Project SHRP 2 R15C **COPY NO. 1**

IDENTIFICATION, MANAGEMENT, AND RESOLUTION OF UTILITY CONFLICTS DURING PROJECT DEVELOPMENT AND DELIVERY

TRAINING MATERIALS

Prepared for
Strategic Highway Research Program 2
Transportation Research Board
of
The National Academies

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UTILITY MAPPING SERVICES

March 2014

ACKNOWLEDGMENT OF SPONSORSHIP

This work was sponsored by one or more of the following as noted:

☐ American Association of State Highway and Transportation Officials, in cooperation with the Federal Highway Administration, and was conducted in the **National Cooperative Highway Research Program**,

☐ Federal Transit Administration and was conducted in the **Transit Cooperative Research Program**,

☐ American Association of State Highway and Transportation Officials, in cooperation with the Federal Motor Carriers Safety Administration, and was conducted in the **Commercial Truck and Bus Safety Synthesis Program**,

☐ Federal Aviation Administration and was conducted in the **Airports Cooperative Research Program**,

☐ Research and Innovative Technology Administration and was conducted in the **National Cooperative Freight Research Program**,

☒ Federal Highway Administration in cooperation with the American Association of State Highway and Transportation Officials, and was conducted in the **Strategic Highway Research Program 2**,

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DISCLAIMER

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COURSE OVERVIEW

INTRODUCTION

A critical factor that contributes to inefficiencies in the project development and delivery process is the lack of adequate information about the location and other characteristics of utility facilities that might be affected by a transportation project. Inaccurate and/or incomplete utility data can result in a number of problems, including the following:

- Disruptions when utility installations are encountered unexpectedly during construction, either because there was no previous information about those installations or because their stated location on the construction plans was incorrect.
- Damage to utility installations, which can lead to disruptions in utility service, environmental damage, and increased risk to the health and safety of construction workers and the public.
- Delays that can extend the period of project development and/or delivery and increase total project costs through higher bids, change orders and/or damage or delay claims, redesign, and litigation by utility owners or agencies. These delays also result in frustration by the traveling public and negative public perception about the project.
- Unplanned environmental corrective actions.
- Unnecessary utility relocations and project delivery inefficiencies that occur because adequate information about existing utility facilities was not available to enable stakeholders apply alternative utility conflict resolution strategies.

Potential for utility conflicts exists at most transportation projects, such as in the following situations:

- Interference between utility facilities and transportation design features (existing or proposed).
- Interference between utility facilities and transportation construction activities or phasing.
- Interference between planned utility facilities and existing utility facilities.
- Noncompliance of utility facilities with utility accommodation policies.
- Noncompliance of utility facilities with safety and accessibility regulations.

Detection of utility conflicts as early as possible during the project development and delivery process can help to identify the optimum application of strategies to resolve those conflicts. Strategies normally available include one or more of the following options:

- Remove, abandon, or relocate the utilities in conflict.
- Modify the proposed transportation facility, e.g., by changing the horizontal and/or vertical alignment of the project, structure dimensions, or other characteristics.
- Implement an engineering (protect-in-place) countermeasure that does not involve utility relocation or changes to the transportation project alignment.
- Accept an exception to policy.

Relocating utilities (frequently the default path in project development) is not necessarily or always the optimal solution, which is one of the reasons that tools such as effective communication, cooperation, and coordination with all affected stakeholders are so important to help identify solution alternatives that are feasible, cost-effective, and beneficial to tax payers *and* rate payers.

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

Practices involving the use of UCMs vary widely throughout the country, not just among states but also within states. There is a need to document these practices and develop optimized UCM concepts and techniques that can contribute to standardization and optimization of the utility coordination process. SHRP 2 Project R15B addressed this need by reviewing the state-of-the-practice around the country, identifying recommendations for best practices, developing and testing standalone and database UCMs, and developing training materials and implementation guidelines. SHRP 2 Project R15C involved a pilot implementation of the SHRP 2 R15B products at the Maryland State Highway Administration.

This document contains the training materials developed as part of SHRP 2 R15B and updated as part of the SHRP 2 R15C pilot implementation.

COMPANION CD

The companion compact disk (CD) includes copies of all the training materials described in this document. The CD is organized as follows:

Folder Name	File Name	Format[1]
Binder	Training Material Binder Participant	pdf
	Training Material Binder Instructor	pdf
Instructional Materials	Lesson 5 Group 1 Exercise Materials	pdf
	Lesson 5 Group 2 Exercise Materials	pdf
	Lesson 5 Group 3 Exercise Materials	pdf
	Lesson 5 Group 4 Exercise Materials	pdf
	Lesson 5 Group Assignment	pdf
	Lesson 5 Test Hole Forms	pdf
	Lesson 5 Utility Conflict Solution Sheet	pdf
Lessons	Lesson 1	pptx
	Lesson 2	pptx
	Lesson 3	pptx
	Lesson 4	pptx
	Lesson 5	pptx
	Lesson 6	pptx
Standalone UCM	Utility Conflict Matrix	xls
Data Model and Database	UCD Data Dictionary	pdf
	UCD Data Model – Access	erwin
	UCD Data Model – Oracle	erwin
	UCD Export Schema Oracle	sql
	UCD Logical Data Model	pdf
	UCD Physical Data Model – Access	pdf
	Utility_Conflict_Database–Application	accdb
	Utility_Conflict_Database–Data	accdb

[1] File formats:

erwin	Computer Associates ERwin Data Modeler
accdb	Microsoft Access® 2010
pdf	Adobe® Portable Document Format
pptx	Microsoft PowerPoint® 2010
sql	Structured Query Language
xls	Microsoft® Excel® 2007

INSTRUCTIONS

The one-day Utility Conflicts and Solutions course is divided into six lessons, as follows:

AM Session:

- Lesson 1: Introductions and Course Overview (30 minutes)
- Lesson 2: Utility Conflict Concepts (75 minutes)
- Lesson 3: Utility Conflict Identification and Management (75 minutes)

PM Session:

- Lesson 4: Use of Database Approach to Manage Utility Conflicts (20 minutes)
- Lesson 5: Hands-On Utility Conflict Management Exercise (120 minutes)
- Lesson 6: Wrap-Up (10 minutes)

The course is designed for a total of seven hours and 15 minutes of instruction, from 8:30 AM to 3:45 PM. It includes 5:30 hours (330 minutes) of direct instructor contact and 1:45 hours (105 minutes) of breaks (including lunch). The course provides ample opportunities for participant interaction and enables the instructor to adjust session and lesson start times and durations depending on the audience and the level of participant engagement in the discussions.

The following pages provide a more detailed description of the lesson plan.

Post-Course Activities

- Instructor consolidates participant feedback forms.
- Instructor completes the instructor review form.

LESSON PLAN

Lesson Number:	**1**
Lesson Title:	**Introductions and Course Overview**
Topics:	• Introductions (both instructor and participants). • Overview of course objectives, outcomes, agenda, and reference materials. • Discussion of ground rules, sign-in-sheet, feedback forms, and other housekeeping items.
Instructional Method:	Activity 1: Instructor welcomes participants, introduces him/herself, and leads participants through introductions. Participants introduce themselves and provide a brief description of their role and experience in utility coordination, design, or other project development and delivery process matters. Activity 2: Instructor provides an overview of the course objectives, outcomes, agenda, and reference materials. Activity 3: Instructor discusses ground rules, sign-in sheet, feedback forms, and other housekeeping items as needed.
Instruction Day:	Day 1: 8:30 AM – 9:00 AM
Time Allocation:	• Activity 1: Introductions 15 minutes • Activity 2: Course overview 10 minutes • Activity 3: Housekeeping 5 minutes • Total Lesson 1 30 minutes Note: Depending on the course setting and the length of time actually spent on Lesson 1 activities, it might be possible to increase the time allocated to Lessons 2 or 3. In any case, for maximum effectiveness, it is not recommended to extend Lesson 3 beyond Noon.
Evaluation Plan:	• Instructor uses the instructor review form to take notes on the background, experience, and role of participants in utility coordination, design, or other project development and delivery process matters.
References:	• Course binder. • Lesson 1 PowerPoint file and handouts. • SHRP 2 R15B research report (http://www.trb.org/Main/Blurbs/166731.aspx). • SHRP 2 R15C research report (hyperlink TRB).

Lesson Number:	**2**
Lesson Title:	**Utility Conflict Concepts**
Learning Outcomes:	• Understanding of relevant concepts related to the management of utility conflicts within the project development and delivery process.
Instructional Method:	Activity 1: Instructor uses PowerPoint slides to: • Describe typical utility conflict management concepts and issues. Activity 2: Instructor uses PowerPoint slides and printed UCM materials to: • Describe the purpose and main findings of the SHRP 2 R15B project. • Summarize trends and other information gathered through the online surveys and follow-up interviews. • Summarize process to develop standalone UCM. • Describe UCM data model and Access database application. Activity 3: Questions and answers: • Instructor answers questions from participants. As needed, other participants participate in the discussion. • Depending on the course setting, instructor might choose to encourage questions from participants throughout the presentation instead of allocating 10 minutes at the end of the lesson for questions and answers.
Instruction Day:	Day 1: 9:00 AM – 10:15 AM
Time Allocation:	• Activity 1: Utility conflicts and project development and delivery 25 minutes • Activity 2: SHRP 2 R15B research findings 40 minutes • Activity 3: Questions and answers 10 minutes • Total Lesson 2 75 minutes
Evaluation Plan:	• Instructor uses the instructor review form to summarize the type of questions and comments from participants. Depending on the setting, this activity might need to be completed after the course. • Participants use the participant feedback form to rate the effectiveness of the presentation.
References:	• Lesson 2 PowerPoint file and handouts. • Standalone and sample UCM printouts.

Lesson Number:	**3**
Lesson Title:	**Utility Conflict Identification and Management**
Learning Outcomes:	• Understanding of process to develop and maintain a UCM using data from a sample project. • Understanding of the types of reporting options available when using a database representation of the UCM.
Instructional Method:	Activity 1: Instructor uses PowerPoint slides and sample materials to: • Demonstrate the process to identify utility conflicts using sample project drawings and associated information. • Describe structure and format of the UCM and the process to populate and maintain the UCM using sample project data. Activity 2: Discussion, questions, and answers: • Instructor answers questions from participants. As needed, other participants participate in the discussion. • Instructor encourages participants to share and discuss real-world examples and/or the applicability of UCMs to real-world situations. • Depending on the course setting, instructor might choose to encourage questions and discussion from participants throughout Activity 1 instead of allocating 30 minutes at the end of the lesson for questions and answers.
Instruction Day:	Day 1: 10:30 AM – 11:45 AM
Time Allocation:	• Activity 1: Utility conflict management and use of UCM 65 minutes • Activity 2: Discussion, questions, and answers 10 minutes • Total Lesson 3 75 minutes
Evaluation Plan:	• Instructor uses the instructor review form to summarize the type of questions and comments from participants. Depending on the setting, this activity might need to be completed after the course. • Participants use the participant feedback form to rate the effectiveness of the presentation.
References:	• Lesson 3 PowerPoint file and handouts. • Sample UCM printouts, plan sheets, and test hole reports.

Lesson Number:	**4**
Lesson Title:	**Use of Database Approach to Manage Utility Conflicts**
Learning Outcomes:	• Understanding of utility conflict data model and database capabilities. • Understanding of the process to develop and use customized queries and reports.
Instructional Method:	Activity 1: Instructor uses PowerPoint slides, Access database, and sample materials to: • Describe data model and database structure and capabilities. • Describe data model connections with other DOT information systems. Activity 2: Instructor uses PowerPoint slides, Access database, and sample materials to: • Describe how utility conflict data are stored into the database. • Illustrate the process to use Access queries, forms, and reports. Activity 3: Questions and answers: • Instructor answers questions from participants. As needed, other participants participate in the discussion. • Depending on the course setting, instructor might choose to encourage questions from participants throughout the presentation instead of allocating 10 minutes at the end of the lesson for questions and answers.
Instruction Day:	Day 1: 1:00 PM – 1:20 PM
Time Allocation:	• Activity 1: Data model structure 5 minutes • Activity 2: Use of Access database to manage utility conflicts 10 minutes • Activity 3: Questions and answers 5 minutes • Total Lesson 4 20 minutes
Evaluation Plan:	Participants' learning will be evaluated by their participation and questions.
References:	• Lesson 4 PowerPoint file and handouts. • Printed copies of sample database queries and reports.

Lesson Number:	**5**
Lesson Title:	**Hands-On Utility Conflict Management Exercise**
Learning Outcomes:	• Identification of utility conflicts on sample project design drawings. • Use of UCMs to manage utility conflicts.
Instructional Method:	For all activities: Instructor uses PowerPoint presentation and other sample materials to: • Direct course participants during exercise and answer questions as needed. Activity 1: Participants organized in groups use sample project materials and blank UCM template to: • Identify as many utility conflicts as possible on sample project materials. • Evaluate potential locations for test holes. • Transcribe utility conflict information into the UCM. Activity 2: Instructor hands out test hole data sheets. Participants use test hole data sheets to: • Review and assess potential utility conflicts. Activity 3: Participants use blank conflict resolution alternatives template to: • Choose 1-2 utility conflicts and develop 3-4 utility conflict resolution strategies each, including cost estimates. • Choose the best strategy to resolve the utility conflicts. Activity 4: Participants use PDF plan sheets and projector to: • Give a 3-minute group presentation, highlighting a utility conflict, the strategies considered to resolve the conflict, and any other lessons learned.
Instruction Day:	Day 1: 1:20 PM – 3:35 PM
Time Allocation:	• Activity 1: Identify conflicts 30 minutes • Activity 2: Review test hole data and analyze utility conflicts 30 minutes • Afternoon Break 15 minutes • Activity 3: Develop conflict resolution strategy 30 minutes • Activity 4: Group presentations 30 minutes • Total Lesson 5 135 minutes
Evaluation Plan:	• Instructor uses the instructor review form to summarize the type of questions and comments from participants. Depending on the setting, this activity might need to be completed after the course. • Participants use feedback form to rate the effectiveness of the presentation.
References:	• Lesson 5 PowerPoint file and handouts. • Sample UCM printouts, plan sheets, and test hole reports.

Lesson Number:	**6**
Lesson Title:	**Wrap-Up**
Topics:	• Instructor provides summary of course. • Instructor collects feedback forms.
Instructional Method:	Activity 1: Instructor summarizes the activities of the course, addresses any final questions of course participants, and provides some closing remarks. Participants fill out the feedback form. The instructor then collects the feedback forms provided by the course participants.
Instruction Day:	Day 1: 3:35 PM – 3:45 PM
Time Allocation:	• Activity 1: Final questions and closing remarks 10 minutes • Total Lesson 6 10 minutes
References:	• Participant feedback form.

INSTRUCTOR MATERIALS

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LESSON 5 GROUP EXERCISE INSTRUCTIONS

The anticipated duration of Lesson 5 is 120 minutes: 90 minutes for a hands-on exercise involving groups of 4-5 individuals and 30 minutes for presentations and discussion of the results. Allow for a 15 minute break in the middle of Lesson 5. Success of the lesson requires planning prior to the course as well as proper coordination and oversight during the course.

PRIOR TO THE COURSE

- **Review files required for Lesson 5**. The companion CD contains seven files with materials for this lesson (folder Instructional Materials\Handouts):

    - Lesson 5 Group Assignment.pdf.
    - Lesson 5 Test Hole Forms.pdf.
    - Lesson 5 Utility Conflict Solution Sheet.pdf.
    - Lesson 5 Group 1 Exercise Materials.pdf
    - Lesson 5 Group 2 Exercise Materials.pdf
    - Lesson 5 Group 3 Exercise Materials.pdf
    - Lesson 5 Group 4 Exercise Materials.pdf

    Lesson 5 Group 1 through 4 Exercise Materials provide 13 design sheets from the same sample project, as follows:

    - Utility Plans: Legend
    - Utility Plans: Utility Pole Data
    - Typical Sections
    - Utility Plans
    - Mainline Plan: Stage 1 Construction
    - Mainline Plan: Stage 2 Construction
    - Mainline Plan: Stage 3 Construction
    - Earthwork Cross Sections (5 sheets)
    - Drainage Profiles

- **Print sets of design sheets and handouts (one for each group)**. One set of documents is necessary for each group, with each group composed of no more than five participants (e.g., if you anticipate 20 participants, prepare four sets of documents). **For each group,** print the following, making sure to **maintain a 1:30 scale**:

    - One copy of the group exercise materials on Arch D-size (24x36 inch) paper in color. Color is necessary to distinguish different types of utilities on the design sheets. Arch D-size should allow sufficient detail for participants to determine conflicts.
    - One copy of file “Lesson 5 Test Hole Forms” (5 pages) in letter size.
    - One copy of file “Lesson 5 Utility Conflict Solution Sheet” in Arch D-size.

- Coordinate with the hosting agency for participants to bring an engineering scale to the course.

- Encourage participants to bring a tablet or laptop so they can display materials on their devices.

DURING THE COURSE

- At the beginning of Lesson 5, ask course participants to form groups of 4-5 individuals and assign each group a number from 1 to 4 (which correspond to document set numbers). Some groups will have the same number if there are more than four groups in the room.

- Divide the hands-on exercise (120 minutes) into four activities as follows:

    - **Activity 1: Identify all "potential" conflicts using QLB data (30 min)**:
        - Give each group a set of plan sheets printed on Arch D-size (24x36 inch) paper and ask participants to use the blank utility conflict matrix in section F of the participant's binder. The utility conflict matrix should be filled out during the exercise.
        - Instruct participants to fill out the utility conflict matrix up to the column that identifies the type of utility investigation needed.
        - For each utility conflict, instruct participants to determine whether there is a need for QLA data.
        - Tell the audience that, at the conclusion of the exercise, groups should be prepared to give a short (3 minutes) presentation of their results and findings.
        - If questions or issues arise during the exercise, use zoom-in views of the design sheets provided in the Lesson 5 PowerPoint file.
        - At the conclusion of 5.1, provide each group with the "solution" plan sheet that shows all the conflicts identified for the project.

    - **Activity 2: Evaluate utility conflicts using QLA test hole data sheets (30 min)**.
        - Hand out a copy of the test hole forms to each group.
        - Instruct participants to use this information to confirm or reject potential utility conflicts discovered in 5.1 of this exercise.

    - **Allow for a 15 minute break between Activity 2 and Activity 3.**

    - **Activity 3: Prepare alternative and cost analysis for one or more utility conflicts (30 min)**. Realistically, the time available is enough for 1-2 utility conflicts.
        - Instruct participants to use the cost estimate analysis subsheet included in section F of the participant's binder. The analysis should also include developing a cost analysis for the alternatives considered. Instruct

participants to establish cost estimates based on their experience with utility relocations.
- Instruct each group to come up with their own set of alternatives on how to resolve the conflict.

- **Activity 4: Group presentations and discussion (30 min).**
  - Each group should give a short presentation of a utility conflict that the group identified and how it was resolved.
  - Participants are encouraged to share other things they noticed during the exercise, such as how the group chose to define the limits of a conflict, and what process the group followed to identify conflicts.

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INSTRUCTOR NOTES

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Lesson 1

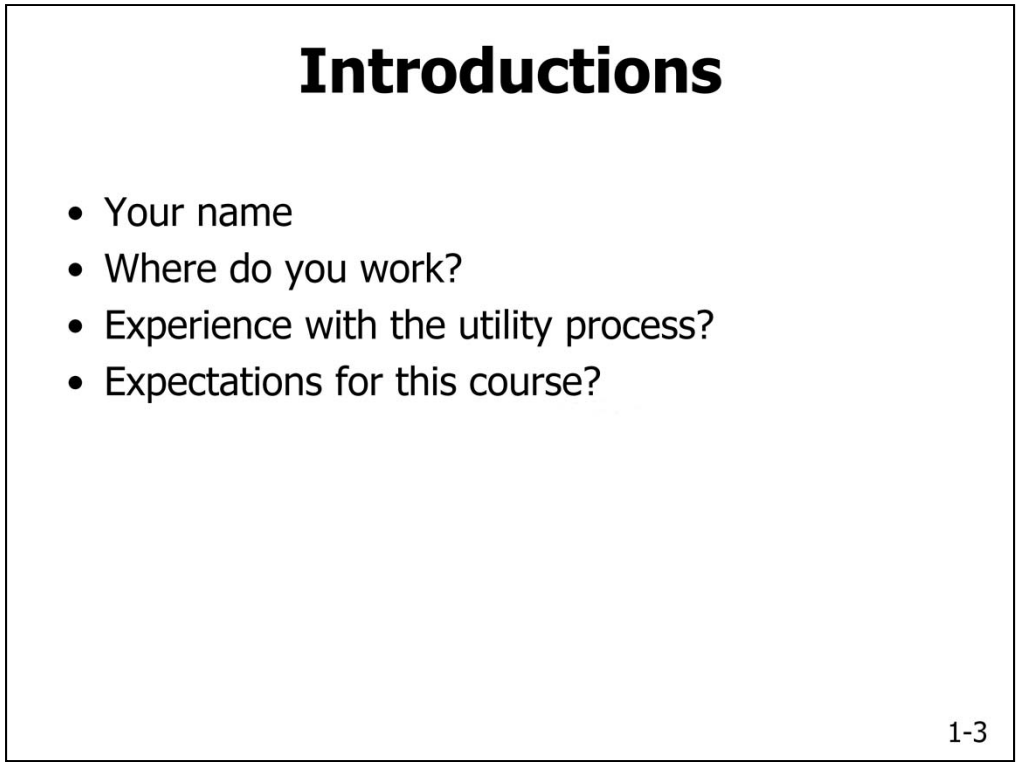
Introductions and Course Overview

1-1

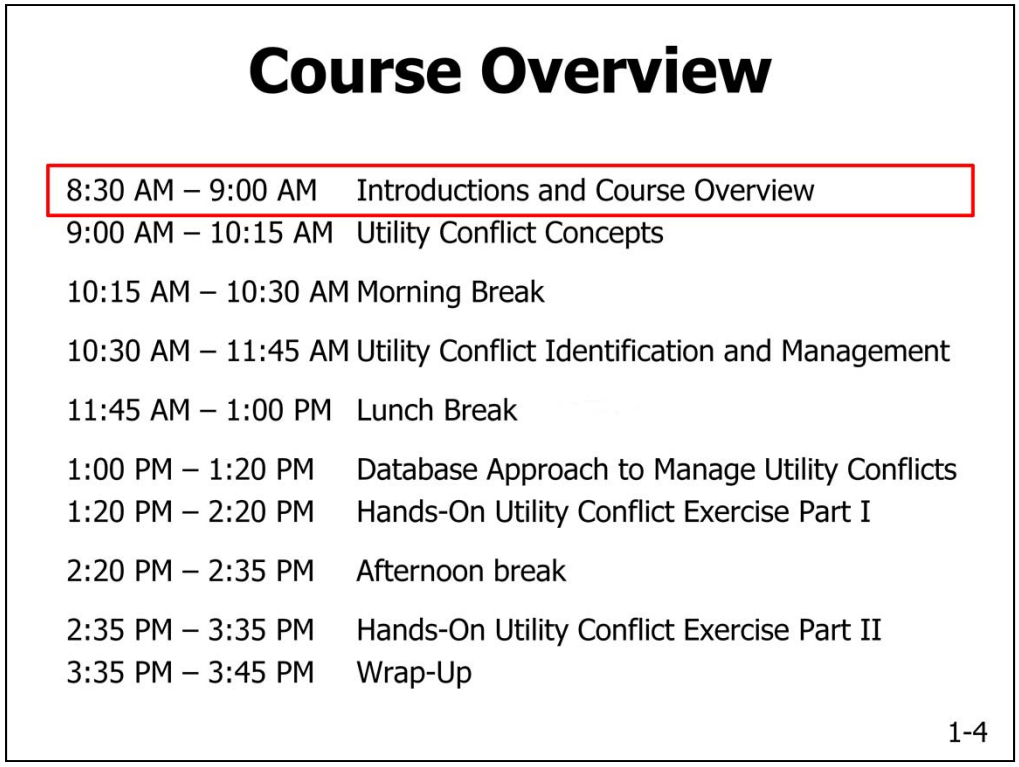
Lesson 1 Overview

1.1 Introductions
1.2 Course overview
1.3 Training objectives
1.4 Participant workbook
1.5 Housekeeping

1-2



While participants introduce themselves, take note of participant's expectations. Once introductions are complete, explain which expectations will be met by the course, and which will not.



This section of the training is Lesson 1, which provides an introduction and overview of the course.

Training Objectives

- Review concepts related to the management of utility conflicts within the project development and delivery process
- Describe the process to develop and maintain utility conflict matrices
- Review reporting options when using a database to manage utility conflicts
- Identify utility conflicts on sample design sheets
- Develop utility conflict resolution strategies

1-5

Participant Workbook

- Section A: Course overview
- Section B: Instructor materials
- Section C: Participant handout
- Section D: Utility Conflict Matrix Update Process
- Section E: Utility Conflict Matrices
- Section F: Sample project files
- Section G: Selected database lookup tables
- Section H: Course forms

1-6

Housekeeping

- Make course time as productive as possible
  - Turn off cell phones
  - Return from breaks and lunch on time
  - Stay on task during activities
- Ask questions
- Use sign-in sheet
- Use course feedback form
- Miscellaneous

1-7

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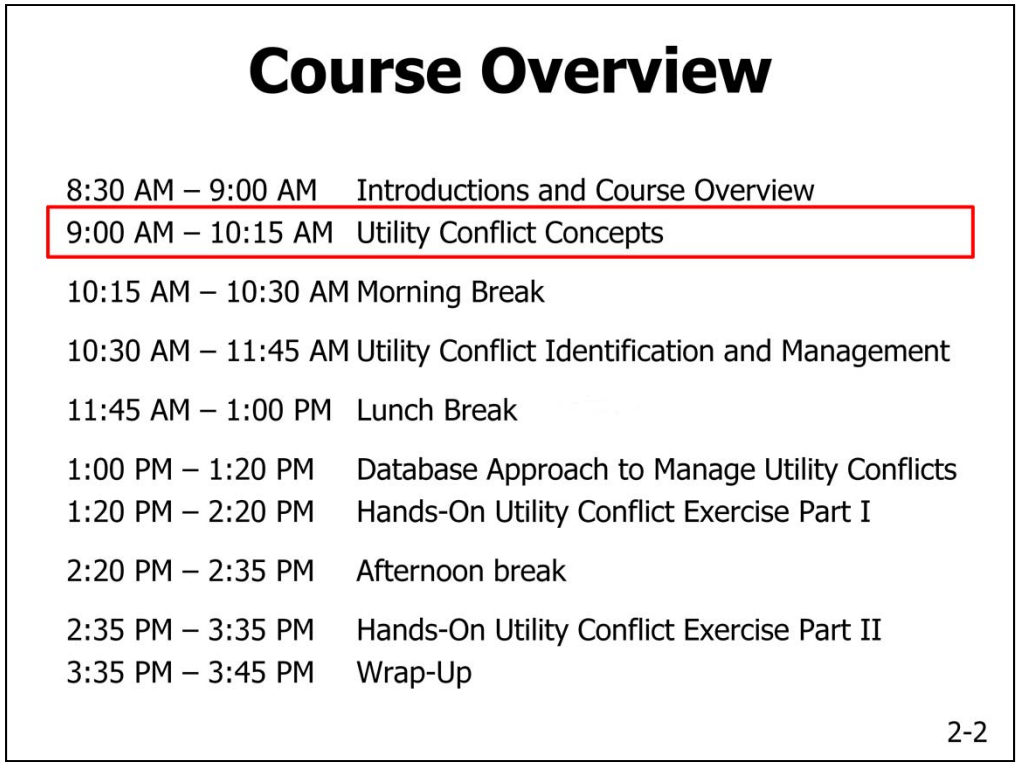
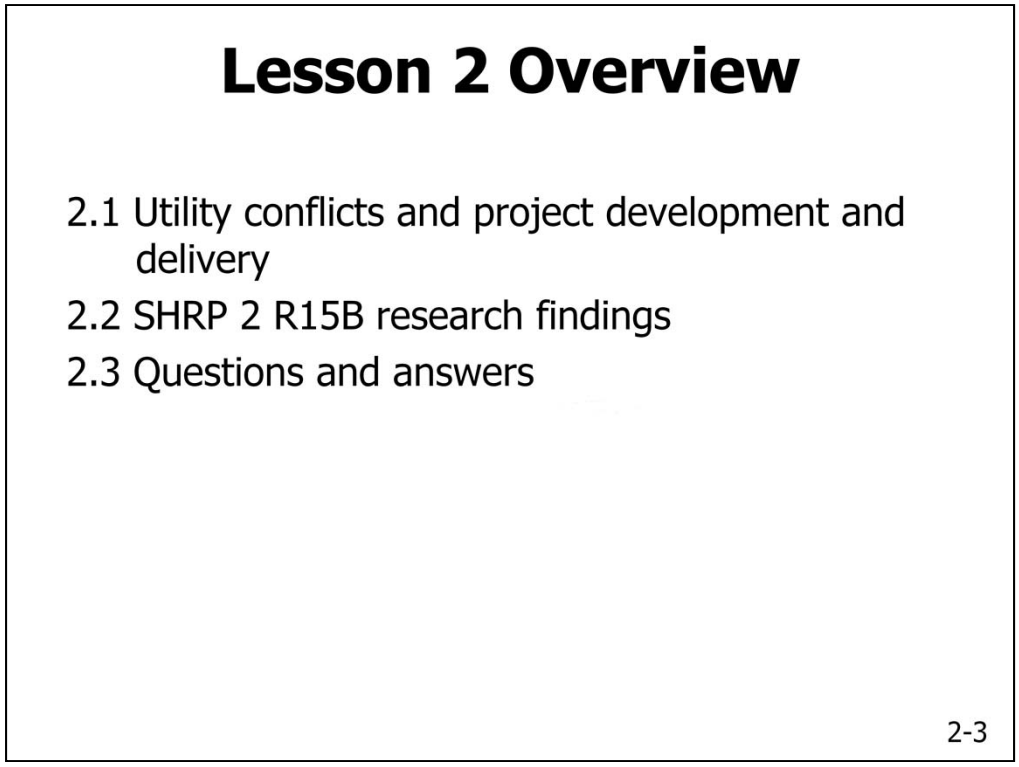
Lesson 2

Utility Conflict Concepts

2-1



This section of the training is Lesson 2, which deals with basic utility conflict concepts and a summary of lessons learned from research project SHRP 2 R15B.



Purpose of Lesson 2:

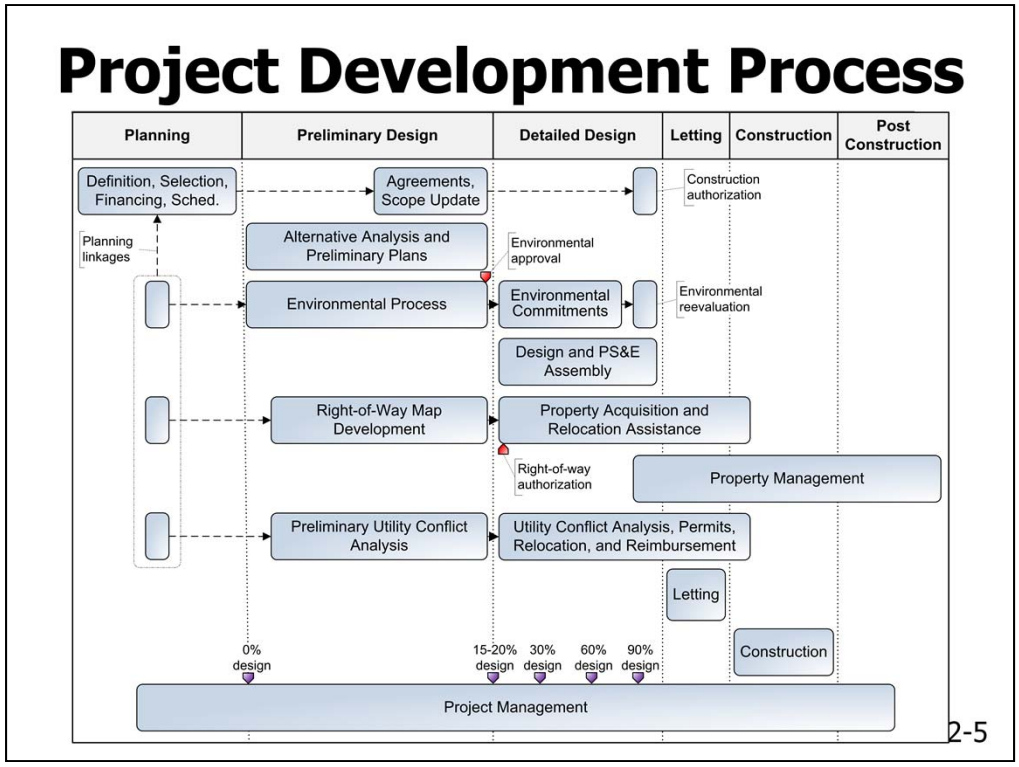
• Provide an understanding of relevant concepts related to the management of utility conflicts within the project development process.

