (STIP)**

**Description.** The State must develop a Statewide Transportation Improvement Program (STIP) for all areas of the state. The STIP is a compilation of Transportation Improvement Programs (see [1640: Place project in Transportation Improvement Programs \(TIP\)](#)) and projects selected by districts. For [non-attainment areas](#), the MPO must prove conformity with the Statewide Implementation Plan (see [1420: Determine if Statewide Implementation Plan requirements apply](#)) before the TIP can be included in the STIP. As with each TIP, the STIP is financially constrained.

The Transportation Planning and Programming Division (TPP) compiles the STIP which is then approved by the Texas Transportation Commission acting for the governor. The Commission forwards the STIP to the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) for review and approval. All federal-aid projects must be included in the STIP before a FHWA Federal Project Authorization & Agreement (FPAA) can be issued to obligate federal funds.

**Pertinent Project Types.**

- ◆ Federally funded projects - using federal funds in **any** portion of project development.
- ◆ Projects that will not use FHWA or FTA funds, but that will require approval by these agencies (such as new access to an interstate) should be shown in the STIP.
- ◆ State funded projects - inclusion required by TxDOT to show financial constraint.
- ◆ Regionally significant projects.
- ◆ Transit projects.
- ◆ Multimodal projects.
- ◆ Aviation projects (optional).

**Responsible Party.** Transportation Planning and Programming Division

**Helpful Suggestions.**

- ◆ The STIP must be consistent with expected funding levels.
- ◆ Before STIP approval, there must be reasonable opportunity for public comment.

**Critical Sequencing.**

- ◆ Federally funded projects must be included in the STIP before issuance of a FPAA.
- ◆ A FPAA to obligate federal funds must be obtained before incurring reimbursable project costs.

**Resource Material.**

- ◆ TxDOT [\*Transportation Planning Manual\*](#)
- ◆ TxDOT [\*Transportation Programming and Scheduling Manual\*](#).

**1670: Place project in one-year letting schedule**

**Description.** On an annual basis, the Letting Management Section of the Finance Division requests that districts formulate a three year letting schedule to meet specific letting volumes provided for each District. This involves updating various fields in DCIS in accordance with specific instructions provided by the Letting Management Section. The “let schedule year” fields on the Project Identification Screen (P1) are opened, or ‘unlocked’, for changes during a six-week period for districts to enter let years for their projects. Other fields requested to be updated, including the “present district estimated let date” are open for changes throughout the year.

From DCIS data in the “let schedule year” and the “present district estimated let date” fields, the Letting Management Section forms a 1-year letting schedule. Letting Management reviews the schedule on a statewide basis to ensure funding goals are met. The schedule is also reviewed for completeness, funding eligibility, federal oversight, etc. and any necessary changes are coordinated with the district. The schedule is then submitted to the administration for their approval. The one-year letting schedule is a planning document and is subject to change. The schedule is posted on the Internet and hard copies are available to the public through the General Services Division.

From DCIS data, the Finance Division tracks letting volumes by district and by funding category. This information is sent to the Texas Transportation Commission monthly and summarized in a quarterly report (with cumulative results) to districts.

**Pertinent Project Types.** All projects.

**Responsible Party.** Director of Transportation Planning and Development

## Chapter 2 — Preliminary Design

### Contents:

[Section 1 — Design Concept Conference](#)

[Section 2 — Data Collection/Preliminary Design Preparation](#)

[Section 3 — Public Meeting\(s\)](#)

[Section 4 — Preliminary Schematic](#)

[Section 5 — Geometric Schematic](#)

[Section 6 — Value Engineering](#)

[Section 7 — Geometric Schematic Approval](#)

## Section 1 — Design Concept Conference

### Overview

The Design Concept Conference is a meeting of key individuals for establishing fundamental aspects of a project. The conference facilitates agreement to basic project features by concerned parties and enhances relationships between those parties.

This section includes the following task:

2000. [Conduct Design Concept Conference](#)

### 2000: Conduct Design Concept Conference

#### Description.

- ◆ **Purpose.** A Design Concept Conference (DCC) is a meeting to establish and agree on fundamental aspects, concepts, and preliminary design criteria of a project. Supporting documents constitute an understanding of basic features of the project by FHWA, TxDOT divisions, TxDOT district office, and local entities.
- ◆ **Advance Planning Risk Analysis.** The Advance Planning Risk Analysis (APRA) tool developed under TxDOT research project 0-5478 offers a method to measure project scope definition for completeness and identify potential risks early in the project. With this tool, users identify the critical elements of the project scope across all disciplines. A high level assessment of the project is recommended at this stage of project development. The APRA tool and The User Guide for the APRA Tool is available [here](#).
- ◆ **Design Summary Report (DSR).** A Design summary Report (DSR) form has been developed for use in preparing for the Design Concept Conference. Use of this form will help ensure that the project team does not overlook potentially critical issues. While all items will not be applicable to all projects, overlooking any item may significantly delay the project. The recommended [DSRform](#), is available in PDF format. The DSR form also contains an attendance list to consider. The project team may not know the correct answer to all issues early in project development. The form should be considered a work in progress and additional information can be added as the project develops. The DSR form should be reviewed in detail and updated during the Design Conference (see [5020: Conduct Design Conference](#)).

#### Pertinent Project Types.

- ◆ New construction, reconstruction, and special transportation projects.
- ◆ Other projects that the Director of Transportation Planning and Development determines would benefit.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Identify and invite participants with sufficient lead time.
- ◆ Schedule field visit to review existing conditions with a team of experienced staff from traffic operations, design, construction and maintenance prior to the Design Concept Conference. Make a video recording of the facility for reference during the Design Concept Conference.
- ◆ Utilize the Advance Planning Risk Analysis tool to align project objectives and stakeholders' needs, identify high priority project deliverables, and facilitate communication.
- ◆ Complete parts of DSR and circulate to all parties invited to the conference for review.
- ◆ Obtain concurrence or disagreement by approval entities listed in the DSR.
- ◆ Update DSR as project progresses, and make updated DSRs available to approval entities and other parties with a need to know.

**Helpful Suggestions.**

- ◆ The primary purpose of the conference is to officially establish the basic features and preliminary design criteria for the project.
- ◆ Appoint an individual to take conference notes.

**Critical Sequencing.** Conduct the conference before preparing schematics or performing other preliminary design.

**Resource Material.**

- ◆ Design Summary Report ([DSRform](#)) in PDF format
- ◆ TxDOT [Roadway Design Manual](#)
- ◆ TxDOT *Landscape and Aesthetics Design Manual*, Chapter 3, Section 2, [Conduct Preliminary Design Conference \(2000\)](#)
- ◆ TxDOT [Environmental Manual](#)
- ◆ TxDOT [Hydraulic Design Manual](#) for information on hydrology
- ◆ TxDOT [Bridge Project Development Manual](#)
- ◆ TxDOT *Traffic Operations Manual*, [Railroad Operations Volume](#).

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## Section 2 — Data Collection/Preliminary Design Preparation

### Overview

This section includes obtaining data necessary for making engineering and environmental decisions related to project design. Data collection efforts should be as complete as possible so project solutions providing the most benefit are selected.

This section includes the following tasks. The tasks are listed in approximate chronological order but may be performed concurrently in some areas.

- 2110. [Conduct early coordination with stakeholders](#)
- 2120. [Prepare and execute additional agreements](#)
- 2140. [Review traffic data](#)
- 2150. [Obtain right of entry](#)
- 2160. [Obtain related data, plans, studies and reports](#)
- 1010. [Perform site visit](#)
- 2180. [Obtain information on existing utilities](#)
- 2190. [Obtain traffic crash data](#)
- 2200. [Obtain hydraulic studies](#)
- 2220. [Obtain aerial photography/planimetrics/DTMs/digital orthophotography](#)
- 2230. [Perform topographic surveys](#)
- 2240. [Perform other surveys](#)

### 2110: Conduct early coordination with stakeholders

**Description.** Early coordination with resource and regulatory agencies and other stakeholders is vital in obtaining concerns and opportunities for a proposed project. Sometimes opportunities may be identified to perform joint activities with a project planned by an agency. Project managers can streamline the overall project development process by proactively seeking out potential stakeholders such as neighborhood associations, schools, fire and police departments, etc.

Permits from regulatory agencies may be required for construction activities affecting the respective resources. Resource agencies may require implementing mitigation measures where environmental effects cannot be avoided. Types of mitigation may include restoration/enhancement, creation, and preservation of natural resources. Mitigation can be a requirement in obtaining permits from regulatory agencies.

**Pertinent Project Types.** New construction, reconstruction and rehabilitation projects. Minor projects (2R, seal coat, overlay) may require coordination if a resource is known to exist within State right of way.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Coordinate with district environmental coordinator and roadway design engineer.
- ◆ Identify resource and regulatory agencies and stakeholders.
- ◆ Identify environmental/design constraints.
- ◆ Identify possible construction methods.
- ◆ Explore project design modifications to avoid, minimize, and/or mitigate effects to natural resources.

**Helpful Suggestions.**

- ◆ Refer to information on Interagency Coordination/Permits. (See Chapter 3, Section 2 [Interagency Coordination/Permits](#)).
- ◆ Early coordination during project planning and development is essential in advancing a project to construction on schedule. Coordination continues throughout the process including construction and maintenance, based on the project's environmental commitments.

**Authority Requirements.** [National Environmental Policy Act](#) (NEPA) 1969

**Resource Material.** TxDOT [Environmental Manual](#)

## 2120: Prepare and execute additional agreements

**Description.** Existing agreements and contracts that TxDOT has with public entities, railroad companies, utility companies, and other agencies need to be identified and taken into consideration during project development. Identification of existing agreements also helps determine the possible need for additional agreements. Some agreements may need to be amended and the appropriate division can assist. The advance funding agreement (see [1610: Prepare and execute advance funding agreements](#)) should have been previously executed.

The following table lists the coordinating division of each type of additional agreement:

**Additional Agreements**

Type of Agreement	Coordinating Division
Agreements with other states	Contract Services Office
Drainage agreements	Right of Way and Design
Joint-use agreements (see <a href="#">4425</a> : Prepare and execute joint-use, multiple-use agreements)	Right of Way
Multiple-use agreements (see <a href="#">4425</a> : Prepare and execute joint-use, multiple-use agreements)	Maintenance
Municipal maintenance	Maintenance
National Resource Conservation Service (formerly, U.S. Soil Conservation Service)	Environmental Affairs
Railroad (see <a href="#">2330</a> : Initiate railroad coordination)	Railroad Section of Traffic Operations
Right of entry	Right of Way
Right of way (agreement to contribute funds)	Right of Way
U.S. Coast Guard	Environmental Affairs
U.S. Corps of Engineers	Environmental Affairs
U.S. Department of Interior Water and Power Resources Service	Environmental Affairs
U.S. Geological Survey (for gaging stations)	Design - Bridge Planning
Utility (pipelines, telephone, etc.)	Right of Way

Agreements or permits between TxDOT and other entities are required in the following situations:

- ◆ work is performed within jurisdiction of another entity (e.g., railroads)
- ◆ other entities construct facilities (e.g., driveways, utilities) on State right of way
- ◆ funds are provided by another entity
- ◆ other entities agree to maintain the facility.

**Pertinent Project Types.** All projects.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Identify existing agreements.
- ◆ Determine need for additional agreements and amendments to existing agreements.
- ◆ Coordinate with district/division staff to develop and execute agreements.

**Critical Sequencing.** Develop agreements as early as possible to allow approval time.

**Authority Requirements.**

- ◆ [43 TAC §§ 15.50 - 15.56](#)
- ◆ TxDOT *Utility Accommodation Policy*, [43 TAC §§ 21.21 - 21.56](#).

**Resource Material.**

- ◆ TxDOT *Traffic Operations Manual*, *Traffic Engineering Agreements Volume*
- ◆ TxDOT *Traffic Operations Manual*, [Railroad Operations Volume](#)
- ◆ TxDOT [Right of Way](#) Collection
- ◆ TxDOT [ROW Utility Manual](#).

**2140: Review traffic data**

**Description.** Traffic data is a key element in highway design. Traffic data requested earlier (see [1430: Obtain Traffic Data](#)) should be reviewed, and additional data should be obtained.

**Pertinent Project Types.** New construction, reconstruction, and rehabilitation projects.

**Responsible Party.** Project manager

**Resource Material.**

- ◆ TxDOT [Transportation Planning Manual](#)
- ◆ TxDOT *Roadway Design Manual*, Chapter 2, Section 2, [Traffic Volume](#) for information on using traffic volumes in design.

**2150: Obtain right of entry**

**Description.** Right of entry (ROE) is permission, granted by a landowner, for others to enter the landowner's property for a specific purpose. ROE should be obtained in writing on a form that is legally binding.

ROE requests to access railroad property should be processed through the district railroad coordinator or through the Railroad Section of the Traffic Operations Division.

Examples of ROE permission request letters for land surveys ([LANDSURV](#)) and environmental surveys ([ENVIRSUR](#)) along with an example cover letter ([COVERLET](#)) are available.

**Pertinent Project Types.** Projects requiring land surveying, environmental surveying, core drilling, or other work activities (not construction) outside public right of way.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Identify properties requiring entry. This includes properties where work activities will be performed and properties that will be traveled upon to reach work activity sites.
- ◆ Research property ownership information - typically at county tax appraiser's office. District Right of Way staff might be able to assist.
- ◆ Prepare letters to property owners requesting permission to enter properties. The letters may be sent by U.S. mail.

**Helpful Suggestions.**

- ◆ Work with district right of way staff to develop appropriate wording for permission letters. They will probably have a standard form letter.
- ◆ Consider keeping the ROE permission request for engineering surveys separate from environmental surveys. Some property owners can become cautious about too much activity on their property. A ROE permission request letter for land surveys ([LANDSURV](#)) and environmental surveys ([ENVIRSUR](#)) are available.
- ◆ As a courtesy, send an extra copy of the ROE request letter for the landowner's records. Include a cover letter containing a description of the overall project and a description of the public involvement process (if applicable) and include a self-addressed, stamped envelope. This should reduce the number of follow-up inquiries and efficiently direct inquiries received. An example ROE cover letter ([COVERLET](#)) is available.
- ◆ If consultants are performing survey work and obtaining ROE
  - The project manager should supply the consultant with copies of a TxDOT cover letter for attachment to the consultant's ROE request letter. This can assist the consultant in securing ROE.
  - The consultant should forward copies of ROE request letters signed by landowners to the TxDOT project manager. These letters should be kept with project records.
- ◆ For time-sensitive ROE requests, landowners may send their signed letters by FAX as a last resort.

**Critical Sequencing.**

- ◆ This task must be done before entering private property.
- ◆ Because it might take months to obtain permission from property owners, begin this task soon after identifying its need.

**Resource Material.** TxDOT [Right of Way Collection](#)

**2160: Obtain related data, plans, studies and reports**

**Description.** Studies and reports can provide information that will assist in decision making and help avoid “re-inventing the wheel.” Consider the following sources:

- ◆ project history files
- ◆ previously studied but suspended projects
- ◆ formal or informal studies addressing a specific issue
- ◆ relevant project information for adjoining or parallel routes
- ◆ studies conducted by other agencies or special districts (e.g. flood control district) related to the proposed project concept or having possible impact on project design.

**Pertinent Project Types.** All projects

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Identify and contact individuals having knowledge of relevant information.
- ◆ Research names of property owners along the project for use in future public involvement.
- ◆ Maintain an inventory of information received.

**Helpful Suggestions.**

- ◆ Identifying and locating information often depends on memories of individuals who worked on related projects.
- ◆ When requesting information, be as specific as possible about information being sought.
- ◆ Information may be obtained through informal interviews.
- ◆ Search for related research finding in the TxDOT Research Library, available on TxDOT's Research and Technology Implementation Office (RTI) [internet site](#).
- ◆ City and county offices have information on local circulation plans or planned residential or commercial development.
- ◆ In urban areas, it may be helpful to contact the local transit operator for information.
- ◆ Private companies may have reports or studies (e.g., a traffic study developed for a commercial property owner).
- ◆ Related information typically available within TxDOT includes the following sources:
  - “as-built” construction plans
  - right of way maps
  - bridge inventory data

- traffic signal studies
- bicycle plans
- environmental studies and schematics for previous or adjacent projects
- Automated Road Inventory Diagrams (ARI) for all on-system highways - available through the Transportation Planning and Programming Division
- traffic data (see [1430: Obtain Traffic Data.](#))
- traffic accident data (see [2190: Obtain Traffic Crash Data.](#))
- archived project history files
- Pavement Management System (PMS) data
- existing hydrologic/hydraulic reports
- existing geotechnical reports
- local agency comprehensive plans.

**Critical Sequencing.** Perform data collection as soon as work is authorized to begin on preliminary design.

### **2180: Obtain information on existing utilities**

**Description.** Utility locations must be identified early in project development. Coordination with utility owners is required when existing utilities are present.

**Pertinent Project Types.** All projects except preventive maintenance and restoration projects.

**Responsible Party.** Project manager

#### **Sub-tasks.**

- ◆ Coordinate with district utility coordinator as needed.
- ◆ Review “as-built” construction plans and permit records to identify existing utility owners.
- ◆ Observe utility locator markers and signs in the field and note owner's name.
- ◆ Contact municipalities adjacent to the project and request help in identifying utility owners to contact.
- ◆ Provide utility owners with the project “footprint” and request information on their utility locations.
- ◆ Conduct utility field surveys. (See [4200: Locate existing utilities](#)).

#### **Helpful Suggestions.**

- ◆ If the project is proposed on new location, review recent area wide aerial photography for evidence of underground transmission lines.

- ◆ [4000](#): Perform preliminary right of way research to establish the locations of existing right of way near utilities
- ◆ Consider using subsurface utility engineering. (See [4200](#): Locate existing utilities).
- ◆ Utility owner representatives may need reminders about information requests; mark your calendar for follow-up contacts. Expect four to six weeks for a response.
- ◆ Citizens ultimately pay for utility relocations, so avoid or minimize relocations when possible.
- ◆ Topographic surveys (see [2230](#): Perform topographic surveys) should be used to locate above ground utilities and signs for underground utilities.

**Critical Sequencing.** Identify utility locations early so there is time to design around them or determine utility adjustment costs.

**Resource Material.** TxDOT [ROW Utility Manual](#)

### 2190: Obtain traffic crash data

**Description.** A crash analysis is essential in the design process for a project involving an existing transportation facility.

Traffic crashes (on- and off-system) investigated by law enforcement officials, which result in injury to, or death of, a person, or that result in damage to the property of any one person to the apparent extent of \$1,000 or more are required to be reported to the Texas Department of Transportation (TxDOT).

**Pertinent Project Types.** All projects except preventive maintenance.

**Responsible Party.** Project manager

#### **Sub-tasks.**

- ◆ If possible, obtain crash data for at least a three-year period.
- ◆ Obtain information about pertinent, physical features of the facility such as geometrics and traffic (i.e., average annual daily traffic).
- ◆ Observe traffic movements at the location during pertinent times (e.g., rush hour).
- ◆ Analyze the data. Look for similarities, patterns, or abrupt changes over time in the way crashes are happening.
- ◆ Consider design features that might reduce potential for crashes, reduce crash severity, or improve operations.

**Helpful Suggestions.**

- ◆ Crash records are accessible to TxDOT and DPS personnel who have been given access to the Crash Records Information System (CRIS). Every district has at least one employee who has access. That employee is usually in the District’s Traffic Operations Section.
- ◆ The Traffic Operations division (TRF) can also assist in obtaining and analyzing crash data.
- ◆ The maintenance supervisor is a good source for traffic crash information.
- ◆ Local authorities may also assist in identifying or tracking problems as they develop.
- ◆ When data alone is insufficient, copies of a law enforcement officer’s report may be obtained from CRIS.

**Resource Material.**

- ◆ TxDOT *Highway Safety Improvement Program Manual* (formerly Hazard Elimination Program Manual; republication pending)
- ◆ [Texas Transportation Code § 550.062](#)

**2200: Obtain hydraulic studies**

**Description.** To determine preliminary drainage structure requirements (i.e., “floodplain screening”), obtain and review existing studies. Floodplain studies and other hydraulic data may be prepared by or for the Federal Emergency Management Agency (FEMA), drainage districts, river authorities, cities, and counties.

Numerous communities throughout Texas participate in the National Flood Insurance Program. For streams within jurisdiction of a participating community, FEMA rules and regulations apply. In instances where TxDOT facilities are located within bounds of a Flood Insurance Study, TxDOT needs to investigate effects that proposed construction will have on the published Flood Insurance Study. The studies have been compiled by organizations such as the Corps of Engineers, the U.S. Geological Survey, the U.S. Natural Resources Conservation Service (formerly the Soil Conservation Service), various local governmental entities, and private consultants.

To analyze existing hydraulics, obtain the FEMA study (see the [Hydraulic Design Manual](#)) or other relevant floodplain study. Use this information to analyze the existing location and develop design alternatives that follow FEMA guidelines - when applicable.

**Pertinent Project Types.** Projects that might change the water surface elevation in a FEMA controlled floodplain. Some examples of these projects are as follows:

- ◆ a new structure (new profile) over a stream
- ◆ project generates an increase in impermeable cover in a watershed (not ultimate development)
- ◆ riprap added to a stream bank or bed
- ◆ addition of concrete median barrier to an existing facility.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Determine whether the project has the potential to affect a stream within jurisdiction of a city or community participating in the National Flood Insurance Program. If so, compliance with minimum FEMA rules and regulations is required.
- ◆ If FEMA compliance is required, contact the Hydraulics Branch of the Roadway Design Section in the Design Division to obtain the relevant hydraulic study (i.e., computer model). Perform modeling and coordination as discussed in the TxDOT [Hydraulic Design Manual](#) section on the Federal Emergency Management Agency. Ask for assistance from the Hydraulics Branch as needed.

**Helpful Suggestions.**

- ◆ The backwater profile program used in originally developing a study may have been one of several types and from one of several sources. In Texas, the model most commonly used is the HEC-2 Water Surface Profile model from the Corps of Engineers. Typically, FEMA encourages that the model be updated to the most current acceptable model. If the stream was originally modeled using HEC-2, subsequent models should be done using HEC-RAS.
- ◆ Floodway and floodplain encroachments must be explained in the environmental document.
- ◆ Detailed FEMA requirements are discussed in the TxDOT [Hydraulic Design Manual](#)
- ◆ Obtaining FEMA studies can take several months.

**Resource Material.**

- ◆ TxDOT [Hydraulic Design Manual](#)

**2220: Obtain aerial photography/ planimetrics/ DTMs/ digital orthophotography**

**Description.** Controlled aerial photography is tied to [surveyed panels](#) that are visible in the aerial photos. Controlled aerial photography is used to obtain the following:

- ◆ [Planimetric map](#)
- ◆ [Digital terrain model](#) (DTM)
- ◆ [Digital orthophotography](#).

Uncontrolled aerial photography involves no ties to ground controls. Uncontrolled aerial photography can be used to produce [photo mosaics](#). Mosaics are used to locate potential project corridors or for displays at public meetings and hearings.

**Pertinent Project Types.**

- ◆ Projects where obtaining data from controlled aerial photography is more feasible than obtaining data solely from field surveying.
- ◆ Projects involving a transportation corridor or other large study area may require uncontrolled aerial photography.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Determine whether aerial photography already exists and is current enough to be useful.
- ◆ Discuss aerial photography needs with the area engineer, district land surveyor, or the Photogrammetry Branch of the Technology Services Division (TSD); aerial photography may be done through consultant contracts or the Photogrammetry Branch of TSD.
- ◆ Complete the TSD Photogrammetric Services Request Form and provide a flight map showing the area where photography is needed in coordination with the district land surveyor or area engineer. Contact TSD for flight map requirements.

**Additional sub-tasks for controlled aerial photography**

- ◆ Conduct or contract out field surveys to obtain ground control coordinates and to lay out ground panels. A registered professional land surveyor (RPLS) should perform the surveying work.
- ◆ Follow up on providing ground control coordinates to TSD.

**Helpful Suggestions.**

- ◆ Plan for a long lead-time before the finished product becomes available.
- ◆ Check with the Photogrammetry Branch of TSD for scheduling.
- ◆ Digital orthophotography is available through the Photogrammetry Branch of TSD. Lower resolution digital ortho is available from the Texas Natural Resource Information System (TNRIS) at [www.tnris.org](http://www.tnris.org).
- ◆ In determining the photography coverage area, consider including intersecting side roads, stream crossings, or complex drainage areas. Try to avoid requesting additional flights for minor areas such as these.
- ◆ Producing planimetric mapping in urban areas requires more effort than in rural areas due to the amount of topographic features.
- ◆ Be sure to follow up on delivering survey control data to TSD because lack of the control data can delay production of DTMs or planimetrics.
- ◆ For projects passing through areas of heavy vegetation, control surveying and the photography flight should occur during winter months when foliage is minimal.

- ◆ For large projects, consider performing control surveying in phases so panels can be more easily set up and maintained. Maintaining and protecting many, widespread panels from natural elements and animals in remote areas can be challenging (i.e., panels may become tasty morsels for cows and goats). A length of ten miles is suggested for maintaining panels for an aerial flight. Longer projects can be done in phases. Phasing requires close coordination with the aerial photography crew.
- ◆ Additional survey work may be needed such as for establishing or re-establishing permanent, survey control monuments.

### 2230: Perform topographic surveys

**Description.** A topographic survey is performed at this stage as a preliminary field survey to locate pertinent, existing features along a project. Data from a topographic survey may be used to create or supplement a [digital terrain model \(DTM\)](#) or [planimetric map](#).

The need for a full topographic survey versus [aerial photography](#) should be analyzed. There may be cases (e.g., small project sites) where it is more feasible to perform a topographic survey rather than obtain aerial photography. When aerial photography is the main source of data, a minor topographic survey may still be needed if areas were “obscured” (i.e., covered by trees) in the photography or if more detailed survey data is needed (e.g., culvert sizes/elevations and bridge clearances).

**Pertinent Project Types.** All projects except preventive maintenance projects.

**Responsible Party.** Project manager

#### Sub-tasks.

- ◆ Obtain the right of entry, if applicable. A right of entry (see [2150: Obtain right of entry](#)) or other written evidence of permission must always be obtained before entering private property.
- ◆ Locate pertinent objects and above-ground features, typically including
  - drainage structures (such as culverts, ditches, inlets, manholes, and outfalls)
  - streams (obtain cross sections at locations directed by the drainage engineer)
  - bridges (note horizontal and vertical clearances, abutment and bent locations, deck and bearing seat elevations, and railing type)
  - utilities (signs or markers showing the presence of underground utilities, valves, manholes, pumps, backflow preventers, vents, meters, poles, and guy wires. If utility marking is requested, locate all paint markings and identify owner/contact numbers).
  - large and significant trees (identify species and trunk diameter)
  - fences (type of fence is important) and gates
  - sidewalks (identify if concrete, asphalt, or other)

- driveways (identify if concrete, asphalt, or gravel)
- signs (roadway and private) - include type of sign and labels/markings on signs
- right of way documentation (If right of way survey is not performed.)
- ◆ Process surveying data to create a plan view of existing features and original cross-section and DTM information.

**Helpful Suggestions.** Plan the survey for **all** design, environmental, aesthetic and landscape needs to minimize the number of survey trips. If applicable, provide limits of requested survey area and provide ortho photos of appropriate area to help define request.

## 2240: Perform other surveys

**Description.** Given the type and extent of existing data available for a project, additional data is sometimes needed to support decisions during preliminary design. A survey is a data collection effort. It is the type of data, level of detail, and collection process that defines a survey. The survey could involve reconnaissance trips to the project site or a review of maps and plans. Level of detail could range from a general listing of items to controlled surveys tying features to a coordinate system.

As a large or complex project develops, it is common to determine that existing data is insufficient or needs updating. In addition to topographic surveys (see [2230: Perform topographic surveys](#)) and preliminary geotechnical surveys (see [2505: Perform preliminary geotechnical surveys](#)), other surveys may include the following:

- ◆ ROW/property surveys (see [4000: Perform preliminary right of way research](#))
- ◆ utility surveys (see [4200: Locate existing utilities](#)) to collect information on location and type of existing utilities
- ◆ survey of historical buildings, cemeteries, and other cultural resources
- ◆ survey of turning movements and through traffic at an intersection
- ◆ origin/destination traffic survey
- ◆ traffic generator survey and classification counts
- ◆ vehicle classification survey to determine the percentage of truck traffic
- ◆ environmental survey to determine the type and location of environmental features.

**Pertinent Project Types.** All projects

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Identify data needs.

- ◆ Define the survey in terms of needed type and limits of information, level of detail, process of collection, and data format.
- ◆ Coordinate with appropriate staff to schedule the survey.
- ◆ Depending on survey type, it may be necessary to obtain right of entry (see [2150](#): obtain right of entry). A right of entry or other written evidence of permission must always be obtained before entering private property.
- ◆ Information on subsurface utility engineering (SUE) is available under [Task 4200](#): Locate existing utilities.

**Helpful Suggestions.** Data collection is time consuming, so get only as much detail as necessary.

## Section 3 — Public Meeting(s)

### Overview

This section discusses obtaining public input on a project and incorporating that input into the project's design. Input from a public meeting can reveal concerns and issues that are not readily apparent, and give the designer an opportunity to address them during project development. Public meetings are not federally mandated and are less formal than public hearings.

This section includes the following tasks listed in chronological order.

2260. [Conduct public meeting](#)

2270. [Revise design based on public input](#)

### 2260: Conduct public meeting

**Description.** A public meeting provides an opportunity for the public to engage in a free exchange of views and ideas and to raise individual concerns. Public meetings may be conducted numerous times throughout the project development process. At least one public meeting must be held during the drafting of an Environmental Impact Statement (EIS). Details and requirements of public meetings are in the TxDOT [Environmental Manual](#).

Preparation for a public meeting should include advance notification to ensure that the public is made aware of the project planning and development process and to ensure full public involvement.

**Pertinent Project Types.** New construction and reconstruction projects and other projects as determined by the Director of Transportation Planning and Development. Public meetings can be held for all project types.

**Responsible Party.** Project manager

#### Sub-tasks.

- ◆ If the project is within a Metropolitan Planning Organization's (MPO's) area, the MPO's public involvement requirements must be checked. MPO requirements may be different from TxDOT's in areas such as required notification procedures, mailing lists, or number of meetings.
- ◆ Prepare exhibits for the meeting.
- ◆ Review the address list of interested individuals and groups.
- ◆ Prepare mailing lists for meetings.

- 
- ◆ Determine staff requirements.
  - ◆ Identify meeting date and location. When selecting a meeting location, ensure the site is accessible to persons with disabilities, including the restrooms and parking.
  - ◆ Arrange for audio/visual recording equipment, or court reporter. A public address system may be necessary, even in moderately sized rooms, to ensure that those with hearing impairments (including many elderly individuals) can hear what is being discussed. Many citizens will not make such a request in advance and may be reluctant to request special accommodations.
  - ◆ Advertise meeting; preferably, this is done 30 days and, again, 10 days before the meeting.
  - ◆ Prepare presentation speeches.
  - ◆ Review exhibits and presentations.
  - ◆ Conduct meeting.
  - ◆ Summarize and analyze input received at the meeting and input furnished in writing after the meeting.
  - ◆ Prepare responses to public input.
  - ◆ Gain response approval from advanced project development engineer.
  - ◆ Review responses with stakeholders, as needed. Stakeholders may include property owners, resource agencies, local government officials, homeowner's associations, and local business organizations.
  - ◆ Submit summary analysis and comment and response report to the district environmental coordinator.

### **Helpful Suggestions.**

- ◆ Coordinate the planning and conduct of the public meeting with the district public information officer.
- ◆ Public meetings are an effective method of obtaining public support for a project and may help avoid controversial public hearings later in project development.
- ◆ On complex projects, holding an “open house” for several hours before the meeting allows the public a better opportunity to understand the proposed improvements and make more meaningful comments.
- ◆ If the project is in an area with a predominant population of non-English speaking individuals, consider publishing meeting notices in English and the predominant non-English language. Also, consider having an interpreter at the meeting.
- ◆ Gain response approval from the advanced project development engineer before conducting coordination with stakeholders.

- ◆ Although Design Division review and approval of a schematic is not required before showing a schematic at a public meeting, coordination with the Design Division is recommended - especially for projects where design exceptions are anticipated.

**Critical Sequencing.** Public meeting(s) should be conducted after the geometric schematic is developed but before it is submitted to the Design Division for approval.

**Resource Material.** TxDOT [\*Environmental Manual\*](#)

### **2270: Revise design based on public input**

**Description.** Preliminary designs may need to be revised after public meetings are held and input is gathered.

**Pertinent Project Types.** All projects where public involvement is sought.

**Responsible Party.** Project manager

## Section 4 — Preliminary Schematic

### Overview

Once data collection is substantially complete, the preliminary schematic activity phase begins. This section describes developing engineering solutions to satisfy the project need. Alternative alignments and typical sections are the major engineering variables set forth. An operational analysis is performed on alternatives to determine the Level of Service of each.

A geometric schematic (Refer to Chapter 2, [Section 5](#)) is required for new location or added capacity projects and for projects requiring control of access or an Environmental Impact Statement. A list of schematic requirements can be found in the TxDOT *Roadway Design Manual*, Chapter 1, [Section 3](#). Schematics are also valuable to communicate design concepts to the parties involved in project development.

Landscape, aesthetic, bicyclist and pedestrian accommodation concepts are studied. Preliminary geotechnical surveys are conducted if important to the decision-making process. Preliminary pavement designs are developed so that project cost estimates can be updated.

Finally, after all alternative solutions are studied, they are compared, ranked, and a preferred alternative is selected.

For new location or added capacity projects, Design Division approval of the preliminary schematic may be requested at the district's option before affording the opportunity for a public hearing. Design Division approval of the geometric schematic (see Chapter 2, [Section 7](#)) for these projects is required but may be obtained after environmental clearance.

Projects requiring control of access or an Environmental Impact Statement require Design Division approval of a geometric schematic before affording an opportunity for a public hearing. Check with the Design Division Field Coordination Section for exceptions to this requirement, particularly for rural projects with few abutting property owners.

A schematic may be developed for other projects as the district determines beneficial; Design Division approval is not required in these cases.

Decisions made in these tasks will be carried forward when developing the geometric schematic for the preferred alternative.

This section includes the following subsections and tasks, many of which may be performed concurrently:

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**Alternative Selection**

- 2300. [Evaluate corridor alternatives](#)
- 2310. [Perform preliminary Level of Service analysis](#)
- 2320. [Evaluate route alternatives](#)
- 2330. [Initiate railroad coordination](#)
- 2340. [Identify requirements for crossing navigable waters](#)

**Geometrics**

- 2350. [Evaluate geometric alternatives](#)
- 2360. [Develop typical sections](#)
- 2370. [Prepare Assessment of Landscape and Aesthetic Issues](#)
- 2380. [Develop bicyclist/pedestrian accommodation concept](#)

**Update cost estimates**

- 2460. [Update cost estimates](#)

**2300: Evaluate corridor alternatives**

**Description.** A corridor is a broad band connection between two points and may encompass many potential routes. Preparing corridor alternatives during preliminary design involves developing many conceptual alternatives, including mode alternatives, that are feasible and reasonable in terms of construction, operation, and satisfying project goals. The end product is a single, preferred corridor and conceptual typical sections. This preferred corridor will be carried forward to the next stage, [2320](#): evaluating route alternatives.

Conceptual typical sections define basic elements including number and type of lanes (e.g., single versus high occupancy vehicle lanes), shoulders, type and range of median width, possible frontage roads, and range of offset to right of way limits. Details such as cross-slopes, side slopes, pavement structure, and station limits are typically not needed to define a particular concept. The number of lanes should be based on the capacity needed to operate at the desired Level of Service in the [design year](#).

Although a more formal evaluation process will follow for selecting the preferred alternative, interim screening levels may be necessary to reduce the list of alternatives to a manageable number. Screening criteria should be based on characteristic elements that differentiate alternatives.

**Pertinent Project Types.** New location, added capacity, or controlled access projects or projects requiring an Environmental Impact Statement.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Review projected design year traffic volumes. (See [1430](#): Obtain Traffic Data).
- ◆ Verify that the facility type continues to remain appropriate.
- ◆ Determine number of lanes.
- ◆ Prepare conceptual typical sections.
- ◆ Schedule public involvement activities such as public meetings. (See [2260](#): Conduct Public Meetings).
- ◆ Select the preferred corridor.

**Helpful Suggestions.**

- ◆ Obtain traffic data early. It may take three to four months to obtain design traffic data.
- ◆ Early on, determine the availability and preference for base mapping such as aerial photos, USGS maps, topographic maps, or TxDOT county maps.
- ◆ Thinking in terms of the end product for this task, determine when public input should be sought and what type of feedback should be requested.
- ◆ Public involvement is a major factor in determining corridor alternatives. Present the development process and definition of alternatives in understandable terms for the public. Give careful consideration to the format used and level of detail presented to the public.
- ◆ In describing alternatives, use names of intersecting roads or landmarks instead of stationing.
- ◆ Establish a clear labeling or naming convention for alternatives.
- ◆ Anticipate the need for creating options to an alternative and possible combinations of alternatives.
- ◆ Some evaluation criteria may be less relevant than others in the decision making process. Therefore, it is important that each element is weighted if a matrix/numerical analysis is performed.
- ◆ Keep alternatives basic in definition and avoid dwelling on details that are not significant at a conceptual level.

- ◆ Prepare study area map after reviewing the TxDOT Environmental Manual, Chapter 2, Section 4, [Define the Study Area](#).
- ◆ Review topography and floodplain maps to estimate whether adverse hydraulic impacts can occur.

**Critical Sequencing.**

- ◆ Request traffic data (e.g., traffic volumes) for use in defining typical sections early.
- ◆ Through site visits or reviewing existing data, develop a clear understanding of the study area limits before developing alternatives.

**Resource Material.**

- ◆ TxDOT [Environmental Manual](#)
- ◆ TxDOT [Roadway Design Manual](#)
- ◆ TxDOT [Bridge Project Development Manual](#) for identifying bridge constraints
- ◆ TxDOT [Transportation Planning Manual](#)
- ◆ AASHTO *Guide for the Development of Bicycle Facilities*
- ◆ *Highway Capacity Manual* by the [Transportation Research Board](#).

**2310: Perform preliminary Level of Service analysis**

**Description.** A planning [Level of Service \(LOS\) analysis](#) uses preliminary traffic volume data for the [design year](#) and the [implementation year](#). In some cases, additional analysis may be performed using data for the [current year](#). After project alternatives are fully defined, including the “no-build” alternative, a planning LOS analysis can be conducted. Given a desired LOS for the design year, the typical number of lanes proposed is usually based on projected design year traffic volumes. As part of the evaluation process, the design year results can be used to compare alternatives to each other - and to the existing facility (as a baseline comparison) using current volumes. The results combined with cost estimates may also determine cost effectiveness.

**Pertinent Project Types.** New construction and reconstruction multi-lane highway and freeway projects.

**Responsible Party.** Roadway design engineer or traffic engineer

**Sub-tasks.**

- ◆ Review existing and projected traffic data obtained (see [1430: Obtain Traffic Data](#)) earlier.
- ◆ Identify desired LOS for the design year.

**Helpful Suggestions.** Several computer software programs are available to run the analysis.

**Resource Material.**

- ◆ *Highway Capacity Manual* by the [Transportation Research Board](#)
- ◆ *TxDOT Roadway Design Manual*, Chapter 2, Section 2, [Traffic Characteristics](#).

**2320: Evaluate route alternatives**

**Description.** A route alternative comparison is performed within the preferred corridor to identify the most feasible and reasonable route alternatives. The evaluation process developed for selecting alternatives is typically based on criteria addressing project objectives. Quality, organization, documentation, and presentation of data are critical to the success and credibility of the evaluation and selection process.

**Pertinent Project Types.** New location, added capacity, or controlled access projects or projects requiring an Environmental Impact Statement.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Review traffic data (see [1430](#): Obtain traffic data) obtained earlier.
- ◆ Select evaluation criteria and measures for comparing alternatives.
- ◆ Evaluate each alternative.
- ◆ Schedule public involvement activities such as ongoing stakeholder meetings (see [2110](#): Conduct early coordination with stakeholders and public meetings (see [2260](#): Conduct public meeting))
- ◆ Identify the most feasible and reasonable alternatives.

**Helpful Suggestions.**

- ◆ Obtain traffic data. It may take three to four months to obtain design traffic data.
- ◆ Early on, determine the availability and preference for base mapping such as aerial photos, USGS maps, topographic maps, floodplain maps, or TxDOT county maps.
- ◆ Determine when public input should be sought and what type of feedback should be requested.
- ◆ In describing alternatives, use intersecting roads or landmarks instead of stationing.
- ◆ Establish a clear labeling or naming convention for alternatives.
- ◆ Anticipate the need for creating options to an alternative and possible combinations of alternatives.