• Provide an understanding of the findings of the SHRP 2 R15B project.

2.1

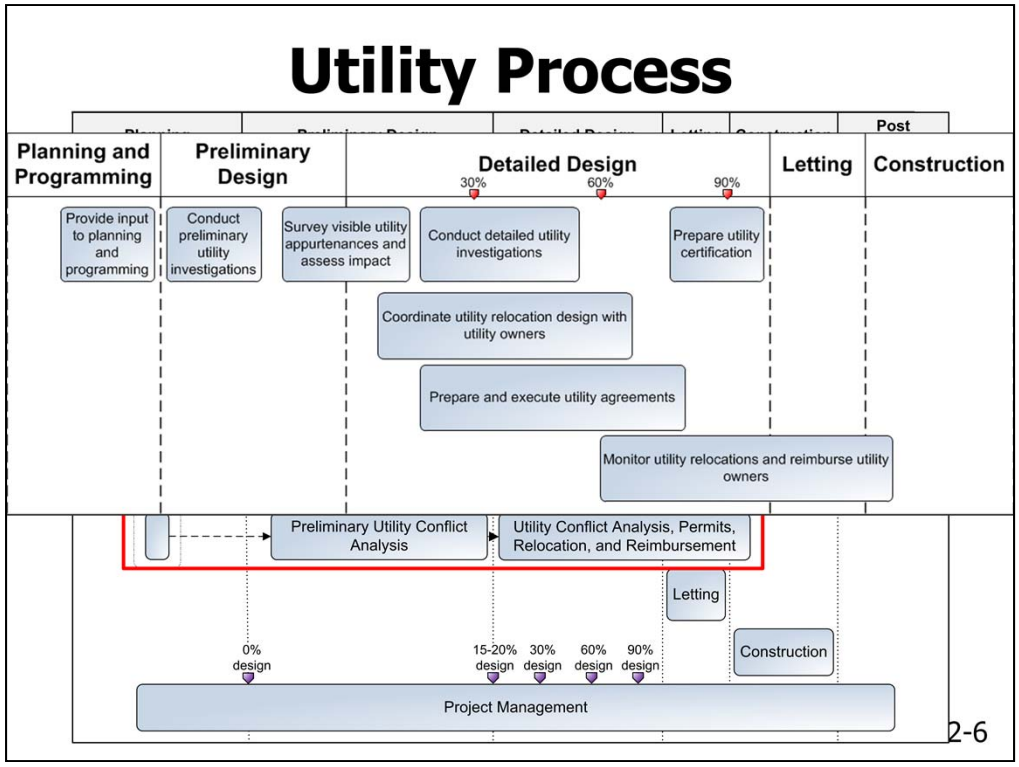
Utility Conflicts and Project Development and Delivery

2-4



The utility process does not exist in the vacuum. It exists within the context of the process to develop and deliver a project, which might involve many different phases.

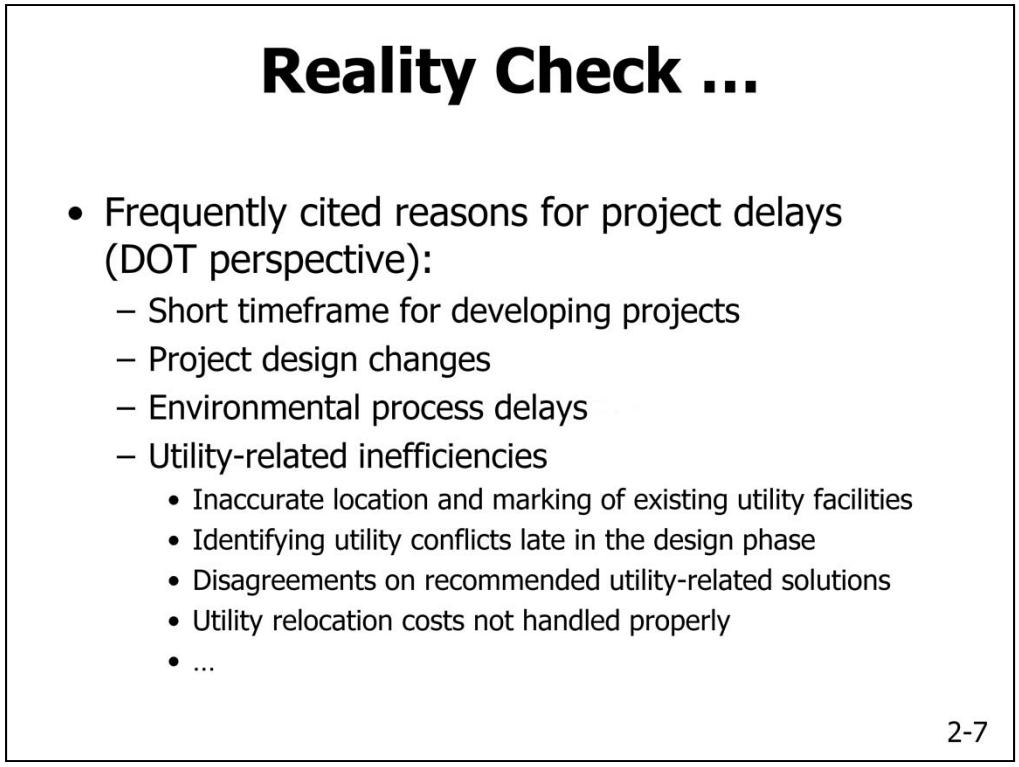
This slide shows a typical representation of the traditional design-bid-build project development and delivery process at most state DOTs. Utility-related activities can start early in the process, and many state DOTs have a goal to complete utility relocations before the project goes to construction. A key element associated with the success of utility activities is Communication, Cooperation, and Coordination between the state DOT and utility owners. In practice, the three Cs do not always happen.



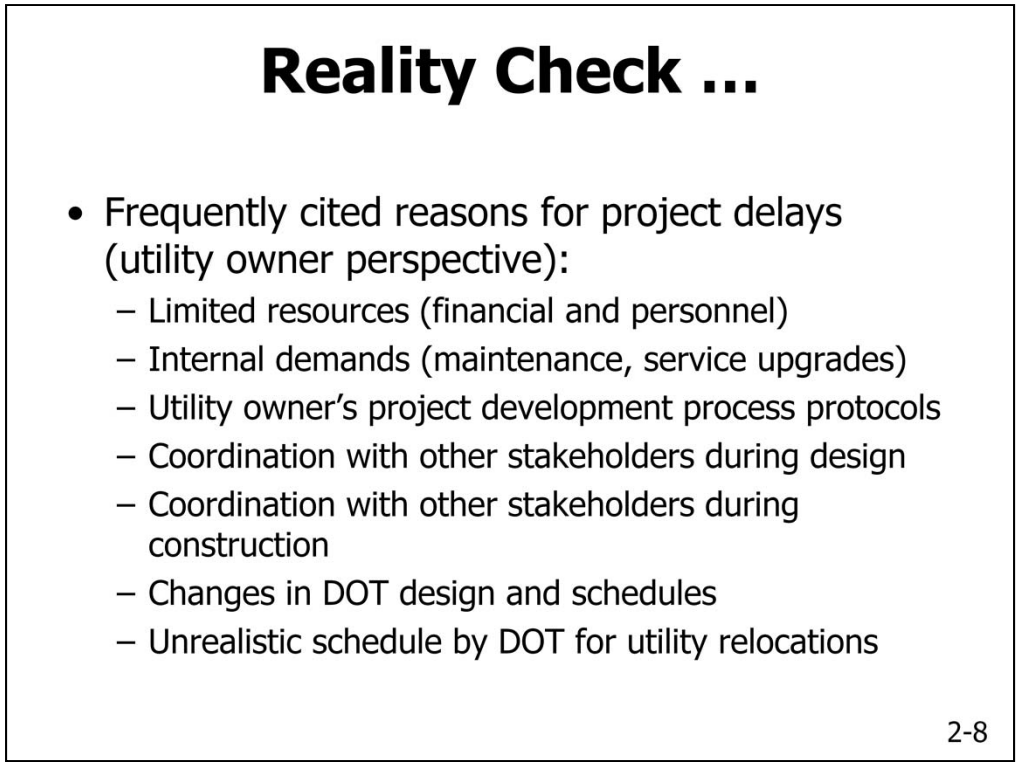
This slide focuses on a portion of the project development and delivery process, the utility process, which may span from planning to post-construction. Utility conflict resolution is a portion of the utility process that typically begins at the end of preliminary design and should ideally end before the beginning of construction.

To function properly, the utility process needs utility data input, which occurs at different times of the process. Typically, as time progresses, utility information becomes more detailed and precise. Although any type of utility data can be collected at any time during the project development process, it is typical to collect QLD and QLC data during preliminary design and the beginning of detailed design, and QLB and QLA data during detailed design.

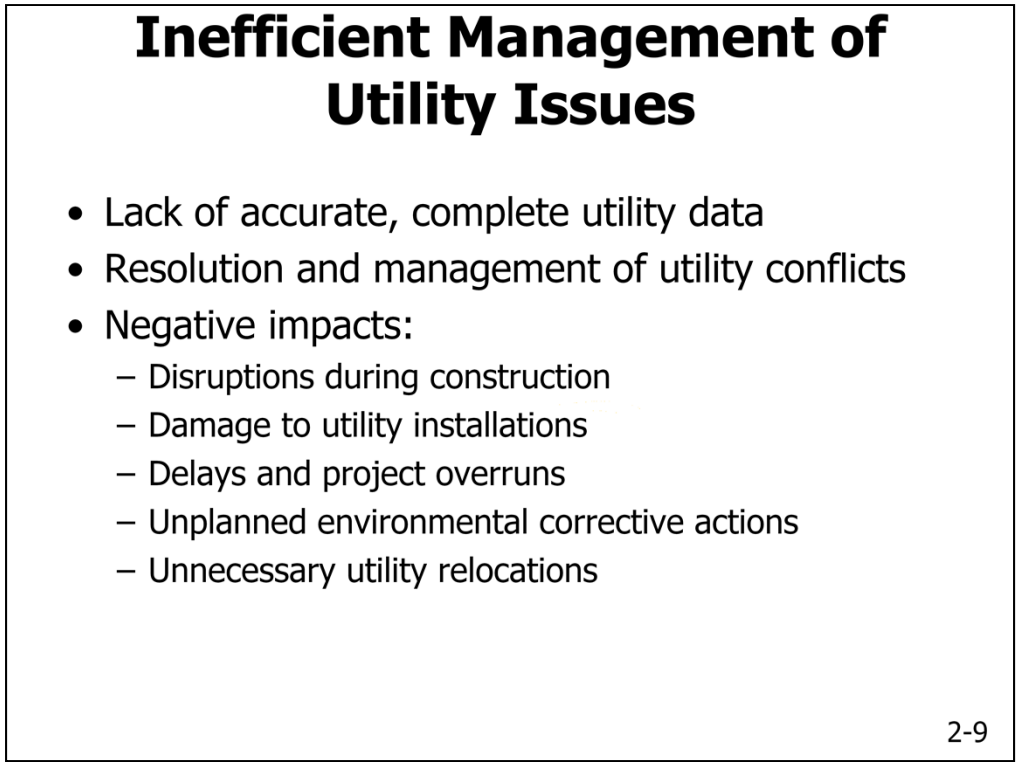
Other elements of the utility process include coordination of utility relocation activities, preparation and execution of utility agreements, preparation of utility certifications, and monitoring of utility relocations and reimbursement of utility owners.



Inefficiencies in the utility process are frequently blamed for delays in developing and delivering projects. The slide shows examples of situations that produce utility inefficiencies. The list is not exhaustive.

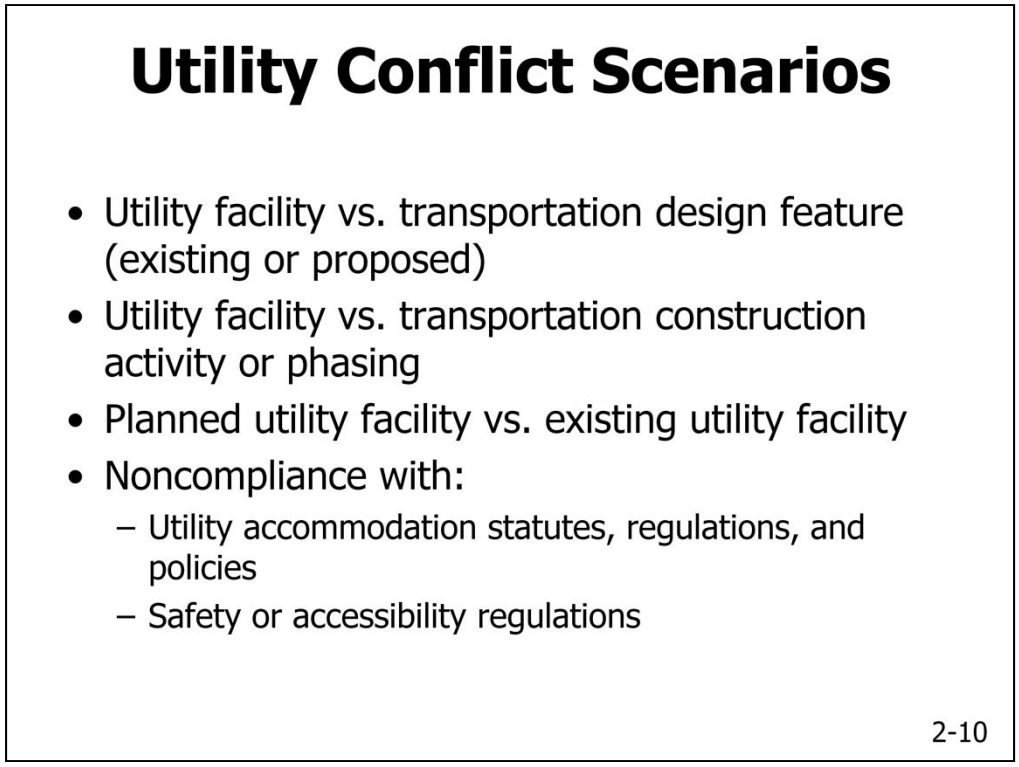


State DOTs are not the only party affected by inefficiencies. This problem also affects other stakeholders, e.g., utility companies. Utility companies have a host of challenges of their own, including operating under tight financial conditions (frequently, utility relocation is a low priority to utilities since it is not a revenue generating activity). They also have their own plans and schedules and need to accommodate requests from a third party (i.e., the DOT). In addition, there are issues related to the coordination with the DOT.



Two critical factors that contribute to inefficiencies in the management of utility issues are (a) the lack of accurate, complete information about utility facilities that might be in conflict with the project and (b) the resolution and overall management of those conflicts. These inefficiencies can result in problems, such as the following:

- Disruptions when utility installations are encountered unexpectedly during construction, either because there was no previous information about those installations or because their stated location on the construction plans was incorrect.
- Damage to utility installations leading to disruptions in utility service, environmental damage, and risks to the health and safety of construction workers and the public.
- Delays that can extend the period of project development and/or delivery and increase total project costs through higher bids, change orders and/or damage or delay claims, redesign, and litigation by utility owners or agencies. These delays also result in frustration by the traveling public and negative public perception about the project.
- Unplanned environmental corrective actions.
- Unnecessary utility relocations and project delivery inefficiencies that occur because adequate information about existing utility facilities was not available to enable stakeholders apply alternative utility conflict resolution strategies.



Potential for utility conflicts exists at most transportation projects, including the following:

• Interference between utility facilities and transportation design features (existing or proposed).

• Interference between utility facilities and transportation construction activities or phasing.

• Interference between planned utility facilities and existing utility facilities.

• Noncompliance of utility facilities with utility accommodation statutes, regulations, and policies.

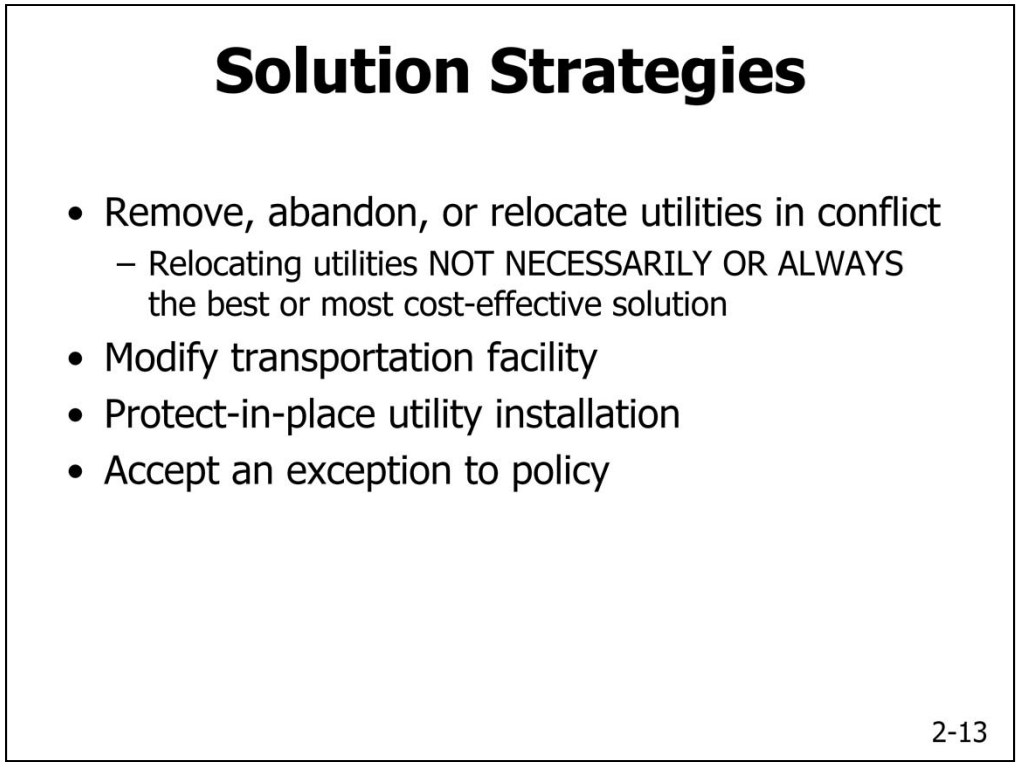
• Noncompliance of utility facilities with safety regulations.

Examples of situations where a utility facility is in conflict with a transportation facility.

In the top-left picture, the property owner arrived home and saw a newly installed pole, which obviously was blocking the driveway. The pole should have been built about 20 feet to the right to coincide roughly with the property line. The situation was corrected soon afterwards.

Picture on the left: Potential conflict of utility facility with a construction phase.

Picture on the right (courtesy of Ray Sterling): Street in Shanghai. Road construction in preparation for the Shanghai Expo. The sign on the pole warns about construction (and congestion) ahead and directs drivers to take a detour to the right (not clear what drivers; presumably those who may be driving on the same lane as where the pole is located). Both poles and attached utility lines appear to be old and waiting to be relocated.



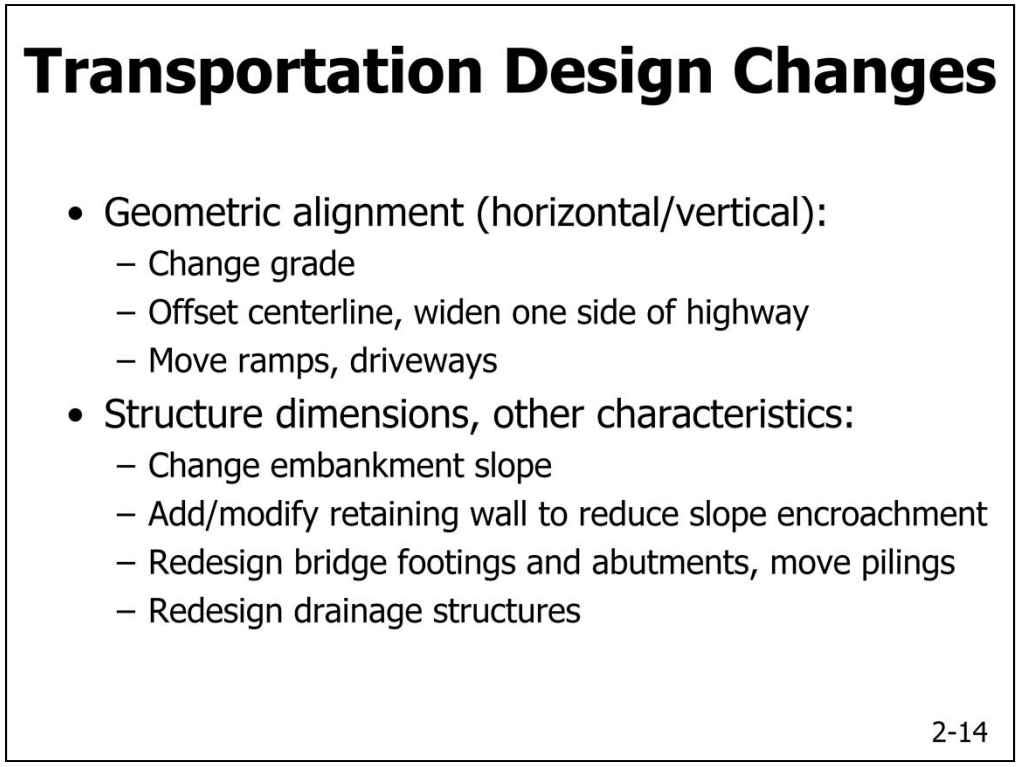
Strategies available to address utility challenges at state DOTs normally include one or more of the following options:

• Remove, abandon, or relocate the utilities in conflict (this is the traditional approach; however, it is not necessarily or always the best solution for the project).

• Change the horizontal and/or vertical alignment of the proposed transportation facility.

• Implement an engineering (protect-in-place) countermeasure that does not involve utility relocation or changes to the transportation project alignment.

• Accept an exception to policy.



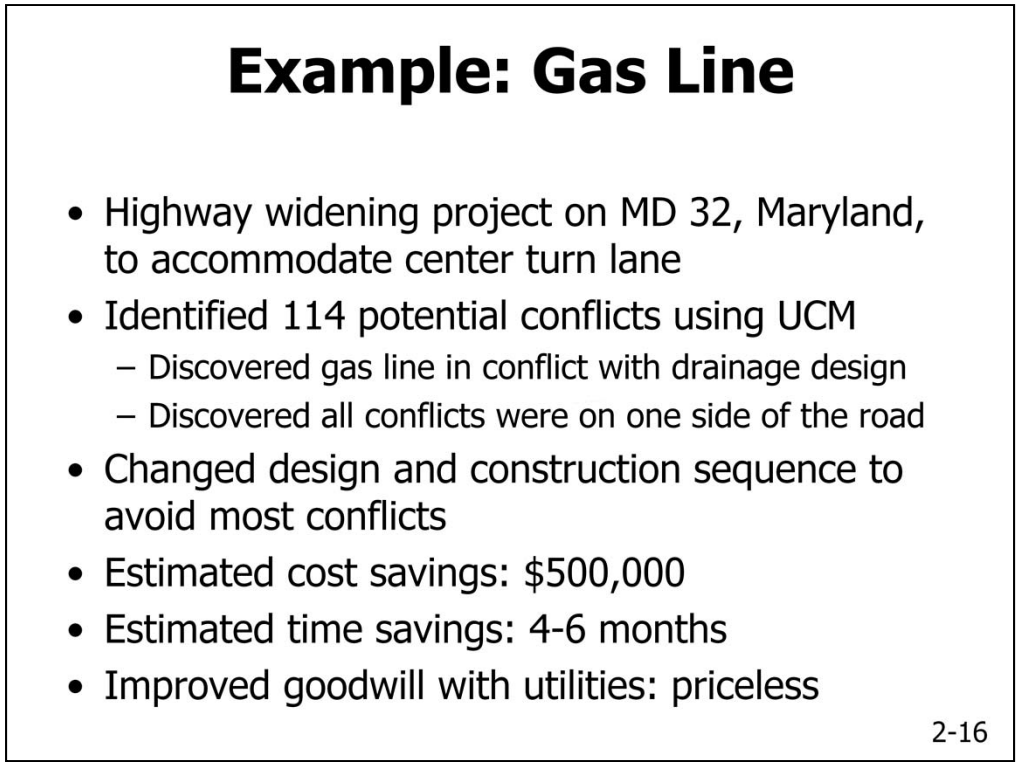
This slide shows potential examples of transportation project design changes that could be implemented to help avoid unnecessary utility relocations.

Example: Widening Both Sides vs. One Side of Highway

- Issues to consider:
  - Widening both sides of highway impacts everyone (no one is spared!)
  - Widening one side can reduce utility impacts
  - Depends on what kind of utilities are affected

2-15

In this example, a project is looking at adding lanes to a corridor, and the question is whether to widen the corridor on both sides (potentially affecting everyone) or only on one side. Widening on one side can reduce utility impacts. However, the decision should be taken after taking into consideration factors such as what kind of utilities would be affected and the total estimated cost.



The preliminary overall utility estimate used to request funding was $1.2 million for this project. District officials at the Maryland State Highway Administration indicated that this estimate decreased by approximately $500,000 because all drainage conflicts with a gas line were avoided through realignment of the proposed drainage pipes and confirming that the gas line was not in conflict with full-depth pavement reconstruction. A rough estimate of time benefits provided by district officials indicated a delay savings of about 4-6 months, i.e., the time it would have taken to move the gas line.

In the view of district officials, the most significant benefit of using the UCM was that it helped them determine that all utility conflicts were on one side of the road, and conflicts could be avoided by changing the sequencing of the work. This made coordination activities with utility owners much easier. Utility owners saw that MDSHA made a genuine effort to avoid unnecessary relocations, which created a much better working relationship with utility owners that is likely to have an impact on future projects.

Example: Embankment

- Due to interstate widening, embankment had to be raised 50-60 feet
- Major gas and water facilities in the area
- Large soil settlement expected
- Modified project to protect-in-place utilities:
  - Foam layer
  - Thin concrete cap
- Costly utility relocation was avoided

2-17

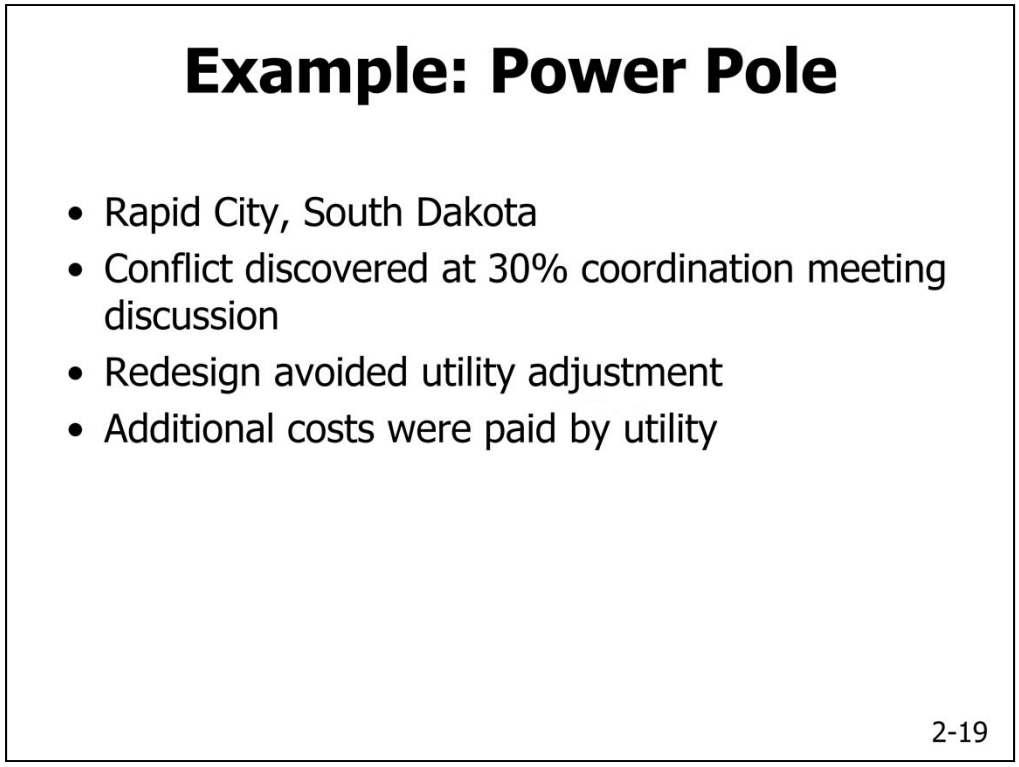
In this example from Georgia, widening an interstate highway required raising the embankment by 50-60 feet. There were major utilities in the area, and significant soil settlement was expected because of the additional weight. The DOT was able to avoid costly utility relocations by using a foam layer and a concrete cap to protect the existing utilities in-place.

Example: Bridge

- Bridge project affected multiple utilities (power, water, sewer, etc.)
- Modifying horizontal bridge alignment slightly
  - Would have avoided any utility impact
  - Would not have impacted right-of-way
  - Would not have compromised bridge construction
- Discovered during construction… too late!
- Utility relocation costs = $5,000,000

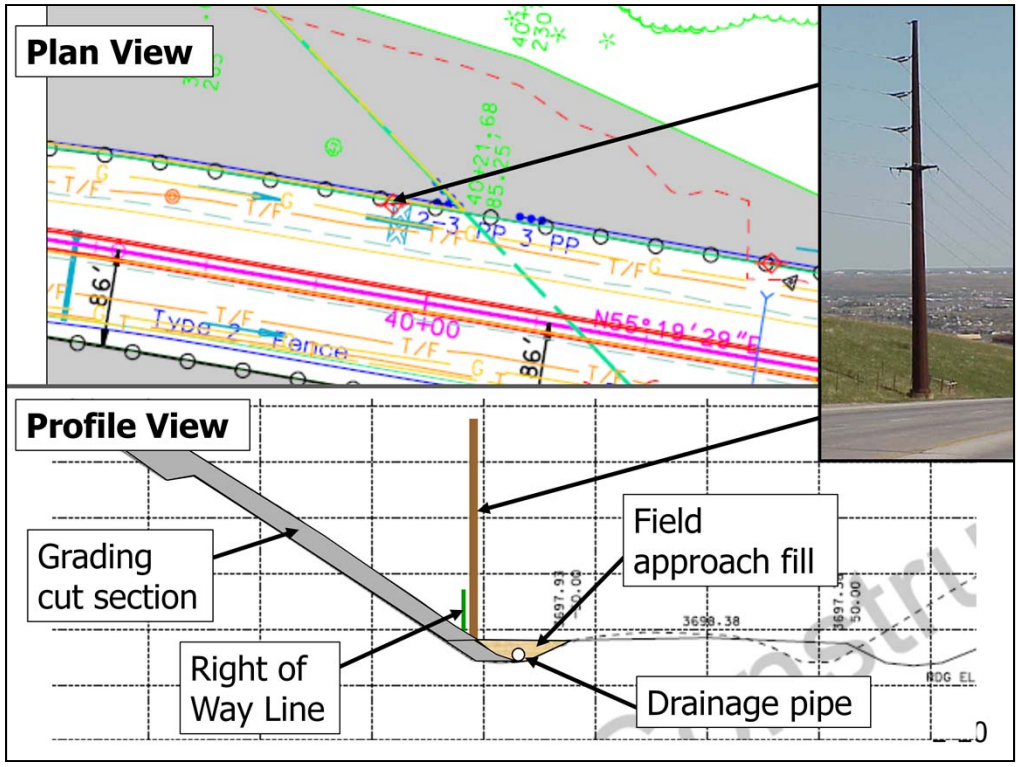
2-18

In this example from Georgia, there was a bridge project that affected many utilities. Unfortunately, only during construction it became evident that modifying the horizontal bridge alignment slightly would have avoided utility impacts without affecting the right-of-way or the construction phase. The affected utilities were relocated at a cost of $5 million, which could have been avoided.