- ◆ Some evaluation criteria may be less relevant than others in the decision making process. Therefore, it is important that each element is weighted if a matrix/numerical analysis is performed.
- ◆ Keep alternatives basic in definition and avoid dwelling on details that are not significant at a concept level.

**Critical Sequencing.** The most feasible and reasonable route alternatives must be selected before evaluating geometric alternatives.

**Resource Material.**

- ◆ TxDOT [Environmental Manual](#)
- ◆ TxDOT [Hydraulic Design Manual](#)
- ◆ TxDOT [Bridge Project Development Manual](#)
- ◆ TxDOT *Landscape and Aesthetics Design Manual*, Chapter 3, Section 2 [Evaluate Corridor Alternatives \(2300\)](#) and [Evaluate Route Alternatives \(2320\)](#).

**2330: Initiate railroad coordination**

**Description.** All work within railroad right of way (ROW) must be coordinated with the railroad owners. TxDOT may not perform work within railroad ROW without the proper agreement, liability insurance, and special provisions.

Approval for new, at-grade railroad crossings is difficult to obtain. Generally, an existing at-grade crossing in the general project area must be closed or grade-separated so no net increase in at-grade crossings results. TxDOT usually bears the burden of finding these “trade-off” crossings and negotiating with third parties if they are located off the State highway system.

**Pertinent Project Types.** Projects involving a highway-rail crossing, either at-grade or grade-separated, and all projects involving joint usage with the railroad (e.g., shared ditches).

**Responsible Party.** Project manager or roadway design engineer

**Sub-tasks.**

- ◆ Coordinate with district railroad coordinator.
- ◆ Locate **all** potential railroad crossings within project limits.
- ◆ Determine existing crossing conditions and traffic control. Investigate the need for interconnection between various signals.
- ◆ Identify opportunities to close or consolidate at-grade crossings.

- ◆ Obtain a train crossing schedule from railroad owners. Inquire into major railroad line improvement plans. Obtain approval of clearances for grade-separated structures.
- ◆ Develop recommendations for proposed rail-highway crossings.
- ◆ Document all correspondence regarding the design of the railroad features.
- ◆ Task [5360](#): Develop Exhibit A for railroad agreements. The Railroad Section of the Traffic Operations Division prepares and negotiates agreements with railroad owners.

**Helpful Suggestions.**

- ◆ Consider installing new, and upgrading existing, railroad warning devices at railroad crossings within and near the project limits. Coordinate this with the railroad owner through the Traffic Operations Division. Railroad owners are responsible for maintaining railroad warning devices.
- ◆ Consider interconnecting closely spaced, active railroad warning devices and highway traffic signals.
- ◆ Consider replacing the crossing surface and subgrade. Both TxDOT and railroad owners have responsibilities for various work items. Identify and determine responsibilities for work on railroad ROW at this time.

**Critical Sequencing.** Initial railroad coordination should be conducted before selecting a preferred alternative because railroad issues may affect final alternative selection.

**Authority Requirements.**

- ◆ Minute order 107279; 09/25/97; “Goals for the department's railroad safety program”
- ◆ TxDOT memo; 01/13/97; “Railroad Agreements for Surface Treatment, ACP Overlay and Other Minor Projects on Railroad Right of Way”; from David Newbern; to all District Engineers
- ◆ TxDOT memo; 07/29/94; “Railroad Agreements, Railroad Protective Liability Insurance, and PS&Es”; from Gary Trietsch and Robert Wilson; to all District Engineers.

**Resource Material.**

- ◆ TxDOT [Bridge Project Development Manual](#)
- ◆ TxDOT *Traffic Operations Manual*, [Railroad Operations Volume](#).

**2340: Identify requirements for crossing navigable waters**

**Description.** The requirements for crossing navigable waters must be determined to ensure that projects are in compliance with federal regulations. All projects affecting a [navigable waterway](#) require coordination with the U.S. Coast Guard (

G) and the U.S. Corps of Engineers (COE). (See the [Environmental Manual](#)).

**Pertinent Project Types.** Projects affecting a navigable waterway

**Sub-Tasks.**

- ◆ Determine if waterways are navigable.
- ◆ Identify required permits.
- ◆ Identify design criteria necessary to secure permits.

**Responsible Party.** District environmental coordinator

**Helpful Suggestions.**

- ◆ For a proposed bridge crossing navigable waterways, lights and/or signals will likely be required which warn of bridge piers, caps, and beams, regardless of whether a
- ◆ G clearance permit is required.
- ◆ Assistance related to bridge requirements is available from the Project Development Section of the Bridge Division.

**Critical Sequencing.** When design criteria must be met to secure a permit, coordinate this early in schematic development.

**Authority Requirements.**

- ◆ [33 USC § 401](#)
- ◆ [33 CFR Part 118](#) Coast Guard Regulations.

**Resource Material.**

- ◆ TxDOT [Environmental Manual](#)
- ◆ TxDOT [Hydraulic Design Manual](#)
- ◆ TxDOT [Bridge Project Development Manual](#).

### 2350: Evaluate geometric alternatives

**Description.** Horizontal and vertical alignments are calculated for each reasonable and feasible route alternative and are shown on preliminary schematics. Normally this requires developing alignments for mainlanes, ramps, crossroads, and interchanges to ensure that design controls are satisfied. The end product is the selection of a preferred alternative.

Design the alignments to fit constraints that were identified earlier. The preliminary hydraulic design (See [2620](#): Perform preliminary hydraulic analysis/design) should be reviewed so the vertical “profile” alignment will accommodate drainage structures.

At this stage, alignments should be defined enough, geometrically, to determine basic requirements - such as required drainage structures, right of way (ROW), business/home relocations, and major utility conflicts. This information can be used in comparing alternatives, along with safety, environmental, travel efficiency and other considerations. Base maps do not need to be made from new field surveys or aerial photogrammetry. Such detailed data collection can be cost prohibitive for projects with several, long route alternatives. Base maps may include U.S. Geological Survey quadrangle (“quad”) maps, digital orthophotography maps, or older aerial photogrammetry maps. From these base maps, approximated existing ground profiles can be generated, proposed profiles can be developed, and rough cross sections can be generated. Horizontal alignments can be drawn to scale on the maps and then roughly computed. Later, a preferred geometric alignment will be selected, and a more detailed schematic may be prepared on survey controlled base mapping.

The preferred alignment and associated geometrics, including typical section(s), will be formally labeled as “preferred” and presented to the public. Reasons for establishing an alignment as preferred must be clear and should be recorded in project files for future reference.

A checklist of items to show on a schematic is available in the *TxDOT Roadway Design Manual*, Chapter 1, [Section 3](#).

A preliminary schematic will accomplish the following goals:

- ◆ Formulate design concepts for the project.
- ◆ Present design elements collected in one graphic document - drainage structures, basic traffic data, project constraints, typical sections, etc.
- ◆ Serve as a basis for approval-agreement on scope, design, etc., between districts, divisions, FHWA, counties, cities, and railroads - as applicable.
- ◆ Establish relationships between the project and environment.
- ◆ Define ROW and access control requirements.
- ◆ Act as a public information communication tool. For better public understanding of a project, a schematic may be supplemented by a physical scale-model or computer visualization. These may be needed for very costly, controversial projects or complex projects such as interchanges.
- ◆ Serve as the guide for detailed design and plan preparation.

**Pertinent Project Types.** New location, added capacity, or controlled access projects or projects requiring an Environmental Impact Statement.

**Responsible Party.** Roadway design engineer

**Sub-tasks.**

- ◆ Review design traffic data (see [1430](#): Obtain Traffic Data) obtained earlier. Traffic data such as current and design year ADT volumes may be shown on the schematic.
- ◆ Prepare a base map for the schematic's plan view showing existing topographic features. Base map is not necessarily from detailed field survey data or aerial photogrammetry; it may be from USGS quad maps or digital orthophotography.
- ◆ For schematics in CADD, follow TxDOT's standards for CADD drawing levels in the *PS&E Manual*, Chapter 2, [Section 4](#); this will provide easy transition to preparing PS&E plan sheets from schematics.
- ◆ Add existing ROW limits (see [4000](#): Perform preliminary right of way research), locations of major utilities, etc.
- ◆ Add constraints (e.g., proximity to historic structure, hazardous/petroleum materials, threatened/endangered species, wetlands, or noise attenuation); add labels or dimensions if appropriate.
- ◆ Show how constraints will be handled.
- ◆ [Task 2360](#): Develop typical sections and add to schematic.
- ◆ Establish computed horizontal alignments and add to schematic.
- ◆ Evaluate need to realign heavily skewed intersections.
- ◆ Establish sizes of drainage structures, and add location and size data to schematic. Only major-cost structures are needed for preliminary schematics.
- ◆ Establish computed vertical alignments and add to schematic; adjust horizontal and vertical alignments as needed.
- ◆ Generate preliminary cross sections to aid in determining right of way (ROW) needs and earthwork volumes.
- ◆ Determine ROW needs and control of access restrictions (see [2630](#): Determine right of way and access needs), and add limits to schematic. Examine ROW needs for special drainage or run-off pollution control measures (e.g., detention or filtration basins). Obtain project-specific minute order for controlled access facilities (see [1235](#): Obtain project specific minute order, if required).
- ◆ Consider significant utility conflicts. Add labels, identifying potential conflicts, to schematic.
- ◆ Consider traffic handling during construction; this should be a major consideration.
- ◆ Evaluate pavement design type (see [2510](#): Prepare pavement design report) for compatibility with proposed construction sequence.
- ◆ Coordinate landscape and aesthetic considerations with landscape architect.
- ◆ Consider hydraulic issues such as backwater flooding and scour/erosion potential.

- ◆ Identify needed design exceptions or waivers (see [2870](#): Submit design exceptions/waivers for approval). Alignment and other geometric features must meet TxDOT's minimum design standards; otherwise a design exception or waiver is required.
- ◆ If any improvements are planned involving railroad ROW, the district railroad coordinator should contact the Railroad Section of the Traffic Operations Division for early coordination with the appropriate railroad company (see [2330](#): Initiate railroad coordination).
- ◆ Schedule public involvement activities such as ongoing stakeholder meetings (see [2110](#): Conduct early coordination with stakeholders) and public meetings (see [2260](#): Conduct public meeting).
- ◆ Select preferred alternative.

### Helpful Suggestions.

- ◆ For schematics in CADD, consider plotting a separate, easy-to-understand schematic for public view using CADD capabilities. Make the schematic as uncluttered as possible; keep stationing because it is useful while taking notes with the public.
- ◆ The CADD schematic is typically plotted in a continuous roll for viewing the entire project; however, it may be cut into sheets if needed. Sometimes separate sheets may be needed to show enlarged areas of a project having large amounts of detail.

**Resource Material.** The following table indicates where more information related to the evaluation of geometric alternatives may be found:

**Resource Material**

For information on	Refer to
Roadway design criteria	TxDOT <a href="#">Roadway Design Manual</a>
Schematic checklist	TxDOT <i>Roadway Design Manual</i> , Chapter 1, <a href="#">Section 3</a>
Bridge planning	TxDOT <a href="#">Bridge Project Development Manual</a>
Bridge design	TxDOT <a href="#">Bridge Design Manual - LRFD</a>
Landscape and aesthetics	TxDOT <i>Landscape and Aesthetics Design Manual</i> , Chapter 3, Section 2, <a href="#">Evaluate Geometric Alternatives (2350)</a>
Hydraulics	TxDOT <a href="#">Hydraulic Design Manual</a>
Bike lane/bike trail design criteria	AASHTO <i>Guide for the Development of Bicycle Facilities</i>
Pedestrian Accommodation	AASHTO <i>Guide for the Planning, Design, and Operation of Pedestrian Facilities</i>
Quantitative safety evaluation	Tools developed under TxDOT research project 0-4703, "Incorporating Safety into the Highway Design Process." Tools and reports are available at <a href="http://d2dtl5nnlpr0r.cloudfront.net/tti.tamu.edu/documents/5-4703-01-1.pdf">http://d2dtl5nnlpr0r.cloudfront.net/tti.tamu.edu/documents/5-4703-01-1.pdf</a> .

**2360: Develop typical sections**

**Description.** Typical sections are developed as part of selecting design alternatives. The typical section geometry should include the following information:

- ◆ existing and proposed right of width,
- ◆ pavement cross slopes,
- ◆ lane, shoulder, and median widths,
- ◆ side-slope rates for both cuts and fills for all proposed highway mainlanes, ramps, frontage roads, and cross roads,
- ◆ clear zone widths,
- ◆ provisions for landscaping and aesthetics,
- ◆ noise attenuation devices, and
- ◆ roadway elevations relative to local floodplain.

Design criteria for features shown on typical sections can be found in TxDOT's *Roadway Design Manual*, [Chapter 2](#). If pavement design information (see [2510](#): Prepare pavement design report) is available at this time, it may be shown on the typical section.

**Pertinent Project Types.** All projects

**Responsible Party.** Roadway design engineer

**Resource Material.**

- ◆ TxDOT *Roadway Design Manual*, [Chapter 2](#)
- ◆ TxDOT *Landscape and Aesthetics Design Manual*, Chapter 3, Section 2, [Develop Typical Sections \(2360\)](#)
- ◆ TxDOT [Pavement Design Guide](#).

**2370: Prepare Assessment of Landscape and Aesthetic Issues**

**Description.** The assessment of landscape and aesthetic issues identifies the issues that will affect the physical design form and detail of the project. A landscape architect should be consulted to prepare an Assessment of Landscape and Aesthetic Issues (ALAI). (See the *Landscape and Aesthetics Design Manual*, Chapter 3, Section 2, Prepare Assessment of Landscape and Aesthetic Issues ([2370](#)). After the project progresses and concepts are refined, recommendations may include any of the following:

- ◆ aesthetic improvements by any of the following:
  - adjustments to the vertical or horizontal alignment or median width

- use of aesthetic construction materials (having color and texture)
- use of vegetation
- use of lighting
- aesthetic design of structural components
- ◆ erosion control (temporary for construction and permanent)
- ◆ environmental mitigation (e.g., restoration of vegetation lost through construction, sound barrier wall).

The district or division landscape architect can assist in providing guidance upon request.

**Pertinent Project Types.** New construction and reconstruction projects.

**Responsible Party.** Roadway design engineer

**Sub-tasks.**

- ◆ Coordinate landscape/aesthetics plan with district or Design Division landscape architect.
- ◆ Obtain data on existing conditions from soil surveys and topographic surveys.
- ◆ Prepare concept proposal including data such as construction and maintenance costs.
- ◆ Consider environmental justice issues if unusual or high-cost amenities are proposed that vary from usual TxDOT practice.

**Authority Requirements.**

- ◆ [23 CFR Part 752](#)
- ◆ [42 USC § 4331](#)
- ◆ [43 TAC § 2.4](#) and [§§ 2.64 - 2.66](#).

**Resource Material.** TxDOT *Landscape and Aesthetics Design Manual*, Chapter 3, Section 2, Prepare Assessment of Landscape and Aesthetic Issues ([2370](#))

**2380: Develop bicyclist/pedestrian accommodation concept**

**Description.** Accommodations for bicyclists and pedestrians should be considered on all roadway projects. If accommodations are to be provided, preliminary plans should be developed for the bicyclist/pedestrian accommodations.

**Pertinent Project Types.** All projects

**Responsible Party.** Roadway design engineer

**Sub-tasks.**

- ◆ Decide what accommodation type, if any, can be reasonably provided.
- ◆ Provide a reasonable alternative route if an existing bicyclist/pedestrian facility is being affected by proposed construction.
- ◆ Coordinate with public transportation providers to facilitate provision of intermodal connections.

### Helpful Suggestions.

- ◆ Refer to local bicyclist/pedestrian plans, if applicable.
- ◆ Coordination with the district bicycle coordinator and district pedestrian coordinator. Coordination is essential during the planning stage.
- ◆ Where new bicyclist/pedestrian facilities are proposed, include sufficient information to explain the reasons for facility selection in the environmental effects statement.

**Critical Sequencing.** Include provisions for bicyclist/pedestrian accommodations in the preliminary schematic.

**Authority Requirements.** [23 CFR Part 652](#)

### Resource Material.

- ◆ TxDOT *Roadway Design Manual*, Chapter 2, Section 6, [Sidewalks](#) and Chapter 6, Section 4, [Bicycle Facilities](#)
- ◆ TxDOT [Bridge Project Development Manual](#)
- ◆ TxDOT *Landscape and Aesthetics Design Manual* Chapter 3, Section 2, “[Develop Bicyclist/Pedestrian Accommodation Concept \(2380\)](#)”
- ◆ *AASHTO Guide for the Development of Bicycle Facilities*
- ◆ *AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities*
- ◆ TxDOT [PED standard details](#) for accessible sidewalks and curb ramp design
- ◆ [Texas Accessibility Standards](#)
- ◆ Americans with Disabilities Act Accessibility Guidelines and proposed rules for public right of way projects (Available online at <http://www.access-board.gov/adaag/html/adaag.htm>.)

## 2460: Update cost estimates

**Description.** Construction and right of way cost estimates, and corresponding DCIS data, should be updated periodically to reflect project changes. Any cost overruns will affect district programming of projects and should be identified as early as possible. For more information, see [1200](#): Prepare cost estimate. The cost estimates should accurately identify approved funding sources (federal, state, and local participation.)

[Eligible utility adjustment](#) costs must be included in the right of way cost estimate.

**Pertinent Project Types.** All projects

**Responsible Party.** Roadway design engineer

**Helpful Suggestions.**

- ◆ When recalculating the cost estimate, be sure to use current unit bid prices.
- ◆ Consider factors such as the following:
  - geographic location (i.e., remoteness) and proximity to material sources
  - recent bid prices on similar projects
  - anticipated difficulty of construction
  - presence of restricted work areas or schedules
  - project size relative to previous project sizes
  - proposed project schedule
  - expected construction staging
- ◆ If VE requirements are met, conduct study.

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## Section 5 — Geometric Schematic

### Overview

This section discusses the process of refining alignments and geometrics, performing analyses on geometrics, and preparing preliminary plans and layouts. Most of the data collected and calculated is shown on a “geometric” schematic - a schematic having computed alignments. Work related to schematic development includes performing hydraulic studies, determining right of way needs, and identifying utility conflicts.

After developing preliminary schematics and performing associated preliminary design, the project cost estimate and, sometimes the project scope are updated to reflect changes.

Requirements for presentation of information in schematics are included in the *Roadway Design Manual*, Chapter 1, [Section 3](#).

Developing the Geometric Schematic includes the following tasks. All tasks should be performed concurrently as much as possible. However, the following sequence of work tasks will likely be necessary:

- 2500. [Develop preferred geometric alignment](#)
- 2505. [Perform preliminary geotechnical surveys](#)
- 2510. [Prepare pavement design report](#)
- 2520. [Refine typical sections](#)
- 2530. [Consider impacts on historic structures](#)
- 2540. [Perform detailed Level of Service analysis](#)
- 2550. [Determine guide signing and operational controls](#)
- 2560. [Submit requests for new or revised access points to interstate highways](#)
- 2570. [Perform preliminary planning for weigh stations](#)
- 2580. [Perform preliminary planning for bridges](#)
- 2590. [Establish preliminary retaining and/or noise wall locations](#)
- 2610. [Perform hydrologic study](#)

- 2620. [Perform preliminary hydraulic analysis/design](#)
- 2630. [Determine right of way and access needs](#)
- 2640. [Identify existing utilities on geometric schematic](#)
- 2650. [Identify potential utility conflicts](#)
- 2660. [Establish preliminary illumination locations](#)
- 2670. [Conduct constructability review](#)
- 2460. [Update cost estimates](#)
- 2690. [Update project scope](#)
- 1400. [Review scope, cost, and staff requirements of project development](#)

## **2500: Develop preferred geometric alignment**

**Description.** A **preferred** geometric alignment is developed after preliminary schematics are developed (see [2350](#): Evaluate geometric alternatives) and a preferred alternative selected. Related disciplines should be consulted in reviewing alternatives and establishing the preferred alignment.

Changes to the preferred alignment after a public hearing may require TxDOT to repeat the review and approval process for the environmental document and hold an additional hearing. However, minor adjustments to alignments may be made by the designer, if feasible and if the change does not compromise project design criteria. Substantial changes to the approved schematic will require submission of several copies of the revised schematic to the Design Division/FHWA.

A checklist of items to show on a schematic is available in the TxDOT *Roadway Design Manual*, Chapter 1, [Section 3](#).

A list of sub-tasks involved in developing a schematic is available in this manual under [2350](#): Evaluate geometric alternatives.

**Pertinent Project Types.** New location, added capacity, or controlled access projects or projects requiring an Environmental Impact Statement.

### **Helpful Suggestions.**

- ◆ Avoid changes to ROW limits and locations of ramp gores shown on the schematic after Design Division and FHWA approval.
- ◆ Consider underground features, such as utilities and septic tank systems, when making alignment adjustments.

- ◆ Begin identifying and securing approval of design exceptions/waivers (see [2870](#): Submit design exceptions/waivers for approval).
- ◆ Consider conducting a value engineering study (see [2700](#): Conduct a Value Engineering (VE) study).

**Responsible Party.** Project manager

**Resource Material.** TxDOT [Roadway Design Manual](#)

### 2505: Perform preliminary geotechnical surveys

**Description.** Preliminary geotechnical surveys are performed to help guide early project layout and design, and to determine 1) feasibility of the preliminary design and 2) limitations on construction staging. Preliminary geotechnical testing serves as a preview to determine the following factors:

- ◆ whether an additional final geotechnical survey (see [5460](#): Perform final geotechnical surveys) is needed.
- ◆ preliminary geotechnical surveys can vary from simple, visual inspections to various forms of [subsurface exploration](#), depending on information needed.

For large structures, preliminary geotechnical surveys form the basis for more rigorous testing. On major projects, a small number of preliminary borings should be obtained to aid in preliminary project layout.

Geotechnical surveys for pavement design should be done at this time and may include roadway pavement testing such as [Falling Weight Deflectometer](#) (FWD) testing.

**Pertinent Project Types.** All projects except preventive maintenance and restoration projects.

**Responsible Party.** Project manager

#### **Sub-tasks.**

- ◆ Determine needs for more data and field testing after evaluating existing geotechnical information.
- ◆ Forward the information to the district pavement engineer, structural engineer, and landscape architect for their use.

#### **Helpful Suggestions.**

- ◆ The Field Operations Section of the Bridge Division is available for geotechnical engineering support in areas of foundations, retaining walls, embankment stability including slope stability and settlement, and stabilization of soft soils under roadway and embankment.

- ◆ The Pavement Section of the Construction Division is responsible for technical support for pavement design such as falling weight deflectometer, ground penetrating radar, dynamic cone penetrometer, and seismic pavement testing.
- ◆ The district laboratory and Materials Section of the Construction Division are responsible for assisting with soils exploration and testing.
- ◆ A right of entry (see [2150](#): Obtain right of entry) or other written evidence of permission must be obtained before entering private property.
- ◆ Results may influence project design (e.g., high water table, hazardous materials).

### Critical Sequencing.

- ◆ Perform hazardous materials investigations (see [3280](#): Perform hazardous materials survey assessment and investigation) before performing this task to avoid spreading contamination.
- ◆ Preliminary geotechnical surveys should be performed before developing a pavement design (see [2510](#): Prepare pavement design report) or establishing preliminary retaining and/or noise wall locations (see [2590](#) Establish preliminary retaining and/or noise: wall locations).
- ◆ Locate existing utilities before conducting subsurface exploration.

### Resource Material.

- ◆ TxDOT [Geotechnical Manual](#)
- ◆ TxDOT Pavement Design Guide, Chapter 3, Section 2, [Geotechnical Investigation for Pavement Structures](#)
- ◆ [U.S. Natural Resources Conservation Service](#) (formerly Soil Conservation Service) Soil Survey by County.

## 2510: Prepare pavement design report

**Description.** The pavement structure represents one of the single most costly items on the typical highway improvement project. One important reason for doing a preliminary pavement design is to facilitate and enhance the accuracy of the cost estimate.

The preliminary pavement design is performed by a design engineer and requires the evaluation of various data to determine a proper pavement structure, including materials properties, environmental conditions, and cost. Traffic data (see [1430](#): Obtain Traffic Data) and geotechnical data (see [2505](#): Perform preliminary geotechnical surveys) should be reviewed. There are benefits and costs to be considered in selecting [rigid pavement](#) or [flexible pavement](#) types. The designer's job is to assess all facts and factors (including [life-cycle costs](#) and user-delay costs) and maximize the benefits.

The designer must determine the purpose of the new pavement structure - such as improving structural capacity or improving functional characteristics such as ride quality or skid resistance. For overlays and rehabilitation projects, it is essential to perform pavement evaluations to identify the types of distress (such as base failures, asphalt stripping, pumping, etc), determine the causes for distresses, and suggest a rehabilitation strategy that will address the problem. For new pavements it is important to perform a full geotechnical investigation to determine whether there is a need for stabilization of the subgrade material in accordance with the stabilization guidelines developed by the Construction Division.

If significant changes occur during project development in project scope, pavement type, traffic data, etc., the report may need to be revised and resubmitted.

**Pertinent Project Types.** All projects on the interstate highway system, and all projects on other facilities except preventive maintenance.

**Responsible Party.** Roadway design engineer or district pavement engineer

**Sub-tasks.**

- ◆ Collect necessary data, such as the following:
  - “as-built” construction plans; field evaluation data
  - Existing and projected traffic data (see [1430](#): Obtain Traffic Data.) (request early in project development)
  - Geotechnical investigation
  - current pavement construction cost information
  - drainage data
  - historical performance information
  - Pavement evaluation
  - available funding.
- ◆ Contact district maintenance personnel for additional information on roadway pavement history.
- ◆ Check the Pavement Management Information System (PMIS) for historical data on pavement conditions. PMIS is available on the TxDOT mainframe computer system.
- ◆ Perform a condition survey - a site visit to assess pavement surface distress.
- ◆ Determine the requirements of the new pavement - what loads must it carry and how long before the first overlay is required.
- ◆ Determine the type of pavement to be built.
- ◆ Determine the different materials to be used for the different layers of the pavement structure.
- ◆ Determine the Performance Grade (PG) to be used for the Hot Mix asphalt layers.

- ◆ Determine the pay schedule to be used for evaluating the ride quality.
- ◆ Perform a life-cycle cost analysis as part of using automated design software (e.g., FPS19).
- ◆ Prepare the pavement design and develop a Pavement Design Report. (See the *Pavement Design Guide*, Chapter 2, Section 8, [Pavement Design Report](#)).
- ◆ Send the design to the district pavement engineer for review and approval. The district pavement engineer is responsible for ensuring compliance with FHWA and TxDOT design policies and procedures. If a district does not have a certified pavement engineer, then pavement design approval reverts to the Materials and Pavement Section of the Construction Division.
- ◆ The district pavement engineer sends the approved copy of the pavement design report to the Pavement Section of the Construction Division for review and analysis. Revise the project cost estimate since pavement is a major portion of the project cost. (See [2460](#), Update Cost Estimates).

### Helpful Suggestions.

- ◆ Contact Transportation Planning and Programming Division for both existing and projected traffic data (see [1430](#): Obtain Traffic Data).
- ◆ The Materials and Pavement Section of the Construction Division is available for assistance as needed. Also, refer to the [Pavement Design Guide](#).
- ◆ Contact the Materials and Pavement Section, through the district pavement engineer, for information on the FWD testing, the dynamic cone penetrometer test, the use of ground penetrating radar, and for a pavement design report format.
- ◆ The district laboratory can run the triaxial test, Atterberg limits, and calculate potential vertical rise as part of the geotechnical investigation.
- ◆ For large, complex projects that take years to design, the pavement design may need to be re-evaluated during detailed design. It is possible for traffic counts and patterns to change enough to require pavement design change.
- ◆ Soil types, weather conditions and material availability vary widely among districts. Consult with the district pavement engineer and construction engineers before starting a design.
- ◆ Pavement design must consider potential effects of groundwater on pavement performance along with other factors such as proposed roadway grades.

### Critical Sequencing.

- ◆ Because one of the purposes of the pavement design is to estimate the cost of pavement related items, the pavement design should be performed before updating the cost estimate.
- ◆ This task should occur after collecting traffic and geotechnical data (see [2505](#): Perform preliminary geotechnical surveys) (including roadway pavement testing) and after setting preliminary grades.

**Resource Material.**

- ◆ TxDOT [Pavement Design Guide](#)
- ◆ AASHTO *Design Procedures For New Pavements*
- ◆ TxDOT [Test Method Tex-117-E](#) (Construction Division, Materials Section).

**2520: Refine typical sections**

**Description.** As the project progresses, a preferred design alternative is selected, and revisions are made to the design. Typical sections need to be updated to show those changes. Information on (See [2360](#): Develop typical sections) their requirements is available in this manual. Design criteria for features to be shown on the typical sections can be found in TxDOT's [Roadway Design Manual](#). If preliminary pavement design information (see [2510](#): Prepare pavement design report) is available at this time, it may be added to the typical section.

Review proposed typical sections with local public agencies responsible for cost participation in the project

**Pertinent Project Types.** All projects.

**Responsible Party.** Roadway design engineer

**Critical Sequencing.** Revisions to the schematic are determined as the schematic is refined, hydraulic studies are performed, and a detailed Level of Service analysis is done.

**Resource Material.** TxDOT *Roadway Design Manual*, [Chapter 2](#)

**2530: Consider impacts on historic structures**

**Description.** A mitigation plan (see the [Environmental Manual](#)) may be needed for projects affecting buildings, structures (including bridges), sites, etc., which are included, or eligible for inclusion in the National Register. If a plan is needed, the project manager should begin considering how mitigation plans will be incorporated into the project.

**Pertinent Project Types.** All projects except preventive maintenance and restoration projects.

**Responsible Party.** Project manager

**Helpful Suggestions.**

- ◆ Coordinate all development with the district environmental coordinator.
- ◆ Request that the landscape architect review the mitigation plan so that landscape and aesthetics are considered.

- ◆ The Environmental Affairs Division will coordinate with the State Historic Preservation Office, which will review the PS&E package for all projects involving historic buildings, structures, or landscapes.

**Authority Requirements.**

- ◆ National Historic Preservation Act of 1966
- ◆ Department of Transportation Act of 1966
- ◆ National Environmental Policy Act of 1969
- ◆ Historical and Archeological Data Preservation Act of 1974
- ◆ Intermodal Surface Transportation Efficiency Act of 1991.

**Resource Material.**

- ◆ TxDOT Bridge Project Development Manual and [Historic Bridge Manual](#) for information on historic bridges
- ◆ TxDOT [Environmental Manual](#)
- ◆ TxDOT *Landscape and Aesthetics Design Manual*, Chapter 3, Section 2, Prepare Mitigation Plan for Historic Structures ([2530](#)).

**2540: Perform detailed Level of Service analysis**

**Description.** Earlier in the process, a preliminary Level of Services (LOS) analysis of project alternatives (see [2310](#): Perform preliminary Level of Service (LOS) analysis) should have been performed to aid in selecting a preferred alternative.

At this stage, a **detailed** LOS analysis may be needed to compare different geometrics to refine the design proposal. For example, the analysis can be used to refine geometrics such as shoulder and lane widths, profile grades, and frequency of access points.

Results of the detailed LOS analysis are incorporated into establishing preferred alignments (see [2500](#): Develop preferred geometric alignment) and (see [2520](#): Refine typical sections).

A LOS analysis is usually performed for the current year using current traffic and geometric conditions, and for the future “design” year using traffic projections and proposed geometric designs. The LOS analysis may show whether a proposed design will meet future transportation needs.

**Pertinent Project Types.** New construction and reconstruction projects on multi-lane highways and freeways, and projects with ramp modifications.

**Responsible Party.** Roadway design engineer

**Sub-tasks.**

- ◆ Review traffic data obtained (see [1430: Obtain Traffic Data](#)) on present and projected traffic volumes and other data such as percent trucks, design hourly volume, and the directional distribution.
- ◆ Obtain data on current and proposed roadway features (e.g., number of lanes, offset to obstructions, lane widths).

**Helpful Suggestions.** Several computer software programs are available to run the analysis.

**Critical Sequencing.** Perform as part of refining the preferred alignment and geometrics.

**Resource Material.**

- ◆ TxDOT *Roadway Design Manual*, Chapter 2, Section 2, [Traffic Volume](#) for LOS requirements
- ◆ *Highway Capacity Manual* by [Transportation Research Board](#).

### 2550: Determine guide signing and operational controls

**Description.** Traffic control guide signs guide vehicle operators along streets and highways. Guide signs show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, or cultural information.

There are different types of guide signs used on freeways or expressways. These include advance signs for interchange exits, supplemental signs, exit direction signs, diagrammatic signs, and miscellaneous signs.

Intelligent Transportation Systems (ITS) are an effort to improve safety and maximize operational efficiency of the transportation system by enabling TxDOT to detect incidents more quickly; provide information immediately to the public on incident location, its severity, effect on traffic flow and expected duration; and, change traffic controls to accommodate traffic flow changes due to the incident.

**Pertinent Project Types.** Mainly freeway/expressway and arterial highway projects; however, there are some rural applications.

**Responsible Party.** Roadway design engineer or traffic engineer

**Sub-tasks.**

- ◆ Obtain traffic data (see [1430: Obtain Traffic Data](#)) and accident/crash data (see [2190: Obtain traffic crash data](#)).
- ◆ Determine guide signs needed to increase roadway efficiency and safety.
- ◆ Consider including ITS strategies in the project.

**Helpful Suggestions.** Design guide signs to be legible to drivers approaching them and to allow adequate time for the driver to respond.

**Critical Sequencing.** Obtain traffic information (see [1430](#): Obtain Traffic Data) before performing this task.

**Resource Material.**

- ◆ *TxDOT Contract Management Manual*, [Traffic Engineering Agreements](#)
- ◆ [Texas Manual on Uniform Traffic Control Devices](#).

**2560: Submit requests for new or revised access points to interstate highways**

**Description.** Regardless of funding or oversight, new or revised (e.g., ramp reversal or relocation) access points on interstate highways must be approved by the Federal Highway Administration (FHWA). The FHWA must ensure there is either no or only minimal adverse effect on the operation of the interstate facility.

A request for access modifications must be documented in an “Interchange Access Justification Report (IAJR).” The IAJR should provide information to support a request for the approval of new or revised points of access on completed sections of the interstate system. A checklist of information to include in this report is being added to the *Roadway Design Manual*, Chapter 1. A Level of Service analysis (see [2540](#): Perform detailed Level of Service analysis) will be required. Submission of the schematic layout is also generally required.

**Pertinent Project Types.** Projects involving new mainlane access points or revisions to existing access points on the interstate system.

**Responsible Party.** Project manager

**Helpful Suggestions.**

- ◆ Consider including a line diagram showing LOS results and traffic volumes.
- ◆ Informal coordination with FHWA during schematic preparation may streamline the FHWA review process later.
- ◆ Coordination and approval of the IAJR can take time since it must be approved by FHWA Headquarters staff in Washington, DC.

**Critical Sequencing.** This task should be done after preparing a schematic.

**Authority Requirements.** [23 USC §111](#)

**Resource Material.** TxDOT [Roadway Design Manual](#)

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**2570: Perform preliminary planning for weigh stations**

**Description.** The need for new weigh/inspection stations and the determination of their location must be coordinated between the TxDOT administration and the Department of Public Safety (DPS). The DPS provides permanent scales, if needed, and also provides manpower to operate weigh/inspection stations. Construction of new weigh stations must be authorized by Texas Transportation Commission minute order. Projects that sever existing weigh stations should include construction of a replacement station as part of the project.

The need for a “weigh-in-motion” detector/station and its location is determined by the Transportation Planning and Programming Division of TxDOT. These stations are used to gather vehicle information - not for law enforcement.

**Pertinent Project Types.** Individual weigh/inspection station projects or highway improvement projects including weigh stations.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Obtain Commission authorization for any new weigh/inspection station construction.
- ◆ Contact the DPS to obtain details on weigh/inspection station design needs, consistent with Commission direction.
- ◆ Develop preliminary plans for the weigh/inspection station.

**Helpful Suggestions.** Clarify funding issues in question before beginning planning or design.

**Critical Sequencing.** If part of a larger project, perform this task when developing other preliminary plans.

**2580: Perform preliminary planning for bridges**

**Description.** The location of proposed bridges must be determined early in project development. Preliminary planning (see the [Bridge Project Development Manual](#)) includes estimating bridge limits, span lengths, and bent locations. Bridge layouts are created from this information and forwarded to the Bridge Division for approval. Accommodations for future bridge widening should be considered at this time.

If a railroad crossing is involved, the Project Development Section of the Bridge Division processes the layout through the Railroad Section of the Traffic Operations Division.

Culverts with a total span greater than or equal to 20 ft (6.1m) are considered bridge-class culverts and their design must follow span bridge guidelines.

**Pertinent Project Types.** Bridge projects or other projects that include bridge class structures.

**Responsible Party.** Roadway design engineer

**Sub-tasks.**

- ◆ Identify applicable Federal Emergency Management Agency (FEMA), U.S. Corps of Engineer and U.S. Coast Guard constraints. (See [2340](#): Identify requirements for crossing navigable waters).
- ◆ Identify type, size, and locations of existing bridges.
- ◆ Determine vertical and horizontal clearance requirements.
- ◆ For bridge widening, determine load rating, and obtain condition survey (see [Bridge Project Development Manual](#)).
- ◆ Consider widening the existing structure versus replacement.
- ◆ Determine type, size, and location of proposed bridges.
- ◆ Review proposed bridge cross sections with local public agency when grade separation structures involve facilities not owned or maintained by TxDOT.
- ◆ Initiate geotechnical surveys (see [2505](#): Perform preliminary geotechnical surveys) for foundation design.

**Helpful Suggestions.** Seek input and guidance from Project Development Section of the Bridge Division or the district bridge section concerning bridge types, application limits for bridge types, and possible innovative solutions.

**Critical Sequencing.** Bridge planning must be addressed early in project development. Characteristics such as limits of bridge, bent locations, span type and lengths of bridges crossing water can usually be set with strong certainty early in project development. Planning for overpasses, underpasses and interchanges requires an iterative process to satisfy structural capability and horizontal and vertical clearance requirements between roadways and bridges.

**Resource Material.**

- ◆ TxDOT [Bridge Project Development Manual](#)
- ◆ TxDOT [Bridge Design Manual](#)
- ◆ TxDOT [Hydraulic Design Manual](#)
- ◆ TxDOT *Landscape and Aesthetics Design Manual*, Chapter 3, Section 2, Perform Preliminary Planning for Bridges ([2580](#)).

**2590: Establish preliminary retaining and/or noise wall locations**

**Description.** Preliminary retaining and/or noise wall locations are established as part of developing geometric schematics. Wall locations may be revised as the project progresses. Locating walls will assist in determining locations of needed soil core borings. (See [2505](#): Perform preliminary geotechnical surveys).

The noise study (see [3330](#): Conduct noise analysis) will include recommendations for mitigating noise. A noise wall is the primary method. Later, during detailed design, retaining and/or noise wall layouts will be prepared. (See [5640](#): Prepare retaining and/or noise wall layouts).

**Pertinent Project Types.** Projects having retaining and/or noise walls

**Responsible Party.** Roadway design engineer

**Sub-tasks.** The following sub-tasks are common to both retaining and noise walls:

- ◆ Determine if aesthetics is an important consideration because this will affect the type of design.
- ◆ Consider traffic control plan, soil considerations, and right of way limitations because these factors may dictate type of wall to be used.
- ◆ Determine limitations on access to construct and maintain the wall. This will affect type of wall design (i.e., precast, cast-in place, drilled shafts, etc.).
- ◆ Determine right of way boundaries, and any additional site constraints.
- ◆ Coordinate with utility companies to determine any potential conflicts.
- ◆ Determine if street lights, overhead bridge signs, concrete traffic barriers, or traffic signs will be attached to the wall.

The following sub-tasks pertain to retaining walls:

- ◆ Determine where walls are needed, and their limits. Compare retaining wall cost to bridge cost to determine height at which bridge is more cost effective.
- ◆ On retaining wall layouts, include horizontal and vertical curvature information with stations and elevations along the top and bottom of the wall.
- ◆ Determine if the retaining wall also needs to act as a noise barrier wall.
- ◆ Determine if concrete barrier is needed at the base of a retaining wall for maintenance reasons (e.g., to protect fragile wall facings) or safety reasons (e.g., to shield vehicles from rough wall facings).
- ◆ Determine if the retaining wall will be supporting traffic lanes. If so, the design must account for traffic loading and barrier affect loading.
- ◆ Check sight distance for walls in cut sections - at intersecting streets and driveways.

- ◆ Submit retaining wall layout to Bridge Division if height will be greater than 25 feet (7.6 m).

The following sub-tasks pertain to noise walls:

- ◆ Coordinate with the environmental specialist to determine if a noise analysis and mitigation study is required. If so, determine if one was completed.
- ◆ Determine if a noise wall is the recommended mitigation measure for noise abatement. Refer to the project noise analysis and mitigation study report.
- ◆ Determine the material type for the noise wall. Material weighing four pounds per square foot is dense enough to prevent noise from passing through it. TxDOT typically uses concrete. Wood is not an acceptable material due to maintenance reasons.