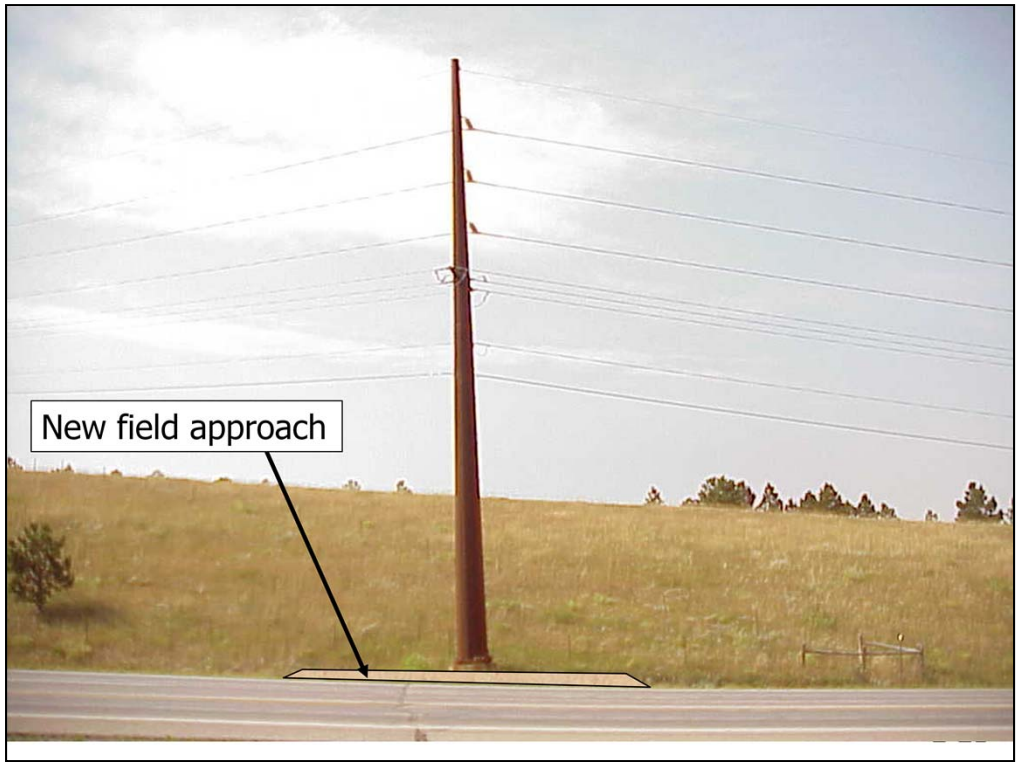


Steel power pole on Catron Blvd. in Rapid City, South Dakota. The impacts to this pole were discussed in a meeting involving SDDOT and utility owner at 30% detailed design. The power company reimbursed SDDOT for the additional cost to install a small field approach, which allowed the pole to remain in place. Black Hills Power and Light also felt that having a flat area to park their maintenance equipment (boom truck) was a bonus.

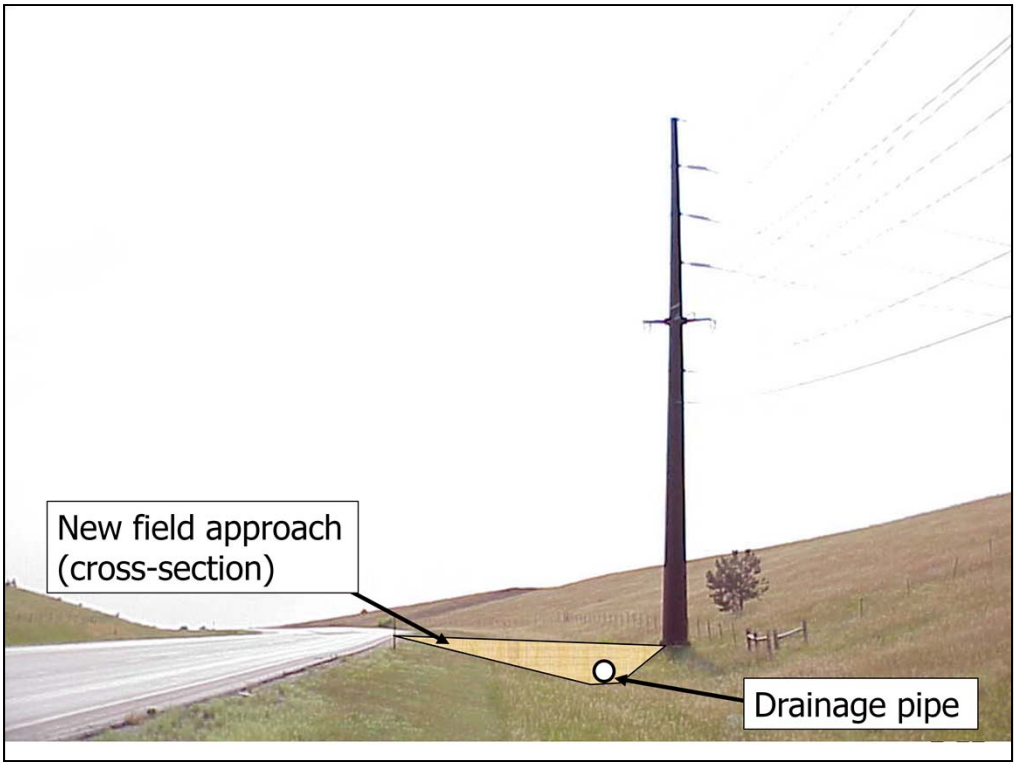
This is an example where utility coordination at an early stage (i.e., 30% design) resulted in significant benefits to stakeholders.



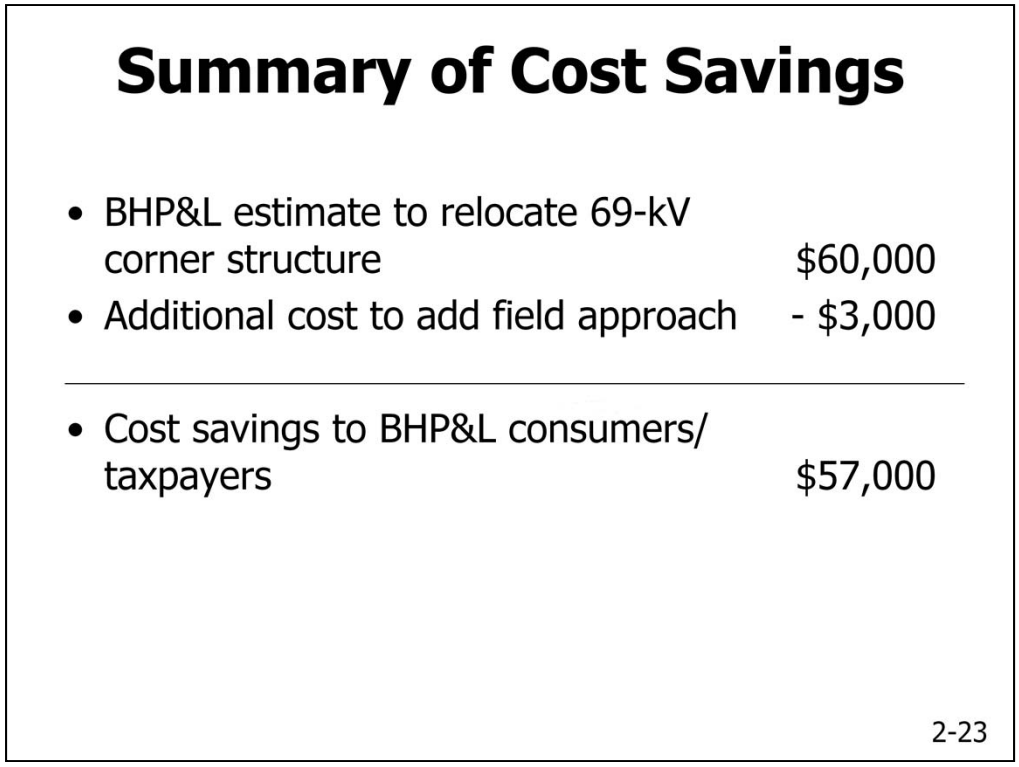
The vertical green line, shown in the cross section view, is depicting the existing right of way line. The shaded area is showing the dirt removed using the typical grading cut section.



The field approach was designed to be small enough so that regular road drivers would not mistake it for an area to pull off the road.



SDDOT added a pipe under the field approach for drainage purposes.



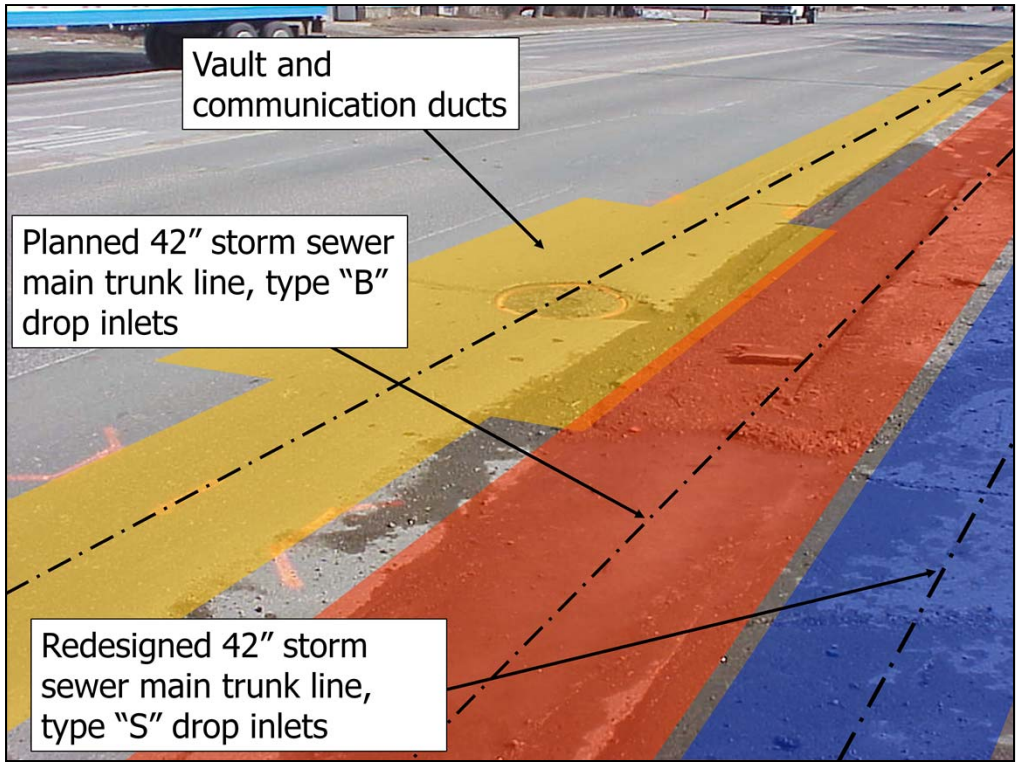
The power company reimbursed SDDOT, which provided substantial savings to the company at no extra cost to the DOT.

Example: Storm Sewer and Communication Duct System

- Aberdeen, South Dakota
- Communication ducts along 5 blocks of city streets
- 5 vaults (5 feet x 7 feet x 12 feet) connected with 9 4-inch ducts encased in concrete
- In conflict with planned storm sewer

2-24

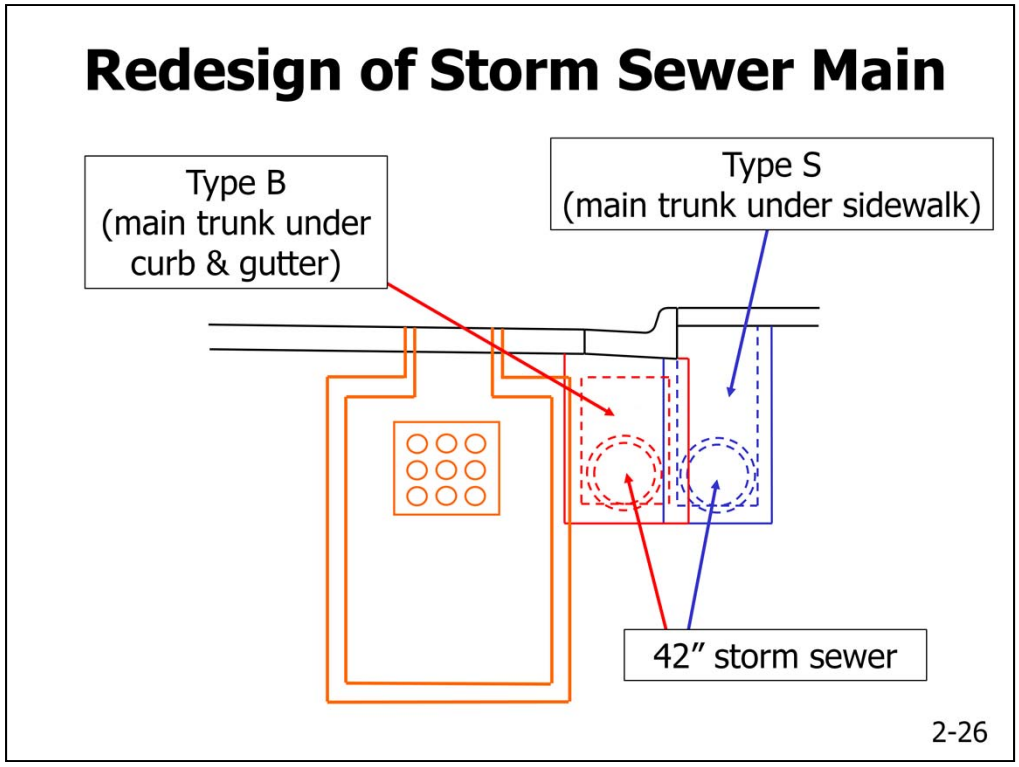
In this example from South Dakota, several vaults connected by a communication duct system were found to be in conflict with a planned storm sewer trunk line.



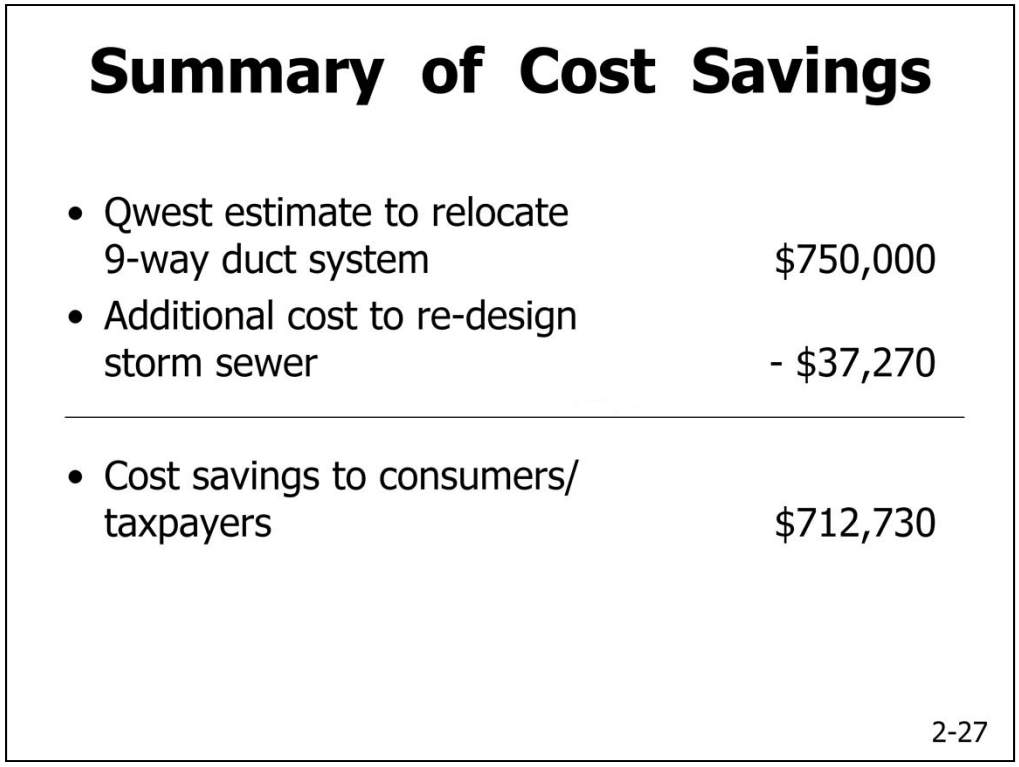
In this slide:

- Yellow shows the approximate footprint of a vault and communication ducts.
- Red shows the approximate footprint of the planned 42" storm sewer trunk line with type "B" drop inlets.
- Blue shows the approximate footprint of the redesigned 42" storm sewer trunk line with type "S" drop inlets.

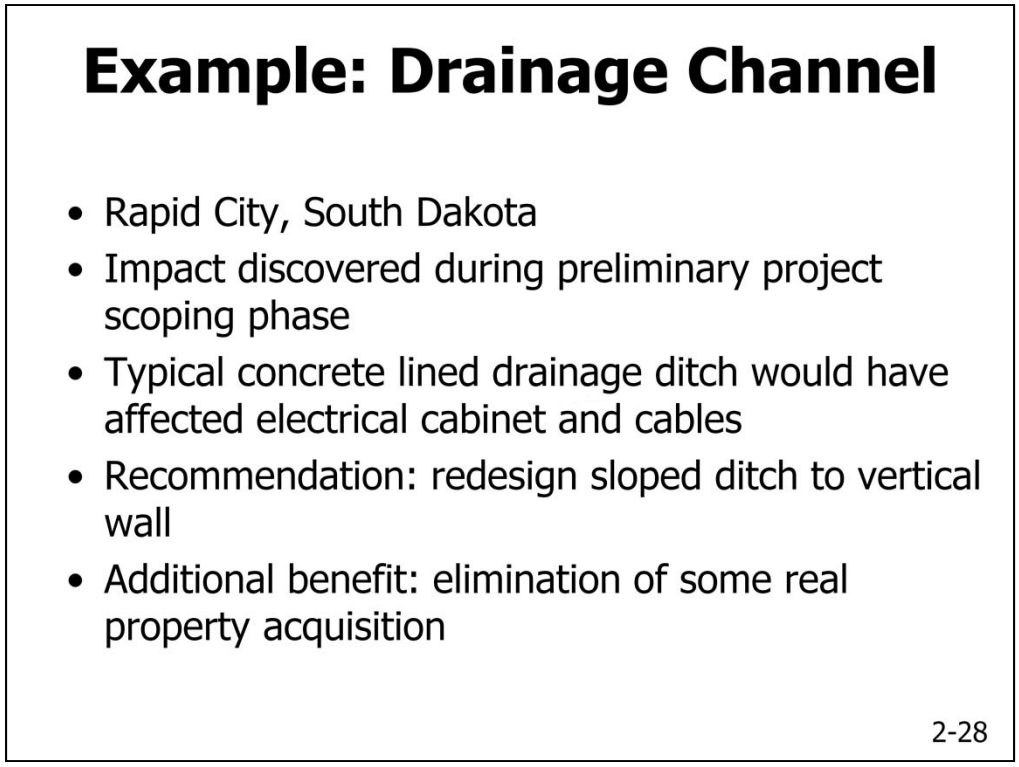
Note: The three color bands are schematic and are only intended to provide an approximate view of the facilities involved.



The storm sewer inlets were planned at the beginning and end of the trunk system, which interfered with the location of the vaults. Moving the inlets may have avoided the vaults but would have caused other problems. The type S inlets allowed the inlets to remain at the same location along the trunk line as planned initially and avoided the conflict with the vaults and duct system.

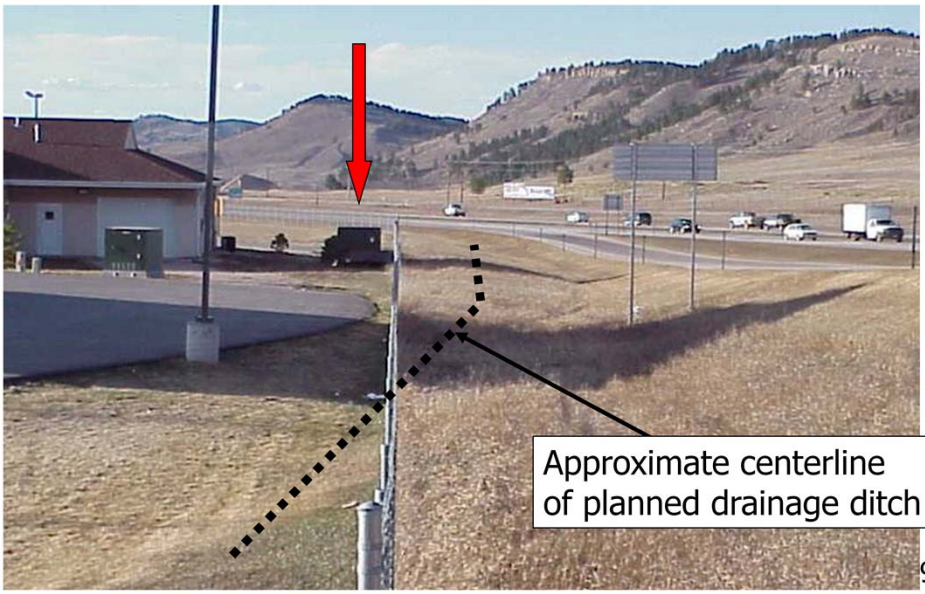


Cost of the redesign were minimal in comparison to the cost savings by allowing the duct system to remain in place.

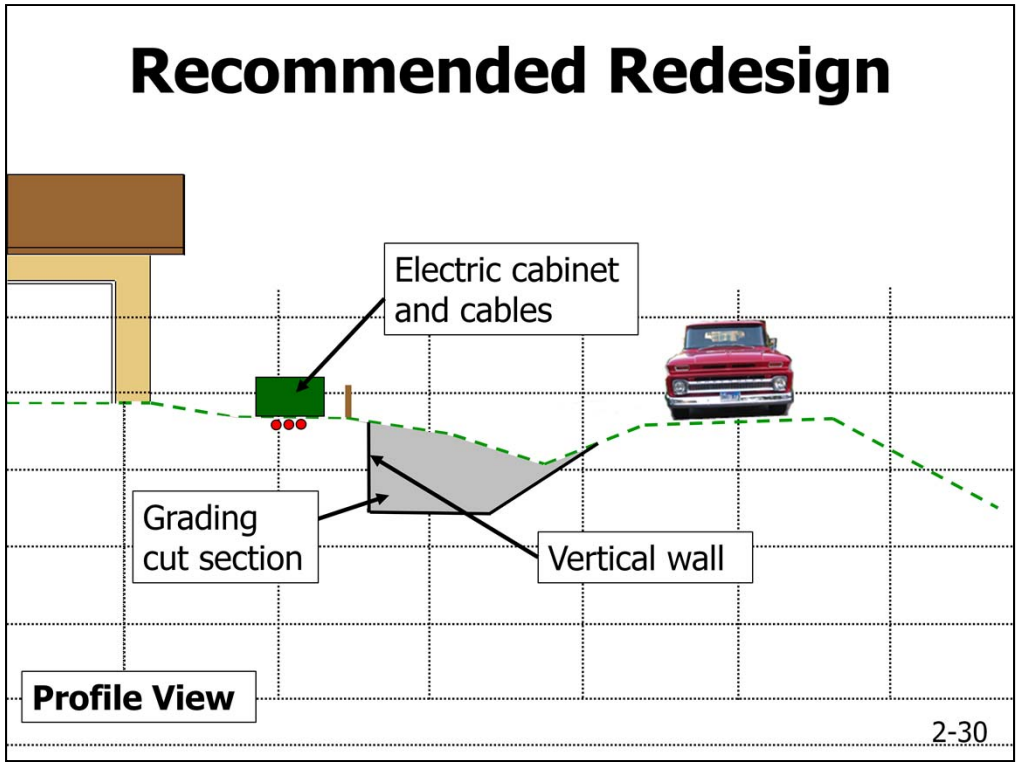


The impact to existing electrical cabinets and cables was discovered during a preliminary project scoping field visit. After some discussion, the state DOT recommended constructing a vertical wall to avoid the utility conflict.

Example: Drainage Channel



9

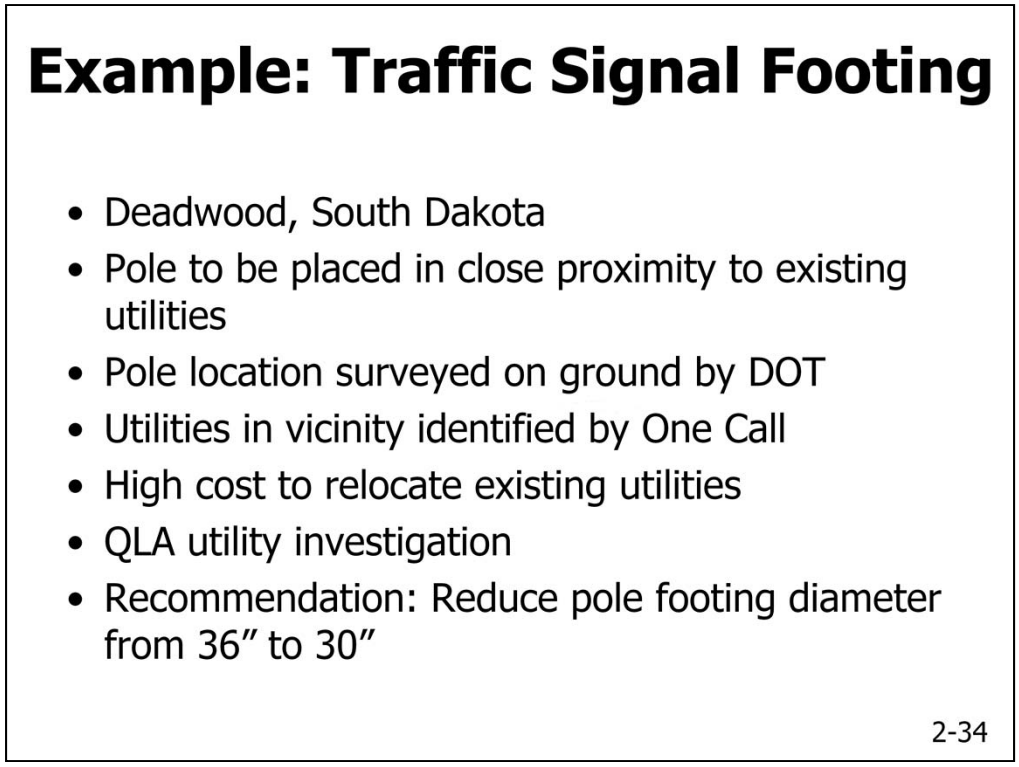


The vertical wall reduced the channel cross-section, but a hydraulic analysis found the cross-section to be adequate if the length of the concrete lining on the sloped side could be increased slightly.

2-31

2-32

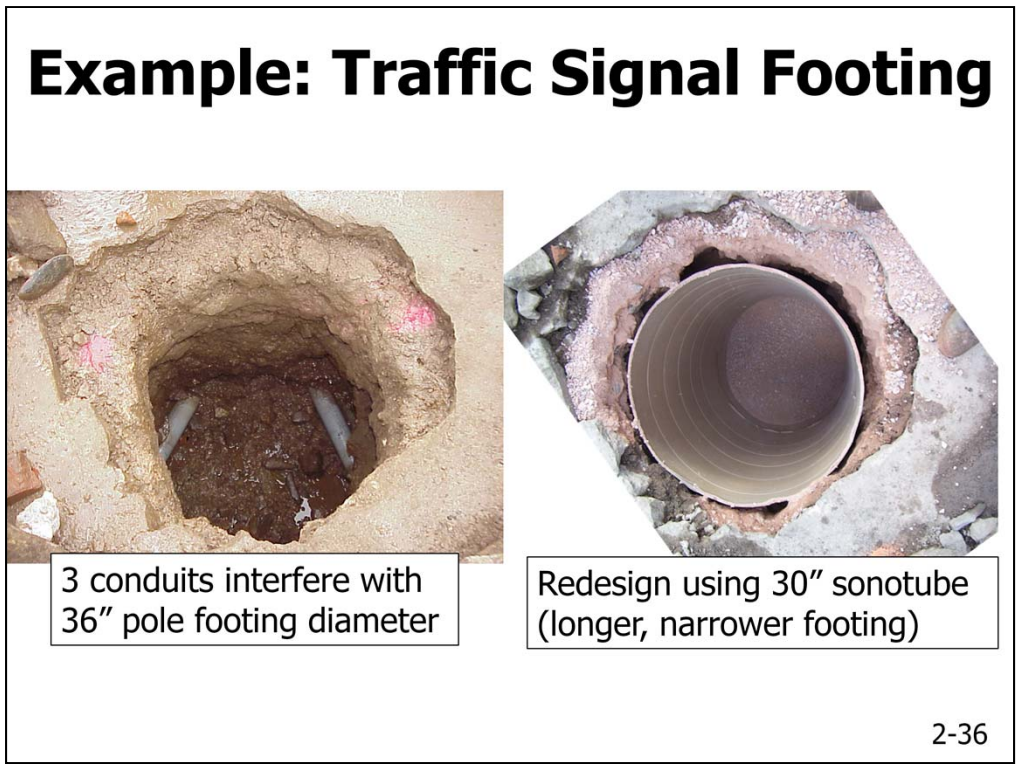
2-33



Utilities were identified by the South Dakota One Call ticket process in the immediate vicinity of a proposed signal location. The power company informed the DOT that there were 3 underground conduits coming from a transformer in the area of the proposed signal footing. The proposed signal location was surveyed on the ground by the DOT, markings were reviewed in the field, and vacuum excavation was used to confirm the location of the utilities. The estimated cost to relocate the utilities was $95,000.

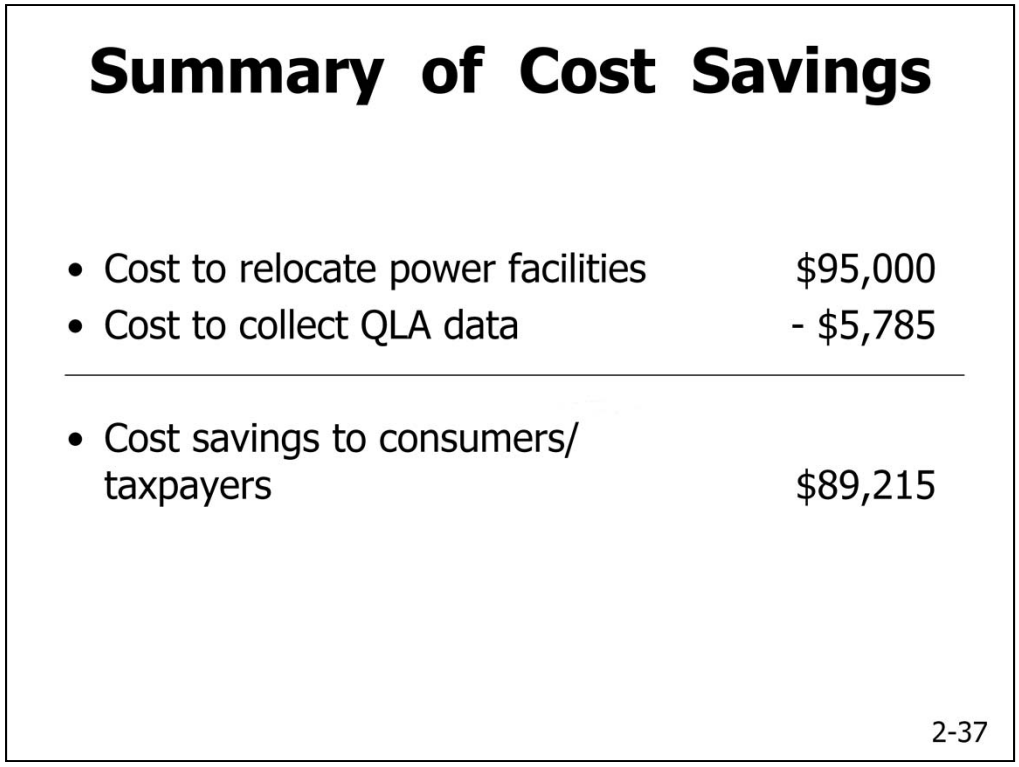
A loss of power would have greatly affected businesses in Deadwood. It was of interest to determine whether the footing could fit with the existing utilities. The typical footing diameter of a signal pole is 36". At this location, this diameter would not fit between the 3 conduits. The solution was to decrease the footing diameter to 30" and increase the depth to equal the designed required lateral support.