### **Helpful Suggestions.**

For retaining and/or noise walls

- ◆ When creating a wall alignment, begin the alignment start point before the wall begins. This will make it easier to revise if, due to roadway or bridge changes, the wall beginning or end is moved.
- ◆ Provide adequate clear zone between travel lanes and the wall.
- ◆ The wall should not be located in gore areas and should be designed to avoid interfering with sight distance - including sight distance at intersecting streets and driveways.
- ◆ Create a smooth profile on the top of the wall for a pleasing appearance.

For noise walls

- ◆ Refer to the noise analysis for the location and dimensions of the proposed noise wall.
- ◆ For noise walls adjacent to residential areas and parklands, aesthetics will play an important role in developing the wall. Coordinate with planners, landscape architects and community groups early in project development.
- ◆ Often, the placement of the noise wall depends on existing or proposed utility lines. Coordinate early with utility owners to determine locations of existing and proposed new lines.
- ◆ Determine if a berm may be effectively used to mitigate noise. It may be used with a noise wall and allow a shorter, more aesthetically pleasing wall.
- ◆ Use caution about building noise walls because they might limit future access to adjacent property.

### **Critical Sequencing.**

- ◆ The noise study must be completed before performing this task.
- ◆ Preliminary retaining wall layouts should be submitted, when required, as soon as practical and before detailed design.

**Authority Requirements.**

- ◆ [23 CFR Part 772](#)

**Resource Material.**

- ◆ TxDOT [Roadway Design Manual](#) for information on horizontal clearances, sight distance requirements, and other considerations for wall placement
- ◆ TxDOT [Geotechnical Manual](#) for information on retaining wall selection and design
- ◆ TxDOT *Landscape and Aesthetics Design Manual*, Chapter 3, Section 2, [Establish Preliminary Retaining and/or Noise Wall Locations \(2590\)](#)
- ◆ TxDOT [Bridge Project Development Manual](#) for information on submission requirements
- ◆ TxDOT [Environmental Manual](#)
- ◆ TxDOT *Guidelines for Analysis and Abatement of Highway Traffic Noise*
- ◆ Internet site - [http://www.dot.state.tx.us/services/environmental\\_affairs/traffic\\_noise.htm](http://www.dot.state.tx.us/services/environmental_affairs/traffic_noise.htm)
- ◆ TxDOT Intranet site- <http://crossroads.org/env/Guidance/Traffic/default.htm>.

**2610: Perform hydrologic study**

**Description.** A hydrologic study is performed to estimate flood magnitudes caused by precipitation. An analysis will provide the designer with fundamental data necessary to perform preliminary sizing of drainage facilities and bridges. Data compiled includes peak runoff (discharge) and discharge hydrographs.

**Pertinent Project Types.** All projects except preventive maintenance and restoration projects.

**Responsible Party.** Roadway design or hydraulic engineer

**Sub-tasks.**

- ◆ Conduct a site investigation. (See the [Hydraulic Design Manual](#)).
- ◆ Identify potential outfall and stream crossing locations.
- ◆ Estimate the runoff (see the [Hydraulic Design Manual](#)) from the watershed.
- ◆ Review previous hydrologic study, reports, as-built construction plans, bridge inspection reports, and available stream gage data. Obtain and evaluate additional data including hydrologic studies, existing structure and channel surveys, existing structure inspection reports, tidal surveys, soil reports, and wetland reports.
- ◆ Review U.S. Natural Resources conservation Service (NRCS)(formerly Soil Conservation Service) reports as well as USGS and FEMA flood maps.
- ◆ Verify past coordination with local governments having jurisdiction over the project area.

**Helpful Suggestions.**

- ◆ Consider the possibilities for future development in the area. Additional buildings and parking lots can change the rate and direction of runoff.
- ◆ Many cities maintain zoning and land use maps; these should be referenced when estimating watershed runoff.

**Critical Sequencing.** This task should be done after the preliminary roadway layout is determined.

**Resource Material.** TxDOT [Hydraulic Design Manual](#)

**2620: Perform preliminary hydraulic analysis/design**

**Description.** A hydraulic analysis is required to create the preliminary plans and profiles of the roadway. The purpose of the analysis/design is to determine approximate elevations and sizes of cross drainage structures and to establish their effects on the roadway profile. The analysis conducted should result in an estimate of the most efficient, cost-effective drainage facilities that can accommodate the design storm. (See the [Hydraulic Design Manual](#)).

The basic hydraulic design process begins with data collection (See the [Hydraulic Design Manual](#)). Ultimately, the type of drainage facilities provided in the hydraulic design will be determined by the highway classification, right of way, geometry, and other considerations. The primary focus at this stage is to balance traffic safety and hydraulic efficiency and to comply with any regulations such as FEMA. Usually, there are not enough funds available to design a facility to handle the biggest flood that would ever occur. Thus, a compromise must be achieved between expense and potential effect.

Other major considerations should be determined, such as the need for large storm drain structures, and detention ponds, pump stations, and other hydraulic facilities; these should be assessed for cost and ROW requirements.

**Pertinent Project Types.** Projects affecting existing drainage, including those that add a concrete median barrier to an existing facility.

**Responsible Party.** Roadway design or hydraulic engineer

**Helpful Suggestion.** The calculation process may be significantly easier with use of TxDOT-approved hydrologic and hydraulic computer software (see the Hydraulic Design Manual). This hydraulic design software is a package of several programs, which provide computational capability for the majority of procedures contained in the TxDOT [Hydraulic Design Manual](#).

**Critical Sequencing.** Preliminary hydraulic design can be performed after runoff is calculated.

**Resource Material.** TxDOT [Hydraulic Design Manual](#)

**2630: Determine right of way and access needs**

**Description.** ROW requirements must be determined as part of developing preliminary and geometric schematics. With the geometric schematic, an accurate estimate of the area of ROW to be acquired is used in estimating the project's cost and refining the alignment to optimize use of the ROW. Earlier while developing preliminary schematics for route alternative selection, ROW needs for each route were approximated to compare alternative effects. Known utility facilities within the needed ROW should be located on the schematics.

The roadway design engineer determines the right of way (ROW) needed based on the proposed alignment, typical sections, access control, and any other information available. In determining proposed ROW limits, the engineer should consider accommodation for construction, drainage, clear zone, access to and maintenance of the highway, accessible pedestrian design if applicable and environmental mitigation.

**Pertinent Project Types.** Projects requiring additional ROW or a change to control of access.

**Responsible Party.** Roadway design engineer

**Sub-tasks.**

- ◆ Gather information on existing ROW, property lines, control of access, etc. (See [4000](#): Perform preliminary ROW research).
- ◆ Obtain project-specific minute order for controlled access facilities (see [1235](#): Obtain project specific minute order, if required).
- ◆ Develop plan to address identified encroachments.

**Helpful Suggestions.**

- ◆ Where possible and practical, consider reducing ROW acquisition costs by developing an alignment so that additional ROW is required from only one side of an existing facility; this will reduce the number individual parcels required.
- ◆ The proposed ROW should be sufficient for parallel drainage channels and cross-drainage structures.
- ◆ Identify needed drainage easements.
- ◆ The designer should strive to minimize displacements of homes or businesses while still meeting other design requirements.
- ◆ Intelligent Transportation System (ITS) infrastructure may affect ROW needs.
- ◆ If ROW is needed from any airport, contact the Planning Section of the Aviation Division for coordination.
- ◆ If existing features are determined to be an [encroachment](#) on State ROW, they will need to be removed.

- ◆ Reconfiguration of existing ramps may necessitate acquisition of additional control of access.
- ◆ Disposal of access rights must be handled according to [43 TAC §§ 21.101 – 21.106](#).

**Critical Sequencing.** This task should be performed concurrently with, or after, determining a preferred alignment and other geometrics. A ROW needs determination may play a key role in determining a preferred alignment because there may be existing ROW and access constraints - especially in urban areas.

**Authority Requirements.**

- ◆ [43 TAC § 15.54](#) and [§§ 21.101 - 21.106](#)

**Resource Material.**

- ◆ TxDOT [Hydraulic Design Manual](#) for information on drainage easements
- ◆ TxDOT [Right of Way Collection](#)
- ◆ TxDOT [Access Management Manual](#).

**2640: Identify existing utilities on geometric schematic**

**Description.** The design engineer should obtain information on existing utilities (See [2180](#): obtain information on existing utilities) from utility owners and create a layout of the existing utilities.

**Pertinent Project Types.** All projects except preventive maintenance and restoration projects.

**Responsible Party.** Roadway design engineer

**Sub-tasks.**

- ◆ Coordinate with district utility coordinator.
- ◆ Collect utility information from utility owners.
- ◆ Develop a utility layout.

**Helpful Suggestions.**

- ◆ A utility layout may be more easily prepared by performing the following steps:
  - sending the schematic to utility owners who do not have utility plans readily available
  - asking the owners to draw their utilities on the schematic - with distances referenced to the ROW or other reference points
- ◆ Consider using subsurface utility engineering (SUE). Information is available under [Task 4200](#): Locate existing utilities.

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**Critical Sequencing.** A utility layout should be created soon after developing the preliminary schematic.

### 2650: Identify potential utility conflicts

**Description.** Utility conflicts refer to physical conflicts between existing utilities and proposed transportation facility construction. Utility conflicts also refer to utilities not complying with TxDOT's Utility Accommodation Rules - such as utilities not complying with location, cover, or clearance requirements. After developing a utility layout, the roadway design engineer determines potential utility conflicts. Knowledge of these conflicts assists the utility owners in budgeting for anticipated adjustment costs.

**Pertinent Project Types.** All projects except preventive maintenance and restoration projects.

**Responsible Party.** Roadway design engineer

#### Sub-tasks.

- ◆ Review preliminary schematic with district utility coordinator.
- ◆ Locate utility conflicts in plan and profile.
- ◆ Contact the affected utility owners to discuss plans to address utility conflicts.

#### Helpful Suggestions.

- ◆ Try to revise alignments and project features to avoid utilities before requesting that the utilities be moved. It can be expensive and time-consuming to adjust the utilities, so it should be done only when it is unavoidable.
- ◆ Utility owners should be advised of potential conflicts as soon as possible. One to two years may be needed to budget, design, and complete required adjustments.

**Resource Material.** TxDOT [ROW Utility Manual](#)

### 2660: Establish preliminary illumination locations

**Description.** There are two basic types of illumination systems 1) continuous illumination systems and 2) safety lighting systems. Illumination must meet the requirements of *AASHTO's Roadway Lighting Design Guide* and must use TxDOT standard equipment and spacing. Electrical systems must be designed in accordance with the National Electrical Code. A preliminary illumination layout should be prepared showing pole locations and power sources.

**Pertinent Project Types.** Projects requiring illumination.

**Responsible Parties.** Roadway design engineer

**Sub-tasks.**

- ◆ Discuss with area/district staff the need for agreements (maintenance and/or construction) with local entities.
- ◆ Determine if the lighting system meets warranting conditions and requirements contained in the TxDOT [Highway Illumination Manual](#).
- ◆ Data to substantiate that warrants are met should be submitted with the request for programming and/or financing to the Design Division and should be shown on Form [1002](#).
- ◆ Determine the locations, mounting heights and offsets, and types of luminaires.
- ◆ Refer to FAA Circular 70/7460-1K to determine if FAA Form 7460-1 (available on the [Federal Aviation Administration website](#)) is needed. A FAA form 7460-1 may be required if the proposed illumination structures meet any of the following criteria:
  - taller than 200 feet (61 m)
  - closer than 20,000 feet (6096 m) to an airport or seaplane base having a runway longer than 3,200 feet (975 m)
  - closer than 10,000 feet (3048 m) to an airport or seaplane base having no runway longer than 3,200 feet (975 m)
  - closer than 5,000 feet (1524 m) to a heliport.

Refer to the FAA website at <http://www.faa.gov/> for more detailed information and to submit the proper form.

- ◆ Determine available power source locations from utility company.
- ◆ Develop plan sheets, pertinent notes, understructure lighting and details.

**Helpful Suggestions.**

- ◆ Lighting systems can be installed only on eligible roadways where the conditions warrant such installation.
- ◆ Intensity of illumination should be reviewed in residential areas to minimize impacts on residents.
- ◆ The power company can help locate power sources.
- ◆ The Traffic Engineering Section of the Traffic Operations Division is available to provide assistance, upon request.

**Critical Sequencing.** Preliminary cross-sections, locations of proposed roadside barriers, topographic maps and information on existing luminaire locations are needed before lighting plans can be developed.

**Authority Requirements.**

- ◆ [Federal Aviation Administration](#) Form 7460-1 for specific requirements on construction near airports, heliports, and seaplane bases.

**Resource Material.**

- ◆ TxDOT [Highway Illumination Manual](#)
- ◆ *AASHTO Roadway Lighting Design Guide*
- ◆ [NFPA 70: National Electric Code](#)
- ◆ ANSI/IESNA RP-8, Roadway Lighting
- ◆ Federal Aviation Administration website at <http://www.oiaa.faa.gov>, for forms and instructions
- ◆ TxDOT [Standard Sheets](#): Roadway Illumination Details (RID); Roadway Illumination Poles (RIP); High Mast Illumination Details (HMID); Electrical Details (ED); High Mast Illumination Pole (HMIP); High Mast Illumination Foundation (HMIF).

**2670: Conduct constructability review**

**Description.** Requirements for construction, including construction phasing, should be considered throughout development of the geometric schematic and preliminary layouts. If needed, seek construction and traffic expertise for assistance.

**Pertinent Project Types.** All projects except preventive maintenance and restoration projects.

**Responsible Party.** Roadway design engineer

**Sub-tasks.**

- ◆ Develop conceptual construction phasing plan.
- ◆ Review requirements for access and operation of construction equipment to ensure that schematic design can be built. Enlist the help of an experienced construction inspector for this review.

**Helpful Suggestions.** Sequence of construction often affects selection of retaining/noise wall and bridge construction method. Future advancements in 3-D and 4-D design and modeling technology may help provide a view of how the project will look as it progresses through construction.

**Resource Material.**

- ◆ [Texas Manual on Uniform Traffic Control Devices](#)
- ◆ NCHRP Report 391: “Constructability Review Process for Transportation Facilities Workbook”, 1997, by the [Transportation Research Board](#)

**2690: Update project scope**

**Description.** As project development progresses, the project scope may change due to design refinements, route or design alternative selection, utility conflicts, environmental mitigation measures, input from public involvement, or value engineering analysis findings.

Changes to project scope or other significant changes should be recorded in the Design Summary Report ([DSRform](#)) that was first prepared during the Design Concept Conference. (See [2000](#): Conduct Design Concept Conference). Updating this form helps serve as a type of project development “journal.” Recording changes and reasons for them assists in project development - especially if project team members change.

**Pertinent Project Types.** Projects for which a Design Summary Report was prepared.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Update DSR form completed during the Design Concept Conference.
- ◆ Revise project cost estimate (see [2460](#), Update Cost Estimates).
- ◆ Assess staffing needs for the next phase of work, detailed design work (see Chapter 5, Section 2 [Begin Detailed Design](#)).
- ◆ Reassess for VE requirements (see [2700](#), Conduct Value Engineering (VE) Study).

**Resource Material.** Design Summary Report ([DSRform](#))

## Section 6 — Value Engineering

### Overview

A Value Engineering (VE) study may be used to assess a project's overall effectiveness or how well the project meets identified needs. Value Engineering is another tool that may be used in alternative selection. Study findings may show that redesign of an alternative is needed, in which case schematics may require revisions.

VE may be viewed as a multi-peer review of project recommendations. VE is designed to gather expertise and experience of individuals to produce the most effective solution to the transportation need.

This section discusses the following s, listed in approximate chronological order.

2700. [Conduct Value Engineering \(VE\) study](#)

2710. [Revise design based on Value Engineering Study findings](#)

2460. [Update cost estimates](#)

2690. [Update project scope](#)

### 2700: Conduct Value Engineering (VE) study

**Description.** A Value Engineering (VE) study covers a broader area than a [life-cycle cost analysis](#). VE studies must include the following phases:

- ◆ information gathering (may be done prior to the actual study)
- ◆ investigation
- ◆ speculation
- ◆ evaluation
- ◆ development
- ◆ presentation
- ◆ final report (after actual study)
- ◆ recommendation approval/rejection process (after final report receipt) using Executive Decision Summary Form.

A VE study is a good opportunity for a multidisciplinary team to evaluate the safety, right of way, economic, environmental and operational benefits of alternative designs.

**Pertinent Project Types.**

- ◆ A VE study is required for all projects on the NHS receiving Federal Assistance with an estimated cost of \$50 million or more.
- ◆ A VE study is required for all bridge projects on the NHS receiving Federal Assistance with an estimated cost of \$40 million or more.
- ◆ If a VE study is done for a corridor covering several projects, then separate VE studies for each project are optional - regardless of individual construction project cost.
- ◆ A VE Study is not required on design-build projects. If the Project Manager chooses to conduct a study, this should be performed prior to the release of the Request for Proposal (RFP) .
- ◆ No exceptions to federal VE requirement will be granted by FHWA.

**Responsible Parties.** Project manager**Sub-tasks.**

- ◆ Contact the Design Division VE Coordinator for current VE requirements and processes.
- ◆ Conduct pre-study conference call with VE facilitator and Design Division.
- ◆ Identify team members and the team leader.
- ◆ Schedule study and collect resources.
- ◆ Conduct the VE study, coordinate report preparation, and make recommendations to the district.
- ◆ District Engineer or District Executive Decision Team determines which recommendations to implement.
- ◆ Executive Decision Summary Form should be completed by district and sent to Design Division and FHWA.

**Helpful Suggestions.**

- ◆ Consider a VE study when cost is approximately \$10 million less than required threshold to account for project scope creep in the estimate.
- ◆ A VE study should be performed on high-cost and/or complex projects.
- ◆ If the team leader is a TxDOT employee, provide sufficient uninterrupted time for the leader to prepare for the VE study and to coordinate production of the final report.
- ◆ Consider inviting representatives from local public agencies, utilities, commercial interests, and special event facilities to participate in VE studies on projects in highly urbanized areas that will impact these stakeholders.

- ◆ Consider any environmental commitments that will be required to obtain environmental clearance of the project.

**Critical Sequencing.**

- ◆ Perform the study after a schematic is available so the study can focus on practical design alternatives and so enough resource information has been generated during preliminary design.
- ◆ Reevaluate project scope and cost as it nears construction letting to determine if a VE study would be required or beneficial.

**Authority Requirements.**

- ◆ [23 CFR Part 627](#)

**Resource Material.**

- ◆ *AASHTO Guidelines for Value Engineering*
- ◆ <http://www.fhwa.dot.gov/ve/index.cfm>
- ◆ <http://www.fhwa.dot.gov/ve/vepolicy.cfm>.

**2710: Revise design based on Value Engineering Study findings**

**Description.** Depending on results of the Value Engineering Study (see [2700](#): Conduct Value Engineering (VE) study), the project's design may need to be modified. Corresponding schematic revisions may be needed as well.

**Pertinent Project Types.** Projects for which VE studies lead to design changes

**Responsible Party.** Project manager

**Sub-tasks.** Make necessary design changes to implement VE recommendations selected by the District Engineer or the Executive Decision Committee for implementation.

Document design changes resulting from VE recommendations on Executive Summary Form.

**Helpful Suggestions.** Sometimes recommendations seem viable at first, but result in offsetting disadvantages when studied in detail and should be re-examined before implementation.

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## Section 7 — Geometric Schematic Approval

### Overview

Before affording the opportunity for a public hearing, schematics are reviewed by district staff and stakeholders to ensure that design criteria, project needs, and commitments are met. Geometric schematics for projects requiring control of access or an Environmental Impact Statement must be approved by the Design Division before affording an opportunity for a public hearing. Check with the Design Division Field Coordination Section for exceptions to this requirement, particularly for rural projects with few abutting property owners. After the hearing, schematics may be changed based on public input. The same stakeholders involved in earlier review should review the changes made. If previously approved schematics are changed after the public hearing, they must be resubmitted to the Design Division for final approval. Geometric schematic approval should be obtained from the Design Division for new location or added capacity projects before beginning detailed design.

The following tasks are part of schematic approval:

- 2850. [Circulate geometric schematic for district review](#)
- 2860. [Review geometric schematic with stakeholders](#)
- 2870. [Submit design exceptions/waivers for approval](#)
- 2880. [Obtain approval of geometric schematic before public hearing](#)
- 2890. [Revise geometric schematic based on input from public hearing](#)
- 2920. [Obtain approval of final geometric schematic](#)

### 2850: Circulate geometric schematic for district review

**Description.** The project schematic should be distributed to the district for review and approval.

**Pertinent Project Types.** New location, added capacity, or controlled access projects or projects requiring an Environmental Impact Statement.

**Responsible Party.** Project manager

**Critical Sequencing.** District staff must review and approve the schematic before showing the schematic to stakeholders.

**2860: Review geometric schematic with stakeholders**

**Description.** When local entities, Metropolitan Planning Organizations, and local government officials are stakeholders in a project, it is advisable to obtain their review and approval of the project schematic - and changes to the schematic. The review will allow for discussion and consensus building on final decisions. The review can be useful if project changes involve significant funding changes.

Stakeholders should be kept involved throughout project development. The project manager may coordinate this task with the advanced project development engineer and roadway design engineer.

**Pertinent Project Types.** New location, added capacity, or controlled access projects or projects requiring an Environmental Impact Statement.

**Responsible Party.** Project manager

**Critical Sequencing.** This task should be completed after schematic review and approval by the district.

**2870: Submit design exceptions/waivers for approval**

**Description.** As the project progresses through preliminary and final design, the need for a [design exception](#) or [design waiver](#) may be identified.

Page 3 of Form [1002](#) is the official place where basic design criteria used for a project are documented. Design exceptions or waivers are required any time design criteria do not meet the TxDOT- or AASHTO-established minimums cited on page 3 of Form 1002.

Design exceptions, along with an explanation of why they are needed, should be sent to the Design Division for approval. The Design Division will coordinate with the Federal Highway Administration (FHWA), as appropriate. The submittal request must include a completed [Form 1002](#) and a completed [Request for Design Exception Form](#).

Design criteria requiring design exceptions and waivers are shown in the TxDOT *Roadway Design Manual*, Chapter 1, [Section 2](#) for the following projects:

- ◆ new construction and reconstruction projects
- ◆ non-freeway resurfacing, restoration, or rehabilitation (3R) projects
- ◆ non-freeway resurfacing or restoration (2R) projects
- ◆ special roadways
- ◆ bicyclist facilities.

Design exception requests for structural or hydraulic components are handled by the Bridge Design Exception Committee. Requests for deviations from the TxDOT or AASHTO criteria for bridge facility designs must be handled according to procedures in the TxDOT [Bridge Project Development Manual](#).

For park road projects off the state highway system, deviations from the “Texas Parks and Wildlife Department Design Standards for Roads and Parking” must be coordinated through the Field Coordination section in the Design Division. The Design Division will forward the request to the Texas Parks and Wildlife Department for approval. Documentation of this approval should be forwarded to the Design Division for inclusion in the project files.

Requests for variances to the Texas Accessibility Standards (TAS) must be coordinated with the respective Design Division Field Coordination Section for submission to the Texas Department of Licensing and Regulation.

**Pertinent Project Types.** All projects.

**Responsible Party.** Roadway design engineer

**Sub-tasks.**

- ◆ Identify design exceptions and waivers.
- ◆ Thoroughly document why design exceptions and waivers are needed.
- ◆ Evaluate the safety, operational and other impacts of the proposed and alternative designs.
- ◆ Prepare design exception and waiver requests.
- ◆ Process design waivers at district level. Design waiver documentation approved by districts should be permanently maintained and documented on [Form 1002](#), Page 3.
- ◆ Submit all exception requests to the Design Division for approval. During schematic development, the Design Division will submit requests to the FHWA for projects on the National Highway System.
- ◆ Obtain approval of design exception requests or revise schematic or plans.
- ◆ Identify and submit additional design exceptions/waivers as the project progresses.

**Critical Sequencing.** As the project progresses, submit design exception/waiver requests soon after identifying their need. Denial of a request will affect final design.

**Resource Material.**

- ◆ TxDOT *Roadway Design Manual*, Chapter 1, [Section 2](#)
- ◆ TxDOT *PS&E Preparation Manual*, Chapter 5, Section 2, [Design Exceptions](#)
- ◆ TxDOT [Bridge Project Development Manual](#)

- ◆ [Texas Accessibility Standards](#).

**2880: Obtain approval of geometric schematic before public hearing**

**Description.** For projects requiring control of access or an Environmental Impact Statement, the district must obtain approval of the geometric schematic from the Design Division and the Federal Highway Administration (FHWA), if applicable, before affording the opportunity for a public hearing. (See [3500: Conduct public hearing](#)). Check with the Design Division Field Coordination Section for exceptions to this requirement, particularly for rural projects with few abutting property owners. A schematic checklist is available in the TxDOT *Roadway Design Manual*, Chapter 1, [Section 3](#).

Submit three copies of the geometric schematic to the Design Division for approval.

**Pertinent Project Types.** Projects requiring control of access or an Environmental Impact Statement.

**Responsible Parties.** Advanced Project Development Engineer

**Critical Sequencing.** Submit schematics at least two months before planning to afford the opportunity for hearing. Generally, this will give adequate time for Design Division review and for the district to make any resulting schematic changes.

**Resource Material.** TxDOT [Roadway Design Manual](#)

**2890: Revise geometric schematic based on input from public hearing**

**Description.** Schematics are finalized after incorporating appropriate comments received at the public hearing.

**Pertinent Project Types.** Projects requiring control of access or an Environmental Impact Statement.

**Responsible Parties.** Project manager

**Sub-tasks.**

- ◆ Review comments received at the public hearing and comments received in writing after the hearing and within the comment period.
- ◆ Determine, based on engineering judgment and cost effectiveness, if any suggestions can be incorporated into the project.
- ◆ [2850: Circulate geometric schematic for district review](#).
- ◆ [2860: Review geometric schematic with stakeholders](#).

**2920: Obtain approval of final geometric schematic**

**Description.** Significant changes, ramp relocations, and changes to control of access after schematic approval will require resubmission of the schematic to the Design Division for final approval. These changes might have material impact on right of way interests to be acquired.

**Pertinent Project Types.** New location, added capacity, or controlled access projects or projects requiring an Environmental Impact Statement.

**Responsible Parties.** Roadway design engineer

## Chapter 3 — Environmental

### Contents:

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[Section 2 — Interagency Coordination/Permits](#)

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## Section 1 — Preliminary Environmental Issues

### Overview

In early project development, it is vital to identify public and environmental concerns regarding a project. This section describes identifying a project's environmental variables and planning an appropriate level of public involvement. This activity should be conducted concurrently with developing the preliminary schematics (see [Preliminary Schematic](#)) and determining utility and right of way ownership. (See [4000](#): Perform preliminary right of way research).

This section includes discussion of the following tasks. These tasks should be performed concurrently as much as possible.

1400. [Review scope, cost, and staff requirements of project development](#)

3010. [Determine public involvement needs](#)

3015. [Develop and implement scoping process](#)

3020. [Conduct meeting with affected property owners](#)

3030. [Collect environmental data](#)

2150. [Obtain right of entry](#)

3050. [Identify potential Section 4\(f\) & TPWD Chapter 26 properties](#)

3080. [Evaluate impacts on waterways and floodplains](#)

### 3010: Determine public involvement needs

**Description.** Public involvement is a continuous part of project development. Stakeholders, such as citizens, abutting property owners, public entities, organizations, and private groups are informed and kept apprised of project development and given an opportunity to become involved by raising individual concerns.

Required public involvement typically involves the following opportunities:

- ◆ scoping meetings (see [3015: Develop and implement scoping process](#))
- ◆ public meetings (see [2260: Conduct public meetings](#))
- ◆ public hearings (see [3500: Conduct public hearings](#))
- ◆ public notifications.

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Formats for the above types of public involvement are described in the *TxDOT Environmental Manual*.

Informal (not required) public involvement needs may change as the project develops. Public involvement activities are commensurate with project complexity, controversy, etc. Typically, there are no set times to reassess public involvement; it is a continuous activity.

**Pertinent Project Types.** All projects can include public involvement elements. Some projects have specific public involvement requirements to obtain environmental clearance.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Consult with the advanced project development engineer, district environmental coordinator, and others, as appropriate to determine public involvement needs, or strategy.
- ◆ Hold a meeting to discuss the project and public involvement strategy.
- ◆ Gain approval of the plan from the advanced project development engineer.
- ◆ Conduct project public involvement according to the plan.

**Helpful Suggestions.** On particularly complex or controversial projects, forming an advisory board, committee, or Citizens' Advisory Committee (CAC) can prove helpful. (See the *Environmental Manual*). Also, a “work group” or Technical Advisory Committee (TAC) comprised of city, county, state, and federal agency personnel may be helpful. This group can assist by exchanging information regarding a project's technical aspects.

**Critical Sequencing.** Public involvement needs and strategies should be determined at the beginning of the planning phase.

**Resource Material.** TxDOT *Environmental Manual*

### 3015: Develop and implement scoping process

**Description.** Scoping (see the *Environmental Manual*) is the public process designed to determine the scope of issues to be addressed in the environmental document. Scoping is required when preparing an [environmental impact statement \(EIS\)](#). It is a useful tool in preparing [environmental assessments \(EAs\)](#) for controversial projects. Scoping may involve preparing a “coordination” or “overview” EA. See the *Environmental Manual* for EIS projects or for a feasibility study and (see [1410](#): Determine need for feasibility (route/corridor) study) to analyze modal alternatives.

**Pertinent Project Types.** Projects requiring an EIS and, where appropriate, for controversial projects.

**Responsible Party.** Environmental coordinator

**Critical Sequencing.** As soon as the decision is made to prepare an EIS, initiate the scoping process.

**Resource Material.** TxDOT [Environmental](#) Manual

### **3020: Conduct meeting with affected property owners**

**Description.** A meeting with affected property owners (MAPO) (see the [Environmental](#) Manual) may be the only type of public involvement that is conducted for categorical exclusion (CE) type projects requiring minor amounts of right of way, such as bridge replacements or shoulder additions. Projects requiring temporary construction easements or detours are also candidates for a MAPO. A MAPO may also be appropriate when a minor design revision occurs after the project's environmental document is approved.

**Pertinent Project Types.** New construction, reconstruction, or rehabilitation projects involving any of the following factors:

- ◆ limited right of way acquisition
- ◆ insignificant changes to the function of an existing transportation facility
- ◆ minor impacts to abutting property
- ◆ insignificant or no social, economic or environmental effects.

**Responsible Party.** Project manager

#### **Sub-tasks.**

- ◆ Make arrangements to conduct the MAPO.
- ◆ Ask members of the project team to attend the MAPO to answer questions in their areas of expertise.
- ◆ Project specifics are presented to the public at the MAPO.
- ◆ A written summary of the MAPO should be submitted to the district environmental coordinator.

**Helpful Suggestions.** If the number of affected property owners does not appear manageable for a MAPO, a standard public meeting may be more appropriate.

**Critical Sequencing.** The MAPO may be conducted after preliminary schematics and draft environmental studies are developed and ready for public presentation.

**Resource Material.** TxDOT [Environmental](#) Manual

**3030: Collect environmental data**

**Description.** Environmental document research (see the [Environmental Manual](#)) includes obtaining information from federal, state, and local agency databases, as well as on-the-ground surveys. This data should be used to estimate environmental effects of the project and confirm the type of environmental document to be prepared.

**Pertinent Project Types.** All projects except preventive maintenance or restoration projects.

**Responsible Party.** Environmental coordinator

**Subtasks.**

- ◆ Perform a site visit to identify and assess environmental constraints, potentially sensitive areas, historic structures, habitats, and landscapes.
- ◆ Gather information in addition to that gathered during detailed site visits performed earlier. (See [1010](#): Perform site visit).
- ◆ Prepare a baseline environmental constraints map showing the location of sensitive environmental features. The roadway design engineer and environmental coordinator use this map to determine potential environmental effects of proposed alignments.

**Helpful Suggestions.** For complex projects or projects with more than one potential corridor, Geographic Information System (GIS) mapping can be used to automatically calculate impacts.

**Critical Sequencing.**

- ◆ Preliminary environmental surveys and data collection should be started early during preliminary design.
- ◆ Develop the baseline environmental constraints map as soon as practical. It will be used for project decision-making. It will serve as an important tool in communicating environmental constraints, and it is the first step in preparing the project's environmental document.

**Resource Material.** TxDOT [Environmental Manual](#)

**3050: Identify potential Section 4(f) & Texas Parks and Wildlife (TPWD) Chapter 26 properties**

**Description.** The project corridor must be surveyed to locate any [Section 4\(f\) property](#). These publicly owned properties include the following:

- ◆ parks
- ◆ recreation areas
- ◆ wildlife or waterfowl refuges
- ◆ [historic properties](#)

- ◆ school grounds or playgrounds open to the public.

Recreational lands purchased or improved with land and water conservation funds may also be subject to [Section 6\(f\) property](#) of the Land and Water Conservation Fund Act.

Section 4(f) properties cannot be used for a federally funded transportation project unless it is determined that (1) there is no prudent and feasible alternative to using the land and (2) the project includes all planning to minimize harm to the property resulting from such use.

Details on preparing a Section 4(f) evaluation can be found in the TxDOT [Environmental Manual](#).

**Pertinent Project Types.** Projects involving right of way acquisition from [Section 4\(f\) property](#) or [constructive use impacts](#) to the Section 4(f) property.

**Responsible Party.** Environmental coordinator

**Helpful Suggestions.**

- ◆ A Section 4(f) evaluation does not necessarily include a Section 6(f) property, but impacting Section 6(f) property will trigger the Section 4(f) process.
- ◆ Projects with minor Section 4(f) involvement properties may qualify for a Programmatic Section 4(f) Evaluation, or a de minimis finding.
- ◆ Section 4 (f) properties should be avoided to the maximum extent feasible.

**Critical Sequencing.** Identify Section 4(f) and Section 6(f) property while developing roadway alignment alternatives.

**Authority Requirements.**

- ◆ [23 CFR 771.135](#)
- ◆ Section 6(f) of the Land and Water Conservation Fund Act of 1965.

**Resource Material.** TxDOT [Environmental Manual](#)

### 3080: Evaluate impacts on waterways and floodplains

**Description.** Preliminary structure and hydraulic studies are needed to evaluate environmental impacts of highway encroachments on waterways and floodplains. Changes in water surface elevation, construction in channels, bridge construction methods, etc. commonly impact environmental resources. In addition, a Corps of Engineers Section 404 permit (see the [Environmental Manual](#)) may be required for wetland area disturbance, work in channels, channel/stream modifications, and dewatering/construction methods necessary to construct the water crossing structure.

**Pertinent Project Types.** Projects encroaching on waterways.

**Responsible Party.** Environmental coordinator

**Sub-tasks.**

- ◆ Review the waterways in the field and provide input to the drainage engineer regarding environmental aspects of the project. This information can help the drainage engineer develop recommendations.
- ◆ Review previously conducted hydraulic studies, FEMA maps, local flood control policies, and Corps of Engineers requirements for specific floodplains.
- ◆ Obtain structures/hydraulics studies when completed and recommend project modifications that reduce environmental impacts.

**Resource Material.**

- ◆ TxDOT [Hydraulic Design Manual](#)
- ◆ TxDOT [Environmental Manual](#).

## Section 2 — Interagency Coordination/Permits

### Overview

Early coordination with regulatory and resource agencies allows for identifying and assessing project potential to affect jurisdictional interests of other agencies. Regulatory agencies have permitting requirements for proposed construction activities in their jurisdictional areas.

This section discusses the activities involved in identifying permit requirements, through coordination with agencies during early project development, so required permits can be obtained.

This section includes the following two tasks:

3100. [Perform early coordination with review/resource agencies](#)

3110. [Determine environmental permit requirements](#)

### 3100: Perform early coordination with review/resource agencies

**Description.** During early project planning, regulatory/resource agencies should be contacted (see the [Environmental Manual](#)) and notified to obtain input, concerns, or opportunities regarding the project.

**Pertinent Project Types.** Projects requiring environmental documentation.

**Responsible Party.** Environmental coordinator

#### Sub-tasks.

- ◆ Obtain mailing list of agencies. Consider those listed under potential permits in the TxDOT [Environmental Manual](#).
- ◆ Coordinate task work with Environmental Affairs Division if necessary.
- ◆ Send letter of notification and request for input to agencies.
- ◆ Begin discussions regarding environmental mitigation. (See [3390](#): Prepare environmental mitigation plans).

#### Helpful Suggestions.

- ◆ Include a project location map and any information that helps produce a project specific response versus a generalized information response.
- ◆ Consider conducting field investigations with resource agencies and discuss issues in the field.

**Critical Sequencing.** This coordination should be initiated after field investigations are conducted.

**Authority Requirements.**

- ◆ Memorandum of Understanding with TNRCC
- ◆ Memorandum of Understanding with TPWD
- ◆ Memorandum of Understanding with Texas Historical Commission.

**Resource Material.** TxDOT [Environmental Manual](#)

### 3110: Determine environmental permit requirements

**Description.** Regulatory agencies have permitting requirements for proposed construction activities. The scope of work should include the need for obtaining permits to comply with federal and state regulations governing activities within, or close to, the project area.

A list of potential environmental permits is shown in the TxDOT [Environmental Manual](#).

Additional, miscellaneous permits may be required. (See [5080](#): Obtaining miscellaneous permits). The permits are listed in a table of miscellaneous permits in the TxDOT *Plans, Specifications, & Estimate Manual*, Chapter 1, Section 2, [Permits](#).

**Pertinent Project Types.** All projects except preventive maintenance or restoration projects.

**Responsible Party.** Environmental coordinator

**Critical Sequencing.** Determine permit requirements through early coordination with review agencies so design/construction requirements may be considered during schematic design.

**Authority Requirements.**

- ◆ National Environmental Policy Act of 1969, as amended
- ◆ Endangered Species Act
- ◆ National Historic Preservation Act of 1966
- ◆ Clean Water Act
- ◆ River and Harbor Act of 1899
- ◆ Farmland Protection Policy Act
- ◆ Clean Air Act
- ◆ Coastal Zone Management Act
- ◆ Marine Protection, Research, and Sanctuaries Act

- ◆ [40 CFR Part 122](#): National Pollutant Discharge Elimination System General Permit for Construction Activities.

**Resource Material.** TxDOT [Environmental](#) Manual

## Section 3 — Environmental Documentation

### Overview

This section describes the activities involved in providing decision makers with information relating to a project's social, economic, and environmental impacts. Documents are prepared that identify and support analyses and evaluations performed during the environmental process of project development.

This section includes discussion of the following tasks. The tasks are listed in approximate chronological order but may be performed concurrently, or may not be required in some cases.

- 3210. [Determine type of environmental document to prepare](#)
- 3240. [Prepare “Purpose and Need” statement](#)
- 3250. [Conduct natural resources study](#)
- 3260. [Conduct cultural resources study](#)
- 3270. [Prepare Section 4\(f\) evaluation](#)
- 3280. [Perform hazardous materials assessment and investigation](#)
- 3300. [Prepare socioeconomic/environmental justice analysis](#)
- 3310. [Determine right of way relocation impacts](#)
- 3315. [Analyze existing environment](#)
- 3330. [Conduct noise analysis](#)
- 3340. [Conduct air quality analysis](#)
- 3345. [Determine project's environmental consequences](#)
- 3350. [Prepare landscape recommendations](#)
- 3360. [Prepare description of project alternatives](#)
- 3370. [Prepare exhibits for environmental documentation](#)
- 3375. [Stake areas of potential impact](#)
- 3390. [Prepare environmental mitigation plans](#)

3420. [Process draft environmental document](#)**3210: Determine type of environmental document to prepare**

**Description.** Environmental documents are described in the TxDOT [Environmental Manual](#), and are referred to by the following types:

- ◆ Environmental Impact Statement (EIS)

An EIS is prepared for a project that may have significant social, economic, or environmental impacts.

- ◆ Environmental Assessment (EA)

An EA is required for a project not meeting requirements for a CE, and for which the significance of impacts is not known. Occasionally, an EA is prepared for a project that results in a finding of significant social, economic, and environmental impacts - which then requires preparing an EIS. The EA is useful as an early coordination document, but this process usually requires additional time for documentation.

- ◆ Categorical Exclusion (CE)

A CE is the environmental class of action required for projects which, based on past experience, do not involve significant environmental impacts. A “programmatic” CE, (or PCE, see the [Environmental Manual](#)) by agreement between the FHWA and TxDOT, is reserved for project types that are historically classified as a CE. A project not qualifying as programmatic, but also not appearing to involve significant environmental impacts, is potentially a CE. The district advanced project development engineer, in coordination with the district environmental coordinator, determines if the project may classify as a PCE or a CE. The Environmental Affairs Division can assist in determining the classification as a CE and is the approval authority for PCEs.