This picture shows the vacuum excavation to expose the utilities.

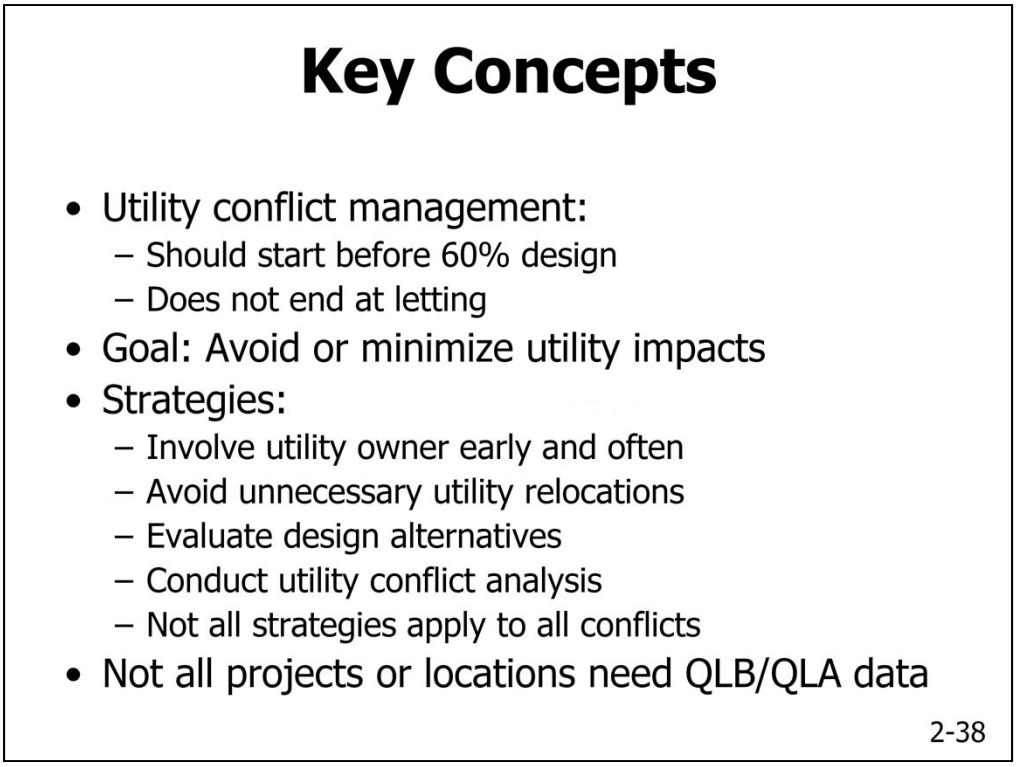


In the picture on the left, the third conduit is not visible. The conduit is located toward the front of the picture.

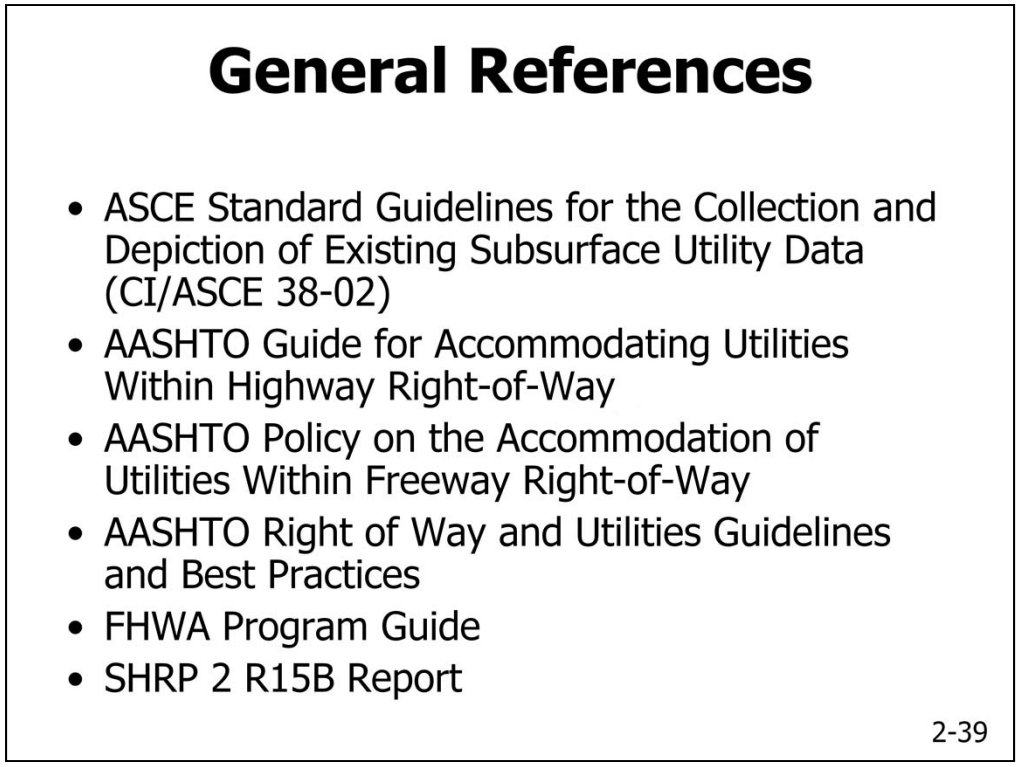
The 30” sonotube fit in between the existing conduits.



The cost to redesign the signal footing were negligible. The cost for the vacuum excavation were only a fraction of the estimated cost to relocate the utilities.



This slide shows key concepts to keep in mind when addressing utility conflicts.



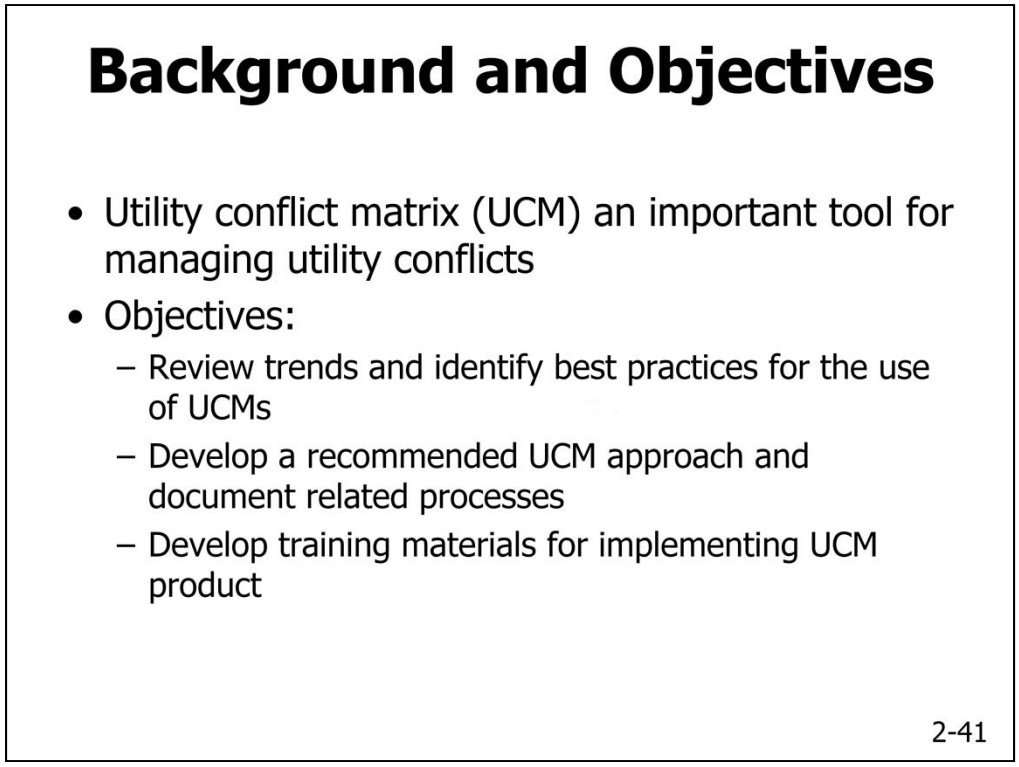
A number of references are available, which discuss utility accommodation and relocation issues (although not necessarily utility conflicts or utility conflict resolution matters).

This part of Lesson 2 provides a summary of the main findings of project SHRP 2 R15B "Identification of Utility Conflicts and Solutions." SHRP 2 was authorized by Congress to address some of the most pressing needs related to the nation's highway system and was organized into four research focus areas:

- Safety
- Renewal
- Reliability
- Capacity

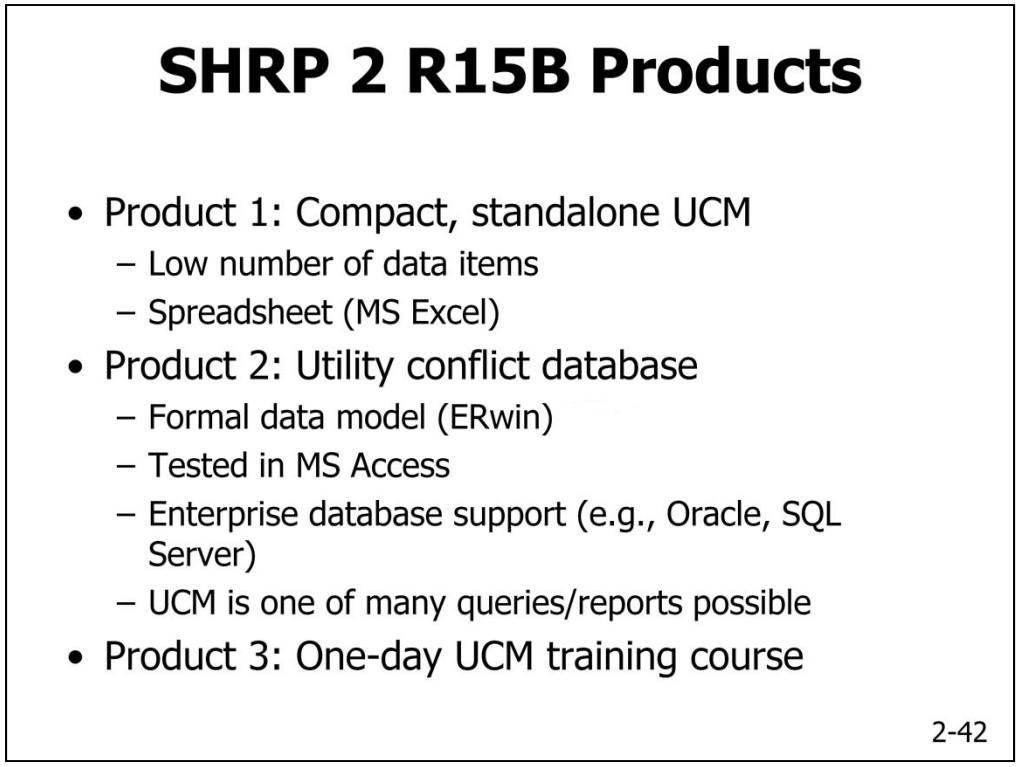
The Renewal area focused on the development of technologies and institutional solutions to support the systematic rehabilitation of highway infrastructure.

SHRP 2 R15B was part of the Renewal area. It started in 2009 and ended in 2011. A follow-on project (SHRP 2 R15C) started in 2012 and ended in 2014, focusing on the pilot implementation of the research products developed as part of SHRP 2 R15B.



As mentioned previously, utility conflicts are frequently blamed for unnecessary project delays and cost overruns. Utility-related activities in the project development process involves the production and exchange of enormous amount of data and supporting documents, including schematics, design files, agreements, and certifications. A critical component of this process is how to document and manage utility conflict data effectively. Utility conflict tables, also known as utility conflict matrices (UCMs) or utility conflict lists, enable users to organize and track utility conflict data. In practice, these tables or matrices support a wide range of related processes, including conflict analyses, utility agreement development, construction letting, as well as utility relocation scheduling, billings, and payments.

Practices involving the use of UCMs vary widely throughout the country, not just among states but also within states. There was a need to document these practices and develop optimized UCM concepts and techniques to standardize and optimize utility-related activities in the project development process. SHRP 2 R15B addressed this need by reviewing the state-of-the-practice around the country, identifying recommendations for best practices, developing and testing a UCM concept, and developing training materials and implementation guidelines.

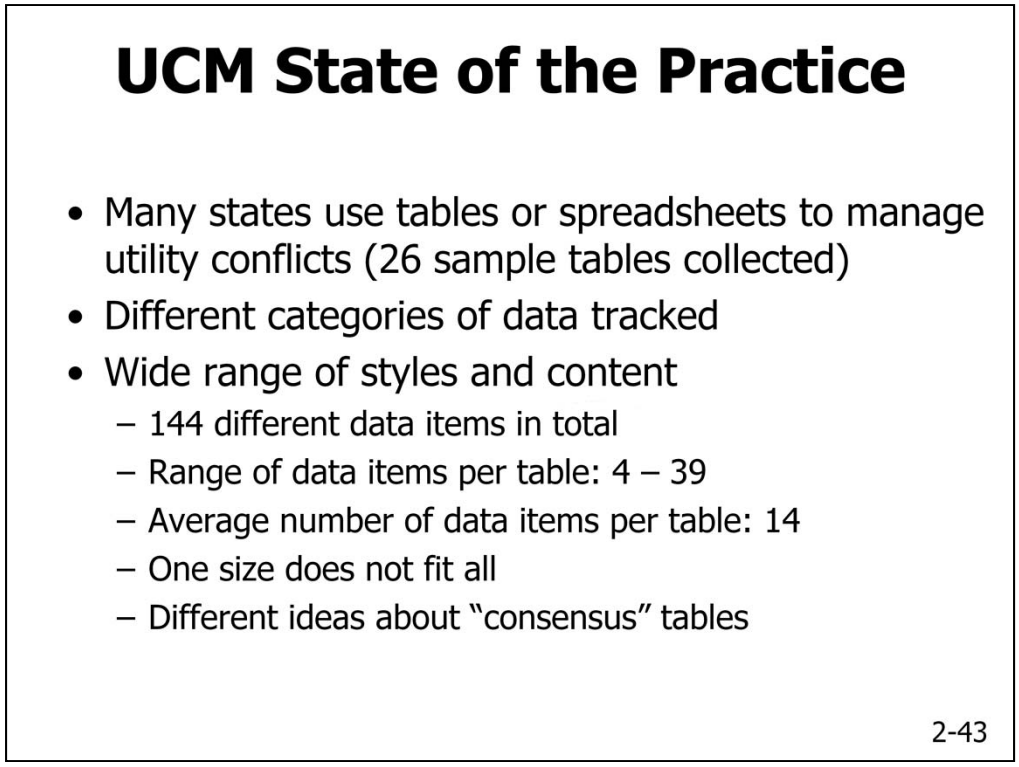


Research products:

• Product 1 (Compact, standalone UCM). This is a template in Excel that contains a limited number of columns (i.e., the minimum number of columns for a UCM to provide meaningful information). In this case, the UCM spreadsheet is the product.

• Product 2 (Database-level UCM). This is a data model for managing utility conflicts and the Access database that provides a physical representation of the data model. The data model is generic and was built using industry standard procedures. The data model is in ERwin Data Modeler format, and can be easily exported to a variety of database environments (e.g., Oracle, SQL Server). In this case, the UCM is actually one of many queries or reports possible.

• Product 3 (One-day training course). This is the training course that includes these presentations and training materials.



The project included an online survey of all 50 states to identify trends and practices in utility conflict management. The survey resulted in 103 responses from 34 states. Of the 103 responses, 82 responses were from utility staff. The remaining 21 responses were from design staff. The survey involved both state DOT headquarters and district level personnel. The research team also conducted follow-up interviews. In total, there were 38 interviews with representatives from 23 states. State DOTs provided 26 sample utility conflict tables that further illustrated current practices (as well as "schools of thought" as to how to structure a UCM) around the country.

Feedback from state DOTs revealed the common use of UCMs to manage utility conflicts, although practices differ widely.

Two critical observations are:

• One size DOES NOT fit all

• Very different ideas about "consensus" tables. A "consensus" table was developed in Florida by an interagency committee composed of utility representatives, FDOT representatives, and consultants. Another "consensus" table was developed in California by a committee composed of California DOT representatives. Although the purpose of both tables was the same (to help manage utility conflicts effectively), the decision making process (and the final products) were quite different.

Sample (Alaska)

DRAFT Utility Conflict Report
West Dowling Road Phase I

Anchorage, Alaska
DOT&PF No. 50898

Table 2: Chugach Electric Association, Incorporated, Conflicts Summary

Station	Offset	Station	Offset	Size/Type	Length	Conflict	ADJ/REL	Cost	PE/CE Cost	Total Cost
CEA Distribution Relocation Costs										
9+00	150' RT		200' LT	3φ UG	350	FG	REL	52,500	15,750	68,250
16+00	100' LT	42+30	80' LT	3φ UG	2630	FG	REL	394,500	118,350	512,850
16+00	100' LT	15+50	100' RT	3φ UG	250	FG	REL	37,500	11,250	48,750
16+00	100' LT	29+00	75' LT	1φ UG	1650	FG	REL	165,000	49,500	214,500
36+40	80' LT	35+80	350' RT	3φ UG	430	FG	REL	64,500	19,350	83,850
36+60	80' LT	36+70	380' LT	3φ UG	300	FG	REL	45,000	13,500	58,500
	UG Loop to the North			3φ UG	1000	FG	REL	150,000	45,000	195,000
							Subtotal	909,000	272,700	1,181,700
CEA Transmission Relocation Costs										
14+75	55' RT			138 kV OH	1	PWY	REL	30,000	9,000	39,000
32+75	55' RT			138 kV OH	1	EX	REL	50,000	15,000	65,000
36+38	45' RT			138 kV OH	1	EX	REL	50,000	15,000	65,000
							Subtotal	130,000	39,000	169,000
							Total CEA Relocation Costs	**1,039,000**	**311,700**	**1,350,700**

1φ Underground (UG) loop to extend across Dowling Road and along the south side to reconnect existing services.
UG loop provided to the north of the project to accommodate undergrounding.
Removal of existing swamp braces removed and steel piling added, down guys replaced with overhead span guy and down guys.

2-44

This utility conflict matrix was provided by the Alaska DOT. Note the emphasis on cost items (three columns plus total), and that there are separate tables for each utility involved in the project.

See handout on page E5.

Sample (California)

I-10-EA 122401-Utilities Conflict Status

date of last revision May 30, 2000
this document was prepared by

Conflict No.	Utility Sheet No.	Pothole No. (On Exhibit)	Owner	Utility Description	Pothole/Manhole Location	Conflict Location	Utility Conflict/ Work Description	Investigation			Depth	Impact?		Action			Util. Reloc. A-Abandon RD-Relocate/Delete P-Protect in place NC-No conflict	Resp. Party U-Utility Co C-Contractor	Required Completion Date	Comments
								Pothole	Manhole	Overhead	(ft)	Y	N	Remove	Relocate	Other				
1	U-2	1	PACBELL	40 DU Telephone	57 m Rt of I-405 Sta 163+55	49 m Rt and 57 m Rt of I-405 Sta 165+55	conflict with Retaining Walls No. 166 & No. 168	X			4.55 14.40		N				P			
2	U-2	2	PACBELL	40 DU Telephone	45 m Lt of I-405 Sta 165+55	49 m Rt and 57 m Rt of I-405 Sta 165+55	conflict with Retaining Walls No. 166 & No. 168				-		N				P			
3	U-3	3	SCE	25 mm DU	30 m Rt of I-405 Sta 165+01	43 m Rt of I-405 Sta 165+01	conflict with Retaining Wall No. 165				-		N				P			Located in Bristol OC
4	U-3	4	SCE	25 mm DU	46 m Lt of I-405 Sta 165+01	43 m Rt of I-405 Sta 165+01	conflict with Retaining Wall No. 165				-		N				P			Located in Bristol OC
5	U-3	5	MWD	900 mm WSP Water in 380 mL ENC	50 m Rt of I-405 Sta 164+96	44 m Rt of I-405 Sta 164+95	conflict with Retaining Wall No. 166	X			6.70		N				P			
6	U-3	6	MWD	900 mm WSP Water in 380 mL ENC	50 m Lt of I-405 Sta 164+96	44 m Rt of I-405 Sta 164+95	conflict with Retaining Wall No. 166	X			6.50		N				P			
7	U-3	7	Caltrans	600 mm RCP	53 m Rt of I-405 Sta 163+42	53 m Rt of I-405 from Sta 163+29 to Sta 163+42	conflict with Delhi Channel Bridge	X			6.00		N				P			
8	U-3	8	Caltrans	600 mm RCP	53 m Rt of I-405 Sta 163+29	53 m Rt of I-405 from Sta 163+29 to Sta 163+42	conflict with Delhi Channel Bridge	X			9.00		N				P			
9	U-3	9	MCWD	300 mm ACP Water in 119mL, 500mm STL Casing	32 m Rt of I-405 Sta 163+25	30 m Rt of I-405 Sta 163+25	conflict with I-405 Widening & BR1 Line	X			10.30		N				P			
10	U-3	10	MCWD	300 mm ACP Water 119mL, 500mm STL Casing	32 m Lt of I-405 Sta 163+25	33 m Lt of I-405 Sta 163+25	conflict with I-405 Widening & BR1 Line	X			8.75		N				P			
11	U-3	MH 11	CSDOC	Manhole	81 m Rt of I-405 Sta 162+92	35 m Rt of I-405 Sta 162+92	conflict with I-405 Widening & BR1 Line		X		18.40		N				P			
12	U-3	12	CSDOC	380 mm VCP Sewer	36 m Lt of I-405 Sta 162+91	32 m Lt of I-405 Sta 162+90	conflict with I-405 Widening & BR1 Line				-		N				P			
13	U-4	13	MCWD	600mm CCP Water in 94m L 900mm Dia Stl Casing	67 m Rt of I-405 Sta 161+44	56 m Rt of I-405 Sta 161+44	Conflict with Airport Channel	X			4.55	Y			X	X	RB			600 mm Waterline to be Lowered Extend Encasement
14	U-4	14	MCWD	600mm CCP Water in 94m L 900mm Dia Stl Casing	38 m Lt of I-405 Sta 161+40	32 m Lt of I-405 Sta 161+42	conflict with I-405 Widening				-		N				P			
15	U-4	15	MCWD	300 mm ACP Water	70 m Rt of I-405 Sta 160+29	72 m Rt of I-405 from Sta 157+20 to Sta 160+29	Conflict with AOA Line and Retaining Wall No. 268	X			-	Y			X		RD			Encroachment CT R/W and Private Owner Encased under Roadway
16	U-4	16	MCWD	300 mm ACP Water	70 m Rt of I-405 Sta 159+07	72 m Rt of I-405 from Sta 157+20 to Sta 160+29	Conflict with AOA Line and Retaining Wall No. 268	X			-	Y			X		RD			Encroachment CT R/W and Private Owner Encased under Roadway
17	U-5	17	MCWD	300 mm ACP Water	70 m Rt of I-405 Sta 156+57	72 m Rt of I-405 from Sta 157+20 to Sta 160+29	conflict with AOA Line and Retaining Wall No. 268	X			4.35		N				P			
18	U-5	MH 18	CSDOC	Manhole	60 m Rt of I-405 Sta 156+65	28 m Rt of I-405 Sta 156+65	conflict with I-405 Widening		X		16.20		N				P			
19	U-5	19	CSDOC	380 mm VCP Sewer	46 m Lt of I-405 Sta 156+65	25 m Rt of I-405 Sta 156+65	conflict with I-405 Widening	X			18.40		N				P			
20	U-5	20	CSDOC	830 mm VCP Sewer	14 m Rt of B2 Sta 24+96		conflict with construction of B2 Line						N				P			
21	U-5	21	CSDOC	830 mm VCP Sewer	6 m Lt of B2 Sta 25+54		conflict with construction of B2 Line						N				P			
22	U-8	MH 22	CSDOC	Manhole	9m Rt of Main St Sta 102+78				X			Y				X	RB			MH to be Lowered New Top MH Elev= 9.568
23	U-8	MH 23 SCE MH 4503	SCE	Manhole No. 4503	9m Rt of Main St Sta 102+87				X			Y				X	RB			MH to be Lowered New Top MH Elev= 9.583 m
24	U-8	MH 24 SCE MH 4502	SCE	Manhole No. 4502	9m Rt of Main St Sta 104+17				X			Y				X	RB			MH to be Lowered New Top MH Elev= 9.728 m

2-45

This utility conflict matrix was provided by the California DOT. Note the large number of columns and detail provided in the utility conflict matrix.

See handout on page E11.

Sample (Florida)

FPID: 1	Description: 2	This matrix was created by _____3_____ to assist the UAO's in identifying conflicts between the UAO's facilities and proposed roadway construction. _____ accepts no liability for conflicts overlooked for this report. Each UAO or designee is responsible to perform a detailed and comprehensive plans review for conflict analysis.
Phase #: 4	Plans Date: 5	
Reviewer: 6		
Date: 7		

Conflict #	Utility Agency/ Owner (UAO)	Station/Offset (From C/L)	Facility Description (Material, Type, Number, Size)	Conflict Description (Possible or Actual)	VVH (Y/N)	VVH #	Recommended Conflict Resolution	Resolved Status
8	9	10	11	12	13	14	15	16

Consider using the form from the beginning of a project as a tool for monitoring areas of concern with UAO facilities. That is the reason for the Phase Number space. The form is set up to: 1. Print legal size and have the header information on each page. 2. The cells where the conflicts are listed are set to word wrap automatically. 3. The footer is set to number the pages 1 of ??.

1 Project number.
2 Project description.
3 Disclaimer that the reviewer and their firm is not responsible for any missed conflicts. The blanks are for the name of the design firm.
4 Phase that the plans represent.
5 The date should be on the plans Key Sheet. The phase and plans date should keep everyone working on the same plans.
6 That would be you, the person that wrote the conflict matrix.
7 The date the matrix was completed.
8 For ease of discussion the conflicts are numbered, plan sheet numbers are not used because they change from Phase to Phase which has caused confusion in the past.
9 Owner of the underground line.
10 The standard reference used on FDOT plans is the Centerline of Construction, it is used for all components of the proposed roadway construction.
11 Describe the facility. What is it? Water main? Force main? Cable? Conduit? Overhead electric? Overhead cable? Manhole? Handhold? What's the size? How many? What's it made of?
12 What is it the facility perceived to be in conflict with? It a possible conflict or actually in conflict with proposed work. Consider the trench and hole size required to place pipe and drainage structures. Don't forget aerial facilities when there are signals and large signs in the project.
13 SUE work can be used to if a conflict is considered a possibility. This entry area is a tool to determine areas where test holes should be taken for confirmation or exclusion of a conflict.
14 Entry area for the test hole number. Test holes should be numbered consecutively to avoid confusion.
15 What can be done to remove the conflict? Don't forget to consult with the Designer for alternatives to the proposed construction.
16 Examples of entries could be "Cleared", "Pending", "No Conflict". It's suggested to keep the entries determined as "No Conflict" in the matrix so other reviewers will know a perceived conflict has been noted and determined to not be an issue.

2-46

This utility conflict matrix was provided by the Florida DOT. This matrix contains 8 columns, which is a relatively small number of columns.

See handout on page E13.

Sample (Georgia)

Conflic	Station and Offset	Utility	Identified Conflict	Testhole Needed	Utility Impact with Cost ("As-designed")	Recommended Resolution	*Benefit of Resolution
C1	100+05, 21'L 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO	No	Relocate 1150LF of BFO-DUCT ($91,000)	Relocate proposed storm drainage into street. Use DI's that drain toward roadway.	Save Cost to Relocate BFO-DUCT ($91,000)
C2	100+66, 21'L 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO	No	See C1		
C3	100+38, 24'R 14th St Constr. BL	UNK@Tee	Proposed 18" storm and unknown utility tee	TH 1	Relocate unknown type and function utility	TH to identify utility and conflict	Eliminate possible delay during construction
C4	100+56, 25'R 14th St Constr. BL	8"W	Proposed 18" storm and existing 8"W	TH 2	Relocate 8"W ($7,500)	TH on 8"W, adjust depth of proposed storm drainage	Save Cost to Relocate 8"W ($6,000)
C5	100+61, 25R 14th St Constr. BL	8"W	Proposed 18" storm and existing 8"W	TH 3	Relocate 8"W ($7,500)	TH on 8"W, adjust depth of proposed storm drainage	Save Cost to Relocate 8"W ($6,000)
C6	100+82, 28R 14th St Constr. BL	4"G	Proposed storm structure and existing 4"G	TH 4	Relocate 20 LF of 4"G ($6,000)	TH on 4"G, adjust depth of proposed storm structure	Save Cost to Relocate 4"G ($4,500)
C7	101+22 27"R 14th St Constr. BL	4"G	Proposed 18" storm and existing 4"x2" gas tee	TH 5	Relocate 2"G & 4"G Tee ($12,500)	TH on G lines, adjust depth of proposed storm structure	Save Cost to Relocate G lines ($11,000)
C8	101+01 28'L 14th St Constr. BL	16"G	Proposed 18" storm and existing 16"G	TH 6	Relocate 16"G ($10,000)	TH on 16"G, adjust depth of proposed storm structure	Save Cost to Relocate 16"G ($8,500)
C9	101+25 41'L 14th St Constr. BL	BT-DUCT 2"G	Proposed storm structure and two BT-ducts	TH 7	Relocate BT-DUCT & 2"G ($11,000)	TH on BT-DUCT & 2"G, adjust depth of proposed storm structure	Save Cost to Relocate BT-DUCT & 2"G ($10,500)
C10	101+37, 41'L 14th St Constr. BL	6"W	Proposed 18" storm and existing 6"W	TH 8	Relocate 6"W ($5,000)	TH on 6"W, adjust depth of proposed storm drainage	Save Cost to Relocate 6"W ($3,500)
C11	101+57, 27'L 14th St Constr. BL	16"G	Proposed 18" storm and existing 16"G	TH 9	Relocate 16"G ($10,000)	TH on 16"G, adjust depth of proposed storm structure	Save Cost to Relocate 16"G ($8,500)
C12	101+58, 22'L 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO	No	See C1		
C13	101+90, 22'L 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO	No	See C1		
C14	102+20, 27'R 14th St Constr. BL	4"G	Proposed storm structure and existing 4"G	No	Relocate 4"G ($4,500)	Relocate 4"G	Elimnate conflict with proposed DI
C15	102+36, 24'L 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO	No	See C1		

*Please include all benefits incurred including time, costs, and safety improvements.

Key:

AC - Asbestos Concrete
BE - Buried Electric
BFO - Buried Fiber Optic
BT - Buried Telephone
G - Gas
L - Left
MES - Mitered End Section
OE - Overhead Electric
OT - Overhead Telephone
R - Right
RCP - Reinforce Concrete Pipe
W - Water
WM - Water Main
TH - Test Hole, verify vert. and horiz
UNK - Unknown Type
SAN - Sanitary Sewer

Utility Owner:

AGL Atlanta Gas Light
BE Georgia Power
BT Bell South
L3 Level 3 Communications
MFN Metromedia Fiber Network
SAN Fulton County Public Works
W City of Atlanta
UNK Unknown Owner

2-47

This utility conflict matrix was provided by the Georgia DOT. This utility conflict matrix has 7 columns, which is also an example of a utility conflict matrix with a small number of columns. However, some of the columns contain multiple data items that other states include in separate columns.

See handout on page E15.

Sample (Michigan)

M-6 (South Beltline) from I-196 to West of Eastern Avenue
South of Grand Rapids, Michigan

Utility Log - Electric

CS 70025 - JN 33330

Item #	Utility Owner / Operator	Conflict Location	Segment	Date Relocation Plan must be submitted	Relocation Plan submitted to Design Team	Design Team Review / Comment / Approval	Permit Application Submitted to MDOT	MDOT Permit Number / Approval Date	Relocation Scheduled	Action Items
1	Consumers Energy Transmission	Consumers Power Transmission Overhead – 8th Ave	1			7/6/2000	7/27/00 rev.	41064-0125-00-0174	4/1/2001	Final permit approval from MDOT.
2	Consumers Energy Transmission	West of Kenowa Ave.	1			7/6/2000	7/27/00 rev.	41064-0125-00-0174	4/1/2001	Final permit approval from MDOT.
3	Consumers Energy Distribution	Aerial Lines at Jackson and Angling Road	1							Design in process.
4	Consumers Energy Distribution	Aerial Lines at Kenowa and 64th St.	2							Design in process.
5	Consumers Energy Transmission	64th at Wilson and East and West of Wilson– Overhead	2			7/6/2000	7/27/00 rev.	41064-0125-00-0174	4/1/2001	Final permit approval from MDOT.
6	Consumers Energy Transmission	East and West of Ivanrest	2			7/6/2000	7/27/00 rev.	41064-0125-00-0174	10/15/2000	Final permit approval from MDOT.
7	**Consumers Energy Distribution**	**along Ivanrest**	**2**							**Permit to be submitted the week of August 14, 2000.**
8	Consumers Energy Transmission	East and West of Byron Center - overhead	3			7/6/2000	7/27/00 rev.	41064-0125-00-0174	4/1/2001	Final permit approval from MDOT. Schedule Relocation

This utility conflict matrix was provided by the Michigan DOT. Note the emphasis on the business process and tracking of critical dates.