**Pertinent Project Types.** All projects.

**Responsible Party.** Advanced project development engineer

**Sub-tasks.** Expected type of environmental documentation is presumed, based on project conditions and experience, during planning and programming. This presumption is either confirmed or revised after conducting preliminary environmental surveys and resource agency coordination.

**Critical Sequencing.** If the project remains idle for three years, a re-evaluation (see [5810](#): Conduct environmental re-evaluation) may be required.

**Authority Requirements.** [23 CFR 771](#)

**Resource Material.** TxDOT [Environmental Manual](#)

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**3240: Prepare “Purpose and Need” statement**

**Description.** The “Purpose and Need” statement (see the [Environmental Manual](#)) should explain both “purpose” for the project and considerations justifying “need” for the project, including alternatives. The evaluation of need is based on current and future conditions - not on an assumption that prior decisions are still valid. The “need” aspect of the statement requires factual justification.

The need should be defined in terms understandable to the public. The discussion should clearly describe problems that the project is to correct. It will form the basis for identifying reasonable alternatives, comparing alternatives, and selecting the preferred alternative.

**Pertinent Project Types.** Projects requiring an environmental assessment or an environmental impact statement.

**Responsible Party.** Environmental coordinator

**Helpful Suggestions.** The purpose and need statement should include a “project status” section which briefly describes project history including actions taken to date, other agencies and governmental units involved, actions pending, schedules, etc. The following list identifies items to consider when developing the purpose and need statement:

- ◆ Results of preliminary plans or studies including Major Investment Study (see [1440: Determine need for Major Investment Study](#)).
- ◆ Supporting legislation – Is there a legislative mandate for the project?
- ◆ Safety – Is the project necessary to correct an existing or potential safety hazard?
- ◆ Transportation system linkage – Does the project provide a connecting link in the transportation system?
- ◆ Maintenance and operational deficiencies – Does the project correct existing deficiencies such as substandard geometrics, load limits, roadway cross-section, or high maintenance costs?
- ◆ Transportation demand exceeding capacity – What is the Level of Service of the existing and proposed facility? Is the project in conformance with adopted state and urban transportation plan(s)?
- ◆ Economic development – What projected economic development or land use changes show the need to improve highway capacity?
- ◆ Modal relationships – How will the facility interface with and serve to complement air, rail, and port facilities, mass transit, etc.?
- ◆ Non-attainment areas – Be sure the project is part of the conforming plan (see the [Transportation Programming and Scheduling Manual](#)) in the Transportation Improvement Program (TIP).
- ◆ Include results of preliminary planning studies. (See [1440: Determine need for Major Investment Study](#)).

**Critical Sequencing.**

- ◆ Prepare the initial purpose and need statement. (See [1000](#): Identify project need and scope) before conducting the design concept conference. (See [2000](#): Conduct Design Concept Conference).
- ◆ During environmental document development stage, the purpose and need statement should be reviewed and updated as needed.

**Resource Material.** *TxDOT [Environmental](#) Manual*

**3250: Conduct natural resources study**

**Description.** Natural resource issues may include potential impacts to features such as

- ◆ biological or botanical resources
- ◆ prime or unique farmland
- ◆ water quality
- ◆ wetlands
- ◆ floodplains
- ◆ navigable waterways
- ◆ water and land resources near an international border.

Review all project alternatives to the same level of detail for potential impacts [ENV – preliminary surveys] to natural resources and perform studies to evaluate the value of, and likely impact to, these resources.

**Pertinent Project Types.** Projects having potential impact to natural resources.

**Responsible Party.** Environmental coordinator

**Helpful Suggestions.**

- ◆ Coordinate this work with project manager.
- ◆ The Environmental Affairs Division can provide technical assistance and will provide reviews of environmental documentation.
- ◆ Geographic Information System (GIS) is a helpful tool in conducting natural resource studies, especially for alternatives on new alignment. The Technology Services Division can assist in using GIS.

**Critical Sequencing.**

- ◆ Conduct natural resource studies as soon as there is reasonable assurance that all project alternatives have been identified. More detailed study and the report can be generated as soon as the preferred alternative has been identified.
- ◆ A right of entry (see [2150](#): Obtain right of entry) or other written evidence of permission must always be obtained before entering private property.

**Authority Requirements.**

- ◆ [50 CFR Part 21](#) – migratory birds
- ◆ [50 CFR Part 17](#) – endangered species
- ◆ [7 CFR Part 658](#) – farmland protection
- ◆ [30 TAC Chapter 213](#) – Edwards Aquifer
- ◆ [43 TAC § 2.48](#) – coastal management
- ◆ [Executive Order 11988](#) and [23 CFR 650, Subpart A](#) – floodplains
- ◆ [40 CFR Part 122](#) – NPDES.

**Resource Material.** TxDOT [Environmental Manual](#)

**3260: Conduct cultural resources study**

**Description.** The cultural resources study documents archeological or historical resources (see the [Environmental Manual](#)) within the project area that may be affected by project alternatives. The study should indicate whether resources within the project area are identified and assessed in accordance with Section 106 of the Historic Preservation Act of 1966, as amended. Historical properties are assessed for their existence on, or eligibility to be on, the National Register of Historic Places (NRHP). The cultural resources report presents and discusses findings of the archeological and historical resources study, and it proposes mitigation measures for each alternative under consideration. Coordination is conducted with the Texas Historical Commission (THC). Conduct the study on all alternatives to the same level of detail.

**Pertinent Project Types.** Projects requiring additional right of way or work in undisturbed areas of existing right of way.

**Responsible Party.** Environmental coordinator

**Helpful Suggestions.**

- ◆ A thorough review of findings with the roadway design engineer is recommended for efficiently developing project alternatives.
- ◆ Coordinate the study and document development with THC.

**Critical Sequencing.**

- ◆ Conduct the study as soon as there is reasonable assurance that all project alternatives are identified. More detailed study and reports can be generated as soon as the preferred alternative is identified.
- ◆ A right of entry (see [2150](#): Obtain right of entry) or other written evidence of permission must always be obtained before entering private property.

**Authority Requirements.**

- ◆ Section 106 of the [National Historic Preservation Act](#)
- ◆ Section 4(f) of the [U. S. DOT Act of 1966](#) (49 USC 303)
- ◆ [36 CFR Part 800.4](#)
- ◆ [23 CFR Part 771](#).

**Resource Material.**

- ◆ TxDOT [Environmental Manual](#)
- ◆ [USGS](#) 7.5 minute quadrangle maps
- ◆ FHWA Technical Advisory T 6640.8A; 10/30/87; [Guidance for Preparing and Processing Environmental and Section 4\(f\) Documents](#).

**3270: Prepare Section 4(f) evaluation**

**Description.** A Section 4(f) evaluation describes the project impacts to a Section 4(f) property (see [3050](#): Identify potential Section 4(f) properties), alternatives and mitigation measures. Perform an evaluation in accordance with Section 4(f) of the U.S. Department of Transportation Act of 1966 (see the [Environmental Manual](#)) if the project may affect an area identified as a Section 4(f) property. For a draft Environmental Impact Statement (EIS), prepare the evaluation for all alternatives. For a final EIS, prepare the evaluation for only the preferred alternative.

**Pertinent Project Types.** Projects affecting a Section 4(f) property.

**Responsible Party.** Environmental coordinator

**Sub-tasks.**

- ◆ Coordinate with project manager.

- ◆ Obtain alignment map.
- ◆ Determine with jurisdictional authority whether Section 4(f) site is significant.
- ◆ Identify and develop alternatives to eliminate or minimize impact to Section 4(f) properties.
- ◆ Prepare draft Section 4(f) report.
- ◆ Obtain approval of draft report from the Environmental Affairs Division.

**Helpful Suggestions.**

- ◆ All reasonable alternatives to eliminate or minimize impacts to Section 4(f) properties must be exhausted before selecting a preferred alternative that affects a Section 4(f) property.
- ◆ Work with the project manager and the roadway design engineer to minimize impacts.
- ◆ A Section 4(f) evaluation may be included in the environmental document, or it may be a stand-alone document.

**Critical Sequencing.** Section 4(f) evaluations should be conducted as soon as there is reasonable assurance that all project alternatives are identified.

**Authority Requirements.**

- ◆ [23 CFR 771.135](#)
- ◆ [36 CFR 59.1 - 59.4](#)
- ◆ Section 4(f) of [U.S. DOT Act of 1966](#) (49 USC §303).

**Resource Material.** TxDOT [Environmental Manual](#)

**3280: Perform hazardous materials assessment and investigation**

**Description.** Soil and groundwater contamination from hazardous substances and petroleum products is often encountered on transportation projects. Also, some projects may generate hazardous materials. For example, projects with structures (enhancement or bridge projects) may involve asbestos containing materials and/or lead-based paint requiring testing and analysis during project development. An initial site assessment (see the [Environmental Manual](#)), (Phase I Environmental Site Assessment (ESA) is performed to identify possible or known contamination sources. Results of an initial site assessment may be used to determine applicable regulatory requirements before, during, or after construction. Additional environmental site investigation(s) (Phase II ESA) may also be required.

**Pertinent Project Types.** All projects

**Responsible Party.** Environmental coordinator

**Sub-tasks.**

- ◆ Coordinate with project manager and right of way staff.
- ◆ Perform initial site assessment including
  - [1010: Performing a site visit](#) and field surveys
  - researching land use
  - reviewing regulatory database and files
  - interviewing appropriate individuals.
- ◆ Determine need, scope, and schedule for further investigation.
- ◆ Contact the Environmental Affairs Division for project specific guidance, if needed.
- ◆ Request a work authorization from the Contract Services Offices if consulting services from the statewide environmental engineering contracts are needed.
- ◆ Conduct or manage consultants to perform environmental site investigation(s) for contamination that will be encountered by the preferred alignment – both horizontal and vertical.
- ◆ Coordinate findings with property owners, potentially responsible parties, regulatory agencies, and local government authorities.
- ◆ Determine regulatory requirements – such as for handling and disposing material.
- ◆ Determine considerations for right of way (ROW) acquisition and design.
- ◆ Monitor progress and make arrangements for handling contamination if required.

**Helpful Suggestions.**

- ◆ The project-specific requirements for each component of an initial site assessment can be based on the preliminary design and right of way requirements.
- ◆ Coordination with regulatory agencies or negotiation with potentially responsible parties to determine responsibilities for additional investigation, corrective action, and closure should be conducted before right of way acquisition.
- ◆ Environmental site investigations should be considered for the preferred alignment if results of the initial site assessment show significant contamination likely exists within the project's ROW (existing and proposed), or outside ROW (easement areas) and will likely be disturbed during construction.
- ◆ Generally, TxDOT is not required to perform environmental site investigations for areas within the existing ROW that will not be disturbed during construction or maintenance activities.

**Critical Sequencing.**

- ◆ Initial site assessments should be conducted as soon as there is reasonable assurance that all project alternatives are identified.

- ◆ Environmental site investigations may be conducted, if determined necessary, as soon as the preferred alternative is identified.
- ◆ A right of entry (see [2150](#): Obtain right of entry) or other written evidence of permission must always be obtained before entering private property.

**Resource Material.** TxDOT [Environmental Manual](#)

### 3300: Prepare socioeconomic/environmental justice analysis

**Description.** Study socioeconomic issues to determine project impact on the human environment. These issues may include concerns such as

- ◆ land use
- ◆ urban growth patterns
- ◆ community/neighborhood cohesion
- ◆ business impacts
- ◆ property values
- ◆ access to public facilities.

Perform a socioeconomic analysis (see the [Environmental Manual](#)) on each project alternative. Assess the extent that alternatives may adversely impact [disadvantaged communities](#) or [minority populations](#). In the environmental justice analysis, (see the [Environmental Manual](#)) consider the degree that each environmental resource may be impacted by each alternative. Socioeconomic and environmental justice issues should be considered when evaluating project alternatives.

**Pertinent Project Types.** New construction and reconstruction projects.

**Responsible Party.** Environmental coordinator

**Helpful Suggestions.** The Environmental Affairs Division can assist in developing studies.

#### Authority Requirements.

- ◆ TxDOT Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations
- ◆ Uniform Relocation Assistance and Real Properties Acquisitions Act (the “Uniform Act”), [42 USC §§4601-4665](#)
- ◆ [23 CFR 771](#).

#### Resource Material.

- ◆ TxDOT [Environmental Manual](#)

- ◆ FHWA-PD-96-036; September 1996; [Community Impact Assessment – a Quick Reference for Transportation](#).

### 3310: Determine right of way relocation impacts

**Description.** The Uniform Relocation Assistance and Real Properties Acquisition Act (the “Uniform Act”) of 1970 requires relocation advisory services and payments to eligible displaced individuals, families, businesses, farms, and non-profit organizations. Identify potential displacees, and the relevant circumstances surrounding displacement in environmental documentation as right of way relocation impacts (see the [Environmental Manual](#)) for all alternatives. Determine relocation impacts while developing the schematic.

**Pertinent Project Types.** Projects involving displacement of individuals, families, businesses, farms, and non-profit organizations.

**Responsible Party.** Environmental coordinator

**Authority Requirements.** Uniform Relocation Assistance and Real Properties Acquisition Act of 1970.

**Resource Material.**

- ◆ TxDOT [Environmental Manual](#)
- ◆ TxDOT [Right of Way Manual](#).

### 3315: Analyze existing environment

**Description.** This discussion in the environmental document provides a concise description of the existing social, economic, and environmental setting for the area affected by all reasonable project alternatives (see the [Environmental Manual](#)).

All socially, economically, or environmentally sensitive locations or features in the project impact area (e.g., neighborhoods, elderly/minority/ethnic groups, parks, hazardous material sites, historic resources, wetlands) should be identified on exhibits and briefly described in the text. This section should also briefly describe the scope and status of the planning processes for local jurisdictions and the project area.

In an Environmental Impact Statement (EIS), this is included as part of the affected environment section. In an Environmental Assessment (EA)/Finding of No Significant Impact (FONSI) or Categorical Exclusion (CE), this is included as part of the impacts section.

**Pertinent Project Types.** Projects requiring either an Environmental Impact Statement (EIS) or Environmental Assessment (EA), and Categorical Exclusion (CE) projects having social, economic, and environmental features.

**Responsible Party.** Environmental coordinator

**Helpful Suggestions.** To save space and communicate effectively, this section of the document should be a single description for the general project area rather than a separate one for each alternative.

**Critical Sequencing.** This section should be completed as soon as all social, economic, and environmental data is collected and evaluations are made.

**Resource Material.** TxDOT [Environmental Manual](#)

### 3330: Conduct noise analysis

**Description.** When projected noise levels at noise-sensitive receptor sites exceed federal, state, or local guidelines, noise abatement measures must be evaluated. Noise abatement measures typically include traffic management, alignment modifications, buffer zones, insulation of public buildings, and construction of noise barriers.

Elements of a noise analysis include traffic information (existing and future), design information, noise-sensitive receptors, results of field measurements, and computer modeling. The analysis is designed to provide comprehensive information to the public and local government officials.

**Pertinent Project Types.** New construction, reconstruction (with substantial horizontal or vertical realignment) and all added capacity projects.

**Responsible Party.** Environmental coordinator

#### Sub-tasks.

- ◆ Determine the need (see the [Environmental Manual](#)) for a noise analysis.
- ◆ Perform the noise analysis according to the TxDOT *Guidelines for Analysis and Abatement of Highway Traffic Noise* (1996).
- ◆ Prepare noise abatement proposal for preferred alternative if abatement would be feasible and reasonable for impacted receivers.

#### Helpful Suggestions.

- ◆ Noise workshops may be appropriate to inform the public about a noise abatement proposal or to obtain input regarding a noise abatement proposal.
- ◆ A noise contour analysis may be useful to compare noise impacts of alternatives.

**Authority Requirements.** [23 CFR Part 772](#)

**Resource Material.**

- ◆ TxDOT [Guidelines for Analysis and Abatement of Highway Traffic Noise](#); by the TxDOT Environmental Affairs Division (1996)
- ◆ TxDOT [Environmental Manual](#).

**3340: Conduct air quality analysis**

**Description.** An air quality analysis (see the [Environmental Manual](#)) needs to be performed for projects in both [attainment](#) and [non-attainment](#) counties in accordance with the TxDOT Air Quality Guidelines.

The air quality analysis is not conducted for various alternatives. Rather, the analysis is performed for the general project airshed.

**Pertinent Project Types.** Projects adding capacity, resulting in travel lanes being closer to the right of way line, or having a design year average daily traffic (ADT) of 20,000 or more, require an air quality analysis.

**Responsible Party.** Environmental coordinator

**Helpful Suggestions.** Use same traffic data throughout project development.

**Resource Material.**

- ◆ TxDOT [Environmental Manual](#)
- ◆ TxDOT [Air Quality Guidelines](#).

**3345: Determine project's environmental consequences**

**Description.** In this section of the environmental document

- ◆ include the expected beneficial and adverse social, economic, and environmental (see the [Environmental Manual](#)) consequences of project alternatives.
- ◆ describe measures proposed to mitigate adverse effects (see: [3390](#): Prepare environmental mitigation plans).
- ◆ be sufficiently scientific to provide a comparative basis for evaluating alternatives.
- ◆ do not use the term “[significantly](#)” unless the term is synonymous with the Council on Environmental Quality definition and is supported by factual information.

**Pertinent Project Types.** Projects requiring an environmental document.

**Responsible Party.** Environmental coordinator

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**Critical Sequencing.** Complete this section as soon as all social, economic, and environmental data is collected.

**Resource Material.** TxDOT [Environmental](#) Manual

### 3350: Prepare landscape recommendations

**Description.** Significant improvements in environmental compatibility as well as increased public support for transportation projects can be achieved by improving the visual and aesthetic quality of the project. Methods that can be used to blend the project with adjacent land use include the following:

- ◆ incorporating architectural features into the design of structures
- ◆ integrating aesthetic elements in the design phase
- ◆ landscaping
- ◆ xeriscaping
- ◆ screening
- ◆ selective clearing and thinning
- ◆ earthwork.

**Pertinent Project Types.** New construction, reconstruction, and rehabilitation projects.

**Responsible Party.** Project manager

#### Sub-tasks.

- ◆ Request the landscape architect perform a visual inspection of the project area and identify visual and aesthetic resources that might be affected.
- ◆ The landscape architect prepares a report identifying the resources and proposing mitigation measures for affected resources.

#### Helpful Suggestions.

- ◆ Enlist the support and advice of the landscape architect early in project development.
- ◆ Consider clear zone, sight distance, and maintenance requirements when developing the landscape plan.
- ◆ Coordinate planning with local officials to ensure compatibility with local aesthetic planning efforts.

**Critical Sequencing.** The aesthetic and landscape recommendations are usually developed only for the preferred alternative.

**Resource Material.**

- ◆ TxDOT *Landscape and Aesthetics Design Manual*, Chapter 3, Section 3, [Prepare Landscape Recommendations \(3350\)](#)
- ◆ TxDOT [Environmental Manual](#)
- ◆ A Guide for Highway Landscape and Environmental Design; 06/30/70; AASHTO Operating Committee on Roadside Development
- ◆ A Guide for Transportation Landscape and Environmental Design; 06/91; by AASHTO Highway Subcommittee on Design – Task Force for Environmental Design.

**3360: Prepare description of project alternatives**

**Description.** The “Alternatives” section (see the [Environmental Manual](#)) of the environmental document discusses the range of alternatives, including all “reasonable alternatives” under consideration and ‘other alternatives’ eliminated from detailed study. Reasonable alternatives should include the ‘no-build’ alternative. All reasonable alternatives under consideration in the draft environmental document should be developed to a similar level of detail so that comparisons are fair.

**Pertinent Project Types.** Projects requiring an environmental document.

**Responsible Party.** Environmental coordinator

**Critical Sequencing.** The environmental document’s section containing a description of project alternatives should be developed throughout the environmental documentation phase.

**Resource Material.** TxDOT [Environmental Manual](#)

**3370: Prepare exhibits for environmental documentation**

**Description.** Environmental document exhibits (see the [Environmental Manual](#)) are prepared to show existing social, economic, and environmental resources, and potential impacts to these resources. The environmental specialist, drainage engineer, and project manager typically contribute to developing certain exhibits.

**Pertinent Project Types.** Projects requiring an environmental document.

**Responsible Party.** Environmental coordinator

**Critical Sequencing.** Exhibit preparation for the environmental document should be accomplished throughout the environmental documentation phase.

**Resource Material.** TxDOT [Environmental Manual](#)

**3375: Stake areas of potential impact**

**Description.** Once a preferred alignment is selected, limits of potential impact areas should be staked (or flagged) on the ground. These limits are established to gain permitting agency approval of the extent of affected natural resources. Once permitting authority is gained, the limits are surveyed to establish quantifiable impacts. This includes the limits of environmentally sensitive areas such as:

- ◆ wetlands
- ◆ high water marks
- ◆ tidal waters
- ◆ water resources
- ◆ archeological/historical properties
- ◆ critical biological habitat
- ◆ endangered species.

**Pertinent Project Types.** Projects having potential environmental impacts to areas such as those listed above.

**Responsible Party.** Environmental coordinator

**Sub-tasks.**

- ◆ Obtain the alignment map showing the preferred alternative.
- ◆ A right of entry (see [2150](#): Obtain right of entry) or other written evidence of permission must always be obtained before entering private property.
- ◆ Stake impact areas in the field.
- ◆ Permitting agencies review and approve the staked impact area limits – by review of a report and map or by field visit.
- ◆ After permitting agency approval of limits, surveyors perform a controlled survey of staked areas. Provide surveyors with impact area map.
- ◆ Refine constraints map (see [3030](#): Collect environmental data) previously prepared and provide impact area limits to the project manager for inclusion on project drawings.

**Resource Material.** TxDOT [Environmental Manual](#)

**3390: Prepare environmental mitigation plans**

**Description.** Preliminary or conceptual plans for mitigating adverse social, economic, and environmental effects (see the [Environmental Manual](#)) are developed at this stage and may be included

in the project plans and/or specifications. If mitigation work must be completed before highway construction begins, detailed plans and specifications may be prepared at this point. Examples include threatened species relocation; habitat/wetland creation or restoration; work outside the typical highway construction to minimize environmental impacts to nesting birds; and hazardous material/petroleum product cleanup. The plan may be a written agreement to compensate others in order for them to perform mitigation elsewhere.

**Pertinent Project Types.** Projects requiring environmental mitigation.

**Responsible Party.** Environmental coordinator

**Sub-tasks.**

- ◆ Obtain environmental mitigation commitments made to the public and resource agencies.
- ◆ Obtain input from the project manager, drainage engineer, landscape architect, biologist, and archaeologist.
- ◆ Prepare mitigation plan drawings and specifications as necessary.
- ◆ Prepare cost estimates for environmental mitigation measures.

**Helpful Suggestions.** Regional mitigation for wetland and wildlife impacts has advantages over isolated, smaller-scale environmental enhancements.

**Critical Sequencing.** The mitigation plan development schedule is usually driven by the permitting process.

**Resource Material.**

- ◆ TxDOT [Environmental Manual](#)
- ◆ TxDOT *Landscape and Aesthetics Design Manual*, Chapter 3, Section 3, [Prepare Environmental Mitigation Plans \(3390\)](#).

### 3420: Process draft environmental document

**Description.** When the draft environmental document is completed, it should be circulated to the following district staff:

- ◆ right of way section
- ◆ project manager
- ◆ area engineer
- ◆ director of transportation planning and development.

Once district approval is obtained, the document is submitted to the Environmental Affairs Division for approval. A Categorical Exclusion must be approved by the Environmental Affairs

**Division.** Approval by the FHWA (for federal-aid projects) or the Environmental Affairs Division (for non federal-aid projects) of the Environmental Assessment (EA) or Environmental Impact Statement (EIS) must be obtained before a public hearing or affording an opportunity for a hearing.

An EIS is circulated to various stakeholders and interested persons. An EA, on the other hand, is not circulated but is made available for public inspection at various federal, state, and local offices.

**Pertinent Project Types.** Projects requiring an EA or EIS.

**Responsible Party.** Environmental coordinator

**Sub-tasks.** Submit draft document to Environmental Affairs Division for approval.

**Helpful Suggestions.**

- ◆ If project does not involve federal funds the Environmental Affairs Division is responsible for approval.
- ◆ If the project involves federal funds, the Environmental Affairs Division forwards the document for FHWA approval.

**Critical Sequencing.** Approval for further processing is needed before advertising for public hearing.

**Resource Material.** TxDOT [Environmental](#) Manual

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## Section 4 — Public Hearing

### Overview

Public involvement is an ongoing phase of the project planning process that encourages and solicits public input and provides the public the opportunity to become informed regarding project development. A public hearing is a specific format that gives the public access to the decision-making process. This section discusses a formal avenue of public involvement and is required with specific project proposals.

This section includes the following tasks, listed in chronological order:

3500. [Conduct public hearing](#)

3520. [Respond to public hearing comments](#)

### 3500: Conduct public hearing

**Description.** A public hearing (see the [Environmental Manual](#)) is held to present project alternatives and to seek public comment on the proposed project location, design, and environmental impacts. A hearing includes portions for introductory remarks, a technical presentation, and receiving public comments.

**Pertinent Project Types.** An opportunity for a hearing must be afforded when required by law.

**Responsible Party.** Advanced project development engineer

#### Helpful Suggestions.

- ◆ Afford (provide) an opportunity for a public hearing by the Electronic Business Daily. If, in response to the advertisement, someone requests that a hearing be conducted, a hearing must be held. If it is anticipated that the hearing will be requested, then the hearing may be scheduled without first affording the opportunity.
- ◆ In addition to projects requiring hearings, a hearing might be appropriate in the following situations:
  - acquisition of a large amount of right of way is proposed
  - the roadway function changes substantially
  - there is public controversy related to a project
  - for a high-profile project.
- ◆ For non-EIS projects, the project development team should go to the hearing with a clearly “preferred” alternative presented. A preferred alternative does not have to be presented for an

EIS project. No final decisions should be made until after the public has the opportunity to provide input.

### **Critical Sequencing.**

- ◆ Approval for further processing of the Draft Environmental Impact Statement (DEIS), EA or CE must be obtained before advertising for the hearing. Approval of a CE, EA or DEIS is obtained from the FHWA for federally-funded projects or from the Environmental Affairs Division for state-funded projects.
- ◆ For controlled access projects or projects requiring an Environmental Impact Statement, approval of the geometric schematic (see [2920](#): Obtain approval of final geometric schematic) must be obtained before advertising for the hearing. Check with the Design Division Field Coordination Section for exceptions to this requirement, particularly for rural projects with few abutting property owners.

**Resource Material.** TxDOT [Environmental Manual](#)

## **3520: Respond to public hearing comments**

**Description.** The public has the opportunity during a public hearing and a minimum of ten days after a public hearing (“hearing”) to comment on any aspect of the project. During the hearing, these comments can be made in writing or orally. After the hearing, the comments must be received in writing.

TxDOT is required to prepare a public hearing summary and analysis which includes the oral comments (see the [Environmental Manual](#)) received during the hearing, written comments received during the comment period, and responses to all comments.

**Pertinent Project Types.** Projects having a hearing.

**Responsible Party.** Environmental coordinator

### **Sub-tasks.**

- ◆ Obtain all comments from the hearing and any additional comments received after the hearing.
- ◆ In cooperation with the project manager, prepare responses to the comments - soon after the hearing. Review comments and responses with the advanced project development engineer.
- ◆ Submit required documentation on the hearing to the Environmental Affairs Division.
- ◆ Coordinate external review of schematic revisions (see [2860](#): Review geometric schematic with stakeholders) with project manager.
- ◆ Prepare and distribute comment and response report, and public hearing summary and analysis. For more information, refer to the *Environmental Manual*, Chapter 4, Section 2, and the discussion regarding “[Post Public Hearing Events](#).”

- ◆ Use hearing information to select a preferred alternative. The preferred alternative may be selected as originally proposed, or it may be selected with modifications, or a new alternative may be selected.

**Helpful Suggestions.** Comments and responses should be viewed with the following question in mind: “How can this result in a better overall project for the public?” If this is used as the standard, then responses and project changes made as a result of comments will be in the public’s best interest.

**Resource Material.** TxDOT [Environmental](#) *Manual*

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## Section 5 — Environmental Clearance

### Overview

This section describes finalizing required environmental documentation and public involvement to obtain approval by the Environmental Affairs Division or FHWA needed for the project to advance to the next stage of project development.

This section includes the following comprehensive task:

3600. [Obtain environmental clearance](#)

### 3600: Obtain environmental clearance

**Description.** Obtaining environmental clearance involves the following activities.

- ◆ Prepare an environmental document that
  - incorporates the comments received on the draft environmental document from the public and regulatory/resource agencies during the public availability and review period
  - includes responses to those comments received on the draft environmental document
  - identifies the selected or preferred alternative if not already identified in the draft as the preferred alternative
  - identifies changes in the proposed project, or mitigation measures, resulting from the comments received.
- ◆ Provide sufficient copies of the final environmental document to the Environmental Affairs Division (ENV) for review. The document is then circulated to ENV staff. Each discipline reviews coordination efforts, comments, and mitigation commitments to complete regulatory/resource agency coordination. Upon satisfactory completion, approval of the document can be requested; however, the document is not circulated to agencies and the public until it is approved. Approval of the document is a one or two step process
  - The one-step process is for state-funded projects. The district submits the document to ENV for approval.
  - The two-step process is for federally-funded projects. This process requires the district to submit the document to ENV for concurrence and forwarding to the FHWA for approval. FHWA approval is required for federally-funded projects.
- ◆ Intergovernmental cooperation and coordination initiated at the beginning of project development continues throughout the process. As part of this effort, the local clearinghouse (usually the Metropolitan Planning Organization (MPO)) is notified of the Finding of No Significant Impact (FONSI) or Record of Decision (ROD). To comply with the Texas Review and Com-

ment System (TRACS) and to foster intergovernmental cooperation and coordination in project development, the governor's office is notified of the FONSI or ROD.

**Pertinent Project Types.** Projects requiring an EA or EIS.

**Responsible Party.** Environmental coordinator

**Sub-tasks.**

- ◆ Prepare final environmental document. Revise draft environmental document, if appropriate, to incorporate changes, comments, and responses.
- ◆ Submit a sufficient number of copies (see the [Environmental Manual](#)) of the final document to ENV.
- ◆ ENV circulates the document to division staff.
- ◆ Obtain approval of the document from ENV and FHWA.
- ◆ ENV and FHWA distribute the document.
- ◆ Publish notice of availability of the document (Final Environmental Impact Statement). (See the [Environmental Manual](#))
- ◆ Obtain approved ROD. (See the [Environmental Manual](#)).
- ◆ Publish ROD in *Federal Register* or *Texas Register*.
- ◆ District notifies the local clearinghouse. (See the [Environmental Manual](#)).
- ◆ Approval of (usually by the MPO) FONSI or ROD
- ◆ ENV notifies the Governor's office of FONSI or ROD approval.

**Critical Sequencing.** Obtaining final environmental document approval follows the formal comment period of the draft environmental document.

**Authority Requirements.**

- ◆ [23 CFR Part 771](#)
- ◆ [43 TAC §§ 2.40 – 2.51](#)

**Resource Material.**

- ◆ TxDOT [Environmental Manual](#)

FHWA Technical Advisory T 6640.8A; 10/30/87; [Guidance for Preparing and Processing Environmental and Section 4\(f\) Documents](#)

## Chapter 4 — Right of Way Utilities

### Contents:

[Section 1 — Right of Way and Utility Data Collection](#)

[Section 2 — Right of Way Map and Property Descriptions](#)

[Section 3 — Right of Way Appraisals and Acquisition](#)

[Section 4 — Utility Adjustments](#)

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## Section 1 — Right of Way and Utility Data Collection

### Overview

This section describes determining existing ROW limits, restrictions to State ROW ownership, ownership of the properties that abut State ROW, and ownership of any properties to be acquired. It also includes identification of owners of any utilities that are in the existing ROW or on the proposed ROW. The project manager, district right of way (ROW) section, and land surveyor coordinate the work described in this section.

Above-ground and underground utility location information may need to be obtained. Above-ground utility information may be obtained by standard land surveying methods.

Underground utility locations may be determined by conventional survey methods or by Subsurface Utility Engineering (SUE). Information is available under [Task 4200](#): Locate existing utilities. SUE is an engineering process that uses new and existing technologies to accurately identify, characterize, and map underground utilities.

This section includes the following tasks:

4000. [Perform preliminary right of way research](#)

2180. [Obtain information on existing utilities](#)

4200. [Locate existing utilities](#)

### 4000: Perform preliminary right of way research

**Description.** Determining existing right of way (ROW) limits, restrictions to State ownership (e.g. easements), and actual property owners is a necessary first step in the identification of property interests. Property records and other records maintained by local public entities should be researched for this information. This preliminary ROW data can be used in refining a preferred alignment to minimize ROW impacts to properties. Schematics for public view can also show data collected, such as names of property owners and approximate locations of existing ROW limits.

ROW maps may be obtained from TxDOT records. Tax assessor maps may be obtained from city, county, and appraisal district offices. Deed and easement records may be obtained from the County Clerk's office.

**Pertinent Project Types.** All projects except preventive maintenance and restoration

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Coordinate this work with the district right of way office and identify information needed.
- ◆ Establish existing ROW.
- ◆ Research abutting property ownership.

**Helpful Suggestions.**

- ◆ Identify property owners as soon as possible in the preliminary design phase of project development.
- ◆ Identify property interests owned by members of the Texas Legislature. These interests must be acquired by condemnation.
- ◆ As the project develops, identification of the rights that individuals, or entities, have in property ownership becomes important. For example, a utility owner may own an easement or fee title to the property they occupy, which may determine who would pay for any necessary utility adjustments. As another example, a local governmental entity may own an easement which would otherwise appear to be privately held (e.g., a drainage canal).
- ◆ If needed, perform a field survey (see [2240](#): Perform other surveys) of existing ROW limits. This may be useful in developing schematics for projects in urban areas with limited ROW.

**Critical Sequencing.**

- ◆ This work should be done before developing a schematic on the preferred alignment.
- ◆ Permission for right of entry (see [2150](#): Obtain right of entry) or other written evidence of permission must always be obtained before entering private property.

**Authority Requirements.** [Article 3, Section 18 of the Texas Constitution](#)

**Resource Material.** TxDOT [Right of Way Collection](#).

**4200: Locate existing utilities**

**Description.** This task involves physically locating, marking, and surveying the physical features of utilities. Topographic surveys may be adequate for project locations with few underground utilities (i.e., in rural areas). However, in urban areas or critical locations along a rural project, subsurface utility engineering (SUE) may be needed.

Some utility features could have been included in the topographic survey (see [2230](#): Perform topographic surveys), but this task identifies utilities specifically and determines elevations as well as horizontal positions. Examples might include manhole covers, gas pipes, overhead lines, and fiber optic cables.

Subsurface Utility Engineering (SUE) is the non-destructive process of accurately locating, identifying, and mapping underground utilities. SUE is an interdisciplinary service, involving professional engineers, geologists, and licensed land surveyors. They can provide comprehensive and reliable information in the format of the client's choosing. SUE is a professional service resulting in signed and sealed deliverables.

The three major activities; designating, locating, and data management involved in SUE and the four quality levels; A, B, C & D of utility data are described at the end of this task summary. (See [Information on Subsurface Utility Engineering \(SUE\)](#) within this task).

**Pertinent Project Types.** Projects with potential utility conflicts

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Call (800) DIG-TESS before any digging is performed
- ◆ For topographic surveying:
  - Coordinate with district land surveyor and district utility coordinator.
  - Locate, log, and survey visible features of utilities.
  - To confirm and survey locations of strategic subsurface features, it may be necessary to “pothole” or excavate down to the utility.
  - Mark and label locations of subsurface utilities with stakes, laths, or other means.
  - Survey utility locations.
- ◆ For SUE:
  - Consult with the district utility coordinator to determine the need for SUE.
  - Develop and execute a work order for the SUE investigation with assistance from the district utility coordinator. Utility Coordination/SUE contracts are professional services contracts and must be coordinated through the Design Division.

**Helpful Suggestions.**

- ◆ Prepare utility and survey data in appropriate format (e.g., electronic CADD drawing). Develop a list of all utilities to monitor their status.
- ◆ Carefully assess the costs for SUE versus its benefits. The costs for SUE can be relatively small compared to overall savings. It has been estimated that for every \$1 spent for SUE, total project savings approach \$15.
- ◆ Work closely with utility owners. They will often supply copies of maps and as-built construction plans, and also do the potholing. It is in their interest to avoid relocating the utility and avoid damage by construction activities.

- ◆ Typically, utility owners are responsible for relocating their own facilities at their own expense. Therefore, it is advisable to inform utility owners (see [4610](#): Coordinate utility adjustment plans) of the proposed construction and potential for conflicts as soon as possible. Smaller utility owners may not be able to budget for relocations without extensive notice.
- ◆ Manhole covers and other obstructions may need to be adjusted for resurfacing projects.

### **Critical Sequencing.**

- ◆ While developing preliminary or geometric schematics, there may be times when it is preferable to obtain some of the utility location data (i.e., for potentially very costly conflicts). Otherwise, most of this data is collected before beginning detailed design.
- ◆ Utility data is needed before establishing final alignments of the roadway and related features (e.g., storm drains, other excavation work) so that the roadway design engineer may avoid or design around some conflicts.

### **Authority Requirements.**

- ◆ TxDOT Right of Way, Utility Adjustment, Relocation, or Removal and Utility Accommodation Policy, [43 TAC §§ 21.21 - 21.56](#)

### **Resource Material.**

- ◆ TxDOT [Utility Manual](#)
- ◆ *Subsurface Utility Engineering*, USDOT, FHWA, Office of Engineering, Federal-Aid & Design Division, Federal-Aid Program Branch, November 1995
- ◆ *Subsurface Utility Engineering, An Engineering Process for Obtaining Reliable Underground Utility Information – A Paper* by C. Paul Scott, P.E., Office of Engineering, Federal Highway Administration, March 1998
- ◆ *Subsurface Utility Engineering – A New Standard of Care*, American Society of Civil Engineers, National Standards Activity
- ◆ TxDOT *Contract Management Manual*, [Chapter 13](#), Engineering, Surveying, and Architectural Negotiated Contracts.

## **Information on Subsurface Utility Engineering (SUE)**

The three major activities involved in SUE are:

- ◆ Designating – the use of surface geophysical techniques to determine the existence and horizontal position of underground utilities. Designating can be done with electromagnetics, magnetometers, terrain conductivity meters, resonant sonics, and other geophysical designating equipment.

- ◆ Locating – the use of non-destructive digging equipment (such as vacuum excavation) at critical points along a subsurface utility’s path to determine the precise horizontal and vertical position, the size, the composition, and the condition of buried utilities.
- ◆ Data Management – the acquisition of utility-location data by conventional and high-tech surveying methods and the reduction and documentation of the data in a format suitable to the client. This may be in the form of a set of plans or an electronic CADD format.

Four “quality levels” of data are described below. Work done for each level includes work done in lower levels. For example, work done in level B includes work done in C and D.

- ◆ Quality Level A information provides the highest level of accuracy presently available. It involves locating (described above) utilities at critical points. When surveyed and mapped, precise plan and profile information is available for use in making final design decisions. The use of non-destructive digging equipment, particularly vacuum excavation, eliminates damage to underground utility facilities traditionally caused by backhoes. By knowing exactly where a utility is positioned, the designer can often make small adjustments in design elevations or horizontal locations and avoid the need to relocate utilities.
- ◆ Quality Level B involves designating (described above) the horizontal position of almost all utilities within the project limits. The information obtained in this manner is surveyed to project control. This two-dimensional horizontal mapping information is usually sufficient to accomplish preliminary engineering goals. Decisions can be made on where to place storm drainage systems and other design features in order to avoid conflicts with existing utilities. Slight adjustments in the design can produce substantial cost savings by eliminating utility relocations.
- ◆ Quality Level C information is a little less accurate than B. It involves surveying visible above ground utility facilities, such as manholes, valve boxes, posts, etc., and correlating this information with existing utility records. When using this information it is not unusual to find that many underground utilities have been either omitted or erroneously plotted on utility records. Its usefulness, therefore, should be confined to rural projects where utilities are not prevalent, or are not too expensive to repair or relocate.
- ◆ Quality Level D is the most basic level of information. It comes solely from existing utility records. It may provide an overall understanding for the congestion of utilities, but it is often highly limited in terms of comprehensiveness and accuracy. Its usefulness should be confined to project planning and route selection activities.

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## Section 2 — Right of Way Map and Property Descriptions

### Overview

This section describes preparing and submitting right of way maps, and property descriptions before acquiring property for a project. To ensure accuracy, the project manager must maintain strong coordination with the project engineers and surveyors.