See handout on page E7.

Sample (South Dakota)

Picture No.	PCN	Picture Looking	City or Town	Hwy. No.	Description
6.JPG	02BF	N	Platte	44	Water valve in the SE quadrant of Hwy 44 & Indiana
7.JPG	02BF	W	Platte	44	Power Pole in the SW quadrant of Hwy 44 & Indiana
8.JPG	02BF	N	Platte	44	Power Pole in the SW quadrant of Hwy 44 & Indiana
9.JPG	02BF	N	Platte	44	Power Pole in the SW quadrant of Hwy 44 & Indiana
10.JPG	02BF	E	Platte	44	Power Pole (Transmission w/ riser) in the SE quadrant of Hwy 44 & Ohio
11.JPG	02BF	E	Platte	44	Power Pole (Transmission w/ riser) in the SE quadrant of Hwy 44 & Ohio
12.JPG	02BF	N	Platte	44	Power Pole, Fire hydrant & water valve in the SE quadrant of Hwy 44 & Ohio
13.JPG	02BG	S	Platte	45	Light Pole in the SW quadrant of Hwy 45 & 4th St
14.JPG	02BG	E	Platte	45	Light Pole in the NE quadrant of Hwy 45 & 4th St
15.JPG	02BG	S	Platte	45	Light Pole in the SW quadrant of Hwy 45 & 6th St
16.JPG	02BG	E	Platte	45	Power Pole in the NE quadrant of Hwy 45 & 6th St
17.JPG	02BG	E	Platte	45	Power Pole in the NE quadrant of Hwy 45 & 6th St
18.JPG	02BG	W	Platte	45	Power Pole & Fire hydrant in the NW quadrant of Hwy 45 & 6th St
19.JPG	02BG	W	Platte	45	Power Pole w/ riser in the NW quadrant of Hwy 45 & 6th St

49

This utility conflict matrix was provided by the South Dakota DOT. This table only has 6 columns. Note a link to a picture is included for each utility conflict.

See handout on page E9.

Sample (Texas)

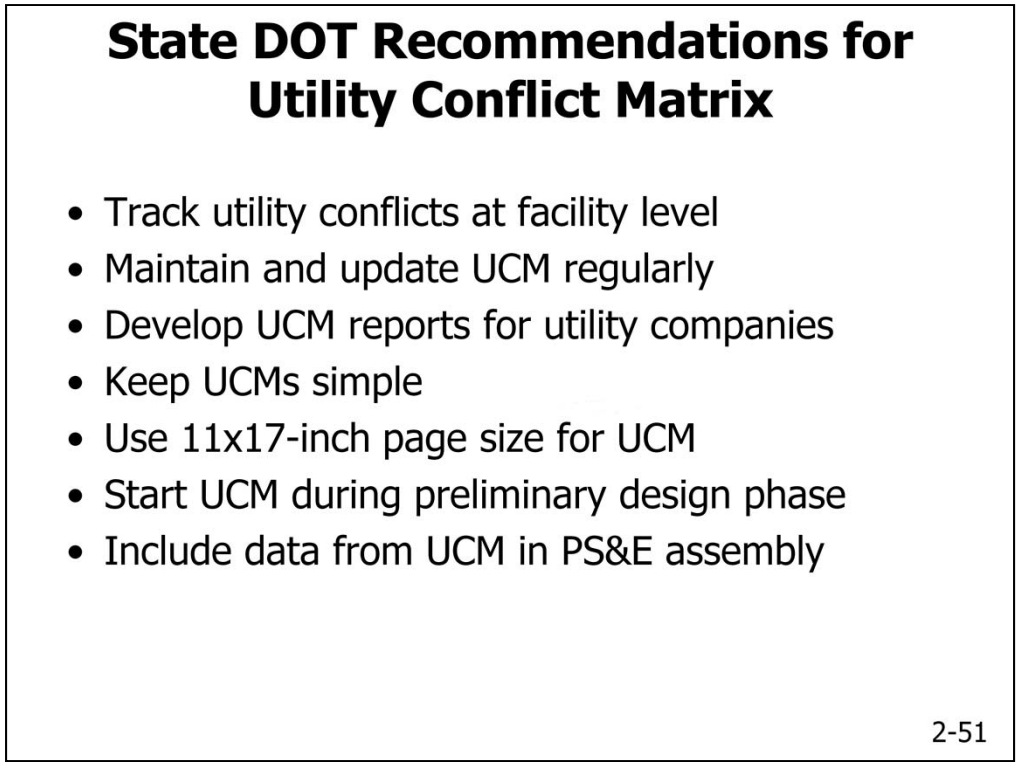
PARIS DISTRICT
UTILITY ADJUSTMENT REPORT

As Of: August 19, 2009
Changes since last update in RED

County Highway ROW CSJ	Name of Utility	Reimbursable?	Location of Agreement Package	Packet Status?	Current Action	Adjustment Status	Responsible TxDOT Employee	Amount Approved	Amount Billed	90% Payment	Audit Exceptions	10% Retainage	Outstanding Balance
HOPKINS SH 11 ROW CSJ: **0003-03-046** SH 19 **0108-09-039**	Verizon	No	ROW	Approved	U11114: Relocation is complete. NR	Complete	Keith Hollje						
	TXU Electric	Yes	ROW	Approved	U11655: Relocation & Reimbursement is complete	Complete	Keith Hollje	$ 74,397.96	$ 62,850.69	$ 56,565.62	$ -	$ 6,285.07	$ -
	Atmos Energy (Trans)	Yes	ROW	Approved	U12208: Relocation & Reimbursement is complete	Complete	Mike Powers	$ 235,912.59	$ 184,436.76	$ 165,993.08	$ -	$ 18,443.68	$ -
	Atmos Energy (Distribution)	No	ROW	Approved	U12446: Relocation is complete. NR	Complete	Mike Powers						
	SS Water & Sewer	No	ROW	Approved	U12450: Relocation is complete. NR	Complete	Mike Powers						
	TXU Distribution	No	ROW	Approved	U12614: Relocation is complete. NR	Complete	Mike Powers						
	Sudden Link Communication	No	AO	Approved	Relocation is complete by Permit. NR	Complete	Tim Taylor						
	People's Telephone	No	AO	Approved	Relocation is complete by Permit. NR	Complete	Tim Taylor						
	Shady Grove WSC	No	AO	Approved	Relocation is complete by Permit. NR	Complete	Tim Taylor						
								$ 310,310.55	$ 247,287.45	$ 222,558.70	$ -	$ 24,728.75	$ -
HUNT US 380 ROW CSJ: **0135-06-022**	Caddo Basin	Yes	ROW	Approved	U11423: Relocation & Reimbursement is complete.	Complete	Mike Powers	$ 853,746.47	$ 783,618.01	$ 705,256.21	$ -	$ 78,361.80	$ -
	Verizon	No	ROW	Approved	U11450: Relocation is complete. NR	Complete	Mike Powers						
	One OK Pipeline	Yes	ROW	Approved	U11523: Relocation is complete. Reimbursement has not been submitted.	Complete	Keith Hollje	$ 229,170.00	$ -	$ -	$ -	$ -	$ 229,170.00
	Cap Rock Energy	Yes	ROW	Approved	U11524: Relocation & Reimbursement is complete.	Complete	Mike Powers	$ 741,668.69	$ 741,668.69	$ 667,388.42	$(27,771.80)	$ 46,508.47	$ -
	AT&T	No	ROW	Approved	U11526: Relocation is complete. NR	Complete	Mike Powers						
	Explorer	Yes	ROW	Approved	U11534: Relocation & Reimbursement is complete.	Complete	Keith Hollje	$ 191,805.22	$ 201,206.44	$ 181,085.80	$ -	$ 20,120.64	$ -
	Energy Transfer (Gas)	Yes	ROW	Approved	U11695: Relocation is complete. Reimbursement returned to Utility 4/29/09. No Coorespondence!	Complete	Mike Powers	$ 370,006.39	$ 420,136.25	$ -	$ -	$ -	$ 370,006.39
	GEUS	No	ROW	Approved	U11850: Relocation is complete. NR	Complete	Mike Powers						
	AT&T	No	ROW	Approved	U12358: Relocation is complete. NR	Complete	Mike Powers						
	TMPA	No	n/a	n/a	No effect (no adjustment required)	n/a	Mike Powers						
	Comcast	No	n/a	n/a	No effect (no adjustment required)	n/a	Mike Powers						
	Kinder-Morgan	No	n/a	n/a	No effect (no adjustment required)	n/a	Mike Powers						
								$ 2,386,396.77	$2,146,629.39	$ 1,553,730.43	$(27,771.80)	$144,990.91	$ 599,176.39
HUNT US 380 ROW CSJ: **0135-07-037**	AT&T	No	ROW	Approved	U11525: Relocation is complete. NR	Complete	Mike Powers						
	Atmos Energy (Pipeline)	Yes	ROW	Approved	U12012: Relocation & Reimbursement is complete.	Complete	Mike Powers	$ 193,912.59	$ 73,187.29	$ 65,868.56	$ -	$ 7,318.73	$ -
	Atmos Energy (Distribution)	No	ROW	Approved	U12013: Relocation is complete. NR	Complete	Mike Powers						
	Caddo Basin	Yes	ROW	Approved	U12026: Relocation & Reimbursement is complete.	Complete	Mike Powers	$ 651,005.00	$ 383,518.60	$ 345,166.74	$ -	$ 38,351.86	$ -
	TMPA	Yes	ROW	Approved	U12076: Relocation is complete. Supplemental Agreement approved 8/06/09.	Complete	Mike Powers	$ 514,097.06	$ 516,702.66	$ 462,196.85	$ -	$ 51,355.21	$ 51,355.21
	GEUS	No	ROW	Approved	U12077: Relocation is complete. NR	Complete	Mike Powers						
	TXU Electric(Transmission)	No	ROW	Approved	U12079: Relocation is complete. NR	Complete	Mike Powers						
	GEUS	Yes	ROW	No	U12445: Utility Package approved 5/19/09. Utility working on relocation.	35%	Mike Powers	$ 88,073.29	$ -	$ -			$ 88,073.29
	City of Greenville (Water)	No	AO	n/a	City has already moved utility on private easement. (no agreement required)	n/a	Mike Powers						
	City of Greenville (Sewer)	No	AO	n/a	City has already moved utility on private easement. (no agreement required)	n/a	Mike Powers						
	Cap Rock Energy	No	AO	n/a	No effect (no adjustment required)	n/a	Mike Powers						
								$ 1,447,087.94	$ 973,408.55	$ 873,232.15	$ -	$ 97,025.80	$ 139,428.50

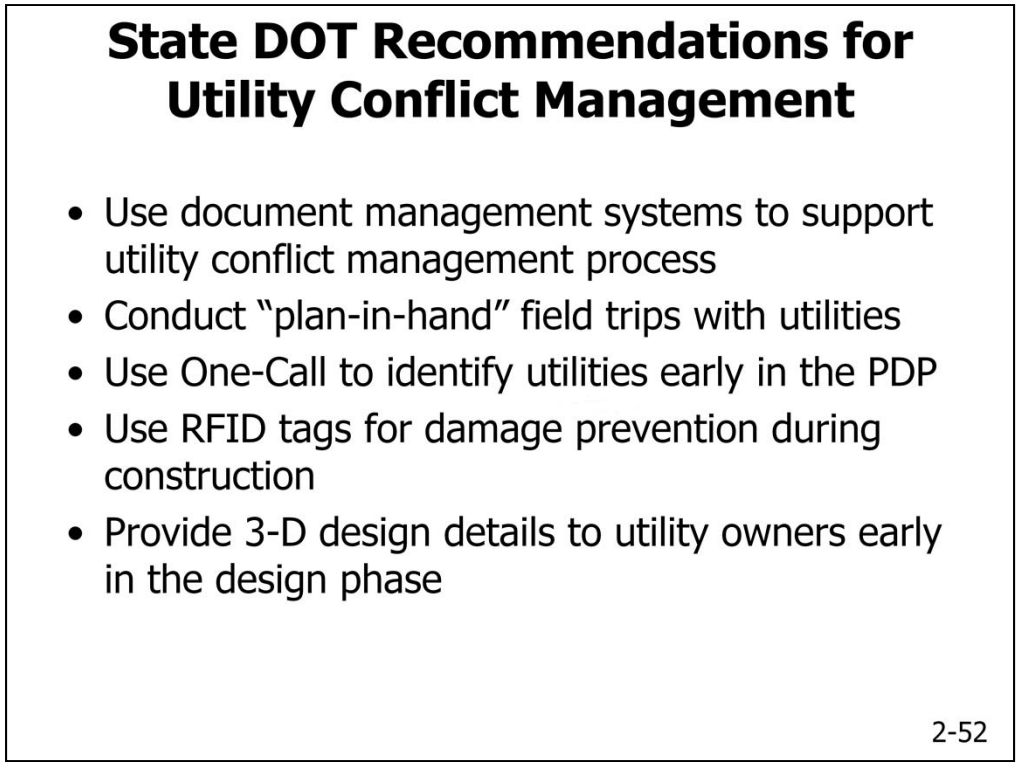
This utility conflict matrix was provided by the Texas DOT. This utility conflict matrix contains a large number of data items. Note the emphasis on business process tracking and tracking of cost items.

See handout on page E17.

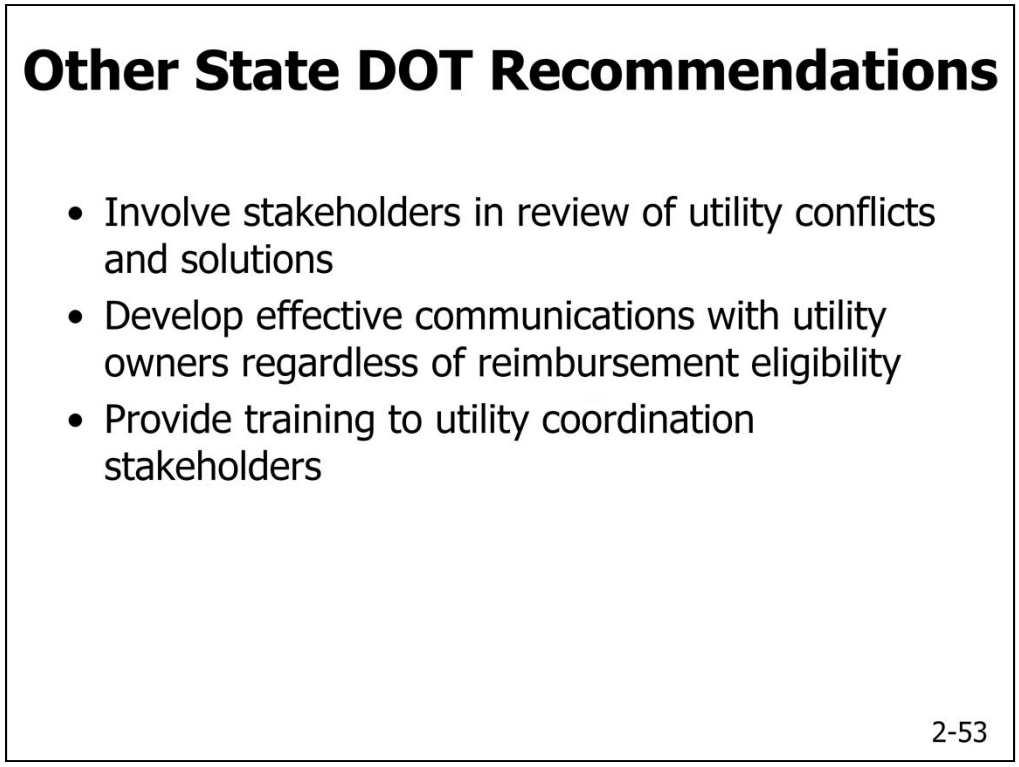


Part of the research effort was to gather information from state DOTs about ideas that worked in relation to utility conflict management (in general) and utility conflict matrices (in particular).

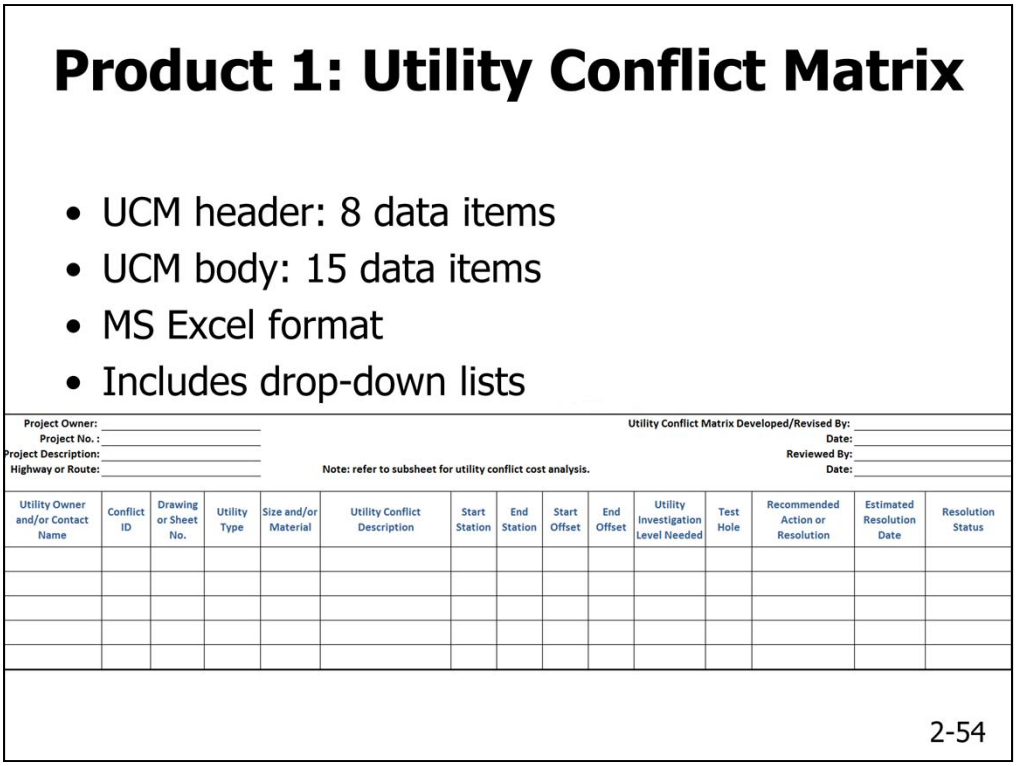
Recommendations for best practices from state DOTs were grouped into three general categories: UCM, utility conflict management, and other. This slide focuses on UCM-level recommendations.



This slide focuses on recommendations dealing with utility conflict management activities.



This slide focuses on other general recommendations for optimization of business practices.

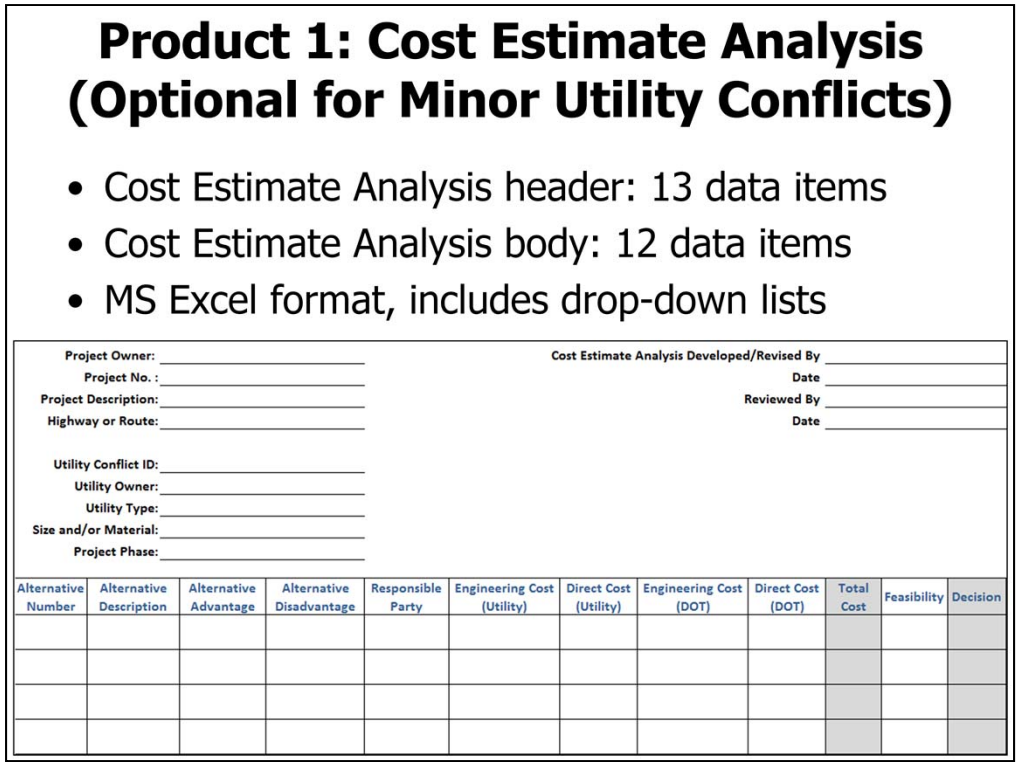


This slide shows the template UCM as developed by the research team.

The UCM product includes 8 header data items and 15 main body data items. It also includes several drop-down lists to provide some automation to the process of populating the UCM.

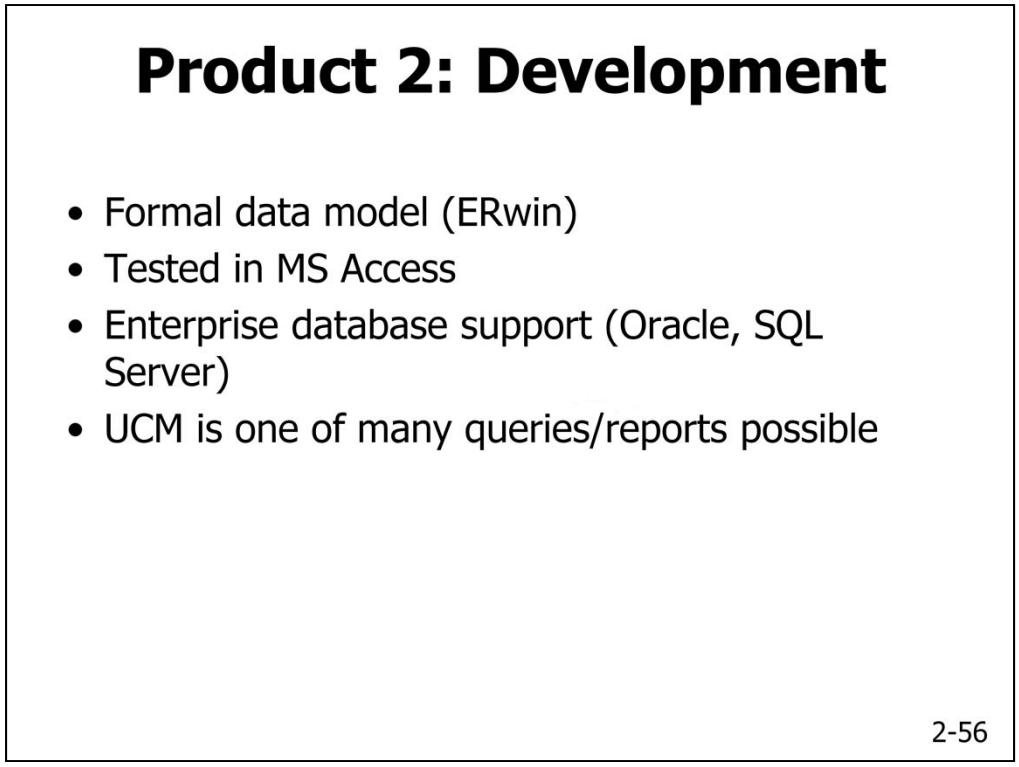
The process involved analyzing the sample data received; analyzing survey conflict and facility data; consolidating, rating, and ranking data; and identifying which data items to include in the UCM. The composite list of data items resulted from ranking data items according to use in the sample documents, ranking data items according to the frequency reported in the survey, and by combining the rankings from these data sources.

The research team then chose 25 data items to include in the standalone UCM, based on group discussions and the ranking of the data items.



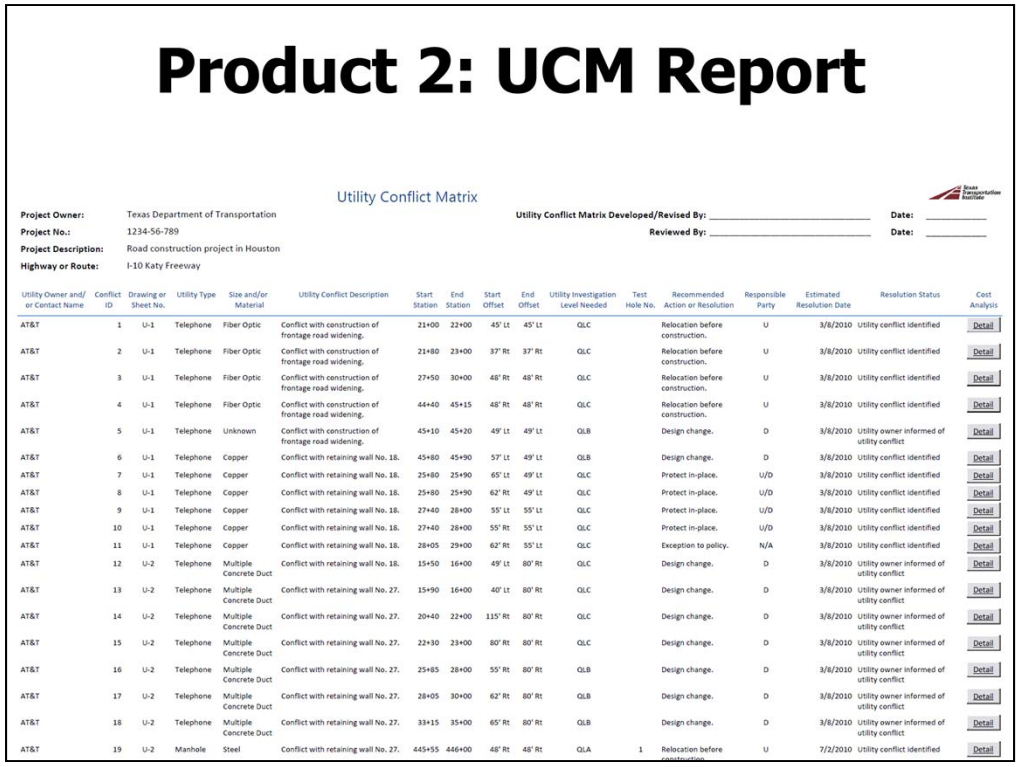
One of the data items in the initial version of the standalone UCM product was cost estimate. During work sessions with a sample of states to discuss properties and features of the UCM, it became clear that having just one field to capture costs was not adequate. For example, this field would not enable an accurate depiction of which agency would be responsible for which costs. It would also not document the process used to select a utility conflict resolution strategy. This realization resulted in the need to use a second table to analyze costs and other elements associated with each utility conflict resolution strategy. This slide shows the design of the sub-table developed as part of the research.

In practice, it might not be necessary to use this table for every utility conflict. However, for major utility conflicts, this table could be very useful to determine the appropriate resolution strategy and to document the process.



As mentioned previously, Product 2 is a data model for managing utility conflicts and an Access database that provides a physical representation of the data model. The data model is generic and was built using industry standard procedures. The data model is in ERwin Data Modeler format, and can be easily exported to a variety of database environments (e.g., Oracle, SQL Server). In this case, the UCM is actually one of many queries or reports possible.