This section includes the following task:

### 4300: Prepare right of way map and property descriptions

**Description.** Right of way (ROW) maps and property descriptions are prepared to describe each parcel of land to be acquired. These documents are prepared after project location and design acceptance is obtained. Since they will form a vital part of future legal instruments (e.g., property deeds, eminent domain documents), these documents must be accurate and must be prepared by a Registered Public Land Surveyor. Preparation of these items is a ROW expense. Therefore, funding approval and a right of way control-section-job (CSJ) should be obtained from the ROW Division after the Commission has approved the project as a Priority 2 project.

**Pertinent Project Types.** Projects requiring additional ROW whether fee title, easement, or other real property interests (e.g., access).

**Responsible Party.** Project manager

#### Sub-tasks.

- ◆ Coordinate with the roadway design engineer to determine proposed ROW limits including temporary and drainage easements, and access denial areas.
- ◆ Obtain and/or verify project specific ROW control-section-job (CSJ) numbers and check the FIMS project set up to be sure the project data is correct in FIMS.
- ◆ Deliver the approved, project schematic to the land surveyor, and discuss ROW issues in detail - obtain an expected delivery date for ROW documents.
- ◆ The surveyor verifies property ownership, and performs field survey of existing ROW and property lines.
- ◆ Coordinate any required use of railroad ROW with the Railroad Section of the Traffic Operations Division.
- ◆ The land surveyor identifies/verifies real property improvements to be acquired.

- ◆ The roadway design engineer performs a quality control check on the completed ROW maps, and property descriptions, comparing them to the project schematic design, or construction plans if available.
- ◆ Submit ROW map and property descriptions to the Right of Way Division to obtain ROW project release.

### **Helpful Suggestions.**

- ◆ Stay in communication with the surveyor preparing the map to answer questions, provide updated ROW requirements for minor modifications, additions, or deletions of ROW.
- ◆ If the project is in PS&E development and ROW planning concurrently, the project manager should encourage clear communication between all engineers and the land surveyor. In this situation, the drainage engineer may develop the need for a drainage easement, the traffic engineer may develop the need for additional fee title at an intersection, the roadway design engineer may develop the need for additional easements or fee title due to construction on soft soils, etc. All these conditions need to be identified and communicated as early as possible in the ROW phase.
- ◆ Seemingly minor errors can have major effects on the acquisition of ROW, especially in the area of eminent domain proceedings. A single discrepancy between a ROW map, parcel plat, or legal description has the potential for disrupting the eminent domain process. Consequently, accuracy is extremely important.
- ◆ Locate and generally describe existing improvements, such as buildings, fences, gates, billboards, signs, driveways, major landscape features (e.g., large trees), on ROW maps and parcel plats. This information will be used later by the appraiser to determine the value of the property – including land and/or improvements.

### **Critical Sequencing.**

- ◆ Other than for advance acquisition (see [4410](#): Perform advance acquisition for qualified parcels), ROW acquisition cannot begin until authority for ROW project release (see [4415](#): Obtain authority for ROW project release) is obtained.
- ◆ All ROW documents must be completed before ROW acquisition can begin.

### **Authority Requirements.**

- ◆ TxDOT Policy Statement 2-95, “TxDOT Surveying Procedures”
- ◆ TxDOT memo; 06/16/97; “FYs 1998, 1999, 2000 Preliminary Allocations and Budgeting Guidelines”; from Wm. G. Burnett; to Management Team.

**Resource Material.** TxDOT [Right of Way Collection](#).

## Section 3 — Right of Way Appraisals and Acquisition

### Overview

[Appraisals](#) and right of way (ROW) acquisitions must be done according to state and federal guidelines. The district right of way administrator assigns a pre-approved appraiser. Appraisal reviews should be conducted after appraisals are completed and before beginning parcel acquisition. The ROW acquisition process involves making offers based on appraisal price, negotiating, and using eminent domain when required. Relocation assistance involves helping with the relocation of residents and business owners being displaced due to ROW acquisition. This activity may take significant time and should be incorporated into the project completion schedule. Improvements on ROW should be removed, sold, or demolished before construction. ROW clearance and encroachment certifications must be prepared and submitted before a project can be advertised for construction bids. These certifications must be furnished to the Design Division with the PS&E submitted for letting.

This section includes information on the following tasks listed in approximate chronological order:

- 4400. [Obtain contractual agreements with local public agencies](#)
- 4410. [Perform advance acquisition for qualified parcels](#)
- 4415. [Obtain authority for right of way project release](#)
- 1400. [Review scope, cost, and staff requirements of project development](#)
- 4420. [Identify impediments to parcel acquisition](#)
- 4425. [Prepare and execute joint-use/multiple-use agreements](#)
- 4430. [Appraise parcels](#)
- 4470. [Implement right of way acquisition process](#)
- 4480. [Implement relocation assistance program](#)
- 4490. [Dispose of improvements](#)
- 4500. [Prepare right of way and encroachment certifications](#)

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**4400: Obtain contractual agreements with local public agencies**

**Description.** Local public agencies are often required to participate in transportation project development by performing or contracting directly for the acquisition of rights of way (ROW) and required adjustments of utility facilities. When this occurs, TxDOT and the local public agency should have already entered into a [Right of Way Agreement](#) to contribute funds which identifies each party's responsibilities. Appraisals and ROW negotiations and acquisitions must be done according to federal and state guidelines.

**Pertinent Project Types.** Projects involving ROW acquisition.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Review local participation requirements in [43 TAC § 15.55](#).
- ◆ Review previously executed advance funding agreements.
- ◆ District right of way administrator and director of transportation planning and development decide how, and by whom, ROW is to be acquired.
- ◆ Give local entity approved ROW maps, plats, parcel descriptions, and notify them to begin acquisition, if applicable.

**Helpful Suggestions.** Standard agreement forms are available in the TxDOT [Right of Way Manual](#) for ROW acquisition by cities or counties.

**Critical Sequencing.** Environmental clearance and ROW documents (e.g., maps, plats, and legal descriptions) must be completed before authorizing a local public agency to begin ROW appraisal and acquisition.

**Resource Material.**

- ◆ TxDOT [Appraisal and Review Manual](#)
- ◆ TxDOT [Right of Way Collection](#).

**4410: Perform advance acquisition for qualified parcels**

**Description.** Under qualifying circumstances, a very limited number of right of way (ROW) parcels may be acquired early, prior to the proper time for acquisition of **all** parcels. These parcels may be acquired before obtaining the authority for right of way project release (see [4415](#): Obtain authority for ROW project release) and before environmental clearance. However, it must be stated that transportation options are still being studied and that results of the study may show the acquired property might not be needed for the ultimate facility. Requirements of early acquisition are

described in the TxDOT [Right of Way Manual](#). Parcels that may qualify for early acquisitions involve one of the following:

- ◆ land donations
- ◆ hardship cases - where the landowner has a unique hardship circumstance that is not common to all property owners
- ◆ protective acquisition - where changes in land use are planned which would substantially increase the cost or effort to construct a transportation facility within the subject ROW.

**Pertinent Project Types.** Projects requiring additional ROW and involving parcel donations, hardship cases, or protective acquisition.

**Responsible Party.** District Right of Way Administrator

**Sub-tasks.**

- ◆ Determine, through communication with property owners and local officials, which parcels may be considered for early acquisition due to land donations or protective acquisition. The project manager may do this work.
- ◆ Determine the need for early acquisition after receiving a request for hardship acquisition.
- ◆ Obtain approval from ROW Division for early acquisition.
- ◆ Obtain title reports and prepare parcel plat and property description.

**Authority Requirements.**

- ◆ Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 ([42 USC §§ 4601-4665](#))

**Resource Material.**

- ◆ TxDOT [Appraisal and Review Manual](#)
- ◆ TxDOT [Right of Way Collection](#).

**4415: Obtain authority for right of way project release**

**Description.** The Right of Way Division authorizes a right of way (ROW) project once all of the following conditions are complete:

- ◆ environmental clearance of construction project
- ◆ receipt of district approved ROW map, and
- ◆ execution of agreement with local public agency to contribute funds (see [4400](#): Obtain contractual agreements with local public agencies).

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ROW project authorization is communicated to the districts by letter notifying them of ROW project release.

**Pertinent Project Types.** All projects requiring ROW acquisition or utility adjustments.

**Responsible Party.** District Right of Way Administrator

**Critical Sequencing.** With the exception of early acquisition, no ROW costs (including utility adjustments) may be incurred before ROW project release.

**Resource Material.** TxDOT [Right of Way Collection](#).

#### **4420: Identify impediments to parcel acquisition**

**Description.** Impediments to parcel acquisition are things that could adversely affect the ability to acquire right of way. These impacts could include parcels without clear record title, parcels with hazardous materials, residents needing relocation, or known contentious property owners.

The project manager, project engineers, and acquisition specialists should meet to discuss issues that might significantly affect the project schedule. They should prepare a prioritized schedule for acquiring parcels and a list of issues pertinent to each parcel.

**Pertinent Project Types.** Projects requiring additional right of way whether fee title or easement.

**Responsible Party.** Project manager

**Critical Sequencing.** This task should be done immediately before starting parcel acquisition. It will aid the acquisition team in prioritizing the parcel acquisition sequence.

#### **4425: Prepare and execute joint-use/multiple-use agreements**

**Description.** [Joint-use agreements](#) are executed to permit TxDOT to use right of way (ROW) owned by public entities (e.g., cities and counties) and quasi-public entities (e.g., utility and railroad companies) under certain conditions. In most cases these entities will not sell ROW outright but will agree to share the ROW (e.g., shared ditch agreements). Sometimes ROW should not be purchased outright because this may involve assuming ownership and maintenance of utilities or other improvements within that ROW. Agreements can be used instead of buying ROW, such as railroad right of way, which is extremely difficult to buy. The agreement allows TxDOT to use the property subject to compatibility with use by the fee owner.

[Multiple-Use Agreements](#) are executed to allow use of TxDOT ROW for other than highway purposes. These agreements are executed with political subdivisions, state or federal agencies for public use of the ROW. These agreements are essentially a license to allow others to use TxDOT ROW. Typical uses include: parking lots, hike and bike trails, boat ramps, landscape areas, or other

similar facilities that may be operated without detriment to, or interference with, the utility of the highway.

Typically, joint-use agreements are between TxDOT and quasi-public entities; and multiple-use agreements are between TxDOT and public entities. Some of these agreements may have been prepared and executed during preliminary design preparation (see [2120](#): Prepare and execute additional agreements). The Right of Way Division can assist with preparing joint-use agreements. The Maintenance Division can assist districts in preparing multiple-use agreements.

**Pertinent Project Types.** Projects requiring interests in property owned by public and quasi-public entities

**Responsible Party.** District Right of Way Administrator or Director of Maintenance

**Sub-tasks.**

- ◆ Identify the need for an agreement versus outright ownership of property. Coordinate with project manager.
- ◆ Prepare property description for ROW map.
- ◆ District submits joint-use agreements to the Right of Way Division for review and execution.
- ◆ District submits multiple-use agreements to the Maintenance Division for review and execution.

**Critical Sequencing.** All property interests, including agreements, must be obtained before TxDOT activity may begin on a property.

#### 4430: Appraise parcels

**Description.** After obtaining authority for right of way project release (see [4415](#): Obtain authority for ROW project release) from the Right of Way Division, the district selects an [approved appraiser](#) from the TxDOT statewide list to determine the market value of property to be acquired.

The appraiser conducts a site analysis, prepares an appraisal report stating the market value of the property, and determines the total compensation that should be paid to the property owner for the property interests (e.g., land, easements, improvements).

District review and approval of all parcel appraisals is required. The district may request that the Right of Way Division assist in the review and approval of appraisals. The Right of Way Division has review and approval authority for values of acquisition by [condemnation](#).

**Pertinent Project Types.** Projects requiring additional ROW whether fee title or easement.

**Responsible Party.** District Right of Way Administrator

**Sub-tasks.**

- ◆ Obtain authority for ROW project release from the Right of Way Division.
- ◆ Arrange for a Registered Professional Land Surveyor (RPLS) to survey and monument the corners of properties to be appraised.
- ◆ Conduct pre-appraisal contact with the property owner.
- ◆ Select appraisers from the list of [approved appraisers](#).
- ◆ Issue appraisal work order for each parcel.
- ◆ Provide property description and parcel plat to appraiser.
- ◆ Appraiser prepares appraisals of required property interests.
- ◆ Review appraisals. Request assistance from the Right of Way Division, if needed.
- ◆ If acquisition is by condemnation, forward appraisals to the Right of Way Division.

**Critical Sequencing.** The appraisals should be started immediately after obtaining the authority for ROW project release from the Right of Way Division.

**Authority Requirements.**

- ◆ Uniform Standards of Professional Appraisal Practice as promulgated by the Appraisal Standards Board of the Appraisal Foundation.

**Resource Material.**

- ◆ TxDOT [Appraisal and Review Manual](#)
- ◆ TxDOT [Right of Way Collection](#).

**4470: Implement right of way acquisition process**

**Description.** The right of way (ROW) acquisition process involves negotiating the conditions of acquisitions, making offers based upon appraised value and using eminent domain when required. The acquisition process must be accomplished according to the TxDOT Right of Way Manual. Sometimes, property interests other than fee title may be required (e.g., easements, temporary easements, joint-use/multiple-use agreements). (See [4425](#): Prepare and execute joint-use/multiple-use agreements).

**Pertinent Project Types.** Projects involving ROW acquisition.

**Responsible Party.** District Right of Way Administrator

**Helpful Suggestions.** Prioritize the sequence of parcel acquisition before beginning the acquisition process. For example, utility adjustments can not be made until certain parcels are obtained. A sin-

gle holdout parcel located in a string of adjacent parcels can prevent utilities from being adjusted within a whole segment of roadway. Parcels involving such utilities need to be prioritized.

**Critical Sequencing.** Right of way acquisition is accomplished after ROW appraisals are performed and before TxDOT work activity can begin on the property.

**Authority Requirements.**

- ◆ [Property Code](#), Chapter 21

**Resource Material.**

- ◆ TxDOT [Appraisal and Review Manual](#)
- ◆ TxDOT [Right of Way Collection](#).

**4480: Implement relocation assistance program**

**Description.** Residents and business owners who will be displaced as a direct result of the acquisition of the real property, in whole or in part, for a construction project are eligible for relocation assistance. Engineering and environmental staff members identify these individuals during preliminary design. Later, district staff provide relocation assistance information to these individuals as part of the project's public involvement efforts.

**Pertinent Project Types.** Projects requiring right of way acquisition

**Responsible Party.** District Right of Way Administrator

**Sub-tasks.**

- ◆ Identify and follow through with any commitments made in the project's environmental documents with respect to relocation assistance.
- ◆ Identify eligible owners and tenants.
- ◆ Send a notice to vacate to all displacees still occupying the project ROW at least 90 days before the intended date to vacate. An additional 30-day notice may be required after the State takes possession of the property.
- ◆ Provide assistance, as required and allowed by law, in the relocation of displaced individuals.

**Helpful Suggestions.**

- ◆ Only trained relocation experts should discuss this issue with property owners.
- ◆ Implementing the relocation assistance program and delivering notices to vacate must be done within the overall project schedule. Relocating individuals can take much time to complete.

**Authority Requirements.**

- ◆ [Property Code § 21.046](#)

**Resource Material.** TxDOT [Right of Way Collection](#).

#### 4490: Dispose of improvements

**Description.** Improvements on right of way (ROW) acquired by the State are considered either salable or nonsalable. The [General Services Commission](#) is responsible for selling salable improvements. 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.

**Pertinent Project Types.** Projects requiring ROW acquisition.

**Responsible Party.** District Right of Way Administrator

##### Sub-tasks.

- ◆ Identify improvements to be removed from the ROW.
- ◆ If field surveying of improvements to be removed is needed before ROW acquisition, obtain permission for right of entry (see [2150](#): Obtain right of entry). Permission for right of entry or other written evidence of permission must always be obtained before entering private property.
- ◆ Develop a plan for removing improvements, if needed. For example, a house containing asbestos would need a containment plan.
- ◆ Verify that the State has title to the right of way parcel and is in possession of the improvements to be removed.
- ◆ For salable improvements, submit request for approval to TxDOT General Services Division, Property Management Section.
- ◆ Identify the most economical way to dispose of nonsalable improvements.

##### Critical Sequencing.

- ◆ Disposal of improvements can not begin until the State owns the improvements.
- ◆ This task should be completed before construction begins unless disposal is in the construction contract.

**Helpful Suggestions.** Dispose of improvements, particularly buildings, as soon as possible to prevent reoccupation and additional relocation expense.

##### Authority Requirements.

- ◆ TxDOT memo; 06/11/98; “Disposal of Right of Way Improvements”; from Gary Bernethy; to District Right of Way Administrators

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**Resource Material.** TxDOT [Right of Way Collection](#)

#### **4500: Prepare right of way and encroachment certifications**

**Description.** In general, encroachment certifications are statements signed by the district engineer and included in the PS&E transmittal letter. A right of way (ROW) certification certifies that required ROW acquisition is complete, or will be complete, by a certain date. An encroachment certification generally certifies that the ROW is free of encroachments, or if they remain temporarily, they will not pose a safety or constructability conflict during construction. ROW encroachments, when identified, must be removed from the ROW by the owner of the encroaching property.

Federal policy requires bid proposals to identify the status of required ROW acquisition. If ROW acquisition is incomplete before bid advertisement, the district must give anticipated acquisition completion dates to the Design Division that must include the status of acquisition and the effect on construction. A map showing uncleared parcels may be required. These dates must be as accurate as possible since delays in ROW acquisition may result in contractor delays and claims.

**Pertinent Project Types.** All projects.

**Responsible Party.** Project manager

#### **Sub-tasks.**

- ◆ Research status of ROW acquisition and removal of identified encroachments.
- ◆ Prepare ROW encroachment certifications. See the *Plans, Specifications & Estimate Preparation Manual*, Chapter 5, [Section 3](#).
- ◆ The District Engineer is responsible for the accuracy and execution of all ROW and encroachment certifications.
- ◆ Submit certifications with the PS&E transmittal letter to the Design Division along with PS&E documents.

**Critical Sequencing.** ROW and encroachment certifications are required before a project can be advertised for construction bids.

#### **Authority Requirements.**

- ◆ TxDOT memo; 08/17/98; “Unacquired ROW and Unadjusted Utilities”; from Robert L. Wilson, et al; to all District Engineers
- ◆ FHWA letter; 11/01/95; “Report for the Joint TxDOT/FHWA Process Review on ROW and Utilities”; from Kenneth Seiler
- ◆ For federally funded projects, [Federal Aid Policy Guide, Section 1.23](#).

**Resource Material.** *TxDOT Plans, Specifications & Estimate Preparation Manual*, Chapter 5, [Section 3](#)

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## Section 4 — Utility Adjustments

### Overview

Public utility owners (companies) legally share State right of way, so when major changes are made to roadways, they very likely affect utilities. It is TxDOT's responsibility to formally notify all affected utility owners of proposed work as early as possible and to coordinate utility adjustments with the utility owners. Utility clearance certifications must be submitted by the district to Design Division with the PS&E.

Typically, utility owners are responsible for moving their own facilities, including budgeting, locating existing lines, preparing plans, specifications and estimates, and letting contracts. Under some circumstances, TxDOT may fund utility adjustments. Furthermore, utility adjustment plans may be made part of the TxDOT project construction plans. This is known as Combined Transportation Utility Construction (CTUC).

This section includes the following tasks. The tasks are listed in approximate chronological order.

- 4610. [Coordinate utility adjustment plans](#)
- 4620. [Prepare and execute utility adjustment agreements](#)
- 4630. [Utility owners adjust facilities](#)
- 4640. [Prepare utility clearance certifications](#)
- 4650. [Reimburse utility owners for eligible adjustment costs](#)

### 4610: Coordinate utility adjustment plans

**Description.** After receiving TxDOT's plans or schematics, the utility owner should prepare their utility adjustment plans (adjustment may include relocation). Utility adjustment plans:

- ◆ should show existing and proposed utilities; key TxDOT project features; and, temporary and permanent relocations - since even temporary relocations may pose construction conflicts.
- ◆ help resolve potential conflicts between utilities and construction activities.
- ◆ may be incorporated into TxDOT PS&E if the utility adjustment is included in the TxDOT construction contract (CTUC).

TxDOT may participate in the cost of [eligible utility adjustments](#). When TxDOT acquires new right of way (ROW) containing utilities, TxDOT typically participates in the cost of adjusting the

utilities. When utilities are located in existing ROW and need adjusting, TxDOT does not typically participate in the cost of adjusting the utilities.

**Pertinent Project Types.** Projects involving potential conflict between utilities and construction activities.

**Responsible Party.** Roadway design engineer

**Sub-tasks.**

- ◆ When design of proposed underground features is substantially complete (approximately 60% complete), send project construction plans to **all** utility owners so they may begin designing required adjustments. This should be documented to show good faith coordination.
- ◆ Determine if additional work is needed to precisely locate existing utilities (see [4200](#): locate existing utilities). This may be needed if adjusting the utility would be very expensive or a roadway feature needs to be built very close to the utility.

**Helpful Suggestions.**

- ◆ Utility Coordination Contracts may supplement state efforts and speed up the coordination process, ensuring good coordination in regard to designing, funding and scheduling issues.
- ◆ Continuous coordination and involvement of the utility owners throughout project development is essential to maintain the project schedule.
- ◆ Utility owners should be advised of potential conflicts as soon as possible. One to two years may be needed to budget, design, and complete required adjustments.
- ◆ Fabrication of major utility equipment (e.g., transmission towers, greater than 18” diameter water pipe) may add 8 to 12 months to the time required to complete the utility adjustment.
- ◆ If TxDOT will participate in adjustment cost, TxDOT’s share must be included in the ROW project cost estimate.
- ◆ TxDOT may determine that it is preferable to design around a utility in accordance with the *Utility Accommodation Rules*, rather than require the owner to adjust the utility.

**Critical Sequencing.** Utility adjustments should be completed before the project is let to contract.

**Authority Requirements.**

- ◆ TxDOT *Utility Accommodation Rules*, [43 TAC §§ 21.21 - 21.56](#)
- ◆ [23 CFR Part 645](#).

**Resource Material.**

- ◆ TxDOT [Utility Manual](#)
- ◆ TxDOT [Right of Way Collection](#)

- ◆ TxDOT [Hydraulic Design Manual](#) for avoiding, adjusting, and accommodating utilities (storm drains)
- ◆ TxDOT [Bridge Project Development Manual](#) for attaching utilities to bridges and relocating gage stations.

#### **4620: Prepare and execute utility adjustment agreements**

**Description.** All required utility adjustments eligible for State cost participation must be performed in accordance with an executed “Utility Agreement.” The agreement specifies each party’s rights and responsibilities with regard to the highway/utility interface. Assignment of agreement approval authority, by the district or Right of Way Division, depends on the agreement type and other conditions. An agreement is required even if the utility adjustment is incorporated in a TxDOT construction contract.

The Utility Agreement includes:

- ◆ standard utility agreement form
- ◆ plans, specifications, and detailed cost estimates (see [4610](#): Coordinate utility adjustment plans)
- ◆ evidence of reimbursable interest
- ◆ the utility joint-use agreement.

The Map, Survey, Utility Section of the Right of Way Division is available for consultation and review of non-typical agreements.

**Pertinent Project Types.** Projects requiring utility adjustments

**Responsible Party.** District Right of Way Administrator

#### **Sub-tasks.**

- ◆ Coordinate work with the project manager and district utility coordinator.
- ◆ Prepare (with input from the Right of Way Division as needed) and submit the draft agreement assembly to utility owners.
- ◆ Any requested modifications to the agreement are negotiated and the agreement is revised as necessary.
- ◆ Ensure that both parties execute the agreement.

**Helpful Suggestions.** The TxDOT Utility Manual contains typical agreements that have been used successfully between TxDOT and utility owners. If a utility is uncooperative, contact the ROW Division for assistance.

**Critical Sequencing.** After coordination with the Right of Way Division, submit the agreement to the utility owners for execution.

**Authority Requirements.**

- ◆ TxDOT *Utility Accommodation Rules*, [43 TAC §§ 21.21 - 21.56](#)
- ◆ TxDOT memo; 09/22/97; “Utility Adjustment Guidelines in Transportation Projects”; from Robert Cuellar; to all Area Engineers
- ◆ For assignments of agreement approval authority: *Planning & Construction Management of Utility Conflicts in Transportation Projects*, Appendix C: District Approval of Utility Agreements; by TxDOT and TEEEX; 10/97.

**Resource Material.**

- ◆ TxDOT [Utility Manual](#)
- ◆ TxDOT [Right of Way Collection](#).

**4630: Utility owners adjust facilities**

**Description.** Once utility adjustment agreements are executed, utility owners can begin adjusting their utilities. Throughout the adjustment period, continuous coordination should be maintained between TxDOT and utility owners. Changes in adjustment schedules and changes in field conditions can affect the overall construction schedule. Periodic inspection by TxDOT of the following items is essential during adjustment of the utility:

- ◆ conformance with the TxDOT *Utility Accommodation Rules*
- ◆ conformance with plan requirements
- ◆ traffic control in accordance with the [TMUTCD](#).

Utility owners are responsible for utility adjustments. The project manager, through the district right of way utility coordinator, is responsible for notifying utility owners that agreements are executed and utility adjustments can begin.

**Pertinent Project Types.** Projects requiring utility adjustments by the utility owner.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Notify utility owners, through the district right of way utility agent, that the agreements are executed and utility adjustments may begin.
- ◆ District inspector maintains utility adjustment construction records to relate billing with work accomplished and to ensure proper location.

**Helpful Suggestions.**

- ◆ Ensure good communication between utility owners to prevent delays. The project manager should follow up with utility owners on coordinating adjustments. One owner's facilities may not be able to be adjusted until another owner's facilities are adjusted.
- ◆ Utility owners have legal rights to use highway rights of way in accordance with TxDOT policy, and they should be regarded as partners in the transportation business.
- ◆ Utility adjustments often require specialized equipment, trained crews, and expertise (e.g., fiber optic cables, electric transmission lines). They are often performed in advance of, and independently of, the transportation construction project. However, in some cases, the adjustment of a utility (e.g., water lines, drainage pipes) may be incorporated into the highway construction plans to be executed by the contractor.

**Critical Sequencing.** To avoid affecting proposed construction, start utility adjustments as soon as environmental clearance is obtained, necessary right of way is available, agreements are executed, and Priority 1 authority for the project is received.

**Authority Requirements.** TxDOT *Utility Accommodation Rules*, [43 TAC §§ 21.21 - 21.56](#)

**Resource Material.** TxDOT [Right of Way Collection](#).

**4640: Prepare utility clearance certifications**

**Description.** The district shall prepare a utility clearance certification (see the *PS&E Preparation Manual*, Chapter 5, Section 3, [Utility Clearance Certification](#)) and submit it with the PS&E to the Design Division. The certification is form submitted with the PS&E transmittal stating whether any utility adjustments remain to be completed.

**Pertinent Project Types.** All projects.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Review status of required utility adjustments.
- ◆ If adjustments will not be complete before letting, a Utility Adjustment Status Form (see the *PS&E Preparation Manual*, Chapter 5, [Section 3](#), Utility Clearance Certification) should be completed and attached to the PS&E transmittal letter. The Form requires obtaining estimated adjustment completion dates. In completing the Form, coordinate with utility owners on adjustment completion date commitments. It is recommended to obtain letters from them stating dates when adjustments will begin and be complete.
- ◆ District engineer reviews and signs the certification and, if needed, the Utility Adjustment Status Form, and transmits these with the PS&E to the Design Division.

- ◆ District must update the Utility Adjustment Status Form before the [letter of authority](#) can be issued.

### Helpful Suggestions.

- ◆ Full clearance of utility conflicts prior to letting is strongly encouraged.
- ◆ When determining completion dates for adjustments after letting, be as accurate as possible. Coordination with utility owners should be current. Dates should be realistic and attainable. This information will go into the bid proposal and construction agreement with the highway contractor. Inaccurate utility adjustment dates can cause contractor change orders and contractor claims.
- ◆ Completion of the Utility Adjustment Status form is required for all Federal-aid projects and suggested for State-funded projects.

**Critical Sequencing.** Prepare the utility clearance certification after TxDOT has inspected the adjustments.

### Authority Requirements.

- ◆ TxDOT *Utility Accommodation Rules*, [43 TAC §§ 21.21 - 21.56](#)
- ◆ TxDOT Memo; 08/17/98; “Unacquired ROW and Unadjusted Utilities”; from Robert L. Wilson; to District Engineers.

### Resource Material.

- ◆ TxDOT [Utility Manual](#)
- ◆ TxDOT [Right of Way Collection](#)
- ◆ TxDOT *PS&E Preparation Manual*, Chapter 5, [Section 3](#), Utility Clearance Certification.

## 4650: Reimburse utility owners for eligible adjustment costs

**Description.** Some utility adjustments are eligible for state or federal reimbursement. Typically, these are utility adjustments that: (1) are caused by highway construction and located within the utility owner’s right of way, or (2) are within interstate highway system right of way. The determination of eligibility is documented in the Standard Utility Agreement.

After utility relocation is complete, utility owners should submit a final billing statement to the district. The district will review, approve, and forward the statement to the Right of Way Division along with its recommendation on reimbursement. By statute, eligible utility adjustment costs are a cost of right of way acquisition.

**Pertinent Project Types.** Projects requiring utility adjustments eligible for reimbursement.

**Responsible Party.** District Right of Way Administrator

**Critical Sequencing.** This task can be started after utility adjustment is complete.

**Authority Requirements.**

- ◆ *TxDOT Utility Accommodation Rules, [43 TAC §§ 21.21 - 21.56](#)*
- ◆ [23 CFR Part 645](#)
- ◆ [Texas Transportation Code §224.008](#); Utility Relocation Costs.

**Resource Material.** TxDOT [Utility Manual](#)

# Chapter 5 — PS&E Development

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## Section 1 — Design Conference

### Overview

This section includes information on assessing background information for completeness, updating the information as needed, and conducting the design conference. If the project is inactive for some time, it is possible that traffic data, right of way maps, and other information will need updating. It is also a good idea for the design team (and possibly the landscape architect and the biologist) to perform a site visit.

The design conference provides the opportunity for key people to review basic design criteria and parameters, accept or change them, and formally endorse decisions. These decisions provide a foundation for the design team to commence detailed design work and PS&E production.

This section includes the following two tasks listed in chronological order.

5010. [Obtain additional or updated data](#)

5020. [Conduct Design Conference](#)

### 5010: Obtain additional or updated data

**Description.** The following data may have changed or need updating throughout project development.

- ◆ **ROW maps.** ROW maps need to be obtained as part of data collection. ROW maps are used to define limits of, and rights to use, state property.
- ◆ **As-built construction plans.** As-built construction plans need to be obtained as part of data collection. As-built plans provide important data regarding project features not apparent from the surface and geometric features, such as vertical curvature, which are not readily obtained by field surveys.
- ◆ **Traffic data.** Traffic data is used to determine: the number of lanes needed, intersection channelization geometry, pavement design requirements, and desired safety-related improvements.
- ◆ **Site information.** A site visit (see [1010: Perform site visit](#)) (field review) should be conducted by the design team. For complex projects, appropriate division staff should be invited to the site visit. The design team should use the site visit to identify issues requiring additional study, items not readily apparent from a two-dimensional plan set, and to identify items which have significantly changed from data collected during preliminary design.
- ◆ **Preliminary cost estimates.** Preliminary cost estimates are prepared during advance planning. Cost estimates (see [2460: Update cost estimates](#)) may change substantially due to the

amount of time since the schematic design was completed or due to changes in project scope. Update the project cost estimate as necessary and transfer data to DCIS.

**Pertinent Project Types.** All projects.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Obtain ROW maps.
- ◆ Obtain as-built construction plans.
- ◆ Request updated traffic data. (See [1430: Obtain traffic data](#)).
- ◆ Perform site visit.
- ◆ 2460. [Update cost estimates](#).

**Helpful Suggestions.**

- ◆ If construction is proposed within existing easements, obtain a copy of the original [conveyance document](#) for the easement and check for restrictions on property use.
- ◆ Check with the area maintenance supervisor to learn about any issues that the project can resolve.
- ◆ Cost estimates (see [2460: Update cost estimates](#)) should be updated and recorded in DCIS throughout final design whenever a significant scope change occurs, as many relatively minor changes can cumulatively affect the cost estimate.
- ◆ For all site visits, take photographs or video of major project issues.

## 5020: Conduct Design Conference

**Description.** This task marks the beginning of PS&E preparation and occurs after most of the background data is gathered. The purpose of the conference is to:

- ◆ review basic design parameters, concepts, and criteria that were established during the Design Concept Conference (see [2000: Conduct Design Concept Conference](#)) or by the project manager
- ◆ confirm or change design criteria necessary to commence detailed design work
- ◆ obtain concurrence with decisions.

**Design Summary Report (DSR).** A Design Summary Report (DSR) form has been developed for use in preparing for the Design Conference. Use of this form will help ensure that the project team does not overlook potentially critical issues. While all items will not be applicable to all projects, overlooking any item may significantly delay the project. The recommended [DSRform](#) is available

in MS-Word format. The DSR form also contains an attendance list to consider. The DSR form that was completed at the Design Concept Conference (see [Task 2000](#): Conduct Design Concept Conference) should be updated at the Design Conference.

**Pertinent Project Types.** All projects except simple projects for which an informal meeting between the district design engineer and project manager suffices.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Gather and organize existing data including maps, aerial photographs, schematics, and environmental documents that might be referred to during the conference.
- ◆ Obtain and review the DSR documenting the Design Concept Conference (see [2000](#): Conduct Design Concept Conference). If there was no Design Concept Conference, then review documents, if any, containing design criteria used during preliminary design.
- ◆ Review design commitments and decisions made during schematic development.
- ◆ Utilize the Advance Planning Risk Analysis (APRA) tool to evaluate risk issues and mitigation plans underway. The APRA tool and The User Guide for the APRA Tool and is available [here](#). Refer to [Task 1200](#) for more information regarding this tool.
- ◆ Discuss staffing and scheduling requirements for detailed design work.
- ◆ Review scheduling of related work such as for right of way acquisition and utility adjustments.
- ◆ Finalize design criteria.
- ◆ Update the DSR and circulate to all parties invited to the conference for their review.
- ◆ Obtain concurrence or comments by approval entities listed in the DSR.
- ◆ Update the DSR as the project progresses.

**Helpful Suggestions.**

- ◆ The project manager should consult with the director of transportation planning and development and the area engineer to determine appropriate individuals to invite to the conference.
- ◆ If additional offices, areas of expertise, or governmental entities have become involved since the Design Concept Conference, consider inviting them.
- ◆ If the PS&E team and schematic design team are different, invite schematic design team members to brief the new team on commitments, decisions, special problems, or constraints.
- ◆ Appoint an individual to take conference minutes or notes.
- ◆ At least two weeks before the conference, invite participants, and distribute meeting materials including the partially completed DSR.

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**Critical Sequencing.** The following information should be available before holding the Design Conference:

- ◆ schematic approval
- ◆ value engineering study
- ◆ public involvement
- ◆ approved environmental document and commitments
- ◆ preliminary pavement design
- ◆ layouts for interchanges
- ◆ level of service analyses
- ◆ hydraulic studies and analyses
- ◆ traffic and accident data
- ◆ aerial photographs and topographic surveys
- ◆ preliminary geotechnical surveys
- ◆ utility coordination.

**Resource Material.**

- ◆ Design Summary Report ([DSRform](#)) in PDF format
- ◆ TxDOT [Roadway Design Manual](#)
- ◆ TxDOT *Landscape and Aesthetics Design Manual*, Chapter 3, Section 4, [Conduct Design Conference \(5020\)](#)
- ◆ TxDOT [Environmental Manual](#)
- ◆ TxDOT [Hydraulic Design Manual](#)
- ◆ TxDOT [Bridge Project Development Manual](#)
- ◆ TxDOT *Traffic Operations Manual*, [Railroad Operations](#) Volume.

## Section 2 — Begin Detailed Design

### Overview

The design field survey, stream crossing hydraulics, and pavement design should be completed before detailed plan development. Traffic control and permits/agreements may delay the project if not handled properly at the beginning of detailed design.

This period of project development requires a substantial amount of the project manager's experience and attention. Decisions made during this time will directly affect the project schedule and quality. Input from the project manager's peers and supervisor should be sought for quality assurance of the project development process.

Design Division approval of geometric schematics for new location or added capacity projects should be obtained before beginning detailed design.

This section includes the following groups of tasks which may be performed concurrently:

- ◆ Traffic Control
  - 5040. [Plan sequence of construction](#)
  - 5050. [Develop conceptual detour/road closure plan](#)
- ◆ Permits and Agreements
  - 5080. [Obtain miscellaneous permits](#)
  - 5100. [Design environmental mitigation details](#)
- ◆ Design Data Collection
  - 5120. [Review data collection needs](#)
- ◆ Stream Crossing Hydraulics
  - 5140. [Refine hydrologic study](#)
  - 5150. [Prepare stream crossing hydraulics](#)
  - 5160. [Prepare hydraulic report](#)
- ◆ Pavement Design
  - 2510. [Prepare pavement design report](#)

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## Traffic Control

### 5040: Plan sequence of construction

**Description.** The designer must consider the construction sequencing, or staging, of the improvements to provide a design that is efficient to construct and maximizes mobility and safety during construction. Considerations include safety of the traveling public, TxDOT employees, and contractor employees.

The construction sequence must be detailed enough to identify the following:

- ◆ additional needs for easements, rights of way, or railroad agreements
- ◆ required modifications to final horizontal or vertical alignments – especially modifications needed for access to existing businesses and residences
- ◆ additional environmental impacts due to construction (e.g., wetland impacts, hazardous material disturbance, or water quality impacts due to an intermediate construction phase)
- ◆ previously unidentified project costs due to construction sequencing.

Safe, continuous operation by pedestrians and bicyclists should be considered in all stages of construction.

Reasonable access to all properties must be maintained during construction unless other arrangements are made with the property owners.

If an off-system roadway must be closed to traffic during construction, coordination with local entities is required. Road closure approval (see [5740: Obtain approval of road closure/detour plans](#)) must be obtained.

In some cases, planning the sequence of construction may involve determining time of day limitations for construction activities to avoid impacts to traffic and adjacent properties.

**Pertinent Project Types.** All projects.

**Responsible Party.** Roadway design engineer

**Sub-tasks.**

- ◆ Plan the sequence of construction with input from the area engineer, drainage, traffic and structural engineers, and construction inspection staff.
- ◆ Obtain preliminary roadway and drainage plans. (See [Preliminary Schematic](#)).
- ◆ Review construction year traffic data to evaluate lane closure impacts. Traffic data (see [1430: Obtain traffic data](#)) should have been previously obtained.

- ◆ Make a site visit to inspect existing conditions pertinent to sequence of construction (e.g., presence of fire stations, hospitals, or other facilities requiring uninterrupted access). This site visit (see [1010: Perform site visit](#)) may supplement earlier site visits.
- ◆ Determine the need for [construction speed zoning](#) and traffic control requirements at intersections.
- ◆ Prepare preliminary staging plan using typical sections with plan views showing complex areas.
- ◆ Coordinate plan with appropriate district and area office staff (construction, right of way, etc.).

### Helpful Suggestions.

- ◆ Make sure that non-typical and transition areas are detailed, because they are not represented in typical sections.
- ◆ Consider the types of construction equipment that will be available or used, and ensure that the access and operational room needed for such equipment is provided.
- ◆ Evaluate pavement design (see [2510: Prepare pavement design report](#)) for compatibility with proposed construction sequence.

**Critical Sequencing.** Construction staging can have a direct impact on requirements for lengthy project activities such as right of way acquisition or environmental permitting. Consequently, the plan for construction sequencing should be developed as one of the first steps in detailed design.

### Resource Material.

- ◆ Texas [Manual on Uniform Traffic Control Devices](#), Part VI (TMUTCD)
- ◆ TxDOT [Traffic Operations Manual, Signs and Markings Volume](#)
- ◆ TxDOT [Procedures for Establishing Speed Zones Manual](#)
- ◆ TxDOT [Traffic Control Standard Sheets](#).

## 5050: Develop conceptual detour/road closure plan

**Description.** Detours and road closures may be necessary to maintain traffic operations at acceptable levels of service during construction. Detours may include rerouting traffic to existing parallel routes, constructing temporary paved routes, or a combination of both. Effects on existing parallel routes and their capacity to handle additional traffic must be evaluated. Improvements to detour routes may be needed, such as pavement overlays, bridge widenings, bridge replacements, adjustments to signal timing or intersection improvements (for truck turning movements).

Consider the layout and operation of traffic control devices and drainage facilities for detours. Preparing final detour plans is described in [5730: Design detour roadways](#).

**Pertinent Project Types.** Projects requiring a plan to maintain traffic operations during construction.

**Responsible Party.** Roadway design engineer

**Sub-tasks.**

- ◆ Obtain input from the area engineer, traffic and drainage engineers, and construction personnel.
- ◆ Obtain preliminary roadway, drainage, and sequence of construction plans.
- ◆ Obtain construction year traffic data for the project facility and potential parallel detour routes.
- ◆ Consider the impacts to existing parallel facilities if capacity of the road being improved is substantially decreased during construction. Impacts to schools, emergency vehicles, pedestrians, bicyclists, and neighborhoods due to traffic rerouting should be considered.
- ◆ Make a site visit (see [1010: Perform site visit](#)) to inspect existing conditions including parallel routes.
- ◆ Evaluate the condition of detour pavements and their ability to carry long term traffic.
- ◆ If a roadway must be closed to traffic during construction, coordination with local entities is required and road closure approval (see [5740: Obtain approval of road closure/detour plans](#)) must be obtained. If non-State owned roads are to be used as part of a detour plan, approval by the road owner (city, county, private) must be obtained. Coordinate with permit office and Motor Carrier Division if necessary.
- ◆ Describe how access to all properties will be maintained during construction, unless other arrangements are made with property owners.
- ◆ Coordinate detour plans with appropriate district and area office staff (roadway, drainage and traffic engineers, construction and right of way staff).
- ◆ Submit District Engineer's approval of road closure to the Design Division with submission of the PS&E.

**Helpful Suggestions.**

- ◆ Detours should be designed to operate at least at the existing posted speed whenever possible. When this can not be accomplished, a [construction speed zone request](#) should be considered and the detour designed to meet the lowered construction speed limit.
- ◆ Refer to information in [5720](#): Finalize sequence of construction, for details on items that will be required for the traffic control plan.
- ◆ Consider safety lighting needs.

**Critical Sequencing.**

- ◆ The detour plan should be developed as one of the first items in final design, along with the sequence of construction plan.
- ◆ Coordination and preliminary approval of road closure/detour plans should be initiated when a road closure or detour is first considered.
- ◆ Written approval of the road closure/detour plan should be obtained as soon as the detour plan is completed to the point that road closure/detour timing can be reasonably well defined and the plan has been approved by the district.

**Resource Material.**

- ◆ TxDOT [Roadway Design Manual](#)
- ◆ Texas [Manual on Uniform Traffic Control Devices](#), Part VI
- ◆ TxDOT [Traffic Operations Manual, Signs and Markings Volume](#)
- ◆ TxDOT [Procedures for Establishing Speed Zones Manual](#)
- ◆ TxDOT [Traffic Control Standard Sheets](#).

**Permits and Agreements****5080: Obtain miscellaneous permits**

**Description.** Numerous state and federal agencies and others (“outside” TxDOT) regulate the impact of construction activities on their operations or environmental features. These entities have permitting requirements for this purpose.

Since approvals of impacts often require substantial completion of detailed plans, it is important to coordinate early with these entities. Some environmental permits (see [3110](#): Determine environmental permit requirements) may have been identified earlier as part of the environmental work on the project. These permits may not be received until environmental clearance is obtained but coordination should be well underway by this point in the project development process.

Refer to the list of potential environmental permits in the TxDOT [Environmental Manual](#).

Refer to the list of miscellaneous permits in the *PS&E Preparation Manual*, Chapter 1, Section 2, [Permits](#).

**Pertinent Project Types.** Projects having potential for impacting resources or entities, listed in permit tables cited above.

**Responsible Party.** Project manager

**Sub-tasks.**

- 
- ◆ Evaluate designs for impacts to resources and entities.
  - ◆ Investigate possible design modifications to reduce or eliminate impacts.
  - ◆ Discuss potential modifications and mitigation alternatives with area and district staff including the environmental coordinator
  - ◆ Review permit application requirements identified in Task [3110](#); determine environmental permit requirements.
  - ◆ Develop supporting data for permit application as required.
  - ◆ Prepare permit application and proposal for mitigation of impacts, if applicable.
  - ◆ Review permit application and mitigation proposal with area and district staff.
  - ◆ District environmental coordinator and/or Environmental Affairs Division staff submit permit applications to resource agencies.
  - ◆ Respond to agency requests for additional information.

### **Helpful Suggestions.**

- ◆ Resource agencies consider impact minimization or avoidance of utmost importance. Conduct a thorough analysis of preliminary engineering assumptions and conclusions regarding impacts. It is helpful to develop your own justification for impacts, especially if you did not perform the preliminary engineering.
- ◆ It is recommended that you discuss assumptions and decisions made during preliminary design with appropriate team members.
- ◆ Get familiar with recent permitting decisions made by resource agencies on similar projects. Obtain this information from the district environmental coordinator.
- ◆ Agreements with railroad companies (see [2330](#): Initiate railroad coordination) are often difficult and time-consuming to obtain. These should be initiated as soon as possible.

**Critical Sequencing.** Obtaining permits can be a lengthy process and is often critical in the project development schedule. Coordination should begin as soon as the need is identified and should be followed throughout project development

### **Authority Requirements.**

- ◆ TxDOT [Storm Water Management](#) Guidelines for Construction Activities.

### **Resource Material.**

- ◆ TxDOT [Environmental](#) Manual
- ◆ TxDOT *Plans, Specifications & Estimate Preparation Manual*, Chapter 1, Section 2, [Permits](#)
- ◆ TxDOT [Hydraulic Design](#) Manual

- ◆ TxDOT [Bridge Project Development Manual](#)
- ◆ TxDOT *Traffic Operations Manual*, [Railroad Operations Volume](#)
- ◆ TxDOT [Storm Water Management Guidelines for Construction Activities](#)
- ◆ Federal Aviation Administration at <http://www.oaaaa.faa.gov>, for circular 70/7460-1K, forms and instructions.

### 5100: Design environmental mitigation details

**Description.** Mitigation for impacts due to highway improvements, should be defined in project environmental documents, permit conditions, or agreements with regulatory or resource agencies. Mitigation measures are typically defined, without much detail, during advance planning. Mitigation plans should have been prepared in task [3390](#): Prepare environmental mitigation plans and in task [2530](#): Prepare mitigation plan for historic structures. Mitigation details to be implemented during construction must be delineated in plans and specifications.

Mitigation of environmental impacts due to the presence of hazardous materials may also be necessary. Mitigation measures typically include soil liners to contain hazardous materials, groundwater removal and treatment, and soil removal and disposal. Often, design modifications can be made to eliminate migration of underground contaminants and thereby eliminate the need for mitigation.

Mitigation details may include design drawing details showing special features such as protection of historic properties or mitigation of environmental concerns.

Off-site mitigation may justify separate construction contracts and schedules for this work. Developing regional mitigation alternatives may be desirable for TxDOT and regulatory agencies. The project manager should consult with the Director of Transportation Planning and Development and the Environmental Affairs Division at the start of detailed design.

**Pertinent Project Types.** Projects requiring mitigation of environmental impacts.

**Responsible Party.** Project manager

#### Sub-tasks.

- ◆ Obtain input from the biologist, geotechnical engineer, landscape architect, and drainage engineer.
- ◆ Obtain permits and agreements with resource agencies.
- ◆ Explore possible regional alternatives and separate contracting on projects involving significant mitigation.
- ◆ Coordinate mitigation measures with others (e.g., wetland creation/restoration or threatened/endangered species relocation with Environmental Affairs Division, or site acquisition with district right of way office).

- ◆ Prepare mitigation plans.
- ◆ Review and update the mitigation cost estimate (see [3390](#): Prepare environmental mitigation plans) as necessary.
- ◆ Send plans to the district environmental coordinator to review for compliance with the environmental document.

**Helpful Suggestions.**

- ◆ Mitigation may need to be completed before construction, and if mitigation requires the acquisition of property, acquisition of these parcels should be emphasized.
- ◆ Obtain design input from related disciplines.
- ◆ For mitigation requiring post-construction monitoring, have the technical expert develop a reporting process for monitoring. Monitoring may likely be long term, and a defined reporting process will ensure uniformity during this time.
- ◆ Projects can be cleared environmentally and approved for letting only after addressing State Historic Preservation Office comments on historic structures.

**Critical Sequencing.** This task should be initiated subsequent to the field review. Timing of the completion of mitigation plans is project-specific and should be driven by the terms of agreement and permit requirements with resource agencies.

**Resource Material.**

- ◆ TxDOT [Environmental Manual](#) mitigation information
- ◆ TxDOT *Landscape and Aesthetics Design Manual*, Chapter 3, Section 4, [Design Environmental Mitigation Details \(5100\)](#)
- ◆ TxDOT [Bridge Project Development Manual](#) for information on handling removal of lead paint.

**5110: Develop Environmental Permits, Issues and Commitments (EPIC) sheet**

**Description.** The Environmental Permits, Issues and Commitments (EPIC) sheet is used to summarize the special requirements and restrictions related to the construction activity that has been permitted and the conditions of any permits. For example, it may depict areas to be avoided during construction due to the presence of endangered species, wetlands, etc.

A standard format is available for this sheet under the Roadway Standards grouping of Statewide [TxDOT CAD Standard Plans Files](#).

**Pertinent Project Types.** All projects.

**Responsible Party.** Project manager.

**Sub-tasks.**

- ◆ Review the environmental document and all permits and clearances to determine what requirements or restrictions apply to the project.
- ◆ Download the latest EPIC standard sheet from the TxDOT website.
- ◆ Ensure that areas to be avoided during construction due to endangered species, wetlands, or for other reasons are clearly identified on the EPIC sheet.
- ◆ Ask the district environmental coordinator to review the draft EPIC sheet for compliance with the environmental document.

**Helpful Suggestions.**

- ◆ Violating the condition of any permit may result in delay to the project. Be sure that all conditions are clearly outlined on the EPIC sheet.
- ◆ The district Director of Transportation Planning and Development will need to certify in the Environmental Tracking System that the environmental commitments have been incorporated into the PS&E with the EPIC sheet.

**Critical Sequencing.** Timing of the completion of the EPIC sheet is project-specific and should be driven by the terms of agreement and permit requirements with resource agencies.

**Resource Material.**

- ◆ TxDOT PS&E manual, Chapter 2, Section 2, [Environmental Permits, Issues and Commitments \(EPIC\) Sheet](#).
- ◆ TxDOT [Environmental Manual](#)

**Design Data Collection****5120: Review data collection needs**

**Description.** Most field data collection will have occurred during preliminary design. However, as a large project develops, it is common for the designer to determine that existing data may be insufficient or need updating. Typically, some modifications to the original project concept occur as a project develops and conditions change. For example, if the development of the project has taken several years, traffic data and turning movements may need to be updated. Often, stream crossing hydraulics are not studied in detail during preliminary design.

Geotechnical investigations are necessary for the satisfactory long-term performance of structure foundations, retaining and noise walls, high embankments, pavement design, and stabilization of soft soils beneath pavements. If additional data is needed to complete the design of any of these features, it should be obtained at this time.

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Previous data collection may include those described in the following tasks:

- ◆ 2505: [Perform preliminary geotechnical surveys](#)
- ◆ 2240: [Perform other surveys](#)
- ◆ 2230: [Perform topographic surveys.](#)

The project manager gathers and reviews all survey and geotechnical data collected, and reviews modifications to the project scope made since preliminary design. The project manager, in coordination with the roadway, structural and drainage engineers, determines the need for additional survey data. The project manager should contact the district pavement engineer, the district structural engineer (if one is available), and the Bridge Division, as necessary, to identify additional geotechnical survey needs.

**Pertinent Project Types.** All projects.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Gather and review existing data.
- ◆ Evaluate the project for changes (e.g., changed field conditions, project scope, environmental mitigation requirements, access revisions, or additional structures) made after original surveys and investigations.
- ◆ Identify additional data required to finalize design.
- ◆ Prepare work order for additional work.
- ◆ Perform additional data collection and field and laboratory investigations.
- ◆ Compile data and report results of investigations.

**Helpful Suggestions.**

- ◆ Field conditions may change, and this can warrant additional data collection, especially in urban areas. Other issues, such as environmental mitigation, roadway access, retaining and noise wall locations, are often determined after performing initial field surveys. The project manager must determine if, and to what extent, these conditions necessitate additional data collection.
- ◆ Geotechnical investigations may have been performed during the preliminary design phase. It is beneficial to discuss the extent and quality of this geotechnical data in the Design Conference (See [5020: Conduct Design Conference](#)). Particular attention should be directed to high fills or deep cuts, highly expansive soils, the presence of groundwater, channel stability, and anticipated need for bridges, retaining walls, and noise walls. Investigations should include data for designing high-mast illumination, signal, and overhead sign structures.

**Critical Sequencing.** This task should occur as soon as possible after beginning detailed design.

**Resource Material.**

- ◆ TxDOT [Survey Manual](#)
- ◆ TxDOT [Hydraulic Design Manual](#)
- ◆ TxDOT [Bridge Design Manual](#).

## Stream Crossing Hydraulics

### 5140: Refine hydrologic study

**Description.** Hydrologic studies establish storm water flow rates, flow volumes, and locations of inflow and outflow to the highway facility for significant drainage areas. Recommendations from these studies can affect such major items as roadway alignments, bridge lengths, bridge foundations and channel design.

The hydrologic study is typically prepared during preliminary design as described in [2610](#): perform hydrologic study. At this stage, a refinement of the original study should be all that is needed. This refinement is usually needed to reflect detailed field survey data or a change in a basic design condition or assumption, or to reflect revised methodology if there is a significant delay between schematic development and PS&E development.

**Pertinent Project Types.** Projects involving a stream or floodplain crossings.

**Responsible Party.** Hydraulic engineer

**Sub-tasks.**

- ◆ Identify any new, relevant data.
- ◆ Verify validity of previous hydrologic study and determine if the study method used is still appropriate.
- ◆ Evaluate any existing hydrologic data/results from previous studies (see [2610](#): perform hydrologic study) and update as appropriate or perform new hydrologic analysis for proposed hydraulic structure locations.
- ◆ Based on the model, determine whether watershed revisions change stream water surface elevations.
- ◆ Coordinate with the local FEMA floodplain administrator (FPA) for changes to water surface elevations and flood maps.

**Helpful Suggestions.** The Hydraulic Branch of the Roadway Design Section of the Design Division is available to provide assistance.

**Critical Sequencing.** This task should occur before [5150](#): prepare stream crossing hydraulics.

**Resource Material.** TxDOT [Hydraulic Design Manual](#)

### **5150: Prepare stream crossing hydraulics**

**Description.** Stream crossings at highways often involve a constricted flow opening. The designer establishes a design storm frequency and other criteria, and determines the size and type of opening. The design storm frequency is established considering factors such as functional classification of highway, size of the stream, or by performing a risk assessment. Other criteria include allowable velocities, allowable backwater/headwater, and [Federal Emergency Management Agency/National Flood Insurance Program](#) (FEMA and any other agency requirements).

The FHWA requires a bridge scour evaluation in the hydraulic design process for span bridges. The results of such an analysis may highlight the need for design adjustments such as increasing opening size, deeper foundations, pier and abutment protection, or other mitigation measures.

**Pertinent Project Types.** Projects involving a bridge, culvert, stream, or floodplain crossing.

**Responsible Party.** Hydraulic engineer

#### **Sub-tasks.**

- ◆ Perform hydraulic analysis of existing conditions.
- ◆ Review the results of FEMA or other studies (see [2200: Obtain hydraulic studies](#)) performed during preliminary design preparation.
- ◆ Identify whether the affected community participates in the FEMA National Flood Insurance Program (NFIP). If so, compliance with FEMA minimum criteria may be required.
  - Assess the accuracy of the FEMA hydrologic studies or computer model.
  - If appropriate, update the FEMA hydrologic model to reflect watershed revisions caused by proposed construction.
  - Hold preliminary coordination with the local FEMA floodplain administrator (FPA) or local government having flood control jurisdiction over the waterway.
- ◆ Design improvements in coordination with the roadway design and structural engineers as applicable.
- ◆ Perform hydraulic analysis of proposed structures, using the current effective FEMA model when available.
- ◆ Perform scour evaluation and coordinate findings with structural and geotechnical engineers for proper foundation design.
- ◆ Coordinate design recommendations with local FEMA floodplain administrator (FPA) or local government having jurisdiction.

**Helpful Suggestions.**

- ◆ Assistance is available from the Hydraulic Branch of the Roadway Design Section of the Design Division.
- ◆ Contact local FEMA floodplain administrator (FPA) early. The FPA can advise which base model to use and how much (if any) increase in backwater will be allowed. The FPA may also provide a copy of the original model or help locate one. It is advised to work closely with the FPA throughout the project.
- ◆ The backwater profile program used in original development of the study may have been one of several types and from one of several sources. In Texas, the model most commonly used is the HEC-2 Water Surface Profile model from the Corps of Engineers. Typically, FEMA encourages that the model be updated to the most current acceptable model. If the stream was originally modeled using HEC-2, subsequent models should be done using HEC-RAS.
- ◆ Floodplain encroachments must be explained in the environmental document.

**Critical Sequencing.**

- ◆ Conduct water crossing hydraulic design along with final alignment design.
- ◆ Hydraulic design may result in the need for drainage easements in areas not already owned or classified as waters of the State. In such instances, this task will have direct input into reviewing and obtaining additional ROW, access control, and easement requirements (see [5250: Review right of way requirements](#)).

**Resource Material.** TxDOT [Hydraulic Design Manual](#)

**5160: Prepare hydraulic report**

**Description.** For bridges, bridge-class culverts, or storm drains handling flows greater than 200 cfs (5.66 m<sup>3</sup>/s), the following must be sent to the Bridge Division for review and approval:

- ◆ scour evaluation (see the [Hydraulic Design Manual](#))
- ◆ hydraulic calculation sheets (see the *PS&E Preparation Manual*, Chapter 2, Section 2, [\(Hydraulic Calculation Sheet\)](#)).

For projects with Federal oversight, the Bridge Division will send the layouts, sheets, and reports to the Federal Highway Administration (FHWA).

Information obtained during the [5140: Refine hydrologic study](#) task is used in performing this task.

**Pertinent Project Types.** Projects having storm drains handling flows greater than 200 cfs (5.66 m<sup>3</sup>/s), bridges or bridge-class culverts.

**Responsible Party.** Project manager

**Helpful Suggestions.** Refer to the TxDOT [Hydraulic Design Manual](#) for documentation requirements.

**Critical Sequencing.**

- ◆ Hydraulic calculation sheets and scour reports should be reviewed by the district and then submitted to the Bridge Division for review and approval before PS&E submission.
- ◆ For bridge projects, send the following information with the bridge layout submission:
  - scour evaluation (do not send for bridge-class culverts)
  - hydraulic calculation sheets (send for bridges and bridge-class culverts).

**Resource Material.**

- ◆ TxDOT [Hydraulic Design Manual](#)
- ◆ TxDOT *Geotechnical Manual*, Chapter 5, Section 5, [Scour](#)
- ◆ TxDOT *PS&E Preparation Manual*, Chapter 2, Section 2, [Hydraulic Calculation Sheet](#).

## Section 3 — Final Alignments/Profiles

### Overview

Finalizing alignments is necessary before proceeding into detailed roadway design and plans development. Setting final alignments should be performed by an experienced roadway design engineer because it involves “fine-tuning” the horizontal and vertical alignments to optimize the design. Environmental impact minimization, safety enhancement, operational improvement, and constructability are qualities that should be sought during this process. Drainage headwater elevation is an important determinant in setting alignment, especially vertical alignment.

This section includes the following task.

5200. [Design final vertical and horizontal alignments](#)

### 5200: Design final vertical and horizontal alignments

**Description.** Finalizing alignments is a necessary first step in completing roadway design. Alignments developed during preliminary design do not take into account as detailed an analysis of conditions as that for final design. Issues that may warrant alignment modifications include final design of superelevation; intersection geometry; access connections; traffic management during construction; major utility adjustments; or drainage facilities. Alignment changes may also be required for minimizing impacts to Section 4(f) properties, wetlands, rights of way, and threatened or endangered species.

Finalizing alignments is not complete without a thorough review of preliminary hydraulic assumptions. Final design considerations for drainage facilities may require alignment changes.

**Pertinent Project Types.** Projects where horizontal or vertical alignments are being established or revised.

**Responsible Party.** Roadway design engineer

#### Sub-tasks.

- ◆ Gather previous schematic designs and engineering reports.
- ◆ Prepare cross sections for preliminary alignments, including sections at access connections.
- ◆ Re-evaluate alignments for opportunities to minimize environmental impacts.
- ◆ Re-evaluate alignments while considering constructability and final design of detailed geometrics.

- ◆ Ensure compliance with applicable design criteria. (See the *Roadway Design Manual*, [Chapter 2](#)).
- ◆ Request the additional survey data required to finalize detailed alignment design.
- ◆ Prepare cross-sections for modified alignments.
- ◆ Prepare final alignments.
- ◆ Review stream crossing hydraulics.
- ◆ Ensure drainage considerations are addressed by “fine-tuning” vertical alignments.
- ◆ Verify stream crossing alignments, elevations, and hydraulics.

### **Helpful Suggestions.**

- ◆ Areas requiring modification become apparent after developing cross-sections which show existing right of way, intersection and connection geometry, superelevation, proposed ditches, wetland limits, headwater elevations, major utilities, etc.
- ◆ Vertical alignments at side roads and driveways should be checked closely to ensure that the intersecting road can be tied in without degrading its vertical alignment.
- ◆ Detailed consideration of construction staging often leads to minor alignment revisions for safe maintenance of traffic.

For hydraulic review and design:

- ◆ Detailed consideration of construction staging for major drainage structures can result in alignment revisions.
- ◆ An area of special concern occurs at drainageway intersections with the roadway. Sags in the roadway’s vertical alignment often occur at these intersections. Drainage structure headwater elevations need to be predicted at these locations.
- ◆ The interrelated elements of ditch capacity, roadside slope safety, and vertical alignment need to be properly designed to provide a safe facility. Ensure that proposed ditch capacity is adequate.
- ◆ If the job is in a tidal area, consider storm surge (tide) analysis.

### **Critical Sequencing.**

- ◆ Final, detailed alignment setting should occur after the roadway design engineer thoroughly evaluates data prepared during preliminary design and coordinates the project with stakeholders. The roadway design engineer should feel comfortable that all project issues relevant to alignment setting are understood and coordinated with others.
- ◆ Final, detailed hydraulic review should occur after the roadway project engineer determines final vertical and horizontal alignments, and after stream crossing hydraulics are completed.

**Resource Material.**

- ◆ TxDOT [Roadway Design](#) *Manual*
- ◆ TxDOT [Hydraulic Design](#) *Manual*
- ◆ TxDOT [Bridge Design](#) *Manual* for information on bridge clearances and geometrics.

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## Section 4 — Roadway Design

### Overview

This section discusses tasks necessary to finalize plan/profile and cross-sections of the proposed facility and additional details related to roadway design.

Note that final determination of right of way requirements and preparation of a remedial action plan for hazardous waste clean up are important relative to the project schedule. These two items have the potential to affect project schedules greatly if not given proper attention.

This section includes the following groups of tasks which may be performed concurrently.

- ◆ Earthwork

- 5240. [Prepare cross sections and compute earthwork](#)

- 5250. [Review right of way requirements](#)

- ◆ Landscape and Aesthetics

- 5280. [Design landscape/aesthetic plans](#)

- 5290. [Develop plan and profile sheets](#)

- 5300. [Design bicyclist and pedestrian facilities](#)

- 5330. [Design miscellaneous details](#)

- 5335. [Review project for design exception/waivers](#)

- 5340. [Prepare hazardous material remediation plan](#)

- ◆ Railroad Agreements

- 5360. [Develop Exhibit A for railroad agreements](#)

### Earthwork

#### 5240: Prepare cross sections and compute earthwork

**Description.** Plotting proposed cross sections and estimating earthwork volumes are important steps to be conducted early in the design process. Cross sections should be plotted at critical locations while finalizing project alignments (see [5200](#): Design final vertical and horizontal

alignments). Once final alignments are set, including ditch and cross structure preliminary sizing, develop final cross sections and earthwork volumes.

**Pertinent Project Types.** All projects involving earthwork.

**Responsible Party.** Roadway design engineer

**Sub-tasks.**

- ◆ Prepare proposed cross sections and earthwork volumes using final alignments.
- ◆ Evaluate and modify side slopes and ditch grades to provide for safety and economy of design.
- ◆ Evaluate tie-ins at intersections and driveways. Secure letter of permission ([DRIVEWAY](#)) from property owners for minor work necessary on their property to tie-in driveways.
- ◆ Prepare to provide earthwork construction cross section data to the prospective bidders upon request for their use in bid preparation. Refer to Task [6133](#): Provide earthwork construction cross section data to contractors (if requested) for more information.

**Helpful Suggestions.**

- ◆ Volumes and haul distances are an important economic consideration for roadways on new alignment. Earthwork volumes are of minor importance, typically, in setting grades for roadway widening projects.
- ◆ Proper roadside safety, in terms of side slopes, ditch size and configuration, clear zone requirements, and use of roadside barriers must be properly considered in preparing proposed cross sections. These items are detailed in the *TxDOT Roadway Design Manual*, [Chapter 2](#).

**Critical Sequencing.** Develop proposed roadway cross sections and earthwork volumes after setting alignments and reviewing stream crossing hydraulics.

**Resource Material.**

- ◆ *TxDOT Roadway Design Manual*, [Chapter 2](#)
- ◆ *TxDOT Bridge Design Manual*
- ◆ AASHTO Roadside Design Guide.

**5250: Review right of way requirements**

**Description.** Once alignments are finalized, determine proposed right of way (ROW). (See [4300](#): Prepare right of way map/parcel plats/property descriptions). ROW acquisition types include fee title, drainage easements, and control of access, etc. Access to private property during construction may require temporary construction easements. Rights for continuous maintenance of permanent construction facilities should be acquired in fee title or an easement interest in areas requiring minimum maintenance. A drainage easement may also be required in areas without permanent highway

structures to protect against development that would restrict the natural drainage flow, and to allow access for maintenance of the drainage channel.

**Pertinent Project Types.** Projects requiring additional ROW.

**Responsible Party.** Roadway design engineer

**Sub-tasks.**

- ◆ Plot existing ROW and lateral limits of earthwork construction on plan sheets using cross-sections generated while computing earthwork. (See [5240](#): Prepare cross sections and compute earthwork).
- ◆ Show proposed ROW limits on plans.
- ◆ In coordination with the drainage engineer, determine the need for drainage easements at water crossings and possibly for long parallel channels.
- ◆ Determine control of access lines and show on plan layout, and ensure that control of access lines match those shown on the ROW map. Schematic revisions and re-submittal are required as a result of changing control of access.
- ◆ Determine the need for [temporary construction easements](#) and incorporate into the ROW map.
- ◆ Coordinate acquisition with the district ROW section.

**Helpful Suggestions.**

- ◆ Many aspects of ROW acquisition are controlled by our legal system. It is important for the engineer to coordinate unclear issues with the district ROW section.
- ◆ Consider safety, constructability, and future maintenance in all ROW recommendations.
- ◆ ROW acquisition must be supported by a legitimate transportation necessity.

**Critical Sequencing.** Final ROW limits should be established before beginning the ROW acquisition process.

**Resource Material.**

- ◆ TxDOT [Right of Way Collection](#)
- ◆ TxDOT [Hydraulic Design Manual](#).

## Landscape and Aesthetics

### 5280: Design landscape/aesthetic plans

**Description.** Landscaping and aesthetics can enhance public acceptance and appreciation of a project. A project does not necessarily need an area of land for “landscaping” to make the facility

more attractive. For example, simple aesthetic treatments such as color and texture of materials used (e.g., retaining walls) can have a positive impact. Consult with a landscape architect, in the district or division, to obtain ideas and assistance with developing landscape and aesthetic plans.

**Pertinent Project Types.** All projects except restoration (2R) projects.

**Responsible Party.** Roadway design engineer

**Sub-tasks.**

- ◆ Determine funding available for landscape and aesthetic improvements. Costs and staff availability for future maintenance should be considered.
- ◆ Write an Assessment of Landscape and Aesthetic Issues. (See *Landscape and Aesthetics Design Manual*, Chapter 2, [Section 2](#)) if needed.
- ◆ Develop landscape and aesthetic plans in coordination with project design engineers, maintenance personnel, and affected parties.

**Helpful Suggestions.**

- ◆ A well-written “program” can help justify spending funds on aesthetics and can be used when discussing the project with the public regarding decisions on facility appearance.
- ◆ Aesthetic improvements must not compromise safety, such as a reduction in sight distance caused by vegetation or a distraction to motorists. For this reason, the roadway design engineer and the landscape architect must work closely with each other.
- ◆ Ensure that environmental justice issues are addressed.

**Critical Sequencing.** Develop landscape and aesthetic plans before, or concurrently with, roadway details since landscape improvements may require facilities added to roadway improvements such as irrigation systems or access for maintenance.

**Resource Material.**

- ◆ TxDOT *Landscape and Aesthetics Design Manual*, Chapter 3, Section 4, [Design Landscape/Aesthetics Plans \(5280\)](#)
- ◆ TxDOT [Bridge Design Manual](#) for aesthetics on bridge projects
- ◆ TxDOT *Bridge Project Development Manual*, Chapter 4, Section 2, [Historically Significant Bridges](#)
- ◆ TxDOT [Roadway Design Manual](#) for information on sight distances, park roads, etc.

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## Plan/Profile and Roadway Details

### 5290: Develop plan and profile sheets

**Description.** Plan and profile sheets are used to depict the horizontal and vertical controls for a project and may also include quantity and related information. Develop plan and profile sheets based on schematic layout sheets. The sheets should conform to requirements specified in the TxDOT *PS&E Preparation Manual*, Chapter 2, Section 2, [Plan and Profile](#) Sheets.

**Pertinent Project Types.** All projects except preventive maintenance, restoration (2R), illumination, traffic signals, etc.

**Responsible Party.** Roadway design engineer

**Resource Material.** TxDOT *PS&E Preparation Manual*, Chapter 2, Section 2, [Plan and Profile](#) Sheets.

### 5300: Design bicyclist and pedestrian facilities

**Description.** Bicyclist and pedestrian facilities can be provided as an integral part of a roadway project or can be facilities designed solely for use by these transportation means. Improvements may include trails with an alignment separate from roadway, bridge structures used exclusively by pedestrians, bicycle lanes, or sidewalks adjacent to roadways.

Designers of **any** type of transportation improvement should consider the need for bicyclist and pedestrian accommodations. Designs must consider these legitimate forms of travel so that safety of all travelers is maximized. Guidance developed by the Federal Highway Administration, as required by the Transportation Equity Act for the 21st Century (TEA-21), states the bicycling and walking facilities will be incorporated into all transportation projects unless “exceptional circumstances” exist. The FHWA Design Guidance referenced below provides more information on these ‘exceptional circumstances.’”

TxDOT guidance states that when any of the following factors are present, sidewalks should be included on a project:

- ◆ Facility is part of a locally adopted sidewalk planning document;
- ◆ There is evidence of pedestrian traffic (either pedestrians are observed, there is a beaten path, or significant potential exists for pedestrians to walk in the roadway); or
- ◆ Facility is located on a route to a school or a transit route.

In addition, where pedestrian generators/attractors exist, new sidewalk construction may be considered.

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**All** pedestrian facilities must be designed according to the Americans with Disabilities Act Accessibility Guidelines (ADAAG) and the Texas Accessibility Standards (TAS).

**Pertinent Project Types.** All projects except preventive maintenance and restoration (2R) projects.

**Responsible Party.** Roadway design engineer

**Sub-tasks.**

- ◆ Obtain reports on planning (see [2380](#): Develop bicyclist/pedestrian accommodation concept) and public involvement conducted for the project.
- ◆ Determine the scope of bicyclist and pedestrian facilities to be provided.
- ◆ Establish design criteria, prepare preliminary facility layouts and typical sections, and develop preliminary cost estimates for the project.
- ◆ Coordinate the project with local governments or jurisdictions benefiting from and supporting improvements, including related disciplines such as landscape architecture.
- ◆ Coordinate the project with other stakeholders such as railroad or utility owners whose right of way is being used for the improvements.
- ◆ Obtain additional design survey data needed to finalize designs.
- ◆ Prepare preliminary design plans, revised cost estimates, and circulate plans for comments and approvals, as appropriate.
- ◆ Prepare final plans and cost estimates.

**Helpful Suggestions.**

- ◆ Bicyclist and pedestrian facilities usually have strong support from local citizens. This support is coupled with the desire to provide input into facility design. Coordination of these issues is important for a successful project.
- ◆ Avoid placing obstructions in walkways.
- ◆ Coordinate alignments with proposed utility locations (i.e., avoid power poles obstructing sidewalks).
- ◆ When crossing driveways, be sure to maintain sidewalk cross slopes according to ADAAG and TAS requirements. Refer to [TxDOT PED Standard Detail sheet](#).

**Critical Sequencing.**

- ◆ Bicyclist and pedestrian facility design coordination can begin as soon as the project is authorized.
- ◆ Design work can begin once design surveys and coordination with local governments are near completion.

**Authority Requirements.**

- ◆ Section 1202 of the Transportation Equity Act for the 21st Century (TEA-21)

**Resource Material.**

- ◆ FHWA Design Guidance: Accommodating Bicycle and Pedestrian Travel: A Recommended Approach.
- ◆ [Americans with Disabilities Act Accessibility Guidelines \(ADAAG\)](#)
- ◆ [Texas Accessibility Standards \(TAS\)](#)
- ◆ *Texas Manual on Uniform Traffic Control Devices* for Streets and Highways
- ◆ *AASHTO. Guide for Development of Bicycle Facilities*
- ◆ *AASHTO Guide for the Planning, Design and Operation of Pedestrian Facilities*
- ◆ TxDOT [Roadway Design](#) Manual
- ◆ TxDOT [Bridge Design](#) Manual
- ◆ TxDOT *Landscape and Aesthetics Design Manual*, Chapter 3, Section 4, [Design Bicyclist and Pedestrian Facilities \(5300\)](#)
- ◆ Accessible design resources on the [Design Division Intranet site](#).

**5330: Design miscellaneous details**

**Description.** Miscellaneous details sheets are typically developed to show design details which are not shown on standard detail sheets and areas where more detailed information will benefit the contractor's understanding of the project. Examples include the following:

- ◆ intersection/ramp contour grading
- ◆ non-standard inlets
- ◆ grate and manhole covers
- ◆ concrete pavement details
- ◆ drainage structure backfill diagrams
- ◆ curb and gutter transitions
- ◆ driveway details
- ◆ ditch details.

Avoid the use of coatings on concrete structures because they tend to peel and become unsightly if the surface is not properly prepared.

**Pertinent Project Type.** Projects requiring details for construction that are not provided on standard sheets.

**Responsible Party.** Roadway design engineer.

**Authority Requirements.** TxDOT memo; 08/31/99; “Concrete Coatings”; from Michael W. Behrens; to District Engineers.

**Resource Material.**

- ◆ TxDOT [Roadway Design Manual](#)
- ◆ TxDOT *PS&E Preparation Manual*, Chapter 2, Section 2, [Miscellaneous Details](#).

### 5335. Review project for design exceptions/waivers

**Description.** As the project progresses through final design, the need for a design exception or design waiver may be identified. Page 3 of Form [1002](#) is the official place where basic design criteria used for a project are documented. Design exceptions or waivers are required any time design criteria do not meet the TxDOT- or AASHTO-established minimums cited on page 3 of Form [1002](#).

Refer to [2870](#): Submit design exception/waivers for approval for more information on submission requirements.

**Pertinent Project Types.** All projects.

**Responsible Party.** Roadway design engineer.

**Critical Sequencing.** Submit design exception/waiver requests soon after identifying their need. The design will have to be modified if the request is not approved.

**Resource Material.**

- ◆ TxDOT *Roadway Design Manual*, [Chapter 1, Section 2](#).
- ◆ TxDOT *PS&E Preparation Manual*, Chapter 5, Section 2, [Design Exceptions](#)
- ◆ TxDOT [Bridge Project Development Manual](#)
- ◆ [Texas Accessibility Standards](#).

### 5340: Prepare hazardous material remediation plan

**Description.** Hazardous materials encountered during construction must be properly handled and disposed of. These materials may range from lead paint on bridges to soil contaminated with gasoline. If a remediation plan is not in place, significant delays might occur during construction.

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**Pertinent Project Types.** Projects involving known or anticipated hazardous materials.

**Responsible Party.** Roadway design engineer

**Sub-tasks.**

- ◆ Review findings of the hazardous materials survey. (See [3280](#): Perform hazardous materials survey assessment and investigation).
- ◆ Prepare remediation plan and cost estimates.
- ◆ Incorporate remediation details into construction plans if appropriate
- ◆ Obtain approval of the remediation plan from the Environmental Affairs Division.

**Helpful Suggestions.** Work closely with the district environmental coordinator and the Environmental Affairs Division.

**Resource Material.**

- ◆ TxDOT [Environmental Manual](#)
- ◆ TxDOT [Bridge Project Development Manual](#) for information on lead paint removal.

## Railroad Agreements

### 5360: Develop Exhibit A for railroad agreement

**Description.** An agreement between TxDOT and the railroad must be executed before any work on railroad right-of-way is done. Plan sheets (including the project title sheet) detailing work to be performed by the railroad company, the State's contractor, or TxDOT are attached to a railroad agreement as Exhibit A. The information to be shown on Exhibit A is described in the *Traffic Operations Manual, Railroad Operations Volume*, [Chapter 3, Section 2](#).

A railroad agreement is required for the following project types:

- ◆ grade separations
- ◆ joint drainage (common ditch)
- ◆ roadway improvements at grade crossings
- ◆ signal interconnects
- ◆ buried conduit and pipe below tracks
- ◆ overhead wire lines
- ◆ seal coats
- ◆ overlays.

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For a bridge project involving railroads, Exhibit A consists of the bridge layout with some additional information of interest to the railroad owner. Refer to the TxDOT [Bridge Project Development Manual](#) for information to provide on the layout.

**Pertinent Project Types.** Projects containing work within railroad right of way.

**Responsible Party.** Roadway design engineer

**Sub-tasks.**

- ◆ Obtain detailed geometry and as-built construction plans of existing railroad crossings, as applicable.
- ◆ Obtain train traffic frequency from the railroad company.
- ◆ Develop Exhibit A, including a description of work to be performed by TxDOT and the railroad company.
- ◆ Submit Exhibit A in accordance with the process outlined in the *Traffic Operations Manual, Railroad Operations Volume* and the [Bridge Project Development Manual](#).

**Helpful Suggestions.**

- ◆ For bridge projects, additional information needed for Exhibit A may simply be added to the bridge layout.
- ◆ Be sure provisions included in the railroad agreement are included in the final PS&E.
- ◆ Consider meeting with railroad owner(s) and Bridge Division Project Development staff when Exhibit A is nearly complete for complex railroad/highway grade separation projects — especially where railroad passes over highway.

**Critical Sequencing.**

- ◆ Exhibit A should be submitted to the appropriate division at least 13 months before letting for railroad overpasses, and 20 months before letting for railroad underpasses.
- ◆ Projects will not be let until the railroad agreement is received.

**Resource Material.**

- ◆ TxDOT [Bridge Project Development Manual](#)
- ◆ TxDOT *Traffic Operations Manual, Railroad Operations Volume*.

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## Section 5 — Operational Design

### Overview

Operational design involves subsections of Illumination, Intelligent Transportation Systems, Signals, and Signing/Striping. Construction plans result from each of the tasks within this section. This section includes the following groups of tasks. The tasks may be performed concurrently.

- ◆ Illumination

- 5380. [Design illumination](#)

- ◆ Intelligent Transportation System

- 5400. [Design Intelligent Transportation System](#)

- ◆ Signals

- 5420. [Design signalization plan](#)

- ◆ Signing and Striping

- 5440. [Design signing and pavement markings](#)

### Illumination

#### 5380: Design illumination

**Description.** There are two types of roadway lighting: continuous lighting and safety lighting. Safety lighting is typically needed at interchanges, high-volume rural or suburban intersections, weigh stations, and rest areas. Continuous lighting provides uniform lighting on all main lanes, ramps, direct connectors, and interchanges. Continuous lighting requires the financial participation of the city. Either type may use conventional roadway lighting or high mast poles.

Technical assistance with design is available from the Traffic Operations Division.

Determination of the eligibility of the project for illumination and compliance with warranting conditions should have been initiated when preliminary illumination locations were established in [Task 2660](#).

For illumination structures taller than 200 feet (61 m) or closer than 20,000 feet (6,096 m) to an airport runway, or closer than 5,000 feet (1,524 m) to a heliport, an FAA form 7460-1 must be completed. Refer to the [FAA website](#) for more detailed information and to submit the proper form.

Safety lighting is typically needed at interchanges, high-volume rural or suburban intersections, weigh stations, and rest areas.

**Pertinent Project Types.** Projects warranting continuous roadway lighting or safety lighting.

**Responsible Party.** Designer with illumination experience.

**Sub-tasks.**

- ◆ Obtain agreement with local government for maintenance of proposed continuous lighting.
- ◆ Obtain preliminary roadway, drainage, traffic, and utility adjustment plans.
- ◆ Obtain design year traffic data.
- ◆ Make a site visit to inspect existing conditions.
- ◆ Obtain or prepare a lighting justification report.
- ◆ Design high mast foundations according to bore logs and HMIF standard sheets.
- ◆ Coordinate plans with roadway design, traffic, and structural engineers.