Product 2: UCM Report



Utility Conflict Matrix

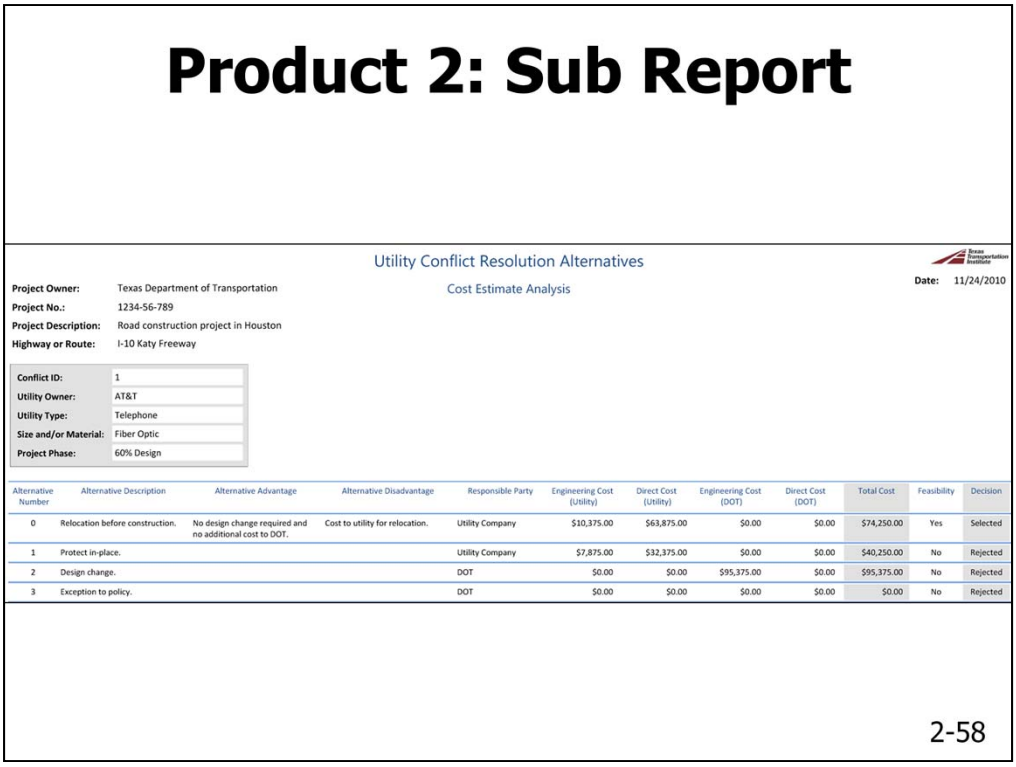
Project Owner: Texas Department of Transportation
Project No.: 1234-56-789
Project Description: Road construction project in Houston
Highway or Route: I-10 Katy Freeway

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

Utility Owner and/ or Contact Name	Conflict ID	Drawing or Sheet No.	Utility Type	Size and/or Material	Utility Conflict Description	Start Station	End Station	Start Offset	End Offset	Utility Investigation Level Needed	Test Hole No.	Recommended Action or Resolution	Responsible Party	Estimated Resolution Date	Resolution Status	Cost Analysis
AT&T	1	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	21+00	22+00	45' Lt	45' Lt	QLC		Relocation before construction.	U	3/8/2010	Utility conflict identified	Detail
AT&T	2	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	21+80	23+00	37' Rt	37' Rt	QLC		Relocation before construction.	U	3/8/2010	Utility conflict identified	Detail
AT&T	3	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	27+50	30+00	48' Rt	48' Rt	QLC		Relocation before construction.	U	3/8/2010	Utility conflict identified	Detail
AT&T	4	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	44+40	45+15	48' Rt	48' Rt	QLC		Relocation before construction.	U	3/8/2010	Utility conflict identified	Detail
AT&T	5	U-1	Telephone	Unknown	Conflict with construction of frontage road widening.	45+10	45+20	49' Lt	49' Lt	QLB		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	6	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	45+80	45+90	57' Lt	49' Lt	QLB		Design change.	D	3/8/2010	Utility conflict identified	Detail
AT&T	7	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	25+80	25+90	65' Lt	49' Lt	QLC		Protect in-place.	U/D	3/8/2010	Utility conflict identified	Detail
AT&T	8	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	25+80	25+90	62' Rt	49' Lt	QLC		Protect in-place.	U/D	3/8/2010	Utility conflict identified	Detail
AT&T	9	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	27+40	28+00	55' Lt	55' Lt	QLC		Protect in-place.	U/D	3/8/2010	Utility conflict identified	Detail
AT&T	10	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	27+40	28+00	55' Rt	55' Lt	QLC		Protect in-place.	U/D	3/8/2010	Utility conflict identified	Detail
AT&T	11	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	28+05	29+00	62' Rt	55' Lt	QLC		Exception to policy.	N/A	3/8/2010	Utility conflict identified	Detail
AT&T	12	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 18.	15+50	16+00	49' Lt	80' Rt	QLC		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	13	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	15+90	16+00	40' Lt	80' Rt	QLC		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	14	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	20+40	22+00	115' Rt	80' Rt	QLC		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	15	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	22+30	23+00	80' Rt	80' Rt	QLC		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	16	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	25+85	28+00	55' Rt	80' Rt	QLB		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	17	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	28+05	30+00	62' Rt	80' Rt	QLB		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	18	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	33+15	35+00	65' Rt	80' Rt	QLB		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	19	U-2	Manhole	Steel	Conflict with retaining wall No. 27.	445+55	446+00	48' Rt	48' Rt	QLA	1	Relocation before construction.	U	7/2/2010	Utility conflict identified	Detail

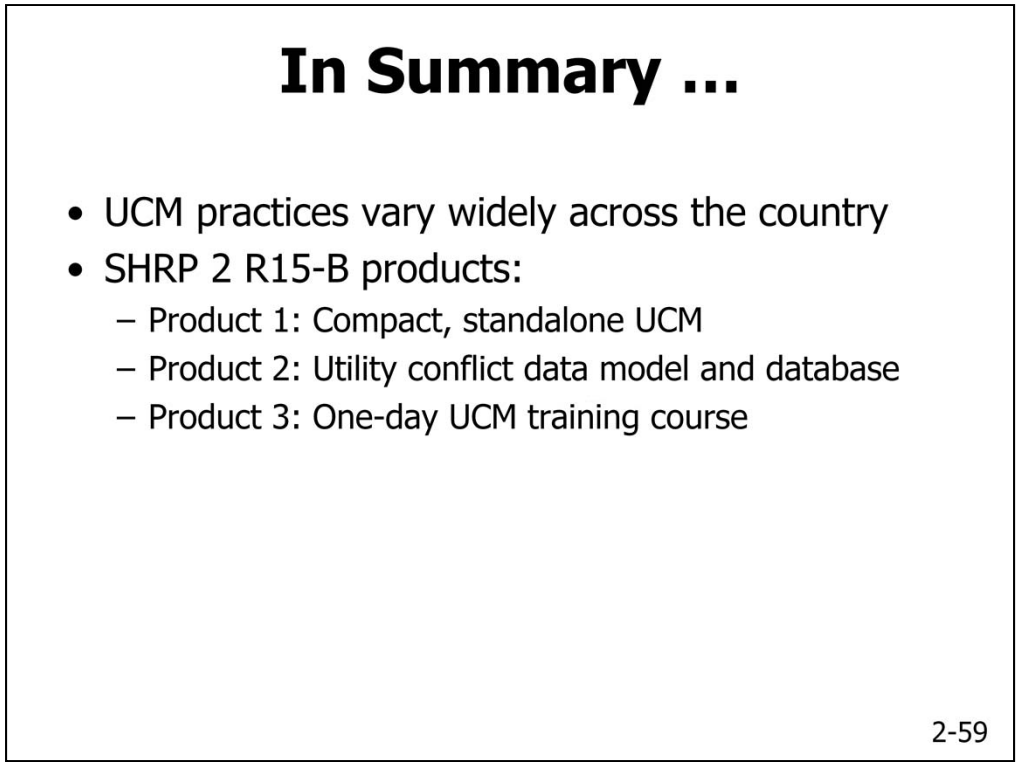
The utility conflict matrix report shown here is a report within the Access database. Note the buttons on the right labeled “Detail”, which are placeholders to provide a link to cost estimate analysis sub reports. This report is only one of many reports that can be created using the Access database.

See handout on page E29.



This slide shows sample records for the cost estimate analysis in connection with the first utility conflict from the previous slide.

See handout on page E31.



In response to the varying use of UCMs across the country, the research team developed three products:

- Product 1 is a compact standalone UCM in Excel format that uses 23 data items and can be immediately used.
- Product 2 is an flexible, scalable data model and database that can accommodate a large number of UCMs. Depending on the level of implementation, involvement by IT personnel at the DOT may be necessary.
- Product 3 is the one-day UCM training course.

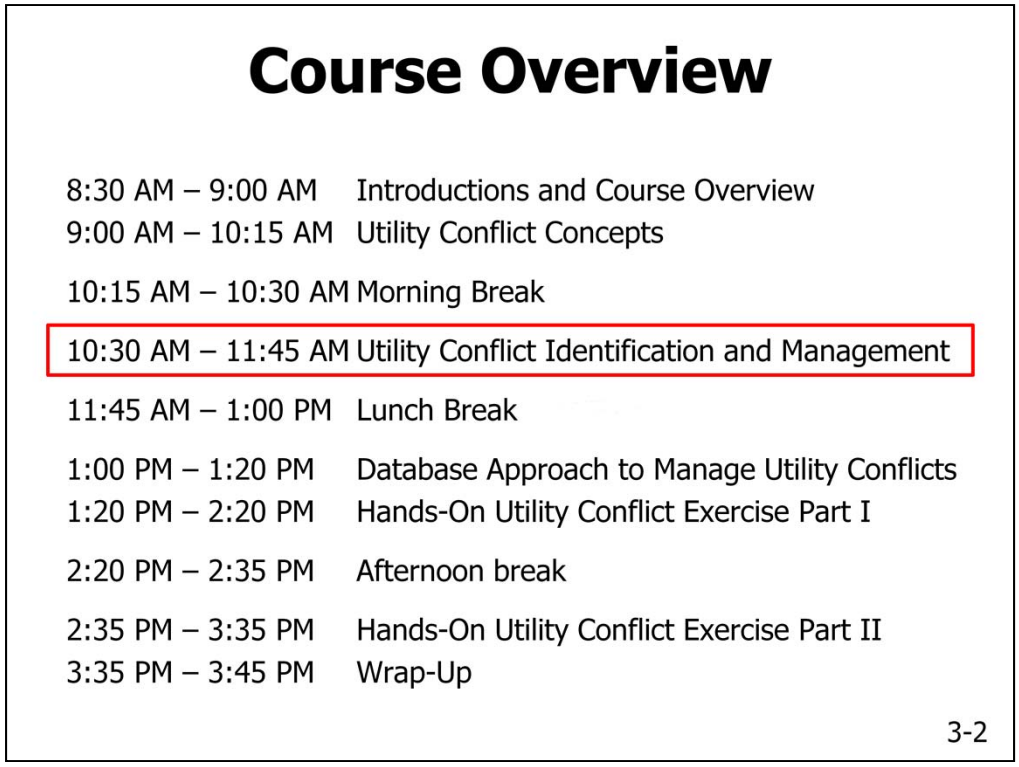
2.3
Questions and Answers

2-60

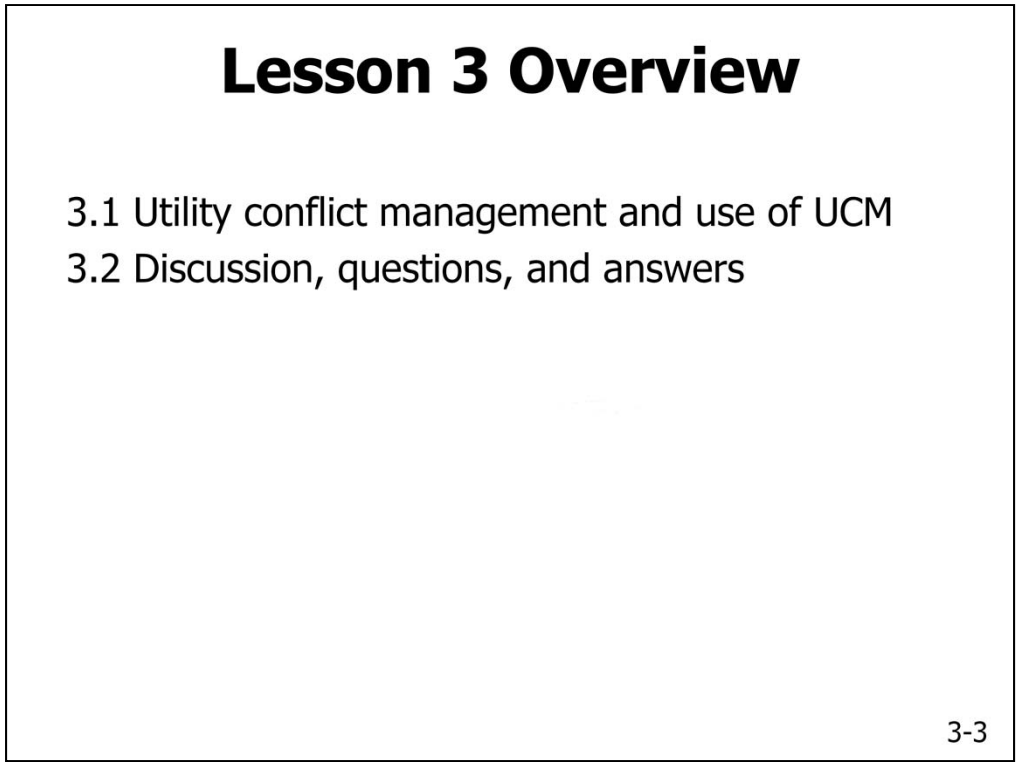
Lesson 3

Utility Conflict Identification and Management

3-1



This section of the training is Lesson 3, which deals with the identification and management of utility conflicts.



Purpose of Lesson 3:

- Provide an overview of utility conflict management strategies and concepts, and the use of the utility conflict matrix to manage utility conflicts.

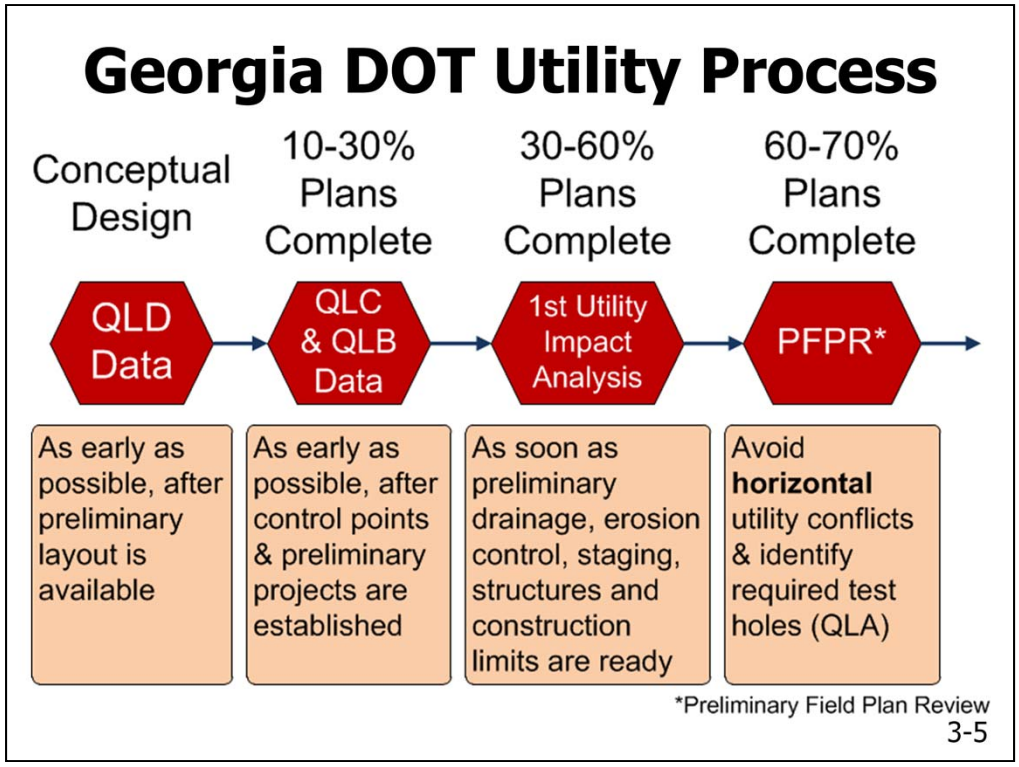
The lesson concludes with a brief discussion of questions and answers.

Acknowledgement: sample project documents used in the development of this lesson were provided by the Georgia DOT and Caltrans.

3.1

Utility Conflict Management and Use of UCM

3-4



Although all state DOTs have to deal with utilities, states have different management procedures and processes. For example, this slide shows the Georgia DOT (GDOT) process, which focuses on conducting utility investigations systematically, conducting utility conflict analysis at critical points during the design phase, and resolving utility conflicts before projects go to letting.

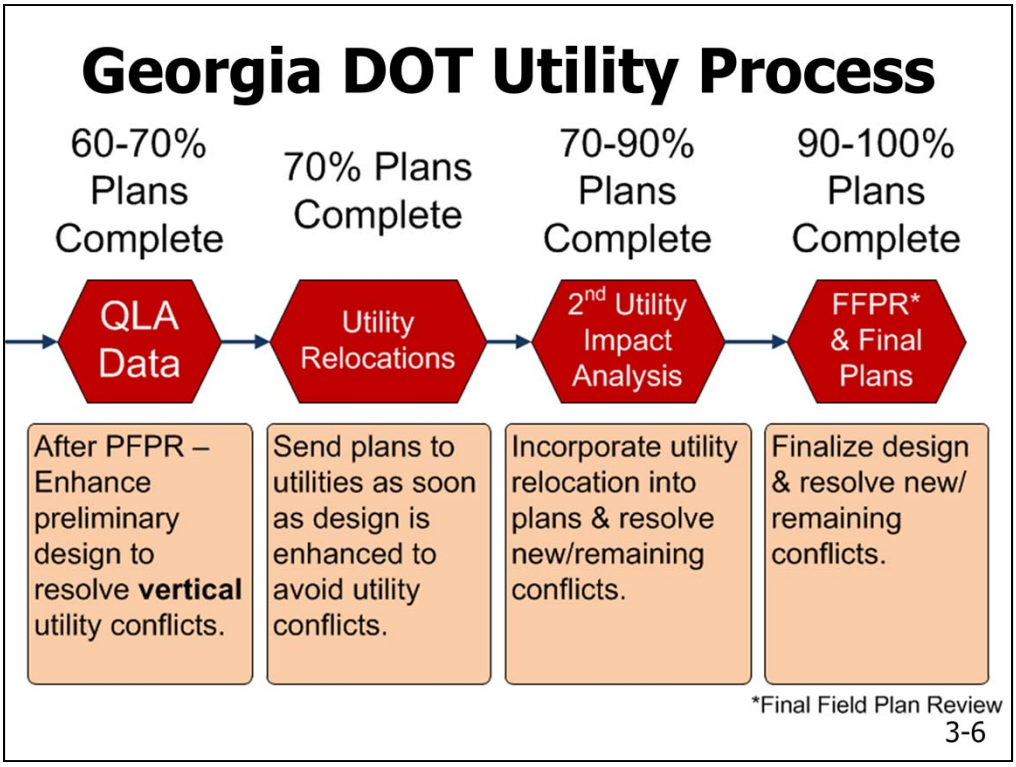
In the GDOT model:

• QLD data are collected as early as possible, once a preliminary layout (or conceptual design) is available.

• QLC and QLB data are collected after control points and preliminary project limits are established, typically when the design is about 10-30% complete.

• As soon as preliminary drainage, erosion control, staging, structures, and construction limits are established (30-60% design), the DOT conducts the first utility impact analysis.

• Once the design is 60-70% complete, GDOT conducts a preliminary field plan review (PFPR) to determine which horizontal utility conflicts are avoidable by changes to the design and which locations require test holes (QLA).



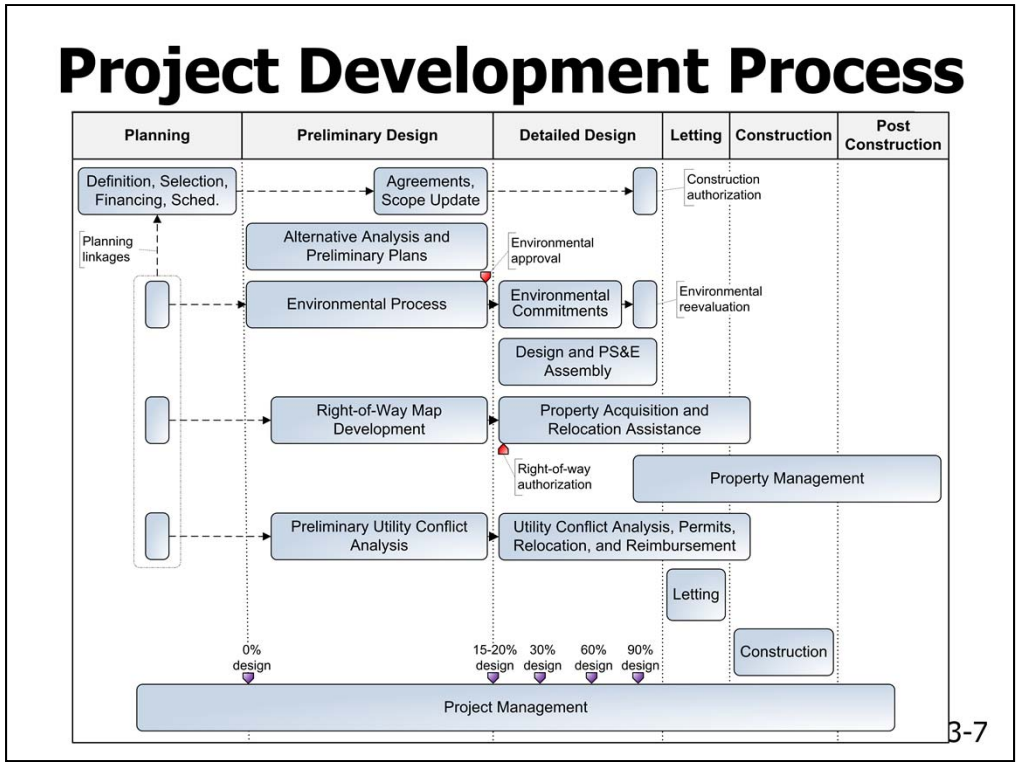
• After the preliminary field plan review is complete and QLA is collected, GDOT reviews the design to determine if any vertical utility conflicts can be resolved.

• When plans are 70% complete, GDOT sends plans to utilities to schedule utility relocations of remaining conflicts.

• At about 70-90% design, GDOT conducts a second utility impact analysis, which incorporates utility relocations into the design plans and resolves any new or remaining conflicts.

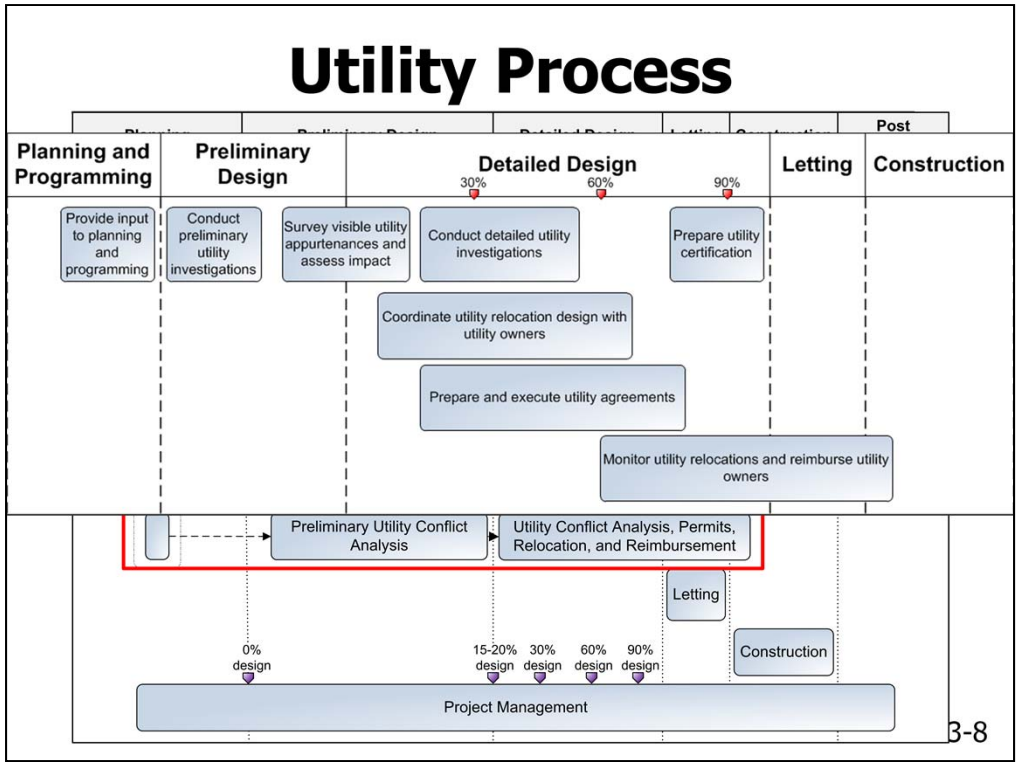
• At about 90-100% design, GDOT conducts the final field plan review, finalizes design, and resolves any new or remaining conflicts.

GDOT's goal is to have all conflicts resolved by the time the transportation project design is finalized.



The following slides describe a generic, systematic process to manage utility conflicts as part of the project development and delivery process.

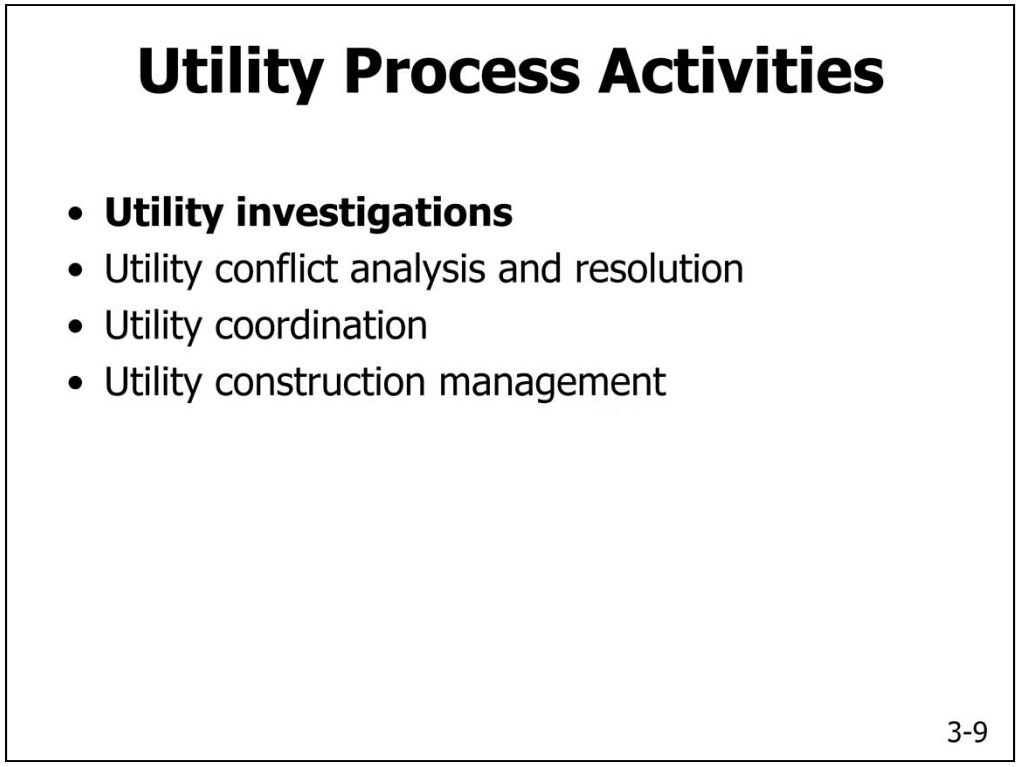
As a reference, the process uses a typical representation of the traditional design-bid-build project development and delivery process at most state DOTs. A similar diagram could be prepared for design-build projects.



This slide shows a zoomed-in view that focuses on the utility process. Utility conflict resolution is a portion of the utility process that typically begins at the end of preliminary design and should ideally end before the beginning of construction.

To function properly, the utility process needs utility data input, which occurs at different times of the process. Typically, as time progresses, utility information becomes more detailed and precise. Other elements of the utility process include coordination of utility relocation activities, preparation and execution of utility agreements, preparation of utility certifications, and monitoring of utility relocations and reimbursement of utility owners.

The following slides describe the utility process in more detail, first with respect to activities and then with respect to stages.



The utility process as described in the previous slides includes the following main activities:

• Utility investigations, including QLD, QLC, QLB, and QLA data collection.

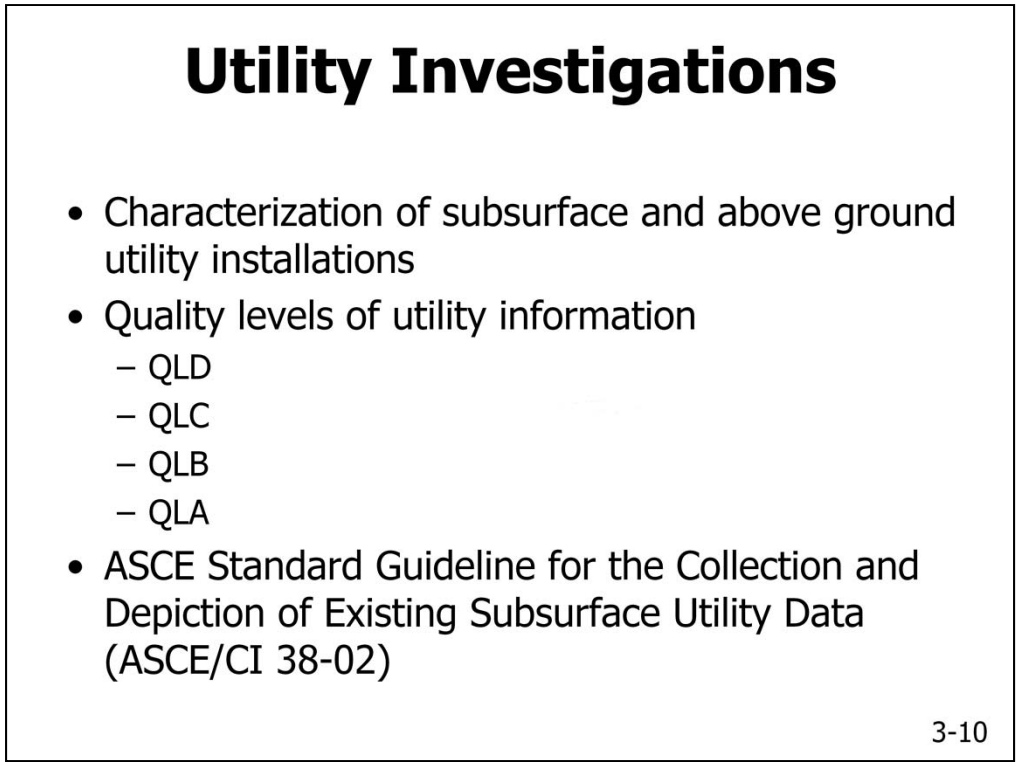
• Utility conflict analysis and resolution.

• Utility coordination.

• Utility construction management, including construction inspections.

• Development of scopes of services, for both internal and external forces.

The following slides cover each main process activity in detail.



Utility investigations characterize subsurface and above ground utility installations at different quality levels. QLD (sometimes called a "records search") and QLC are often performed by DOT staff, while QLB and QLA are typically performed by consultants.

The ASCE 38-02 standard contains the following:

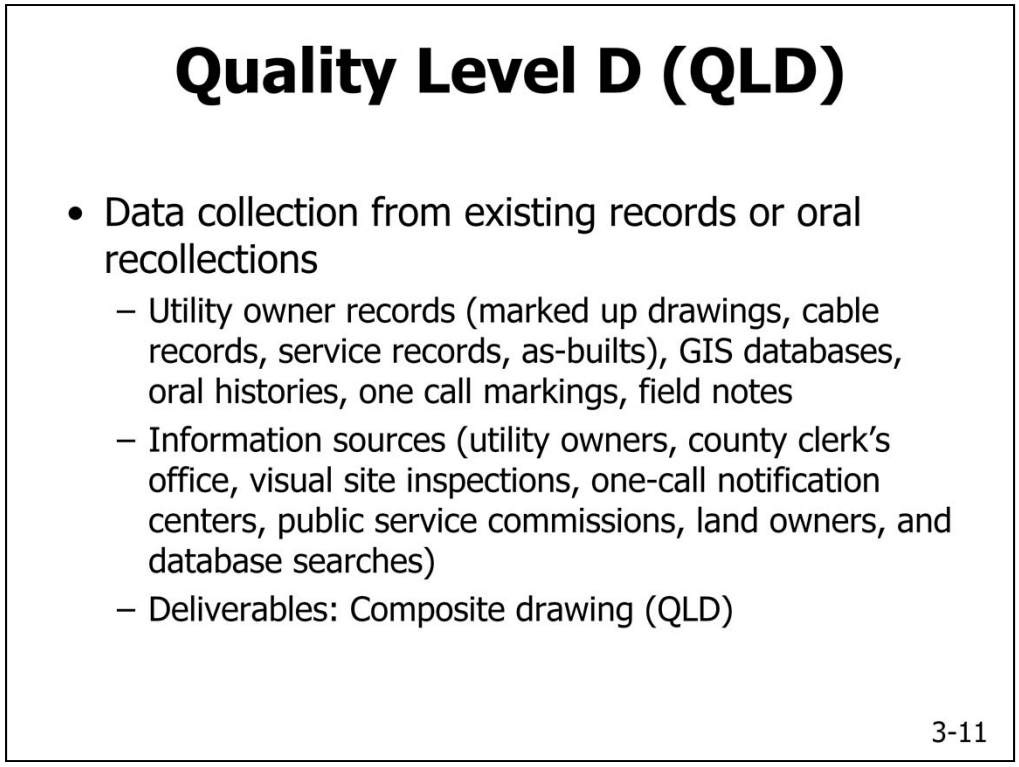
• Definitions

• Engineer and owner tasks

• Descriptions of actions necessary to achieve specific quality levels

• Formatting of deliverables

• Relative costs and benefits of various quality levels

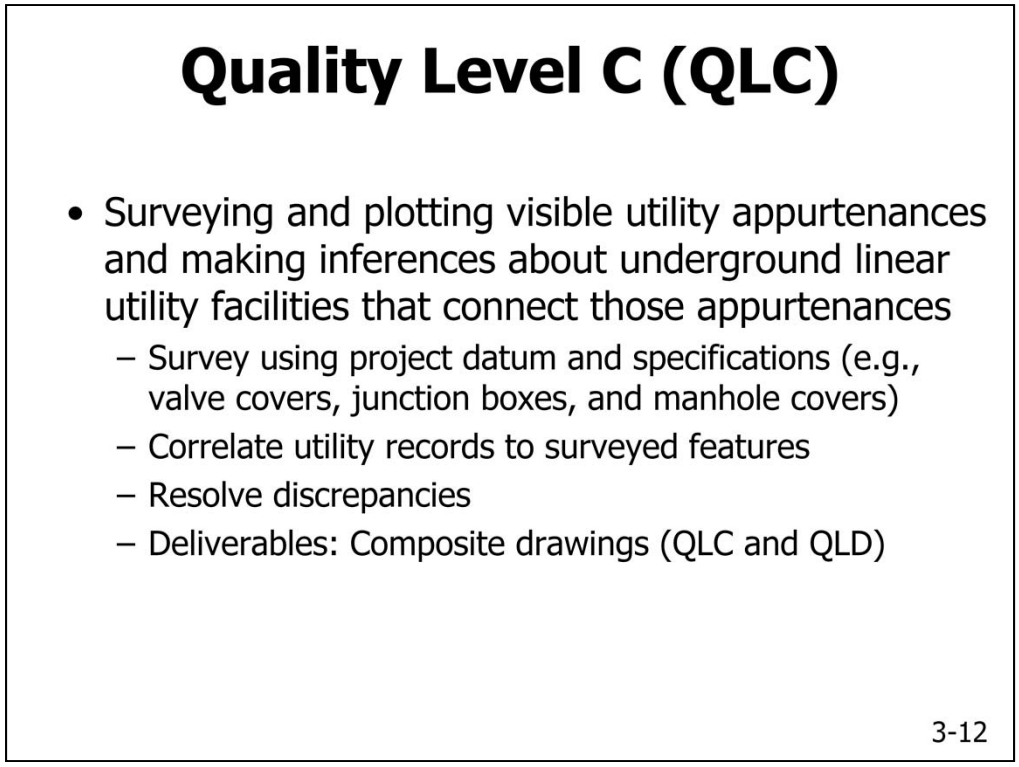


QLD utility investigations collect data from existing records or oral recollections. This may include the following:

• Utility owner records (marked up drawings, cable records, service records, as-builts), GIS databases, oral histories, one call markings, field notes

• Information sources (utility owners, county clerk's office, visual site inspections, one-call notification centers, public service commissions, land owners, and database searches)

Deliverables are composite drawing depicting QLD facilities.