**Helpful Suggestions.**

- ◆ Know the project requirements for horizontal clearance to obstructions (clear zone). Use breakaway devices according to [Highway Illumination Manual](#) and AASHTO requirements.
- ◆ Find out where traffic barrier will be located, and try to place hazardous objects behind or on barriers that are already proposed for other purposes.
- ◆ Determine the locations of existing and proposed utilities, drainage facilities, and traffic signs and signals.
- ◆ Consider maintenance requirements when locating illumination supports.
- ◆ For lighting on bridges, coordinate design illumination with bridge details so conduit is made part of bridge plans; this will avoid unsightly conduit additions to bridges.
- ◆ Determine illuminance design values according to roadway classification and *AASHTO Roadway Lighting Design Guide*.
- ◆ Texas is required by Health and Safety Code Chapter 425 to use cutoff fixtures when installing lighting using state funds to minimize glare and light pollution.
- ◆ When designing lighting for a sidewalk adjacent to a roadway, the street must be lit to the same level as the sidewalk.

**Authority Requirements.**

- ◆ [43 TAC §25.11](#)

**Resource Material.**

- ◆ TxDOT [Highway Illumination Manual](#)
- ◆ AASHTO *Roadway Lighting Design Guide*
- ◆ [NFPA 70: National Electric Code](#)
- ◆ ANSI/IESNA RP-8, Roadway Lighting
- ◆ TxDOT [PS&E Preparation Manual](#)
- ◆ TxDOT [Bridge Design Manual](#)
- ◆ Federal Aviation Administration website at <http://www.oaava.faa.gov> for forms and instructions.
- ◆ TxDOT Standard Sheets: Roadway Illumination Details (RID); Roadway Illumination Poles (RIP); High Mast Illumination Details (HMID); Electrical Details (ED); High Mast Illumination Pole (HMIP); High Mast Illumination Foundation (HMIF).

## Intelligent Transportation System

### 5400: Design Intelligent Transportation System (ITS)

**Description.** ITS projects should be designed in accordance with the National ITS Architecture. ITS applications include the following:

- ◆ Integration of traffic control and transportation management systems
- ◆ Traffic signals which adapt to traffic and change their timing in each cycle
- ◆ Highway advisory radio (HAR) systems
- ◆ Vehicle detection
- ◆ Closed-Circuit Television (CCTV)
- ◆ Lane Control Signals (LCS)
- ◆ Communication infrastructure.

The project manager should coordinate work with the district traffic engineer, the Traffic Operations Division, and the Technology Services Division (TSD) to ensure compliance with IT core architecture and other TxDOT requirements.

**Pertinent Project Types.** Projects involving high traffic volumes or complex traffic movements. However, rural projects with lower traffic volumes may call for ITS applications.

**Responsible Party.** Project manager, traffic operations engineer

**Sub-tasks.**

- ◆ Find out where traffic barrier will be located, and try to place hazardous objects behind barriers that are already proposed for other purposes.
- ◆ Obtain recent information on ITS alternatives, this is a rapidly advancing field.
- ◆ Incorporate standard communications equipment when possible
- ◆ Consult with the District Traffic Engineer and the Traffic Management Section of the Traffic Operations Division.
- ◆ When possible, submit plans to Traffic Operations Division for early review.

#### **Helpful Suggestions.**

- ◆ It is important to involve the Traffic Management Section of the Traffic Operations Division as early as possible in a project with ITS elements. Technical assistance is available for designing ITS and for developing contracts for ITS design or construction.
- ◆ Consider future maintenance requirements for the system. Design to minimize maintenance but also consider how maintenance will be performed safely with minimum impact on traffic.
- ◆ Utilize existing structures and roadside barriers for ITS, when possible.

**Critical Sequencing.** ITS plans should be designed concurrently with roadway plans to assure that necessary provisions, such as mounting structures and conduit systems, are made part of the overall plans.

#### **Resource Material.**

- ◆ TxDOT [Traffic Operations Division](#) Intranet site on ITS.

## **Signals**

### **5420: Design signalization plan**

**Description.** A comprehensive investigation of traffic conditions and characteristics of potential signal locations is necessary to determine the need for signal installations and to collect data for the design and operation of signals. Traffic control signals should **not** be installed unless the investigation reveals that at least one of the **warrants** contained in the *Texas Manual on Uniform Traffic Control Devices* ([TMUTCD](#)) is met. Meeting a volume warrant is only the first step to justifying a traffic signal. The TMUTCD states that engineering judgment is required and that all factors should be considered when determining if a traffic signal should be installed.

Signal operation types include full-actuated, semi-actuated, pre-timed, or combinations thereof. They can also be operated at isolated intersections, in coordination with nearby signals, or as mid-block operations.

**Pertinent Project Types.** Projects warranting signalization.

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**Responsible Party.** Traffic engineer

**Sub-tasks.**

- ◆ Obtain or perform a signal warrant study.
- ◆ A roadway design engineer may design the signals and prepare the plans; however, a traffic or transportation engineer should carefully check the design and specifications.
- ◆ Coordinate plans with the roadway design engineer, drainage engineer, etc.
- ◆ Coordinate signal design and details with local government if signals will be operated and maintained by a local government.
- ◆ Obtain concurrence from the local government for locating signals within their jurisdiction and ensure that required agreements are executed as described in the TxDOT *Contract Management Manual*, [Traffic Engineering Agreements, Chapter 15](#).
- ◆ Obtain preliminary roadway, drainage, and utility adjustment plans.
- ◆ Obtain existing and design year traffic data.
- ◆ Make a site visit to inspect existing conditions and to verify minimum visibility distances.
- ◆ Order and obtain geotechnical foundation designs for signal foundations.
- ◆ Develop traffic signal layouts (see the *PS&E Preparation Manual*, Chapter 2, Section 2, [Traffic Signal Layout](#)).

**Helpful Suggestions.**

- ◆ Technical assistance is available from the district traffic engineer and the Traffic Engineering Section of the Traffic Operations Division.
- ◆ Coordinate intersection geometry, turn lane lengths, median types, and access control at signalized intersections. In urban areas having remote signal timing control and coordinated signals, signal control design should be discussed with the local entity.
- ◆ Signal supports should be located to maximize safety and meet ADAAG and TAS requirements regarding accessibility requirements. All pedestrian features, including pushbuttons to activate pedestrian signals, must be accessible to persons with disabilities.
- ◆ Detail intersection striping before preparing signal layouts to ensure proper location of signal heads.
- ◆ Pedestrian crossing times should be sufficient for the expected user population to cross the street safely, and meet or exceed the requirements contained in the TMUTCD.

**Resource Material.**

- ◆ TxDOT *PS&E Preparation Manual*, Chapter 2, Section 2, [Traffic Signal Layout](#)
- ◆ TxDOT *Traffic Operations Manual*, [Traffic Signals Volume](#)

- ◆ TxDOT *Contract Management Manual*, [Traffic Engineering Agreements](#)
- ◆ TxDOT [Texas Manual on Uniform Traffic Control Devices \(TMUTCD\)](#)
- ◆ TxDOT [Traffic Control Standard Sheets](#).

## Signing and Striping

### 5440: Design signing and pavement markings

**Description.** Signing and pavement marking plans include plan view layouts of final signs, striping, pavement markers, and other pavement markings. Show cross sections and sign size and legend details for the locations of **all** overhead signs. Detail **all** ground mounted guide signs and reference locations on the plans. Use sign summary sheets to detail color, location, size of structural steel.

**Pertinent Project Types.** All projects.

**Responsible Party.** Traffic engineer

#### Sub-tasks.

- ◆ Obtain roadway and drainage plans.
- ◆ Prepare a signing, striping, and pavement marking schematic and obtain preliminary approval from the Traffic Operations Division for roadways with new guide signing. This is not required for upgrades of existing signs; in this case, plans can be prepared without schematics.
- ◆ Obtain a geotechnical survey and coordinate with a structural engineer when designing overhead sign bridge foundations.
- ◆ Coordinate plans with the roadway design engineer.
- ◆ Prepare final signing and pavement marking plans.

#### Helpful Suggestions.

- ◆ Roadway and traffic engineers should coordinate intersection and ramp geometry early in the design process. There may be some areas of channelization improvement that become apparent only when preliminary striping designs are prepared.
- ◆ Roadway and traffic engineers need to coordinate lane transitions at project ends (especially lane drops) during early stages of design. The combination of signing and design speed requirements will likely require the lane transition to be longer than geometrically necessary.
- ◆ Overhead sign bridge supports should be located to maximize safety.
- ◆ Striping of pedestrian facilities, such as crosswalks, must be closely coordinated with the design of curb ramps.

**Critical Sequencing.** Preliminary design can be as simple as a line diagram showing proposed number of lanes, lane drops, and proposed overhead and large ground mounted, guide signs and their proposed locations.

**Resource Material.**

- ◆ TxDOT *PS&E Preparation Manual*, Chapter 2, Section 2, [Signing and Delineation](#)
- ◆ TxDOT *Traffic Operations Manual*, [Signs and Markings Volume](#)
- ◆ TxDOT [Texas Manual on Uniform Traffic Control Devices \(TMUTCD\)](#)
- ◆ TxDOT *Traffic Operations Manual*, [Traffic Signals Volume](#)
- ◆ TxDOT [traffic control standard sheets](#)
- ◆ Sign Crew Field Book, available from the TxDOT [Traffic Operations Division](#)
- ◆ TxDOT [Pavement Marking Handbook](#).

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## Section 6 — Bridge Design

### Overview

This section includes tasks typically performed by the structural engineer. The geotechnical engineer should review and comment on the preliminary and final structure plans.

Bridges include [bridge-class culverts](#).

This section includes the following groups of tasks, listed in chronological order.

- ◆ Final Geotechnical Surveys

5460. [Perform final geotechnical surveys](#)

- ◆ Bridge Layouts

5480. [Prepare preliminary bridge layouts](#)

- ◆ Bridge Design and Details

5500. [Prepare bridge details](#)

5510. [District reviews bridge plans](#)

5515. [Submit Exhibit B to railroad company](#)

### Final Geotechnical Surveys

#### 5460: Perform final geotechnical surveys

**Description.** Geotechnical investigations are necessary to design for satisfactory long-term performance of structure foundations. For major projects, some geotechnical data may have been collected during preliminary design. (See [2505](#): Perform preliminary geotechnical surveys). All required data to finish designs should be obtained at this time.

To make a single data collection effort, coordinate obtaining geotechnical data for designing and planning the following:

- ◆ bridges
- ◆ retaining and noise wall foundations
- ◆ high mast illumination foundations
- ◆ signal mast arm foundations

- ◆ overhead sign bridge foundations
- ◆ pavement structures
- ◆ embankment and cut slopes
- ◆ trench excavation protection (shoring).

**Pertinent Project Types.** Projects involving foundation design.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Gather and review existing geotechnical data.
- ◆ Evaluate project for changes (e.g., added structures, changed structure limits) made after original geotechnical investigations are performed during advance planning.
- ◆ Contact the Bridge Division, as necessary, for guidance in obtaining additional geotechnical data.
- ◆ Identify additional data required to finalize design.
- ◆ Prepare or obtain a work order for this additional work.
- ◆ Perform field and laboratory investigations.
- ◆ Report results of investigations.

**Resource Material.**

- ◆ TxDOT [Geotechnical](#) *Manual*

## Bridge Layouts

### 5480: Prepare preliminary bridge layouts

**Description.** A preliminary bridge layout depicts proposed features of a structure and is used to obtain early approvals before beginning detailed design. A checklist of information to be shown on bridge layouts is contained in the TxDOT [Bridge Detailing](#) *Manual*. Sample plan and elevation views for bridge layouts are shown in the TxDOT [Bridge Detailing](#) *Manual*.

If the bridge layout involves a railroad crossing, prepare an Exhibit A (see [5360](#): Develop Exhibit A for railroad agreements).

**Pertinent Project Types.** Projects including bridges to be newly constructed, replaced, or modified.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Review commitments made during the public involvement phase for information related to restrictions on bridge types.
- ◆ Obtain preliminary engineering recommendations, as-built construction plans, and bridge inspection reports for existing structures.
- ◆ Obtain layouts depicting existing structures, utilities, rights of way, crossroads, and railroad crossings.
- ◆ For rehabilitation and/or widening projects, contact the Bridge Division Project Development staff to obtain a load rating and condition survey.
- ◆ Coordinate preliminary bridge hydraulics with the drainage engineer.
- ◆ Obtain additional geotechnical (see [5460](#): Perform final geotechnical surveys) or survey data needed to finalize designs.
- ◆ Identify necessary design exceptions.

**Helpful Suggestions.**

- ◆ The Bridge Division Project Development staff are available for assistance with preparing preliminary layouts, particularly if a bridge will be widened or modified in any way, or if unusual features exist.
- ◆ A site visit is highly recommended. Items such as crutch bents, stream gages, and utilities seldom show up on as-built construction plans.
- ◆ Assuming a structural engineer is working on the project team at this time, alert the structural engineer to commitments made to resource agencies. These may affect wetland impact minimization, bent locations, substructure type, and construction methods.
- ◆ The designer should determine and document the need for design exceptions before submitting layouts to the Bridge Division.

**Critical Sequencing.**

- ◆ Start bridge layouts after developing final alignments and preliminary bridge hydraulics.
- ◆ Finalize bridge layouts after completing bridge hydraulics, including scour analysis, and any geotechnical investigations.
- ◆ Obtain district approval of bridge layouts, hydraulic calculation sheets, and hydraulic reports before submitting them to the Bridge Division.

**Resource Material.**

- ◆ TxDOT *PS&E Preparation Manual*, Chapter 2, Section 2 [Bridge Layout](#)
- ◆ TxDOT [Bridge Project Development Manual](#)

- ◆ TxDOT [Bridge Design](#) Manual
- ◆ TxDOT [Bridge Detailing](#) Manual
- ◆ TxDOT [Bridge Inspection](#) Manual
- ◆ TxDOT [Hydraulic Design](#) Manual.

## Bridge Design and Details

### 5500: Prepare bridge details

**Description.** Update bridge layouts, as necessary, after Bridge Division review and approval of the layouts. Bridge design includes determining superstructure and substructure of span bridges and culvert details to handle design loads. Structure type is usually determined while preparing bridge layouts. Bridge details provide information for the contractor to build all structural elements.

**Pertinent Project Types.** Projects including bridge class culverts requiring non-standard design and new, rehabilitated, or modified span bridges.

**Responsible Party.** Structural engineer

#### Sub-tasks.

- ◆ Update preliminary bridge layouts per Bridge Division and Federal Highway Administration comments.
- ◆ Obtain the following from the roadway design engineer:
  - current typical section
  - alignments
  - superelevation and transition locations
  - pedestrian features
  - required clearances
  - proposed utilities
  - roadway lighting
  - drainage conveyance method
  - construction staging
  - resource agency commitments
  - information regarding special issues such as noise wall on bridges and overhead power line restrictions.
- ◆ Obtain current bridge hydraulics from the drainage engineer.

**Helpful Suggestions.**

- ◆ A site visit may be necessary.
- ◆ Notify the structural engineer about commitments made to resource agencies. These may affect wetland impact minimization, bent locations, substructure type, superstructure type, and construction methods.
- ◆ Bridge design and detailing also includes many areas, such as retaining walls, bridge rails, structural pedestrian features, fender systems, utility attachments, bridge illumination, landscape/aesthetic components and drainage systems.

**Resource Material.**

- ◆ TxDOT [Bridge Design Manual](#)
- ◆ TxDOT [Bridge Detailing Manual](#)
- ◆ TxDOT [Geotechnical Manual](#)
- ◆ *Landscape and Aesthetics Design Manual*, Chapter 3, Section 4, [Prepare Bridge Details \(5500\)](#).

**5510: District reviews bridge plans**

**Description.** Once bridge plans and details are prepared, the district is responsible for a final review to determine what changes are made to the initial bridge layout and to verify the quantities. Review any significant changes made to the initial layout with the Project Development Section of the Bridge Division. The district is also responsible for incorporating these structural details into the final plan set (e.g., updating the index of sheets, numbering the plan sheets).

**Pertinent Project Types.** All projects.

**Responsible Party.** Project manager

**Helpful Suggestions.** If structural plans are prepared by a consultant, they should be reviewed by a member of TxDOT with structural expertise. The Bridge Division is available for assistance if needed.

**Resource Material.**

- ◆ TxDOT [Bridge Project Development Manual](#)
- ◆ TxDOT [Bridge Detailing Manual](#).

**5515: Submit Exhibit B to railroad company**

**Description.** After receiving the final PS&E, an Exhibit B to the railroad agreement is prepared and forwarded to the appropriate railroad company for final approval of all aspects of a proposed bridge. Refer to the TxDOT *Traffic Operations Manual, Railroad Operations Volume*, [Chapter 8, Section 1](#) for more information on the process.

**Pertinent Project Types.** Bridge projects involving grade separated railroad crossings.

**Responsible Parties.**

- ◆ Project Development Section of the Bridge Division
- ◆ Traffic Operations Division.

**Critical Sequencing.** This task is performed after TxDOT and FHWA comments on PS&E are addressed by the district.

**Resource Material.**

- ◆ TxDOT *Traffic Operations Manual*, [Railroad Operations Volume](#)
- ◆ TxDOT [Bridge Project Development Manual](#).

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## Section 7 — Drainage Design

### Overview

This section discusses project elements typically designed by the drainage engineer. For information on designing [bridge-class culverts](#), refer to [Section 6, Bridge Design](#). Tasks fall into categories of hydraulic design, drainage details, and storm water pollution prevention plan preparation. Drainage design requires continuous coordination with roadway design activities.

This section includes the following groups of tasks. Tasks are listed in approximate chronological order but may be performed concurrently unless noted otherwise. Work performed at this stage is done after preparing stream crossing hydraulics. (See [5150: Prepare stream crossing hydraulics](#)).

- ◆ Hydraulic Design

- 5540. [Perform hydraulic design for culverts and storm drains](#)

- 5560. [Perform hydraulic design for pump station\(s\)](#)

- ◆ Drainage Details

- 5570. [Prepare culvert and storm drain details](#)

- 5590. [Prepare pump station details](#)

- ◆ Storm Water Pollution Prevention Plan

- 5600. [Design Storm Water Pollution Prevention Plan](#)

### Hydraulic Design

#### 5540: Perform hydraulic design for culverts and storm drains

**Description.** Roadway culvert and storm drain hydraulic design includes determining culvert and storm drain sizes and grades to handle design storm water flows.

**Pertinent Project Types.** Projects involving new or modified culvert and storm drain systems.

**Responsible Party.** Drainage engineer

**Sub-tasks.**

- ◆ Review preliminary engineering recommendations, as-built construction plans, drainage area maps, and hydrology reports.

- ◆ Obtain proposed typical sections, alignments, superelevation, geometric layouts, existing and proposed utilities, construction staging, resource agency commitments, and preliminary cross sections from the roadway design engineer.
- ◆ Make a site visit to inspect existing facilities, flow patterns, and erosion conditions.
- ◆ Review site drainage history with maintenance and local public agency personnel. Request information about existing or proposed major outfall storm drains, and review existing and proposed detention ponding by others. Determine if detention by TxDOT is appropriate.
- ◆ Update hydrology design (see the [Hydraulic Design Manual](#)) to match current, proposed roadway design.
- ◆ Design cross drainage facilities (see the [Hydraulic Design Manual](#)).
- ◆ Design parallel ditch and culvert facilities (see the [Hydraulic Design Manual](#)).
- ◆ Finalize all computer runs (see the [Hydraulic Design Manual](#)) for inclusion in plans.
- ◆ Data must be submitted to the Design Division for review and approval if an individual storm drain has an outfall flow exceeding 200 cfs (5.66 m<sup>3</sup>/s) for the design year storm.
- ◆ Review design results and proposed drainage changes with local agencies.

#### **Helpful Suggestions.**

- ◆ Perform a site visit, preferably during a major rain event. Personally inspect items such as broken or damaged culverts, culvert end treatment type, localized flooding, sedimentation, and utilities. Taking these issues into account can be critical to the design of drainage facilities. Research commitments made to resource agencies.
- ◆ Drainage design should include consideration of pedestrian facilities, utility impacts, driveway grades, outfall and ditch erosion, and retaining wall drainage.
- ◆ Placement of concrete traffic barrier should be evaluated for drainage impacts.
- ◆ Maintain on-going communication with the roadway design engineer regarding roadway design changes affecting drainage. Make recommendations concerning geometric modifications that would result in more desirable drainage improvements.

**Critical Sequencing.** Roadway culvert designs can be performed after the detailed hydrology study is completed, final roadway alignments are determined, and stream crossing hydraulics are finished.

#### **Resource Material.**

- ◆ TxDOT [Hydraulic Design Manual](#)
- ◆ TxDOT *Roadway Design Manual*, Chapter 2, [Section 7](#) .

**5560: Perform hydraulic design for pump station(s)**

**Description.** Pump station design includes pump sizing, foundation design, outfall design, power/control design, and enclosure design for facilities to handle storm water flows in sump areas. Pumps may also be needed for wetland restoration or storm water detention facilities. Generally, pump stations are used when the existing outfall is too high above the elevation required to drain a roadway with a gravity drain. The hydraulic design of pump stations includes selecting the type, capacity, and power of the pumps, determining the on- and off- cycling requirements, providing for trash collection, and designing a discharge chamber. Pumps require extensive maintenance, since they are mechanical and susceptible to failure. For this reason, pumps should be used only when absolutely necessary. Also, backup systems should be considered.

**Pertinent Project Types.** Projects involving sump storm water conditions.

**Responsible Party.** Drainage engineer

**Sub-tasks.**

- ◆ Coordinate with Design Division before designing pump stations.
- ◆ Review preliminary engineering recommendations, drainage areas, and hydrology report.
- ◆ Make a site visit to inspect existing flow patterns near proposed sump and outfall areas. Consider the effect of the pump effluent on the outfall recipient.
- ◆ Order additional survey data if necessary for outfall design.
- ◆ Modify design storm water flow rates as necessary.
- ◆ Design outfall (see the [Hydraulic Design Manual](#)).
- ◆ Select pump type and size (see the [Hydraulic Design Manual](#)).
- ◆ Design control house.
- ◆ Analyze for, and design to avoid, flotation of pump wet well.
- ◆ Request input from TxDOT or local public agency personnel responsible for maintenance of pump systems.

**Helpful Suggestions.**

- ◆ Avoid the need for pump stations if possible as they require substantial maintenance.
- ◆ Perform a site visit to determine a gravity flow alternative to a pump station, if one exists. Such an alternative would likely require additional right of way or easements to be initiated as early as possible.

**Critical Sequencing.** Pump designs should be performed simultaneously with roadway drainage design.

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**Resource Material.**

- ◆ TxDOT [Hydraulic Design Manual](#)
- ◆ FHWA [Highway Stormwater Pump Station Design](#), Hydraulic Engineering Circular No. 24 (HEC-24), available online.

**Drainage Details****5570: Prepare culvert and storm drain details**

**Description.** The primary aim of an urban storm drain design is to limit the amount of water flowing along the gutters or ponding at low points to quantities which will not interfere with the passage of traffic or incur damage to the highway and local property. This is accomplished by placing appropriately sized inlets at the proper spacing. Culverts are used to carry water underneath a roadway.

Culvert detail sheets typically include following elements:

- ◆ culvert cross sections
- ◆ ditch plan/profiles
- ◆ miscellaneous drainage details
- ◆ culvert hydraulics (table or computer output)
- ◆ drainage facility/quantity summaries
- ◆ standard details

Storm drain detail sheets typically include the following information:

- ◆ drainage areas
- ◆ storm drain plan/profiles
- ◆ ditch plan/profiles
- ◆ detention/retention facility details
- ◆ storm drain hydraulics (table or computer output)
- ◆ drainage facility/quantity summaries
- ◆ outfall details
- ◆ inlet details
- ◆ manhole and junction box standards
- ◆ location of underground utilities.

**Pertinent Project Types.** Projects involving proposed pipe or box culvert construction or storm drain construction.

**Responsible Party.** Drainage engineer

**Sub-tasks.**

- ◆ Prepare plan/profile sheets for inlet and outfall ditches (generally perpendicular to roadway), as required. These situations usually require a drainage easement.
- ◆ Prepare plan/profile sheets for **large** ditches, or canals, running generally parallel to the roadway, as required. These ditches do not include typical roadside ditches detailed on the roadway plan/profile sheets.
- ◆ Prepare culvert cross sections. (See the example in the *PS&E Preparation Manual* Chapter 2, Section 2, [Culvert Cross Sections, Layout and Detail Sheets](#)).
- ◆ Evaluate need for a geotechnical survey (see [5460](#): Perform final geotechnical surveys) for trench excavation and shoring.
- ◆ Prepare detention/retention facility plans, cross sections, and outfall profiles.
- ◆ Prepare drainage area maps; these may be superimposed on the storm drain plan.
- ◆ Prepare storm drain plan/profiles.
- ◆ Identify and obtain standard details for items such as inlets, manholes, junction boxes, and end treatment.
- ◆ Prepare details for non-standard inlets, manholes, and junction boxes.
- ◆ Prepare drainage details such as outlet protection, outlet structures, and utility accommodation details.
- ◆ Identify pipe strength requirements.
- ◆ Prepare drainage facility/quantity summaries.
- ◆ Finalize computer runs for inclusion in plans.
- ◆ Obtain necessary standard detail sheets.

**Helpful Suggestions.**

- ◆ Perform a site visit during a significant event to identify contributing drainage from adjacent properties.
- ◆ During detailing of drainage design, utility conflicts become defined. Utility conflicts should be avoided wherever possible by redesigning proposed drainage facilities. Whether borne by utility owners or TxDOT, utility adjustments are public costs and should be minimized when possible.

- ◆ The drainage engineer must coordinate construction staging with the roadway design engineer. Drainage problems can be caused by not considering conditions during construction phases.
- ◆ Furnish preliminary storm drain plans to local agencies if TxDOT proposes to connect to the local agency's system.

**Critical Sequencing.** Storm drain and culvert drainage details can be prepared during, or immediately following, design of storm drain and culvert drainage. (See [5540](#): Perform hydraulic design for culverts and storm drains).

**Resource Material.**

- ◆ TxDOT *PS&E Preparation Manual*, Chapter 2, Section 2, [Culvert Cross Sections](#), Layout and Detail Sheets
- ◆ TxDOT [Hydraulic Design Manual](#)
- ◆ TxDOT [Bridge Design Manual](#).

**5590: Prepare pump station details**

**Description.** Pump station detail sheets typically include the following information:

- ◆ wet well details
- ◆ control house structural details
- ◆ outfall plan/profiles
- ◆ control panel details
- ◆ electrical service/motor control center details
- ◆ electrical wiring diagrams
- ◆ miscellaneous drainage details
- ◆ pump hydraulics (table or computer output)
- ◆ quantity summaries.

**Pertinent Project Types.** Projects involving pump facility construction.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Prepare drainage area maps for areas draining to the pump station
- ◆ Prepare pump outfall plan/profiles
- ◆ Prepare control house details

- ◆ Prepare electrical service/motor control center details
- ◆ Prepare control panel details
- ◆ Prepare backup generator details and specifications
- ◆ Prepare wiring diagrams
- ◆ Prepare structural details for pump house wet wells and site plans
- ◆ Prepare pump details and specifications
- ◆ Prepare miscellaneous drainage details
- ◆ Prepare miscellaneous pump station details
- ◆ Prepare quantity summaries
- ◆ Finalize hydraulic analysis or computer runs for inclusion in plans
- ◆ Determine a suitable source of energy for the backup generator (gasoline, diesel, gas).

**Helpful Suggestions.**

- ◆ Refer to the TxDOT [Hydraulic Design Manual](#) for design considerations and hydraulic calculations.
- ◆ The pump station should be located outside the roadway clear zone. In cases where this is not feasible, the pump station should be positioned underground or in a protected area so it does not pose a hazard to motorists.
- ◆ Provide space around the facility to allow access for service vehicles. The pump housing should include electrical outlets and lights for convenient maintenance.
- ◆ The control house shall include electrical outlets and lights for convenient maintenance.
- ◆ Consider installing a high fence around the station to discourage vandalism.
- ◆ The flow line of the pipe inflow to the wet well should be at or above the pump cut-off elevation to prevent storm water from backing up in the pipe system. Consider including multiple pumps and/or alternate power sources in the design for added dependability.
- ◆ Controls for pump stations may be linked to Intelligent Transportation System centers for monitoring or control purposes. The Traffic Operations Division may assist in designing pump controls, or an electrical consultant may be considered.

**Critical Sequencing.** Pump details can be prepared during, or immediately following, pump design task.

**Resource Material.**

- ◆ TxDOT [Hydraulic Design Manual](#)

- ◆ FHWA [Highway Stormwater Pump Station Design](#), Hydraulic Engineering Circular No. 24 (HEC-24), available online.

## Storm Water Pollution Prevention Plan

### 5600: Design Storm Water Pollution Prevention Plan

**Description.** Designing erosion and sediment control devices includes determining the type and size of facilities for minimizing erosion and siltation during and after project construction. Storm Water Pollution Prevention Plans (SW3Ps) are prepared to show the construction of devices that minimize erosion and siltation during construction. Various grasses, and other typically proprietary devices, are used to control long-term erosion.

**Pertinent Project Types.** Projects that will disturb one or more acres.

**Responsible Party.** Project manager

#### Sub-tasks.

- ◆ Review commitments to resource agencies.
- ◆ Obtain drainage designs and plans.
- ◆ Make a site visit to inspect existing erosion conditions.
- ◆ Design permanent and temporary erosion control measures to be consistent with proposed construction staging. Consider roadside safety in selecting the type of devices to include.
- ◆ Develop SW3P to be consistent with the requirements of the current Construction General Permit (CGP) for storm water discharges (TXR150000) published by the Texas Commission on Environmental Quality (TCEQ).

Prepare the Notice of Intent (see the [Environmental Manual](#)).

#### Helpful Suggestions.

- ◆ The drainage engineer should coordinate designs with the landscape architect for re-vegetation. This is especially important when designing items for controlling long-term erosion.
- ◆ SW3P details may be shown on construction phasing plans. This is especially useful for detailing erosion and sediment control by construction stage.

**Critical Sequencing.** SW3P designs and plans should be prepared after the roadway drainage design and traffic control plans are substantially complete.

#### Resource Material.

- ◆ TxDOT [Environmental Manual](#)

- ◆ TxDOT [Hydraulic Design Manual](#)
- ◆ TxDOT Environmental Affairs Division Storm Water Resources site on the Intranet at <http://crossroads.org/env/NRMintranet/env-wrm.htm>.
- ◆ TxDOT *PS&E Preparation Manual*, Chapter 2, Section 2, [Storm Water Pollution Prevention Plans](#).

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## Section 8 — Retaining/Noise Walls & Miscellaneous Structures

### Overview

This section discusses project elements typically designed by a roadway or structural engineer.

This section includes the following groups of tasks, which may be performed concurrently:

- ◆ Final Geotechnical Surveys

5460. [Perform final geotechnical surveys](#)

- ◆ Retaining/Noise Wall Layouts

5640. [Prepare retaining and/or noise wall layouts](#)

- ◆ Retaining/Noise Wall Design and Details

5680. [Prepare retaining and/or noise wall plans and details](#)

- ◆ Miscellaneous Structures

5700. [Prepare plans for miscellaneous structures](#)

### Retaining/Noise Wall Layouts

#### 5640: Prepare retaining and/or noise wall layouts

**Description.** This task involves preparing a retaining wall and/or noise wall layout and performing subsequent research needed for submittal to the Bridge Division. Wall layouts show horizontal and vertical geometry, cross sections, wall type, and geotechnical data as appropriate. Refer to the *Environment Manual* for information on noise wall warrants. Refer to the TxDOT *Geotechnical Manual*, Chapter 6, [Section 2](#) for details on information to be shown on retaining wall layouts. Refer to the TxDOT *Bridge Project Development Manual*, [Chapter 5, Section 2](#), for information on submitting preliminary retaining wall layouts to the Bridge Division.

**Pertinent Project Types.** Projects involving retaining or noise walls.

**Responsible Party.** Roadway design engineer

#### Sub-tasks.

- ◆ Review all commitments made during the public involvement phase to determine if agreements were made relative to wall types, heights, locations, or aesthetic treatments.

- ◆ Obtain plots of existing utilities, right of way limits, and catch points of earthwork construction on cross-section sheets to determine proposed wall locations.
- ◆ Coordinate with the drainage engineer regarding drainage needs at the top of, and possibly through and under walls.
- ◆ Coordinate the aesthetics of walls with a landscape architect and stakeholders.
- ◆ Coordinate wall locations with proposed utility adjustments for construction clearances.
- ◆ A standard soils computer program is used for a uniform representation of core boring data on a statewide basis. Contact the Geotechnical Branch of the Field Operations Section of the Bridge Division for technical assistance.
- ◆ Obtain any additional geotechnical data necessary to finalize designs. Refer to the TxDOT *Geotechnical Manual* for soil core boring information.
- ◆ Retaining walls exceeding a 25 ft (7.6 m) height **require** Bridge Division approval of the layout.

#### **Helpful Suggestions.**

- ◆ Establish a smooth vertical alignment along the top of retaining walls for a pleasing appearance.
- ◆ Coordinate retaining/noise wall layouts with bridge layouts to ensure compatibility of elevation, horizontal control, and proposed aesthetic treatments.
- ◆ Walls founded in soft soils may require deep foundations. Proper preliminary geotechnical investigation is important.
- ◆ Coordinate with district maintenance personnel regarding maintenance requirements adjacent to walls.
- ◆ The Bridge Division is available for consultation upon district request.

#### **Critical Sequencing.**

- ◆ Wall layouts can be started after developing final alignments and preliminary cross-sections.
- ◆ Wall layouts can be finished after completing the final geotechnical survey (see [5460](#): Perform final geotechnical surveys).
- ◆ Retaining wall layouts should be submitted at least six months before submitting the PS&E.

#### **Resource Material.**

- ◆ TxDOT *PS&E Preparation Manual*, Chapter 2, Section 2, [Retaining Wall Layouts](#)
- ◆ TxDOT *Geotechnical Manual*, [Chapter 6](#)
- ◆ TxDOT *Landscape and Aesthetics Design Manual*, Chapter 3, Section 4, [Retaining/Noise Walls and Miscellaneous Structures](#)

- ◆ TxDOT *Roadway Design Manual*, [Chapter 2](#) for information on design criteria
- ◆ TxDOT *Environmental Manual*, Chapter 2, [Section 6](#)
- ◆ TxDOT [Bridge Design Manual](#)
- ◆ TxDOT [Hydraulic Design Manual](#).

## Retaining/Noise Wall Design and Details

### 5680: Prepare retaining and/or noise wall plans and details

**Description.** Wall plans include details for constructing the walls and related items such as footings, piles, drainage systems, and tie-backs.

Refer to the TxDOT *Geotechnical Manual*, [Chapter 6, Section 2](#), for additional information to be included on layouts for various types of retaining walls.

TxDOT standard sheets exist for walls, with various facings available.

**Pertinent Project Types.** Projects involving retaining or noise walls.

**Responsible Party.** Roadway design engineer

#### Sub-tasks.

- ◆ Update wall layouts as requested by Bridge Division, if applicable.
- ◆ Coordinate with the drainage engineer regarding drainage needs at the top of, and possibly through and under, walls.
- ◆ Coordinate with landscape architect regarding aesthetics of, and landscaping around, walls. Review proposed aesthetic treatment with stakeholders.
- ◆ Prepare plan details and obtain standard sheets as necessary.

#### Helpful Suggestions.

- ◆ Establish a smooth vertical alignment along the top of retaining walls to provide a pleasing appearance.
- ◆ The Geotechnical Branch of the Field Operations Section of the Bridge Division may be contacted for technical assistance.

**Critical Sequencing.** Wall designs and plan details can be started as soon as approval of wall layouts is obtained.

#### Resource Material.

- ◆ TxDOT [Geotechnical Manual](#)

## Miscellaneous Structures

### 5700: Prepare plans for miscellaneous structures

**Description.** Examples of miscellaneous structures include non-standard concrete traffic barrier (CTB) which accommodates parallel roadways with differing profiles, overhead sign bridges, high mast illumination, or different applications of bridge rail. Occasionally, there is the need to modify standard TxDOT designs.

**Pertinent Project Types.** All projects.

**Responsible Party.** Roadway design engineer

#### Sub-tasks.

- ◆ Obtain TxDOT standard details for items involved.
- ◆ Research special design details used on similar projects.
- ◆ Contact the project development staff of the Bridge Division for technical assistance.

#### Resource Material.

- ◆ TxDOT [Bridge Project Development Manual](#)
- ◆ TxDOT [Bridge Railing Manual](#)
- ◆ TxDOT *Traffic Operations Manual*, [Highway Illumination Volume](#).

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## Section 9 — Traffic Control Plan

### Overview

This section describes elements typically designed by a roadway design engineer or traffic engineer. A traffic control plan consists of the following elements:

- ◆ a sequence of construction plan
- ◆ a detour plan (when required)
- ◆ a temporary signing, striping and pavement marking plan
- ◆ contract provisions.

Traffic control plans should clearly show provisions for safe and efficient operation of all modes of transportation during construction and safety of construction workers and inspection personnel. Coordination of work zone impacts on drivers, bicyclists and pedestrians, as well as local businesses and transit routes, is important to develop the best possible traffic control plan.

This section includes the following groups of tasks. The tasks are listed in approximate chronological order but may be performed concurrently.

- ◆ Sequence of Work

5720. [Finalize sequence of construction](#)

- ◆ Detour Plans

5730. [Design detour roadways](#)

5740. [Obtain approval of road closure/detour plans](#)

- ◆ Temporary Signing, Striping, and Pavement Marking

5760. [Prepare details for temporary signing, striping, and pavement marking](#)

- ◆ Contract Provisions

5780. [Develop contract requirements](#)

- ◆ Review

5790. [Review Traffic Control Plan](#)

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## Sequence of Work

### 5720: Finalize sequence of construction

**Description.** Construction staging plans detail the recommended phasing of project improvements. Staging should maximize traffic operations and safety during construction, and should maximize construction worker safety, while considering ease of construction.

Detours may be required to maintain traffic during certain construction stages.

Detailed layout and arrangement of work zone signs, work zone pavement markings, traffic control devices, and drainage facilities should be provided for each construction stage.

**Pertinent Project Types.** Projects impacting the normal flow of traffic.

**Responsible Party.** Roadway design engineer or traffic engineer

#### Sub-tasks.

- ◆ Obtain preliminary roadway, drainage, and traffic plans. Refer to plans prepared while planning the sequence of construction. (See [5040](#): Plan sequence of construction.)
- ◆ Evaluate potential of construction impacts on existing traffic (e.g., pavement drop offs, work adjacent to travel lanes, lane closures).
- ◆ Consider need for night time illumination of construction area.
- ◆ Prepare written description of construction sequence (optional).
- ◆ Coordinate with District Pavement Engineer to obtain temporary pavement designs.
- ◆ Coordinate plans with appropriate district and area office staff to include design, construction, drainage, utilities, and traffic.

#### Helpful Suggestions.

- ◆ Make sure that non-typical and transition areas are detailed. The designer should envision what the driver will see along the project.
- ◆ Consider safe operation by pedestrians and bicyclists in all stages of construction. Construction markings, traffic control devices, and barriers should be designed with this goal.
- ◆ Continuous safe access to all properties during construction is necessary. Staging must consider this need and plans must describe how this need will be met.
- ◆ Consider incorporating the effects of utility adjustments performed during construction.

#### Resource Material.

- ◆ Texas [Manual on Uniform Traffic Control Devices, Part VI](#)

- ◆ TxDOT [Traffic Control Standard Sheets](#).

## Detour Plans

### 5730: Design detour roadways

**Description.** Detours may be required to maintain traffic during certain construction stages. Detours may include rerouting traffic to existing parallel routes, constructing temporary paved routes, or a combination thereof. Impacts to existing parallel routes and the capacity to handle additional traffic must be analyzed.

Detailed layout and arrangement of construction signs, construction pavement markings, traffic control devices, and drainage facilities should be provided for each detour. Plans should include horizontal and vertical alignment and cross sections, as appropriate.

**Pertinent Project Types.** All projects involving detours.

**Responsible Party.** Roadway design engineer

#### Sub-tasks.

- ◆ Obtain preliminary roadway, drainage, and traffic plans. Refer to plans prepared while finalizing the sequence of construction. (See [5720](#): Finalize sequence of construction).
- ◆ Prepare preliminary detour plans (see [5050](#): Develop conceptual detour/road closure plan). Determine horizontal and vertical alignments and typical cross sections. Determine right of way required, if any. Begin coordinating with local entities.
- ◆ Coordinate detour plans with local entities and major traffic generators.
- ◆ Evaluate impact on existing utilities. (e.g., access utility cover and clearances)
- ◆ Coordinate with District Pavement Engineer to obtain temporary pavement designs.
- ◆ Coordinate plans with appropriate district and area office staff to include design, construction, drainage, and traffic.
- ◆ Prepare final detour plans.

#### Helpful Suggestions.

- ◆ Make sure that non-typical and transition areas are detailed.
- ◆ Consider safe operation by pedestrians and bicyclists in all stages of construction. Construction markings, traffic control devices, and barriers should be designed with this goal.
- ◆ Consider impacts to existing, parallel facilities in addition to the roadway's capacity to handle traffic. Consider impacts to schools, emergency vehicles, pedestrians, bicyclists, and neighborhoods due to traffic rerouting.

- ◆ Detours should be designed to operate at least at the existing posted speed whenever possible. When this cannot be accomplished, a [construction speed zone request](#) (See [Form 1204](#)) should be considered and the detour designed to meet the lowered construction speed limit.
- ◆ Continuous safe access to all properties during construction is necessary. Staging and detour designs must consider this need, and plans should describe how the need will be met.

**Critical Sequencing.** Prepare detour designs and plans after the roadway, drainage, and traffic plans are substantially complete and the construction staging plan is developed.

**Resource Material.**

- ◆ TxDOT [Roadway Design Manual](#)
- ◆ Texas [Manual on Uniform Traffic Control Devices, Part VI](#)
- ◆ TxDOT *Traffic Operations Manual, [Signs and Markings Volume](#)*
- ◆ TxDOT [Traffic Control Standard Sheets](#).

**5740: Obtain approval of road closure/detour plans**

**Description.** Closing a roadway during construction may impact local entities, school districts, and the post office. Concurrence from entities having jurisdiction over affected roadways should be obtained. Coordinate with entities such as the post office, county, city, school district, major employers, and emergency vehicle response teams to minimize the impact of a road closure on the community.

On-system roadways should not be closed unless highly unusual circumstances exist.

Impacts to off-system roadways may result from completely closing a roadway to rehabilitate or replace a bridge or from using an off-system facility as a detour route for an on-system closure.

Refer to related information in task [5050](#): Develop conceptual detour/road closure plan.

**Pertinent Project Types.** Projects including a road closure (on- or off-system) or detour route on an existing off-system facility.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Submit a closure request to the local entities through appropriate channels in the district.
- ◆ Notify local post office, police, fire departments and school districts of road closure.

- ◆ Document coordination with affected entities as follows:

Type of route to be closed	Detouring to	Documentation required
off-system	off- or on-system	letter of concurrence signed by city and/or county officials
on-system	off-system	executed agreement outlining the responsibilities of each party
on-system	on-system	Return receipt or signature confirmation to document that notification was delivered to city and/or county officials (including post office, fire, police, EMS, and school district)

- ◆ Prepare a map showing the location of the project site, the detour route including length and current physical condition, the amount of traffic (ADT), and the percentage of trucks using the road to be closed and on all roads used as a detour.
- ◆ Send a road closure memorandum to the District Engineer for approval. Include the following in the memorandum:
  - road closure duration
  - recommendations to expedite project completion (i.e. calendar days, liquidated damages)
  - documentation of required notifications, concurrence letters and/or agreements
  - map prepared as described above
- ◆ Submit district engineer's approval to Design Division with PS&E package (see [5910](#): Submit PS&E package to Design Division) for letting.

### Helpful Suggestions.

- ◆ Allow enough lead time for approval of municipal actions.
- ◆ Impacts to the traveling public due to detours may be calculated in the form of road user costs. If these impacts are substantial, a special provision may be included in the PS&E to require payment of increased liquidated damages by the contractor.

**Critical Sequencing.** Discussion and preliminary approval of road closure/detour plans should be initiated when a road closure or detour is first considered. Written approval should be obtained as soon as detour plans are completed to the point where road closure/detour timing can be reasonably defined.

**Resource Material.** TxDOT *Plans, Specifications & Estimate Preparation Manual*, Chapter 5, Section 3, [Temporary Road Closure Request](#)

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## Temporary Signing, Striping, and Pavement Marking

### 5760: Prepare details for temporary signing, striping, and pavement marking

**Description.** For detour routes on existing pavement and parallel routes, provide a detailed layout and arrangement of construction signs, construction pavement markings, traffic control devices (including temporary signals and signal heads), and drainage facilities. Dimension typical sections and plans both horizontally and vertically as necessary to result in a safe product.

Traffic control plans (TCP) detail how construction of project improvements will be accomplished. TCP should maximize traffic operations and safety, and should maximize construction worker safety during construction.

Details may be needed for parallel routes or shifted traffic on existing pavement. Night time work may also be specified.

TxDOT standard sheets should be used whenever possible because of contractor and inspector familiarity with these sheets.

**Pertinent Project Types.** All projects except those that are simple enough to be described using barricade and construction standards.

**Responsible Party.** Roadway design engineer

#### Sub-tasks.

- ◆ Obtain construction staging and detour plans.
- ◆ Determine the need for construction speed zoning and traffic control at intersections.
- ◆ Coordinate plans with appropriate district and area office staff.
- ◆ Prepare final traffic control plans.

#### Helpful Suggestions.

- ◆ Make sure that non-typical and transition areas are detailed.
- ◆ Consider safe operation by pedestrians and bicyclists in detailing the TCP. Design construction markings, traffic control devices, and barriers with this goal.

#### Resource Material.

- ◆ Texas [Manual on Uniform Traffic Control Devices, Part VI](#)
- ◆ TxDOT *PS&E Preparation Manual*, Chapter 2, Section 2, [Traffic Control Plan \(TCP\) Sheets](#)
- ◆ TxDOT *Traffic Operations Manual*, [Signs and Markings Volume](#)
- ◆ TxDOT [Procedures for Establishing Speed Zones](#).

## Contract Provisions

### 5780: Develop contract requirements

**Description.** A traffic control plan may require developing specific contract requirements. These contract requirements may address the following subjects:

- ◆ work hour restrictions
- ◆ lane closure restrictions
- ◆ access to work area
- ◆ use of off-duty law enforcement personnel
- ◆ accelerated construction provisions.

**Pertinent Project Types.** Projects impacting the normal flow of traffic.

**Responsible Party.** Roadway design engineer

**Helpful Suggestions.** Design Division and Traffic Operations Division Field Coordination personnel are available to provide assistance.

**Resource Material.**

- ◆ *Texas [Manual on Uniform Traffic Control Devices, Part VI](#)*
- ◆ *TxDOT Traffic Operations Manual, [Signs and Markings Volume](#) .*

## Review

### 5790: Review traffic control plan

**Description.** Each district should have a District Safety Review Team (DSRT). The team should consist of district individuals having sufficient authority to implement, monitor, and review the application of safety techniques and strategies, including project traffic control plans. The team might include:

- ◆ District Design Engineer
- ◆ District Construction Engineer
- ◆ District Traffic Engineer
- ◆ District Maintenance Engineer
- ◆ Area Engineer
- ◆ a traffic safety coordinator.

The District Safety Review Team should review as many traffic control plans as practical, but more importantly, the team should be involved in the development process to eliminate the need for lengthy reviews.

**Pertinent Project Types.** Projects impacting the normal flow of traffic.

**Responsible Party.** Roadway design engineer

**Resource Material.**

- ◆ *Texas [Manual on Uniform Traffic Control Devices, Part VI](#)*
- ◆ TxDOT Traffic Operations Division, Traffic Control Standard Detail Sheets available on the Internet at <http://www.dot.state.tx.us/business/disclaim.htm>.

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## Section 10 — PS&E Assembly/Design Review

### Overview

The end of the design process is the assembly of the PS&E package and supporting documents. The design review process gives the designer the last opportunity to check PS&E for completeness, accuracy and to minimize potential for construction related problems including contractor claims. Refer to the TxDOT [PS&E Preparation](#) Manual for detailed information.

This section includes the following tasks. The tasks are listed in approximate chronological order but may be performed concurrently.

- 5810. [Conduct environmental re-evaluation](#)
- 2870. [Submit design exceptions/waivers for approval](#)
- 5830. [Prepare PS&E package](#)
- 5840. [Conduct district PS&E review](#)
- 5850. [Assemble project plans](#)
- 2460. [Update cost estimates](#)
- 5855. [District conducts final agreement/permit review](#)
- 5860. [Collect outside, additional funding based on advance funding agreements](#)
- 5900. [District performs final review of PS&E](#)
- 5910. [Submit PS&E to Design Division](#)
- 5915. [Obtain approval for program overruns](#)

### 5810: Conduct environmental re-evaluation

**Description.** After a project has received environmental clearance, project advancement may be delayed or design changes may be needed. Environmental re-evaluations (see the [Environmental Manual](#)) are performed to determine whether:

- ◆ an environmental approval (FONSI or ROD) is still valid
- ◆ an approved environmental document (EA, DEIS, FEIS) is still valid.

Re-evaluations are generally required three years after either environmental clearance, or approval, when any one of the following occurs:

- ◆ changes in design, scope, land use or right of way requirements
- ◆ new environmental impacts not discussed in the original documentation are identified or impacts previously discussed change
- ◆ regulatory changes.

The re-evaluation can be either a brief letter or a document. The extent of changes or impact differences should determine the type of re-evaluation.

#### **Pertinent Project Types.**

- ◆ Projects having changes (described above) resulting in environmental impacts which were not evaluated in the original document.
- ◆ The FHWA requires a re-evaluation after three years of no activity (i.e., no design work, no right of way acquisition, etc.).

**Responsible Party.** Environmental coordinator

#### **Helpful Suggestions.**

- ◆ In some cases, project activities may continue during re-evaluation if the re-evaluation is to address only limited issues.
- ◆ In conducting a re-evaluation, the design team should reassess the project relative to the initial purpose and need statement that sets the foundation for detailed design decisions.
- ◆ Public involvement needs must be reassessed (see [3010](#): Determine public involvement needs) as part of the re-evaluation.

**Critical Sequencing.** Begin this task soon after determining its need to avoid project delay.

#### **Authority Requirements.**

- ◆ For Federal projects, [23 CFR 771.129](#)
- ◆ For State projects, [43 TAC § 2.13](#).

#### **Resource Material.**

- ◆ TxDOT [Environmental Manual](#)
- ◆ FHWA Technical Advisory T 6640.8A; 10/30/87; [Guidance for Preparing and Processing Environmental and Section 4\(f\) Documents](#).

**5830: Prepare PS&E package**

**Description.** At this point in project development, the PS&E package is a completed plan set from the designer -- pending district review and update. Major items included in the package are:

- ◆ plan sheets (on paper – not reproducible at this time)
- ◆ standard and special specifications
- ◆ general notes
- ◆ special provisions
- ◆ cost estimate
- ◆ project agreements.

For a more detailed list of items to include, refer to the TxDOT [PS&E Preparation Manual](#). Final checklists describing district responsibilities for division and district review projects may be found in the TxDOT *PS&E Preparation Manual*, Chapter 5, [Section 4](#). Refer to the [Local Government Project Procedures](#) for information on projects let by local public agencies.

Documents included with the PS&E are commonly referred to as “supporting papers.” The PS&E Submission Data Form [1002](#) contains a checklist of supporting papers that should be used when preparing the draft PS&E package. Page 3 of Form [1002](#) is the official place where design criteria is documented. Refer to [Chapter 5](#) of the *PS&E Preparation Manual* for more information.

Use a consistent order of sheets for PS&E document assembly. This will aid bidders and should result in more competitive bidding.

**Pertinent Project Types.** All projects.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Compile plans and a current Form [1002](#). Include utility plans, specifications and cost estimates if utility adjustments are to be part of the construction contract.
- ◆ Prepare the “spec list” which is a list of governing project specifications and special provisions.
- ◆ Prepare “spec data” sheets, including data which supplements the project specifications and which will be placed in the plans as the General Notes and Specification Data sheets.
- ◆ Obtain the following for inclusion with the PS&E package:
  - geotechnical materials test data results
  - requests for construction speed zoning
  - contract time determination

- agreements, such as for advance funding, municipal maintenance, railroad involvement, municipal construction, or material-option
- appropriate engineering and contingencies (E&C) percentage; number of working days; and need for a pre-bid conference
- complete utility (see [4640](#): Prepare utility clearance certifications), right of way and encroachment certifications (see [4500](#): Prepare right of way and encroachment certifications) and related special provisions.
- ◆ Use Form [1002](#) to review the PS&E package for completeness a final time.
- ◆ Verify quantities and unit prices on the cost estimate.
- ◆ Estimate the cost of pedestrian elements and include on Form [1002](#). Include items such as sidewalks, curb ramps, pedestrian signal equipment, etc.
- ◆ Identify [non-participating](#) items (i.e., items that the FHWA is not paying for) on the cost estimate.
- ◆ Submit proposed special specifications to the Design Division at least two months before submitting plans to the Design Division to obtain approval and item descriptive codes.
- ◆ Coordinate railroad agreements. (See [2330](#): Initiate railroad coordination).
- ◆ Ensure that all environmental commitments are addressed in the PS&E (including the EPIC sheet - see [Task 5110](#)) and that the environmental process is complete.
- ◆ Evaluate the need for: expedited construction prosecution and progress; [A+B bidding](#); the number of work days; increased [liquidated damages](#); using [calendar days](#) (district engineer approval required); and, [lane rentals](#).

**Helpful Suggestions.** For projects with accelerated construction schedules, the [calendar day](#) definition of working days should be considered. District engineer approval is needed to use calendar days.

**Critical Sequencing.** Complete the PS&E package according to district review schedules.

#### Resource Material.

- ◆ TxDOT [DCIS User Manual](#)
- ◆ TxDOT [Design Division Intranet](#) site.

#### 5840: Conduct district PS&E review

**Description.** An in-house district review by a multi-discipline team of the plans, specifications, and estimate (PS&E) package is required. This quality control review is conducted to allow others with subject matter expertise the opportunity to identify inconsistencies in the package.

**Pertinent Project Types.** All projects.

**Responsible Party.** District design engineer

**Sub-tasks.**

- ◆ Distribute the PS&E package to review team members, preferably before the review meeting. At the meeting, cover project highlights concentrating on items that should receive a more detailed review.
- ◆ Utilize the Advance Planning Risk Analysis (APRA) tool to review all risk issues and make sure that the project is ready for letting. The APRA tool and the User Guide for the APRA Tool is available [here](#). Refer to Task [1200](#) for more information regarding this tool.
- ◆ Gather review comments at the meeting and set up a deadline for follow-up comments.
- ◆ Conduct follow-up meetings with reviewers as necessary to clarify their comments.
- ◆ Revise the PS&E package.

**Critical Sequencing.** Perform the review according to district review schedules.

**Resource Material.** TxDOT *PS&E Preparation Manual*, Chapter 5, [Section 5](#) for information on recommended review process.

### 5850: Assemble project plans

**Description.** Assembling project plans involves producing final, reproducible (mylar<sup>®</sup>) plan sheets, inserting standard sheets, preparing general notes and specification data sheets (if district review), finalizing title sheet information, and completing title block information on all sheets.

For information on the order of plan sheets in a PS&E package refer to the TxDOT *PS&E Preparation Manual*, Chapter 2, Section 2, [Overview](#).

**Pertinent Project Types.** All projects.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Produce final reproducible (mylar<sup>®</sup>) plan sheets.
- ◆ Sign, seal, and date appropriate sheets.
- ◆ Prepare General Notes and Specification Data sheets.
- ◆ Obtain and insert standard details sheets.
- ◆ Finalize title sheet and title block data.

**Helpful Suggestions.**

- ◆ Allow sufficient time for signing, sealing, and dating sheets.
- ◆ For a list of standards, see TxDOT's Internet site: <http://www.dot.state.tx.us/business/disclaim.htm>.

**Critical Sequencing.** Assemble plans according to the district schedule.

**Resource Material.** TxDOT *PS&E Preparation Manual*, Chapter 5, [Section 4](#)

**5855: District conducts final agreement/permit review**

**Description.** Before submitting the PS&E to the Design Division, the district should conduct a final agreement and permit review to ensure that supporting documents are in order and that the project is in full compliance with agreements and permits.

A table of environmental permits is available in the TxDOT [Environmental Manual](#). A table of miscellaneous permits is available in the TxDOT *PS&E Preparation Manual*, Chapter 1, Section 2, "[Permits](#)".

**Pertinent Project Types.** Projects involving any third-party agreement or permit.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Ensure **all** permits have been issued and are current; check permit expiration dates.
- ◆ Ensure **all** permit conditions are met; failure to meet the conditions of a particular permit could delay a project.
- ◆ Ensure that **all** necessary agreements are obtained (e.g., utility agreement, railroad agreement).

**Critical Sequencing.** Conduct the final agreement and permit review after assembling project plans.

**5860: Collect outside, additional funding based on advance funding agreements**

**Description.** Advance funding agreements (AFAs) define the cost participation and payment method for outside funding participation on a project. The AFA should have been executed (see [1610: Prepare and execute advance funding agreements](#)) early in project planning. Local participation may be based on either an [actual cost advance funding agreement](#) or a [fixed price advanced funding agreement](#). Funds must be received by TxDOT before the construction contract is executed.

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After completing PS&E and finalizing the project cost estimate, review **all** local participation agreements to determine whether sufficient funds are received according to the AFA.

**Pertinent Project Types.** Projects having AFAs.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Obtain the final project cost estimate and funding agreements.
- ◆ Determine participation level for each party to the funding agreement.
- ◆ Verify amounts previously received.
- ◆ Coordinate with the district director of transportation planning and development regarding the need to obtain funding.
- ◆ Send financial clearance notification. (See [6000](#): Perform financial clearance analysis).

**Critical Sequencing.** Collect funding in accordance with provisions of the agreement.

**Authority Requirements.** [43 TAC §§ 15.50 – 15.56](#)

**Resource Material.** TxDOT [GSD-CSS](#) intranet site

### **5900: District performs final review of PS&E**

**Description.** Before submitting the PS&E to the Design Division, the district conducts a final review to ensure that the completed PS&E is ready to submit. For [minor, state-funded projects](#), final review may be delegated to the district; for these projects, no further review is conducted by the divisions.

**Pertinent Project Types.** All projects.

**Responsible Party.** District design engineer

**Helpful Suggestions.**

- ◆ Update standard project details, specifications and special provisions to reflect the latest copy of all such documents.
- ◆ Helpful checklists are available in the *PS&E Preparation Manual*, Chapter 5, [Section 4](#)

**Critical Sequencing.** Final PS&E review should be conducted following completion of **all** documents.

## 5910: Submit PS&E to Design Division

**Description.** Complete the district's PS&E submittal and send to the Design Division for review and processing. For more information, refer to the *PS&E Preparation Manual*, [Chapter 5, Section 3](#).

For enhancement or projects let by local public agencies (LPAs), the Design Division submits proposal documents to the Construction Division for approval of letting procedures, HUB/DBE requirements, and insurance provisions.

**Pertinent Project Types.** All projects.

**Responsible Party.** District Design Engineer

### Sub-tasks.

- ◆ Update the PS&E based on comments received during District final review of PS&E. (See [5900](#): District performs final review of PS&E).
- ◆ Prepare one set of reproducible (mylar<sup>®</sup>) copies. The reproducible copies may be full-scale or half-scale (11"x17").
- ◆ Prepare 11"x17" sets of paper copies. Refer to Form 1002 (See Form [1002](#)) for the number of review prints required for division review projects.
- ◆ Refer to Form [1002](#) for the number of copies of supporting papers that need to be submitted with the PS&E.
- ◆ Seal and date DCIS (S1) screen and release the estimate to the Design Division.
- ◆ Transmit Microsoft<sup>®</sup> Word documents associated with the PS&E (such as general notes, special provisions, and special specifications) to the appropriate Design Division Field Coordination Section GroupWise account. (For more information refer to the TxDOT Intranet site at: <http://crossroads/org/des/tools/props/docs/Groupwise.asp>)
- ◆ Send the PS&E submittal for Design Division review and processing.

**Resource Material.** TxDOT *PS&E Preparation Manual*, Chapter 1, Section 3, [General Deadlines and Project Categories](#), for information on PS&E submission schedules.

## 5915: Obtain approval for program overruns

**Description.** When overruns exist, there is usually a justification such as additional scope of work not originally anticipated or a significant increase in unit prices. Program overrun memorandums are required to ensure accountability in cost estimating and provide detailed justification for increased funding levels. Handle project cost estimate increases before letting as described in Min-

ute Order 109864. Various levels of approval are required depending on the funding category and the amount of the program overrun.

**Pertinent Project Types.** Projects having final cost estimates exceeding programmed cost estimates.

**Responsible Party.** Project manager

**Sub-tasks.**

- ◆ Obtain the project's final cost estimate and compare it to the programmed estimate.
- ◆ Coordinate with the Director of Transportation Planning and Development regarding obtaining any needed additional funding.

**Critical Sequencing.** Prepare program overrun memorandums as soon as the final project cost estimate is prepared.

**Resource Material.** *TxDOT [PS&E Preparation](#) Manual*

# Chapter 6 — Letting

**Contents:**

[Section 1 — Final Processing and Letting](#)

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## Section 1 — Final Processing and Letting

### Overview

This section describes the process of reviewing the completed PS&E package, including supporting documents, before TxDOT takes construction bids (letting). The process described is used for the design-bid-build (DBB) method of project delivery. The Design Division has primary responsibility for reviewing and processing the PS&E up to letting. Divisions with secondary responsibility include Traffic Operations, Construction, and General Services. FHWA may also be involved in reviewing PS&E for projects having FHWA oversight.

The final review of some [minor, state-funded projects](#) is delegated to the districts. For projects where the district has accepted responsibility for final review, no division review will be performed.

For division review projects, multiple copies of the PS&E and supporting documents are submitted to the Design Division generally several months before letting. The Design Division distributes the PS&E package to the different offices involved in the review. The review generally involves the following tasks:

- ◆ checking to ensure the project is authorized for letting
- ◆ reviewing plans for consistency with approved design standards and criteria
- ◆ checking for completeness of plans
- ◆ checking for compliance with applicable rules and regulations
- ◆ ensuring that funding is allocated
- ◆ ensuring that other legal requirements are met to satisfy the letting process

This section includes the following tasks. The tasks are listed in approximate chronological order but some tasks may be performed concurrently.

6000. [Perform financial clearance analysis](#)

6010. [Prepare and review draft proposal](#)

6030. [Obtain funding and approval of PS&E](#)

6100. [Release final proposal](#)

6130. [Advertise request for bids](#)

6133. [Provide earthwork construction cross section data to contractors \(if requested\)](#)

- 6135. [Amend issued proposal documents](#)
- 6140. [Conduct pre-bid conference](#)
- 6150. [Conduct bid opening](#)
- 6200. [Tabulate and review bids](#)
- 5860. [Collect outside, additional funding based on advance funding agreements](#)
- 6210. [Award contract](#)
- 6230. [Notify the public in advance of construction](#)
- 6240. [Store and retain project records](#)

#### **6000: Perform financial clearance analysis**

**Description.** For projects having Advance Funding Agreements (AFAs) (See [1610: Prepare and execute advance funding agreements](#)), a Notice of Financial Clearance: Conditional Project (“notice”) is needed as part of the bid process. The notice is a standardized form available from the General Services Division - Contract Services Section (GSD-CSS).

Projects with outside funds (arranged through AFAs) are conditionally awarded, and contracts are not released until the district indicates all funds are received.

**Pertinent Project Types.** Projects having Advance Funding Agreements.

**Responsible Party.** District engineer

**Sub-tasks.** Procedures for performing the financial clearance analysis are contained in the TxDOT PS&E Preparation Manual, Chapter 6, [Section 4](#).

**Resource Material.**

- ◆ TxDOT [PS&E Preparation Manual](#)

#### **6010: Prepare and review draft proposal**

**Description.** The draft [bidding proposal](#) is a document that includes all the information necessary for bidders to bid a project’s construction work. The proposal does not include construction plan drawings. The proposal document includes the following information:

- ◆ Proposal cover page, indicating number of working days for the project and proposal guaranty amount

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- ◆ Bidder’s return check address form (for proposal guaranty)
  - ◆ Various certifications
  - ◆ Notice to bidders (general information found in project advertisement)
  - ◆ Bid inserts (forms on which bidders submit their itemized bid)
  - ◆ General notes
  - ◆ Specifications list (does not include specifications descriptions)
  - ◆ Special provisions
  - ◆ Special specifications (non-standard project specifications)
  - ◆ Wage rates (minimum wage rates allowed by labor category)

The draft of proposal documents is commonly referred to as the proposal “check copy” and is necessary for internal review before issuing the proposal.

For division review projects, the Design Division will send several check copies to the district for review. The district is responsible for reviewing the check copy for completeness and conformity between the plans and proposal. The district should pay close attention that the following items are included:

- ◆ Notification of any pre-bid meeting contains correct information.
- ◆ Number of working days is shown on the proposal.
- ◆ Proposal guaranty amount is correct.
- ◆ Bid inserts match with the estimate and quantity sheet.
- ◆ **All** project items are included in the specification list.
- ◆ **All** applicable special provisions.
- ◆ **All** applicable special specifications.
- ◆ Current wage rates that cover the appropriate county.

**Pertinent Project Types.** All projects.

**Responsible Party.**

- ◆ For preparing the proposal:
  - the Design Division or Traffic Operations Division is responsible for division review projects
  - the district design engineer is responsible for district review projects. (See the PS&E Preparation Manual, Chapter 5, Section 4, for [PS&E Checklist for District Review Projects](#))
- ◆ For reviewing the proposal, the district design engineer is responsible.

**Critical Sequencing.** The district must review and comment on the draft proposal quickly to ensure any necessary changes are made before releasing the proposal to prospective bidders.

### 6030: Obtain funding and approval of PS&E

**Description.** Before advertising for construction bids, the PS&E must be approved by the responsible office. Approval signifies that plans were checked and all federal and state requirements have been met. PS&E is approved, and funding is secured (federal-aid projects only), as shown in the table below:

**Project Approval Authority**

Project Type	Approval by
State-funded	Responsible Division (DES, BRG, or TRF) signs State LOA.
Federal Funds with State oversight	TxDOT Finance Division - Letting Management Section and FHWA sign FPAA. Responsible Division (DES, BRG, or TRF) signs State LOA
Federal Funds with Federal (FHWA) oversight	Responsible Division (DES, BRG, or TRF) and FHWA sign FPAA

The following documents are used in securing federal funds for projects and in approving the PS&E to proceed to letting:

- ◆ Federal Project Authorization & Agreement (FPAA)
- ◆ State Letter of Authority (State LOA)

The function of the FPAA is as follows:

- ◆ obligate federal funds for a project's preliminary engineering, construction, right of way, or combination thereof.
- ◆ clear the project to proceed to advertising for letting or begin [force account labor](#).

The State LOA documents that the following have been addressed:

- ◆ status of right of way and utility clearance, and necessary permits.
- ◆ project has environmental clearance.
- ◆ design aspects meet project requirements.
- ◆ design/agreement/permit conditions placed on project letting and/or award.
- ◆ clearance of the project to proceed to advertising for letting or begin force account labor.

**Pertinent Project Types.** All projects.

**Responsible Party.**

- ◆ Finance Division assures that FPAA and State LOA are secured for projects let by TxDOT.
- ◆ District coordinates with responsible division and assures that FPAA and State LOA are obtained from the responsible division for federal-aid force account projects and projects let by local entities.
- ◆ District engineer assures compliance with State laws, policies, and procedures on district review projects by signing the PS&E title sheet.

**Helpful Suggestions.**

- ◆ If an FPAA is received to authorize [funds](#) for preliminary engineering, another FPAA and State LOA must be obtained for construction, as described above.
- ◆ PS&E revisions or addenda on federal oversight projects must be sent to the responsible division for coordination with FHWA before letting.

**Critical Sequencing.**

- ◆ This task should be completed after the responsible office(s) completes PS&E review.
- ◆ This task must be completed before advertising the project for bids or starting force account work.
- ◆ The FPAA must be signed by the FHWA before costs are incurred. Costs incurred before the FHWA signs the FPAA will not be eligible for Federal reimbursement.

**6100: Release final proposal**

**Description.** For division review projects, the district notifies the Design Division or Traffic Operations Division of any changes to the draft proposal before release to contractors. Once these revisions are made, the final proposal is built by the Design Division or Traffic Operations Division and released to the Construction Division.

For district review projects, the final proposal is built by the Design Division and released when the PS&E is received by the Design Division.

The Construction Division begins to issue the bid documents after final revisions are complete and three weeks before letting. Prospective bidders, and other interested parties may request proposals from the Construction Division.

**Pertinent Project Types.** All projects.

**Responsible Party.**

- ◆ Design Division or Traffic Operations Division

- ◆ Construction Division is responsible for distributing final proposals

**Helpful Suggestions.**

- ◆ If revisions are extensive or if the project is a district review project, district personnel will generally be required to submit the revisions to the Design, Bridge or Traffic Operations Division.
- ◆ If revisions are minor, Design, Bridge or Traffic Operations Division personnel might be able to make the revisions.
- ◆ The district or area engineer offices must not distribute proposal copies under any circumstances. The Construction Division issues all bid proposals to bidders and informational proposals requested by suppliers, subcontractors, or others.

**6130: Advertise request for bids**

**Description.** The department shall publish notice of the time and place at which bids on contracts will be opened and the contract awarded. The Finance Division performs the following task:

- ◆ Posts the advertisement on the Texas Electronic State Business Daily (ESBD) website <http://esbd.cpa.state.tx.us/> and TxDOT <http://www.dot.state.tx.us/business/business.htm>.

TxDOT personnel retain the option of using newspaper advertisements where they deem appropriate.

**Pertinent Project Types.** All construction and maintenance projects.

**Responsible Party.**

- ◆ Finance Division is responsible for validating construction projects for advertising on CMCS
- ◆ District maintenance personnel are responsible for validating local let maintenance projects for advertising on CMCS
- ◆ Maintenance Division personnel are responsible for validating state let maintenance projects for advertising on CMCS

**Authority Requirements.**

- ◆ [43 TAC § 9.13](#)
- ◆ Government Code, [Section 2155.083](#)

**6133: Provide earthwork construction cross section data to contractors (if requested)**

**Description.** Contractor access to construction cross section data in electronic format allows the contractor to prepare more accurate and concise bids, particularly on projects with significant earthwork items. Construction cross section data typically includes the following information:

- ◆ Cross section baseline (horizontal alignment data);
- ◆ Original ground cross sections; and
- ◆ Proposed design cross sections.

Upon contractor request, district or area offices should provide earthwork construction cross section data to the requestor for bid preparation. This information should be in ASCII format (plain text file) and made available prior to letting at no cost. In addition, cross section plots in a PDF format should be provided upon request, and a hard copy should be made available to contractors for the purpose of making copies at the contractor's expense. Consultant engineering firms involved in TxDOT design projects should include this data as part of their deliverable to the district.

The following disclaimer must be included in the transmittal of the cross section data:

The following data is for non-construction purposes only.

It is the responsibility of prospective bidder to validate the data.

Texas Department of Transportation

If construction cross section data is provided directly in the plans, that data should also be clearly labeled for information purposes only.

**Pertinent Project Types.** All projects with earthwork construction cross section data.

**Responsible Party.** District or Area Office.

**Helpful Suggestions.**

- ◆ TxDOT has developed procedures for the creation of this data using GEOPAK Road software. This procedure also instructs the user on how to properly place the disclaimer in the content of the data files. Refer to the GEOPAK II Training manual or contact the Technical Services Division design support team at 512-302-2350 for technical assistance.
- ◆ Contact your Field Coordination Engineer in the Design division for procedural assistance.

**Critical Sequencing.** Cross section data must be provided upon request, and in a timely manner so the contract can prepare an accurate bid on the project.

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**6135: Amend issued proposal document**

**Description.** Occasionally it may become necessary to amend the proposal or plans after they are released to prospective bidders. If amendments are needed, the district coordinates changes with the Design Division or Traffic Operations Division. The Construction Division also notifies all parties who previously received the original documents of the changes and forwards amended documents to them. All amendments to the contract must be processed officially and should never be handled verbally. Contractors must not be given additional information not contained in the bidding documents to ensure that all prospective bidders receive identical information.

**Pertinent Project Types.** All projects.

**Responsible Party.** Construction Division

**Helpful Suggestions.**

- ◆ After final bid proposal preparation, the district must submit any amendments to the Design Division or Traffic Operations Division- preferably, in writing.
- ◆ During the time that amendments are being made, the contract documents are withdrawn from availability to the contracting community. This shortens the time that plans are available to prospective bidders for examination.
- ◆ Amendments result in prospective bidders having to re-evaluate their bid prices. Therefore, any large amendments should be made as early as possible.
- ◆ Very minor amendments to the contract, which are not anticipated to impact bid prices, should not be made unless combined with other essential changes.
- ◆ Refer to the TxDOT *PS&E Preparation Manual*, [Chapter 5, Section 7](#) for more information.

**Critical Sequencing.** Completed changes must be received by the deadlines shown in the PS&E Processing Schedule, <http://crossroads.org/des/lmo/pse.asp> to maintain the letting schedule.

**6140: Conduct pre-bid conference**

**Description.** Pre-bid conferences are used to present a general review of the completed plans and specifications plus a detailed review of the project's special requirements. Pre-bid conferences are not recommended unless determined necessary to convey special or unique project requirements, such as new construction techniques, materials, or complex construction sequencing. No additional project requirements may be added at a pre-bid conference. Bid documents must stand on their own so that all bidders are using the same information.

A pre-bid conference may require either mandatory (determined mandatory by a district), or optional attendance by bidders as a condition of their bids. This will be stated in the Notice to Bidders and the bid advertisement. Mandatory attendance is usually reserved for highly complex

projects and requires approval by the Director of the Design Division. Whether mandatory or optional, the area engineer is responsible for preparing meeting minutes for distribution to bidders. The person responsible for holding the conference must give the Construction Division a list of bidders attending a mandatory conference on the same day as the conference.

**Pertinent Project Types.** All projects.

**Responsible Party.** District area engineer

**Helpful Suggestions.**

- ◆ Hold a pre-bid conference about two weeks before letting, if possible.
- ◆ A minimum of seven days are required between the conference and bid opening dates. If the conference is scheduled this close to the bid opening date, questions posed by contractors at the meeting will not be able to be answered with the appropriate addendum
- ◆ Never give the engineer's estimate to the contracting community.

**Resource Material.** TxDOT PS&E Preparation Manual, Chapter 6, [Section 5](#)

### 6150: Conduct bid opening

**Description.** Bid openings are held in Austin and are conducted by Construction Division personnel. All conditions of bid acceptance must be reviewed at the opening of each bid. These conditions include any of the following:

- ◆ mandatory pre-bid conference attendance (See [6140: Conduct pre-bid conference](#))
- ◆ acknowledgement of receipt of addenda
- ◆ proper presentation of bids
- ◆ proposal guaranty check, etc.

Bid totals are announced at bid opening.

**Pertinent Project Types.** All projects.

**Responsible Party.** Construction Division

**Authority Requirements.** [23 CFR Part 635](#)

### 6200: Tabulate and review bids

**Description.** After the bid opening, the Construction Division tabulates and reviews the bids as follows:

- ◆ checks bids to see if they are mathematically or materially unbalanced or incorrect.

A mathematically unbalanced bid is one that contains lump sum or unit bid items which do not reflect reasonable actual costs plus a reasonable, proportionate share of the bidder's anticipated profit, overhead costs, and other indirect costs. The Transportation Commission may still award these projects.

A materially unbalanced bid is one that generates reasonable doubt that a mathematically unbalanced bid will result in the lowest, ultimate cost to the State. The Texas Transportation Commission must reject a materially unbalanced bid. Materially unbalanced bids generally result from two situations:

- There is an error in quantities (too low) and the contractor bids a high price on these items. In this case, the apparent low bidder might not be the actual low bidder once the quantity error is corrected.
- The contractor's bid prices are high on items of work occurring early in the project. In this case, the apparent low bidder might not be the actual low bidder when the State's financial loss of potential interest income is calculated.

- ◆ checks to ensure that conditions for bid acceptance are met.
- ◆ tabulates bids in increasing amounts.
- ◆ verifies the low bidder.

**Pertinent Project Types.** All projects.

**Responsible Party.** Construction Division

**Authority Requirements.** [43 TAC §§ 9.15 – 9.17](#)

## 6210: Award contract

**Description.** Construction contracts let by the State require award by the Texas Transportation Commission (the "Commission") before execution of the contract. The Construction Division makes a contract award recommendation to the Commission after all bids are tabulated and reviewed, and after all letting and procedural requirements are checked. Federal-aid projects require FHWA concurrence in award.

If a local entity is involved in funding a portion of a project, their concurrence is also required if the project overruns the cost estimate.

For projects let by local entities, concurrence in award must be obtained from TxDOT **before** the local entity awards the project; the Commission delegated this concurrence authority to the Assistant Executive Director for Engineering Operations. Also, engineer's estimates and bid tabulations should be submitted to the Design Division for review and coordination with the Construction Division to obtain concurrence in awarding the project. Refer to Local Government Project Proce-

dures (LGPP) modules at [http://www.dot.state.tx.us/services/design/lgpp\\_modules.htm](http://www.dot.state.tx.us/services/design/lgpp_modules.htm) for more information.

Cost overrun justification memorandums must be prepared for all projects when either of the following situations occurs:

- ◆ The low bid is 20 percent or more over the engineer's estimate
- ◆ or, there is only one bidder, and the bid is 10 percent or more over the engineer's estimate.

Concurrence from an MPO must be obtained for cost overruns on projects selected by the MPO in compliance with the MPO's policy.

Letting overrun justification memos are prepared by the district for district review projects and by the Design Division with input from the district for division review projects. The Commission officially accepts or rejects bids at their monthly meetings. The General Services Division notifies successful bidders of the contract award.

**Pertinent Project Types.** All projects.

**Responsible Party.**

- ◆ For contract award recommendation and concurrence: Construction Division
- ◆ For cost overrun justification for district review projects: District
- ◆ For cost overrun justification for division review projects: Design Division or Traffic Operations Division

**Authority Requirements.**

- ◆ [43 TAC §§ 9.17 – 9.18](#)

**Resource Material.** See the *PS&E Preparation Manual*, [Chapter 7](#) for information on award of local let projects.

**6230: Notify the public in advance of construction**

**Description.** The district public information office may provide public notices before construction. Notices may include press releases to various media types, roadway signs, or notices posted on the Internet.

Depending on project size, give public notices far enough in advance of construction so that motorists can adjust their travel plans accordingly.

To provide accurate public notices, the district public information officer should obtain project information from the project manager, area engineer, or the director of transportation planning and development.

**Pertinent Project Types.** Major projects that may affect normal traffic patterns.

**Responsible Party.** District public information officer

**Sub-tasks.**

- ◆ Identify projects that merit public notice.
- ◆ Notify elected officials before beginning construction.
- ◆ Prepare and distribute press releases or other notices (e.g., Internet information).

**Authority Requirements.** TxDOT Administrative Circular No. 25-93; 10/11/93; “Notification to Legislators”; from Bill Burnett; to Administration, Division Directors, and District Engineers

### 6240: Store and retain project records

**Description.** Project records, including plans, specifications, and estimates must be retained for minimum periods of time according to provisions of TxDOT’s *Communications Manual, Records Management Volume - Chapter 3, [Records Retention Schedule](#)*. Other requirements may apply, such as those in TxDOT’s *Contract Management Manual*. Most records must be retained for at least three years - some for at least ten years. Refer to the *Communications Manual, Records Management Volume* for more information. Design waivers and design exception justifications should be retained permanently.

The *Communications Manual* also describes storage techniques. Give careful attention to this matter. For example, vital (essential) records must not be stored in a basement; basements may collect water from efforts to extinguish fires, and flooding is an obvious danger.

Once the retention period is complete, records may be destroyed. Destruction of records must be performed according to provisions of the TxDOT *Communications Manual*.

Questions on records may be directed to the Records Management Unit of the General Services Division.

**Pertinent Project Types.** All projects.

**Responsible Party.** For storing and retaining records:

- ◆ Project manager
- ◆ District, division, and special office records coordinator – a TxDOT employee who coordinates and implements TxDOT’s record management program within a specific department office.
- ◆ District, division, and special offices records administrator - a senior staff-level representative who administers TxDOT’s records management program within a specific department office.

- ◆ TxDOT records manager – A records manager has overall responsibility for records management in TxDOT and is also designated by TxDOT’s executive director as the TxDOT records administrator for the purposes of coordinating TxDOT’s records management program with external agencies.

The responsible parties for destroying records are:

- ◆ State auditor
- ◆ State librarian
- ◆ TxDOT executive director or agency records administrator, if designated by executive director

**Authority Requirements.**

- ◆ [13 TAC §§ 6.91 – 6.99](#)
- ◆ [Texas Government Code, §§441.031 - 441.175](#)

**Resource Material.**

- ◆ TxDOT *Communications Manual* - [Records Management Volume](#)
- ◆ TxDOT [Contract Management Manual](#)