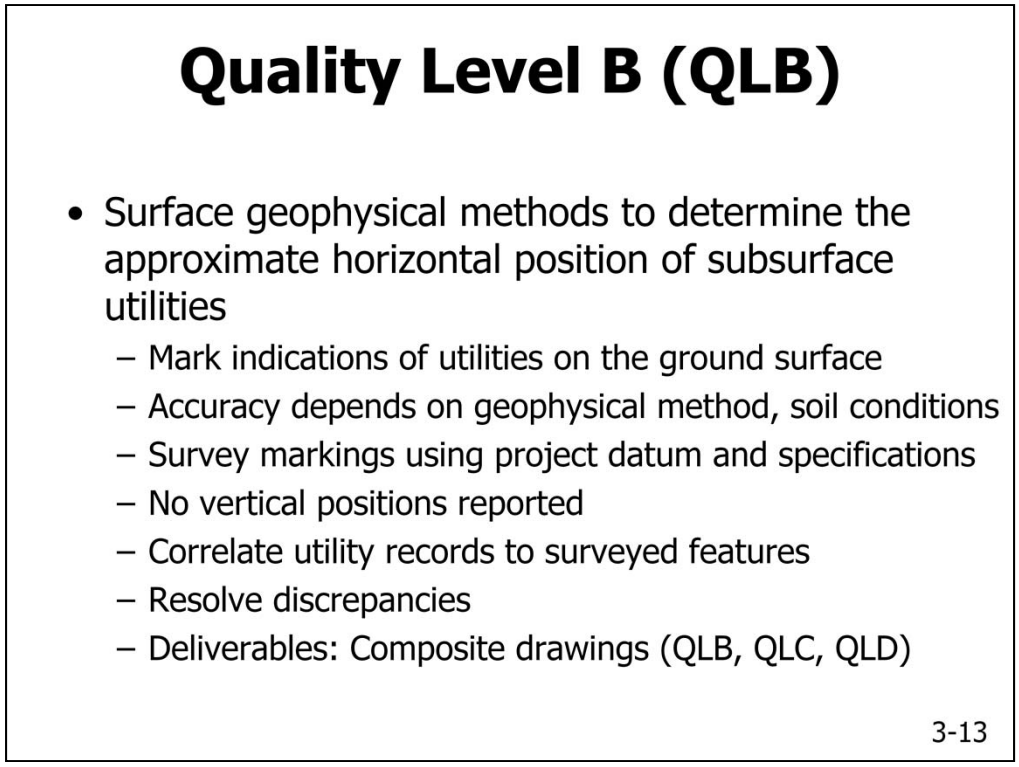
QLC utility investigations survey and plot visible utility appurtenances and make inferences about underground linear utility facilities that connect those appurtenances. QLC utility investigations may include the following activities:

• Survey using project datum and specifications (e.g., valve covers, junction boxes, and manhole covers)

• Correlate utility records to surveyed features

• Resolve discrepancies

Deliverables are composite drawings including QLC and QLD data.



Positional inaccuracies in QLD data can range from several feet to several hundred feet. To avoid these problems, QLB utility investigations use a variety of noninvasive surface geophysical methods, including electromagnetic and radar techniques, to determine the approximate horizontal position of subsurface utilities. QLB utility investigations are characterized by the following:

• Mark indications of utilities on the ground surface

• Accuracy depends on geophysical method, soil conditions

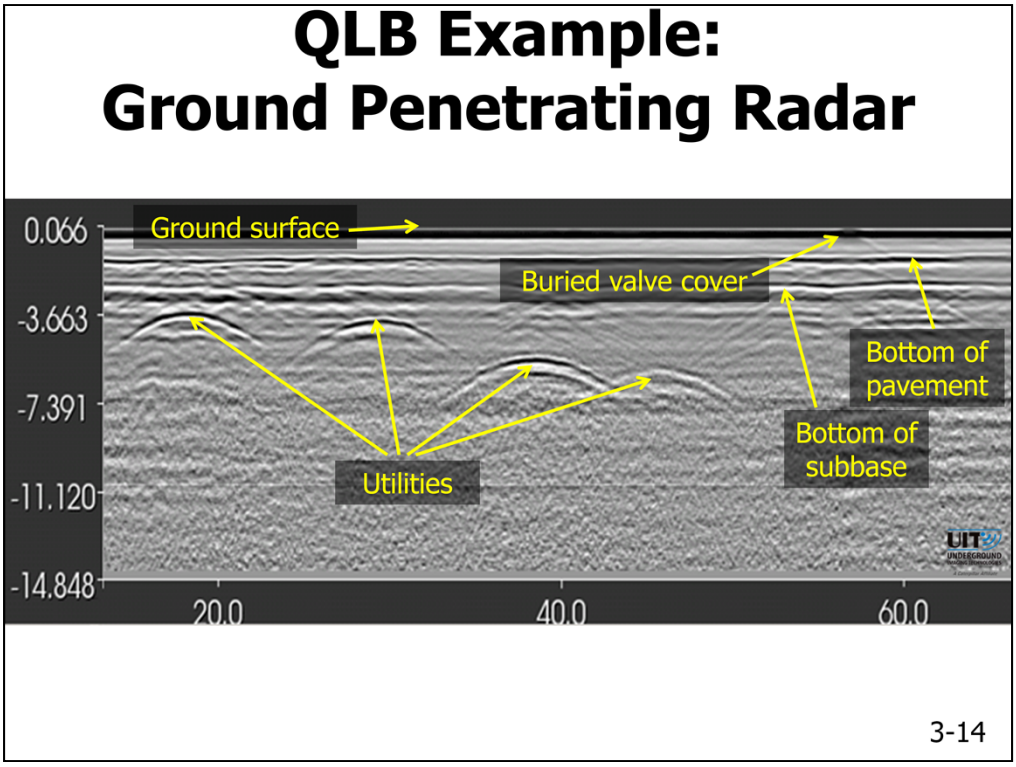
• Survey markings using project datum and specifications

• No vertical positions reported

• Correlate utility records to surveyed features

• Resolve discrepancies

Deliverables are composite drawings including QLB, QLC, and QLD data.



This slide provides an example of a geophysical method to collect QLB data, ground penetrating radar (GPR). The image shows a GRP image that was generated for a Florida DOT project in St. Cloud, Florida. The purpose of this slide is to give the audience an idea of the need to professionally interpret QLB data. This process can be compared to a doctor who needs experience to interpret an X-ray image.

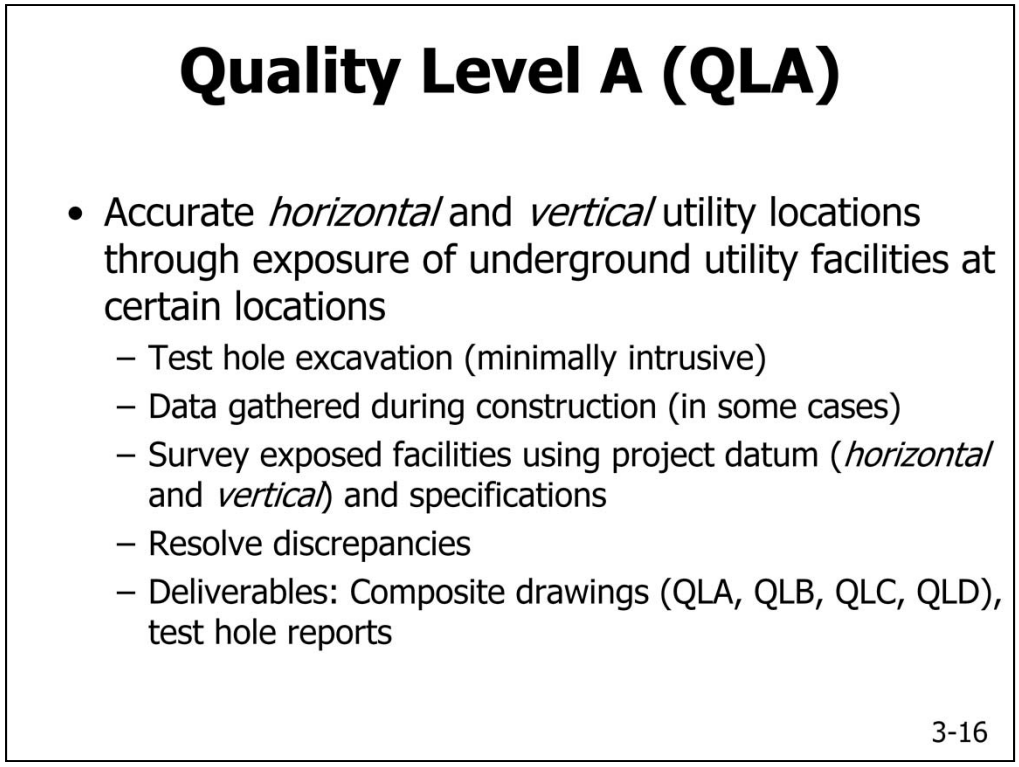
Ask the audience if they can identify ground surface, bottom of pavement, bottom of subbase, and how many utilities are shown in this picture, then advance to provide the solution.

GPR is only one of many available geophysical methods to collect QLB data. Other methods include pipe and cable locators, magnetic methods, terrain conductivity, and acoustic location. GPR is only suitable for certain types of utilities in certain types of soils. In general, the higher the conductivity of the soil, the lesser the effectiveness of GPR.

Acknowledgement: UIT Underground Imaging Technologies provided the screenshot.

These images provide a few examples of QLB data collections.

- Picture 1 shows a technician using a pipe and cable locator and painting marks on the ground to designate the approximate horizontal position of a subsurface utility.
- Picture 2 shows a technician tracing the location of utility lines using a hand-held device.
- Picture 3 shows a technician tracing the location of utility lines.
- Picture 4 shows a technician tracing the location of utility lines.



QLA utility investigations determine accurate horizontal and vertical utility locations through exposure of underground utility facilities at certain locations. QLA utility investigations may include the following activities:

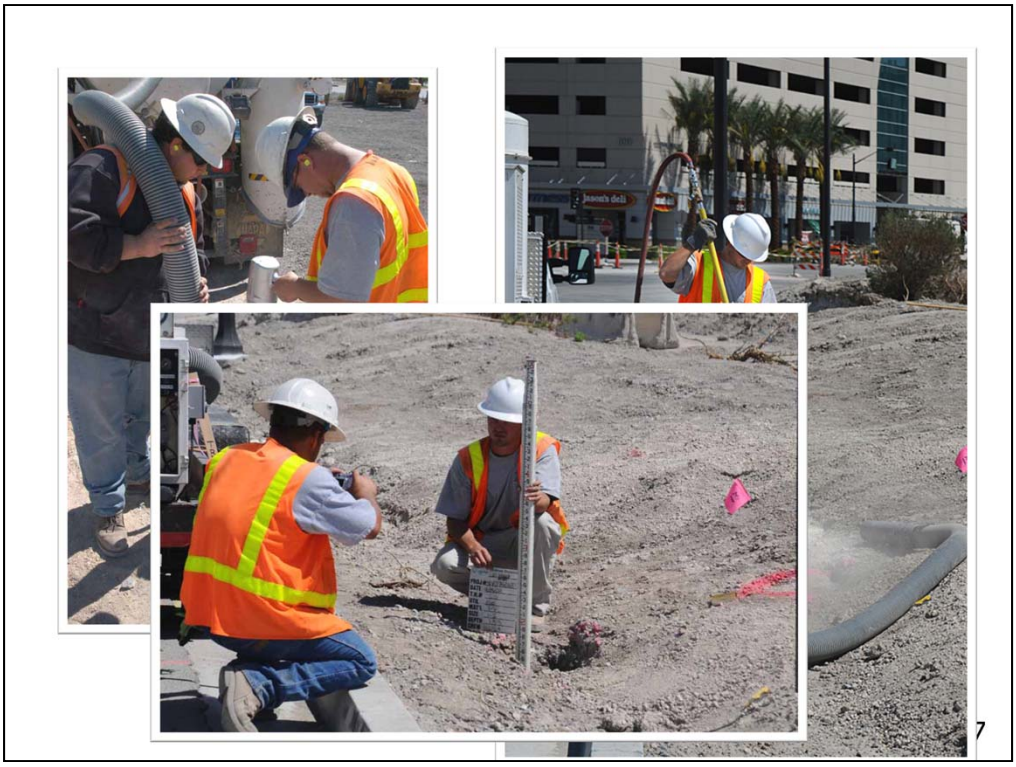
• Test hole excavation (minimally intrusive)

• Data gathered during construction (in some cases)

• Survey exposed facilities using project datum (horizontal and vertical) and specifications

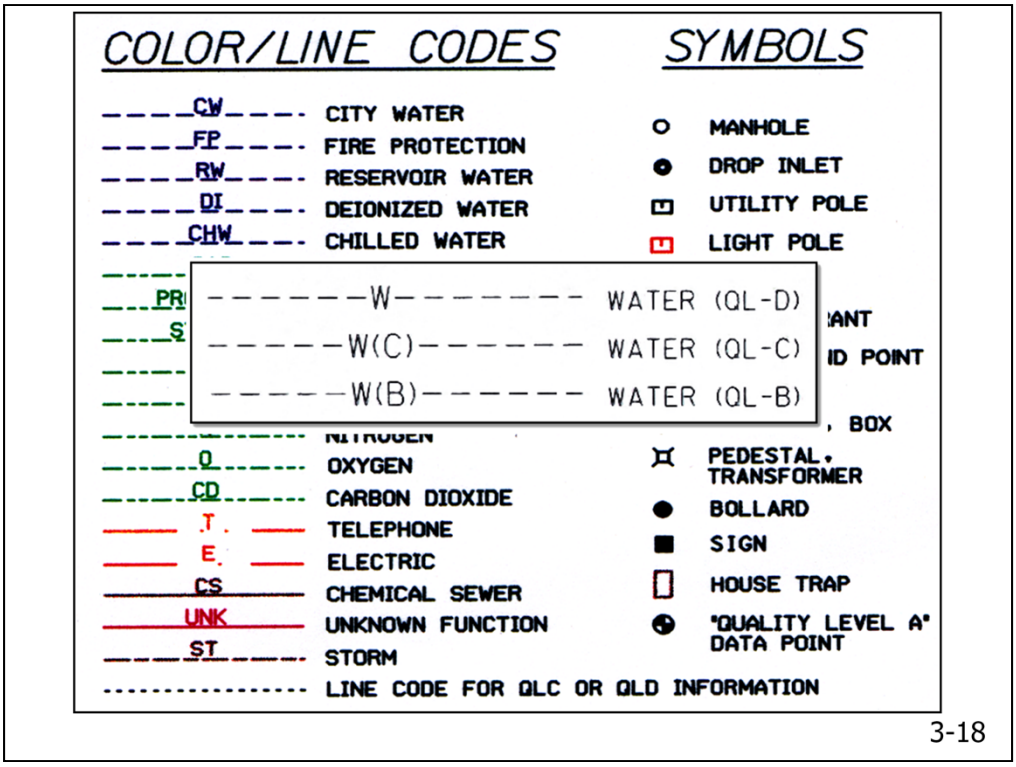
• Resolve discrepancies

Deliverables are composite drawings including QLA, QLB, QLC, and QLD data, and test hole reports, which include information about the top/bottom of utilities, grade, outside diameter, material, pavement thickness, soil conditions, and other.

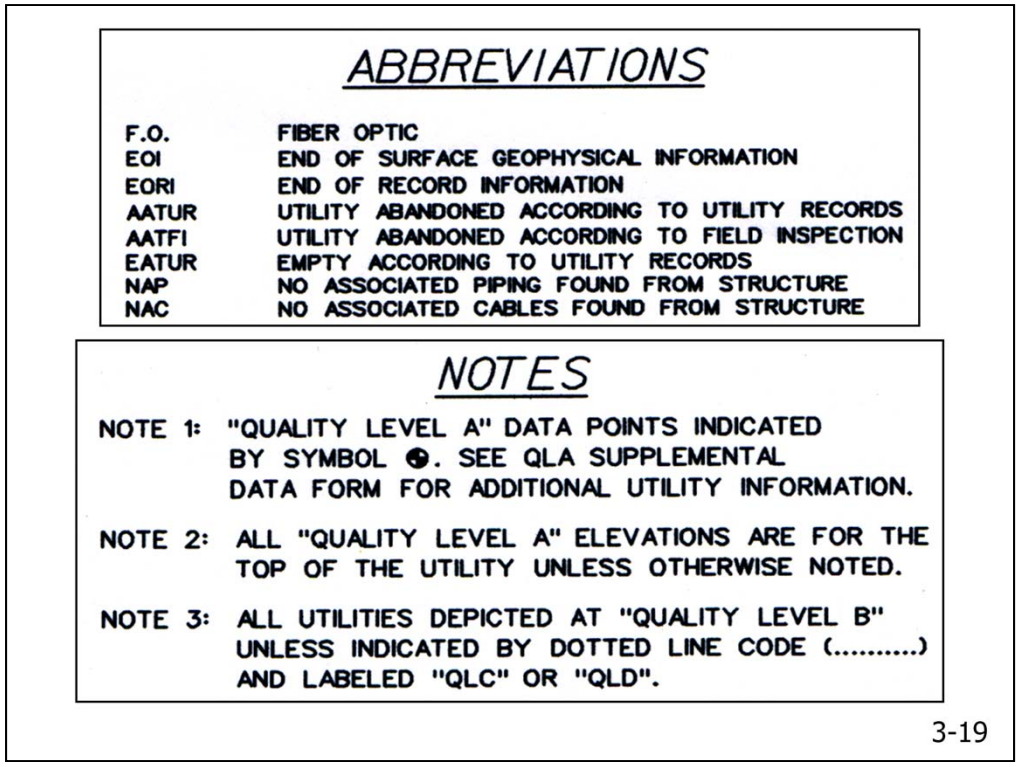


These images provide a few examples of QLA data collections.

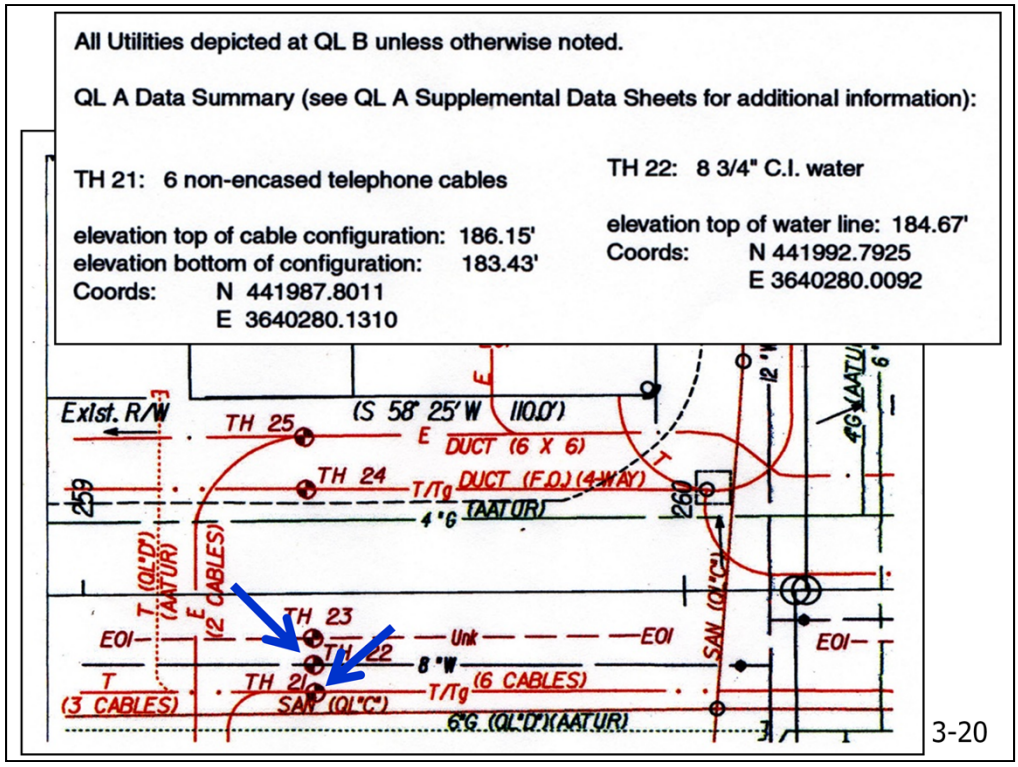
- Picture 1 shows a technician using an air lance and a nondestructive vacuum excavator to dig a test hole to locate an underground utility line along a road in Las Vegas, NV.
- Picture 2 shows a technician using an air lance to loosen soil during a project in Las Vegas, NV, in conjunction with a nondestructive vacuum excavation to locate an underground utility line.
- Picture 3 shows a technician measuring the top of the utility line from the surface.



Typical symbology for utility investigation data used on project design sheets. Notice the different line codes for QLB, QLC, and QLD data.



Abbreviations and notes block for utility investigation data used on design sheets.



Example of test hole report that relates to data on design sheets. This excerpt from the test hole report provides information about test holes 21 and 22.

Test Hole Form

Utility Type		Utility Material	Offset Measured From	Identified By
E	Electrical	1 Steel	30 Edge of Pavement	20 Sleeve
G	Gas Line	2 PVC (Polyvinyl Chloride)	31 Baseline	21 Hub/Lathe
BT	Buried Telephone	3 DIP (Ductile Iron Pipe)	32 Right-of-Way	22 Nail/Disk
FOC	Fiber Optic Cable	4 VCP (Vitrified Clay Pipe)	33 Centerline	23 "X" in Concrete
W	Water	5 PE (Polyethylene Pipe)	34 Back of Curb	24 Set Iron Rod and Cap 5/8"
SAN	Sanitary Sewer	6 AC (Transite)	35 Survey Hub	25
STM	Storm Sewer	7 CI (Cast Iron)	36 "X" in Concrete	26
CATV	Cable TV	8 DBC (Direct Buried Cable)	37 Swing Ties	
FM	Force Main	9 Concrete Pipe	38 Ref. Point in Driveway	
RW	Reclaimed Water	10 Corrugated Metal Pipe	39	
SL	Street Light	11 Duct	**Surface Type**	
TS	Traffic Signal	12 Fiberglass	A Asphalt	
FL	Fuel Line	13 Unknown	C Concrete	
EXP	Exploratory	14 Corrugated Plastic	NG Natural Ground	
UNK	Unknown	15 Concrete Duct		
IRR	Irrigation			

Conflict No.	Test Hole No.	Utility Type	Utility Material	Utility Size (O.D.) in. ☑ mm. ☐	Approx. Station	Approx. Offset Distance ft. ☑ m. ☐ L	R	Offset From	Manual Depth (Top) ft. ☑ m. ☐	Cross Sectional View	Utility Direction	ID'd By	Surface Type	Pvmnt. Thick-ness in. ☑ mm. ☐
C40	19	BE	2	6"	37+00	62.0		31	3.16'			22	NG	
C42	20	BE	2	6"	37+00	57.0		31	3.33'			22	NG	
C43	21	W	6	12"	37+00	53.0		31	4.21'			22	NG	
C44	22	G	1	6"	37+00	48.0		31	3.56'			22	NG	
C18	23	BE	2	6"	37+40	60.0		31	3.19'			22	NG	
C19	24	BT	8	1"	37+90	43.0		31	4.52'			22	NG	
C23	25	W	2	6"	39+00	110		31	3.83'			22	NG	
C24	26	CATV	8	1"	35+30	105		31	4.12'			22	NG	

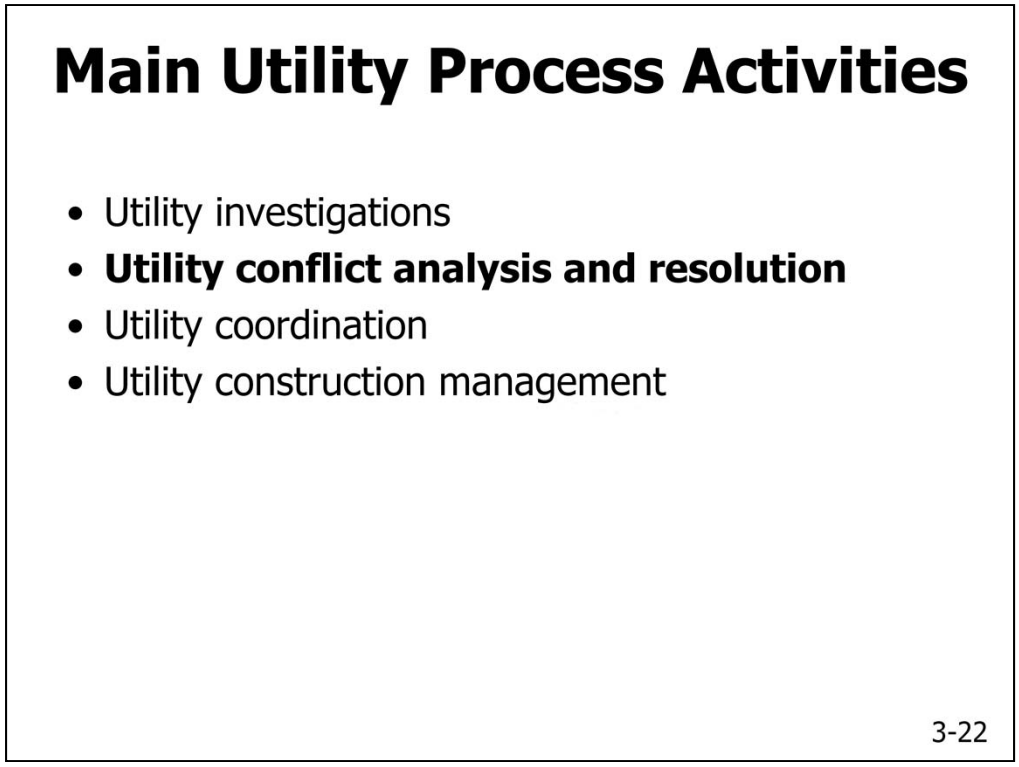
Notes:

Sheet 1 of 1 Prepared By: VL Date: 10/13/06 Checked By: RMP Date: 10/14/06

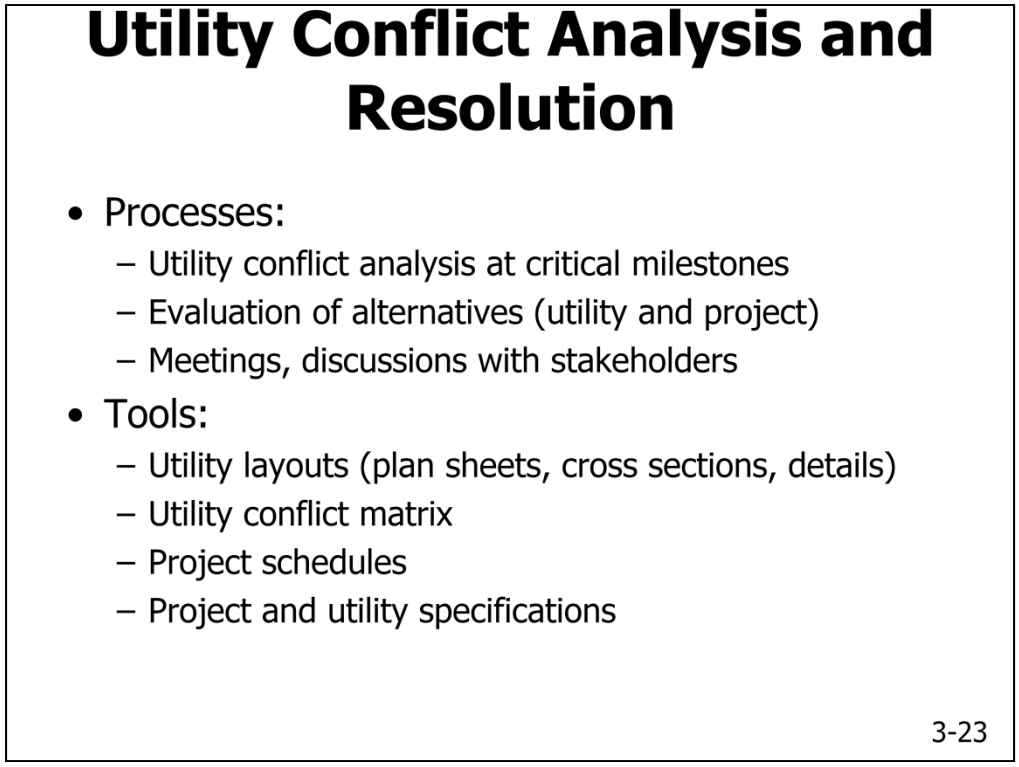
3-21

Example of test hole report.

A copy of this test hole report is provided in on page F3 of the participant notes.



The following slide focuses on the utility conflict analysis and resolution aspect of the utility process.



The main processes of utility conflict analysis and resolution are the following:

• Utility impact analysis

• Evaluation of alternatives (utility and project)

• Meetings, discussions with stakeholders

Utility conflict analysis and resolution uses the following tools:

• Utility layouts (plan sheets, cross sections, details)

• Utility conflict matrix

• Project schedules

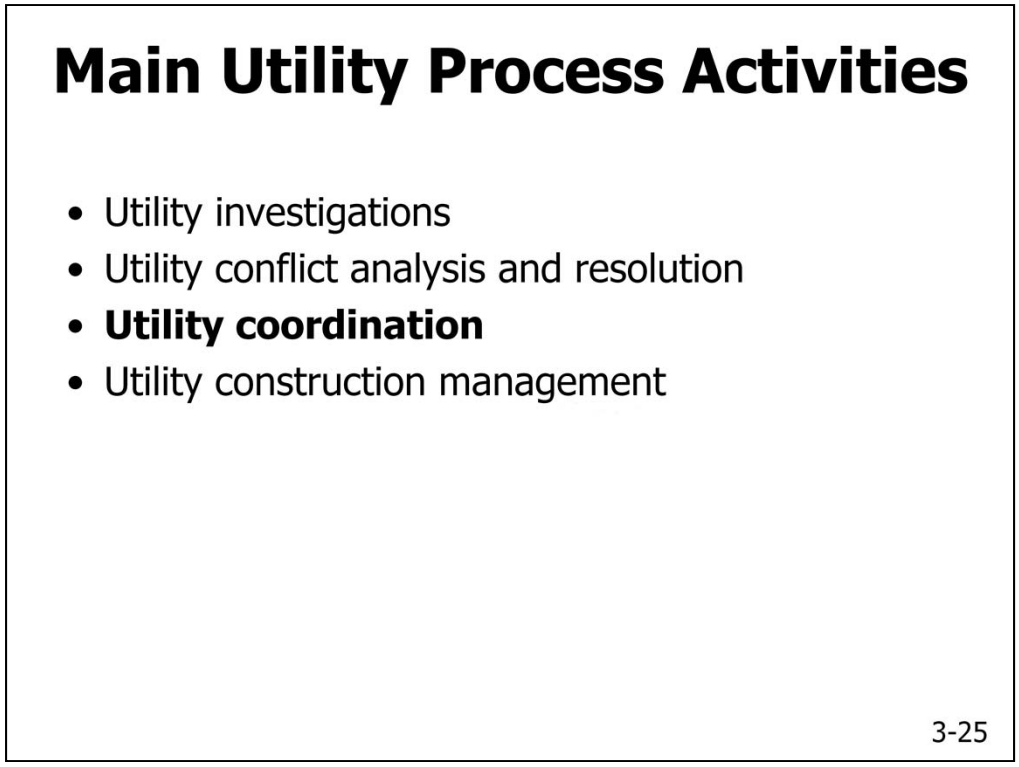
• Project and utility specifications

Utility Conflict Analysis and Resolution

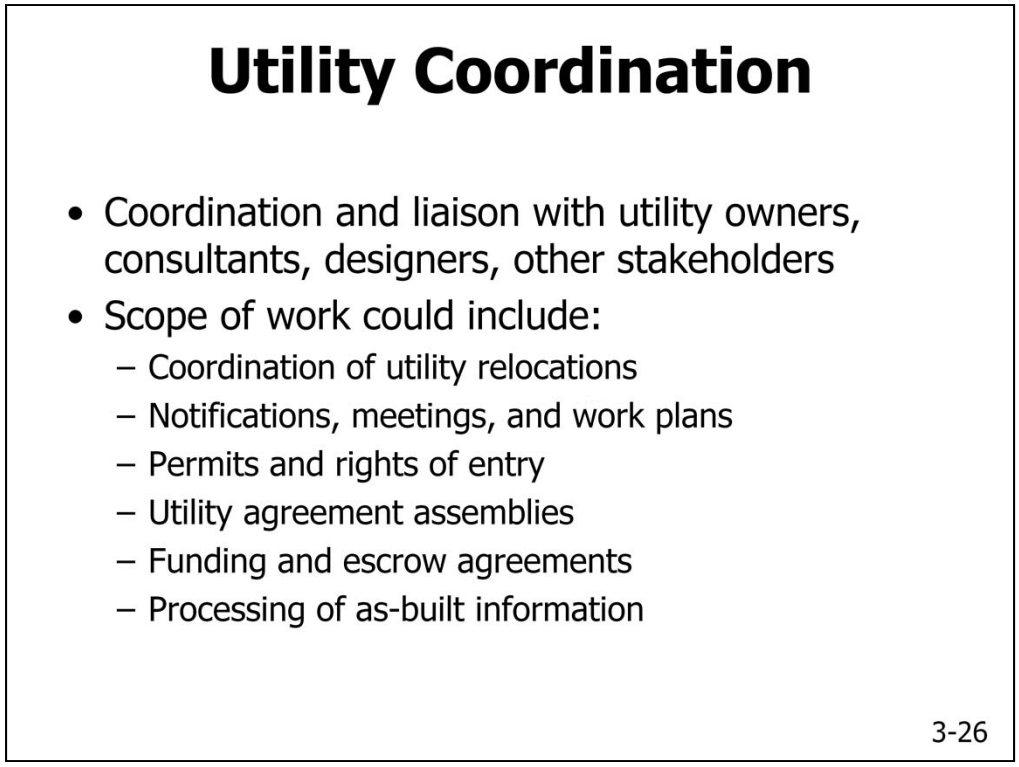
- Outcomes:
  - Alternatives for utility conflict resolution
  - Utility construction phasing
  - Constructability recommendations
  - Traffic control plan
  - Project management reports during design
  - Project management reports during construction
  - Plans, schedules, and estimates
  - Certifications/special provisions in PS&E assembly

3-24

Outcomes of utility conflict analysis and resolution are alternatives for utility conflict resolution; utility construction phasing plans; constructability recommendations; traffic control plans; project management reports during design and/or construction; plans, schedules, and estimates; and certifications or special provisions for PS&E assembly documents.

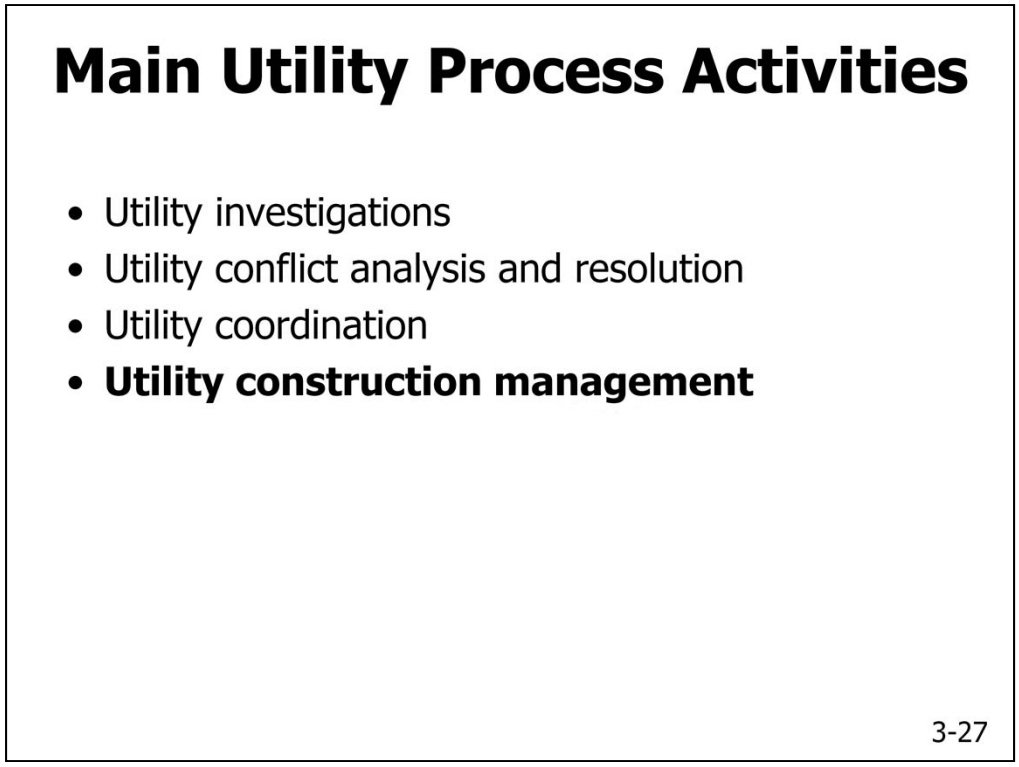


The following slide focus on the utility coordination aspect of the utility process.



The main activities of utility coordination are coordination and liaison with utility owners, consultants, designers, other stakeholders. A scope of work could include the following:

- Coordination of utility relocations
- Notifications, meetings, and work plans
- Permits and rights of entry
- Utility agreement assemblies
- Funding and escrow agreements
- Processing of as-built information



The following slide focuses on the utility construction management aspect of the utility process.

Utility Construction Management

- Coordination of utility construction
  - Pre and post letting
- Inspection and verification
- Compliance with policies (e.g., utility accommodation policy, traffic control, SW3P, OSHA, etc.)
- Payment request reviews
- Gathering or preparing as-built plans

3-28

The main activities of utility construction management are the following:

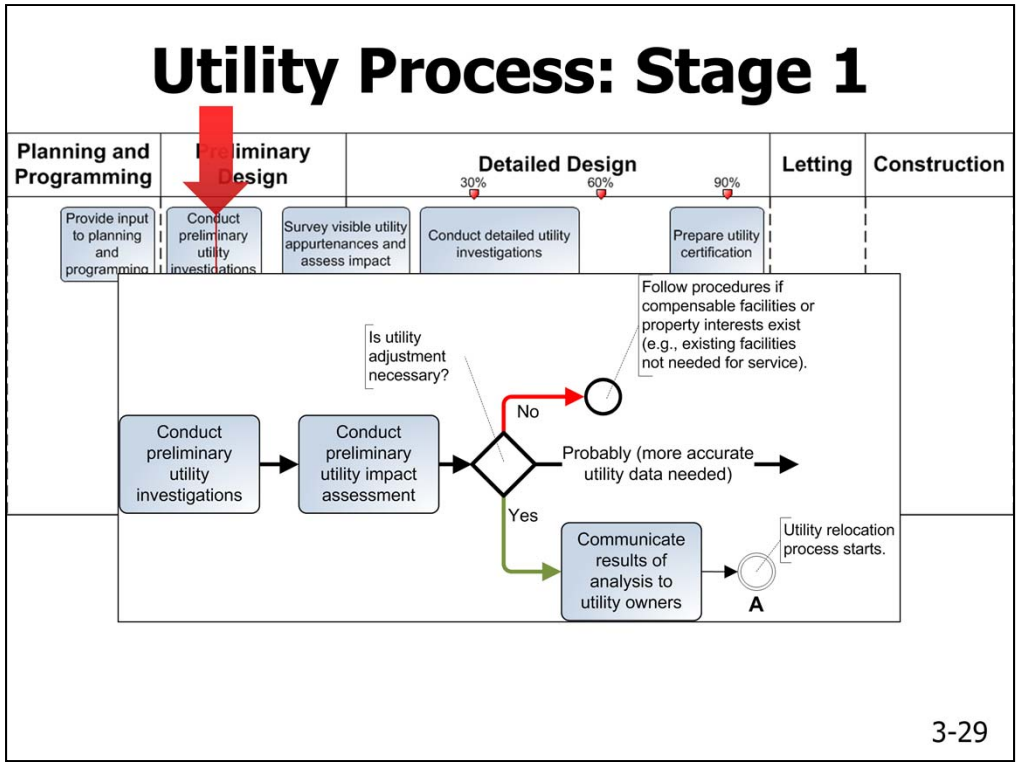
• Coordination of utility construction, including pre and post letting

• Inspection and verification

• Compliance with policies, e.g., utility accommodation policy, traffic control, storm water pollution prevention plans (SW3P), Occupational Safety and Health Administration (OSHA), etc.

• Payment request reviews

• Gathering or preparing as-built plans after relocation of utility facilities

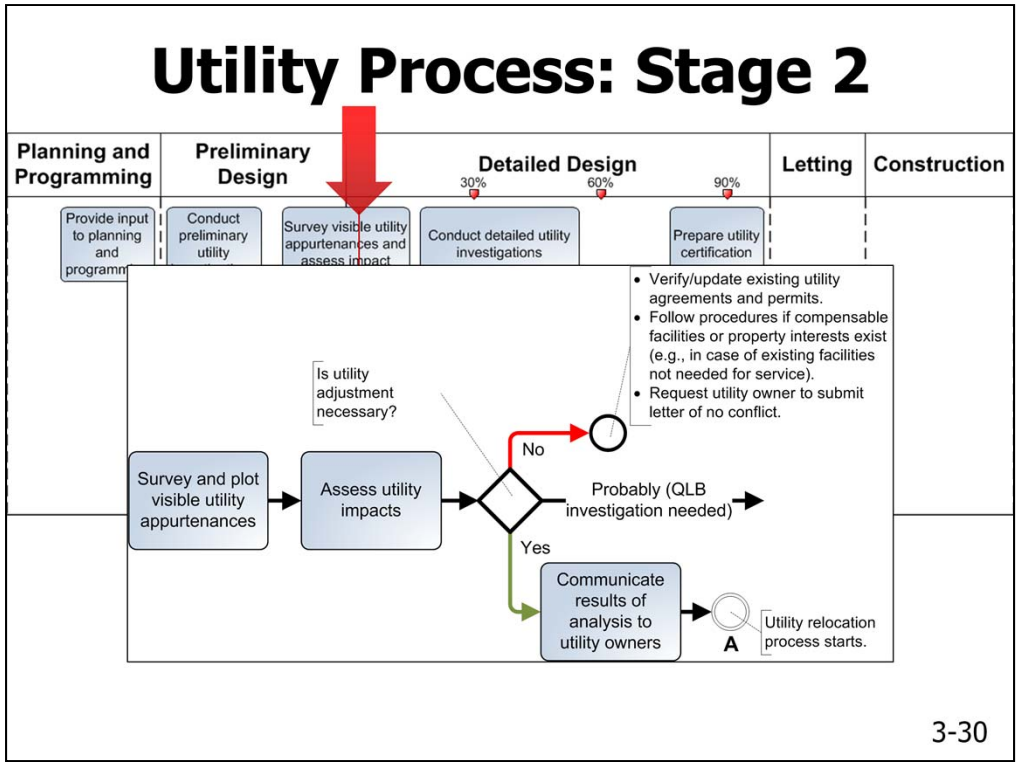


The previous slides looked at the utility process from the standpoint of activities. This and the following slides will look at the utility process from the standpoint of stages.

Stage 1 corresponds to the beginning of the process when potential utility conflicts are identified for the first time. It involves the following activities:

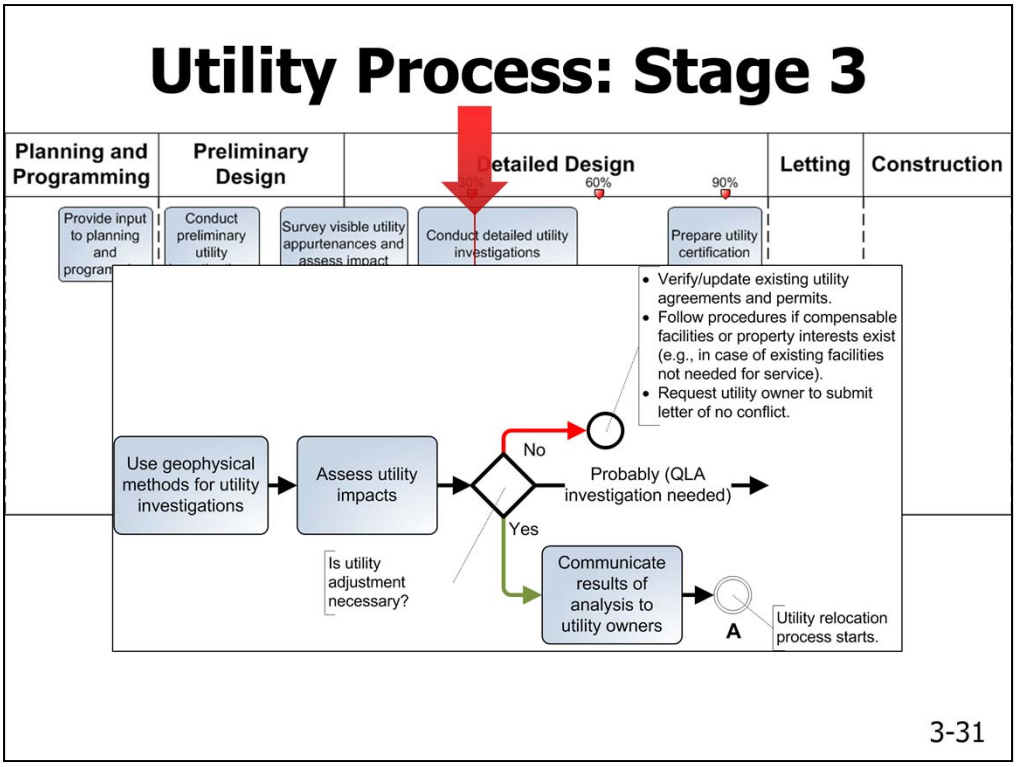
- Conduct preliminary investigation based on existing records.
- Assess potential impact. For each potential conflict, determine if the utility is in conflict or not, or whether more accurate data are needed to make a determination. Depending on project specifics, this assessment can occur with input from utility owners at an initial utility coordination meeting or can be performed by an internal DOT review team. In either case, results of the assessment should be communicated with the utility owner.

This slide and the following three slides may be hard to read on-screen, therefore ask participants to review their handout material in section D, page D3, in parallel.



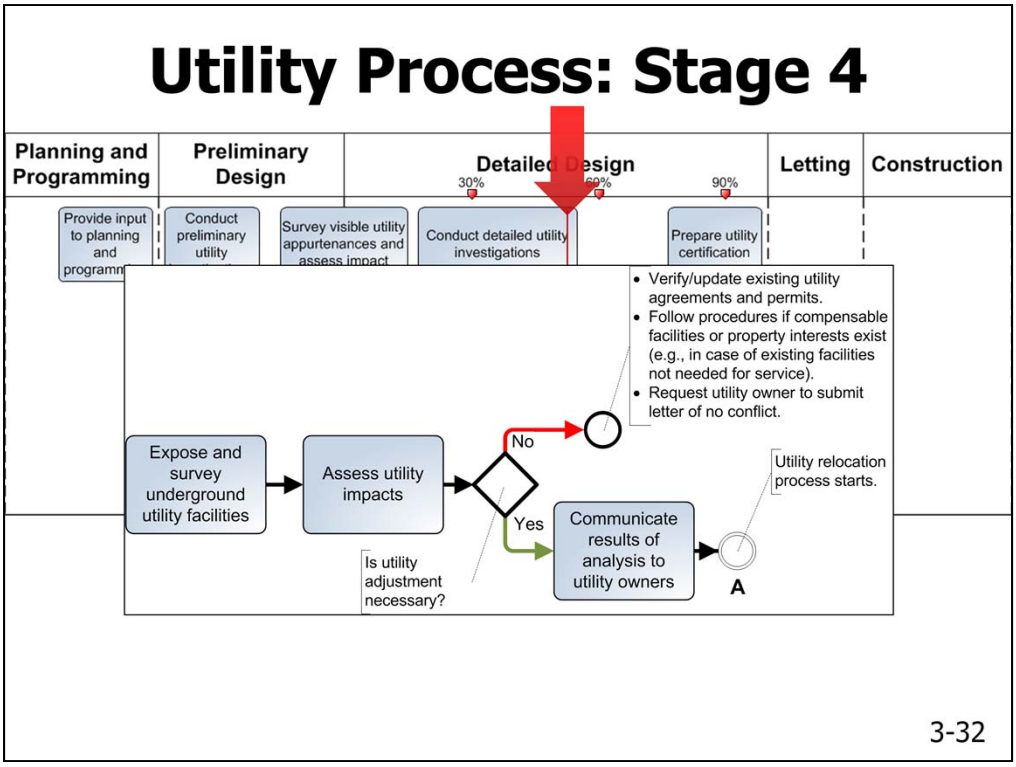
Stage 2 corresponds to the part of the process (typically at the end of the preliminary design phase or beginning of the design phase) when the DOT collects detailed survey data, including visible utility appurtenances. It includes the following activities:

- Survey visible utility appurtenances. The survey should include all aboveground utilities, such as poles, guy wires, manholes, and valves.
- Assess potential impacts. For each potential conflict, determine if the utility is in conflict or not, or whether more accurate data are needed to make a determination. For belowground installations, QLB data might be needed to make that determination. In that case, the assessment should list the locations where the QLB data are needed.
- Analyze and review utility conflict resolution strategies, including the option to make changes to the highway design. Depending on project specifics, this assessment can occur with input from utility owners at a utility coordination meeting or can be performed by an internal DOT review team. In either case, results of the assessment should be communicated with the utility owner.



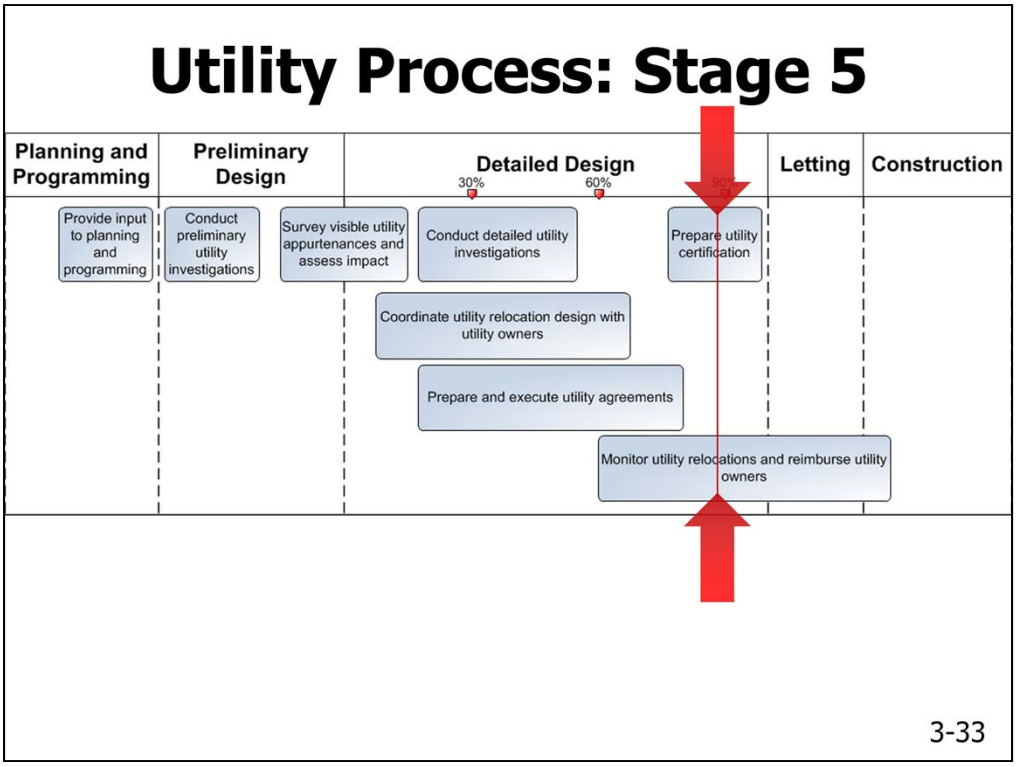
Stage 3 corresponds to the part of the process, around 30-percent design, when the DOT collects detailed information about underground utility installations and uses the resulting data to identify or confirm utility conflicts, as well as analyze and review utility conflict resolution strategies. It includes the following activities:

- Conduct detailed utility investigations using appropriate geophysical methods at QLB for the location and soil conditions of the project to produce a map of horizontal locations of underground utility installations.
- Assess potential impact. For each potential conflict, determine if the utility is in conflict or not, or whether test holes (QLA data) are needed.
- Analyze and review utility conflict resolution strategies, including the option to make changes to the highway design. Depending on project specifics, this assessment can occur with input from utility owners at a utility coordination meeting or can be performed by an internal DOT review team. In either case, results of the assessment should be communicated with the utility owner.
- If a utility installation needs to be relocated, coordinate utility relocation design with utility owners. Coordination with utility owners involves all aspects leading to the identification and design of utility conflict resolution measures such as notifications and setting of dates by which critical milestones must be complete.
- Begin preparing and executing utility agreements. Preparation and execution of utility agreements is typically required for utilities that will seek reimbursement for their utility relocation costs. These agreements outline the conditions of the utility accommodation, responsibilities of the parties involved, important timelines, and procedures for the relocation.



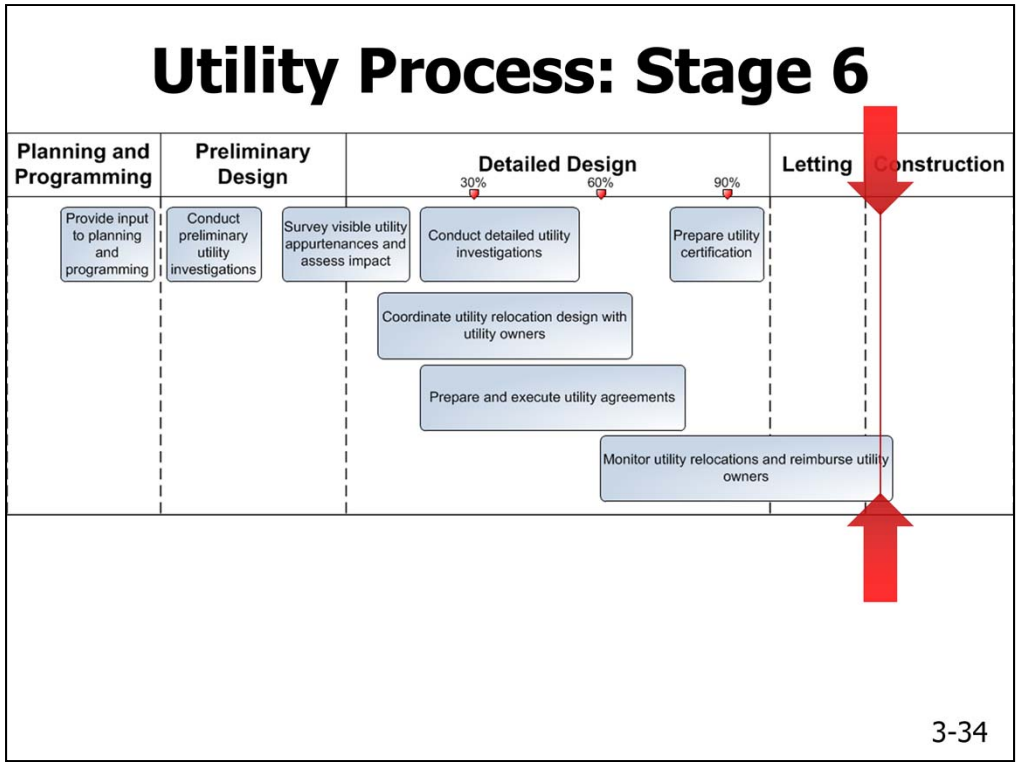
Stage 4 corresponds to the part of the process, around 60-percent design (or earlier if possible), when the DOT exposes underground utility installations at specific locations to gather accurate depth data and other critical facility information. It includes the following activities:

- Conduct detailed utility investigations at QLA at specific locations to gather accurate depth data and other critical facility information.
- Assess potential impact. For each potential conflict, determine if the utility is in conflict or not.
- Analyze and review utility conflict resolution strategies, including the option to make changes to the highway design. Depending on project specifics, this assessment can occur with input from utility owners at a utility coordination meeting or can be performed by an internal DOT review team. In either case, results of the assessment should be communicated with the utility owner.
- If a utility installation needs to be relocated, coordinate utility relocation design with utility owners. Coordination with utility owners involves all aspects leading to the identification and design of utility conflict resolution measures such as notifications and setting of dates by which critical milestones must be complete.
- Begin preparing and executing utility agreements. Preparation and execution of utility agreements is typically required for utilities that will seek reimbursement for their utility relocation costs. These agreements outline the conditions of the utility accommodation, responsibilities of the parties involved, important timelines, and procedures for the relocation.



Stage 5 corresponds to the part of the process, around 90-percent design, when the DOT begins to prepare utility certifications for plan, specifications, and estimate (PS&E) documents. This stage also involves monitoring utility relocations and reimbursing utility owners, as applicable. It includes the following activities:

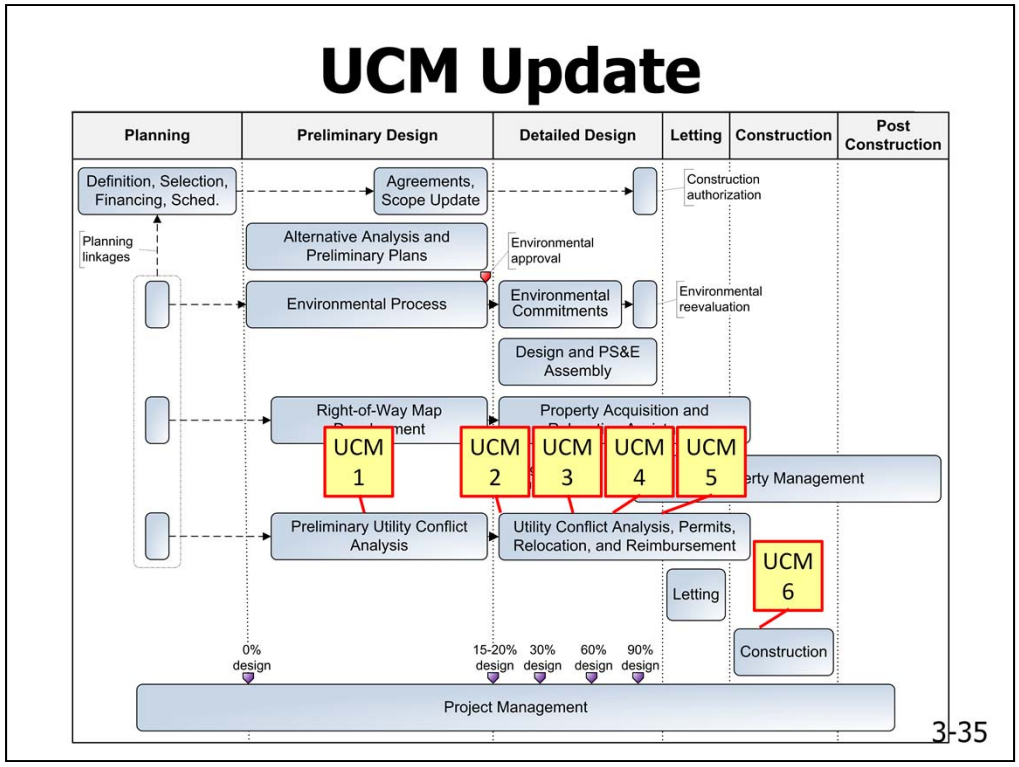
- Prepare utility certifications. Many DOTs provide a listing within the letting documents to alert potential bidders to utilities that will need to be adjusted during the construction phase of the project, sometimes referred to as a utility certification.
- Monitor utility relocations and reimburse utility owners. Ideally, utility relocations should be completed before the beginning of construction. In reality, some utility installations may need to take place during the construction phase. This part of the process also involves reimbursing utility owners for eligible relocation expenses.



Stage 6 corresponds to the part of the process, normally at the beginning of the construction phase, when utilities finish their relocations and the DOT proceeds with the rest of the construction project. It also involves managing new utility conflicts that are identified, which were missed earlier in the project. It includes the following activities:

- Monitor utility relocations and reimburse utility owners. Ideally, utility relocations should be completed before the beginning of construction. In reality, some utility installations may need to take place during the construction phase. This part of the process also involves reimbursing utility owners for eligible relocation expenses.
- Analyze, review, and implement utility conflict resolution strategies for conflicts that are identified during construction.

Important: Although the previous slides illustrate a linear process for the collection of utility data from QLD to QLA, for many projects data collection involving different quality levels can occur in parallel.



This slide shows how the UCM would be updated at each of the stages shown in the previous slides:

UCM 1: during preliminary design.

UCM 2: end of preliminary design or beginning of detailed design.

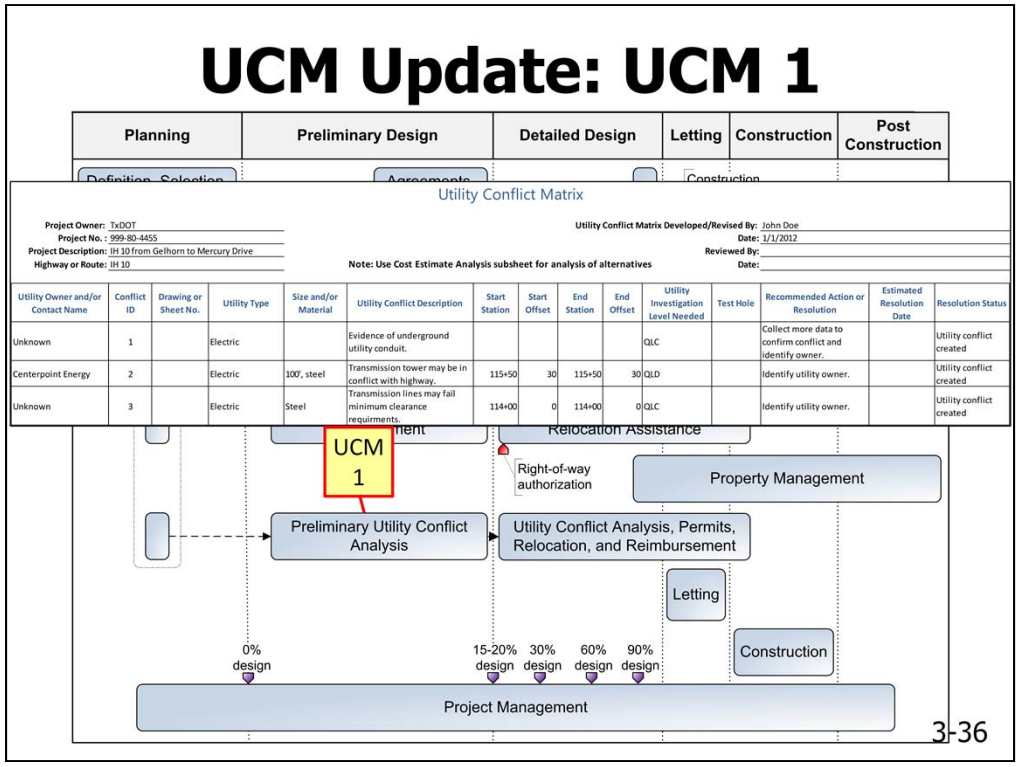
UCM 3: around 30% detailed design.

UCM 4: around 60% detailed design.

UCM 5: around 90% detailed design.

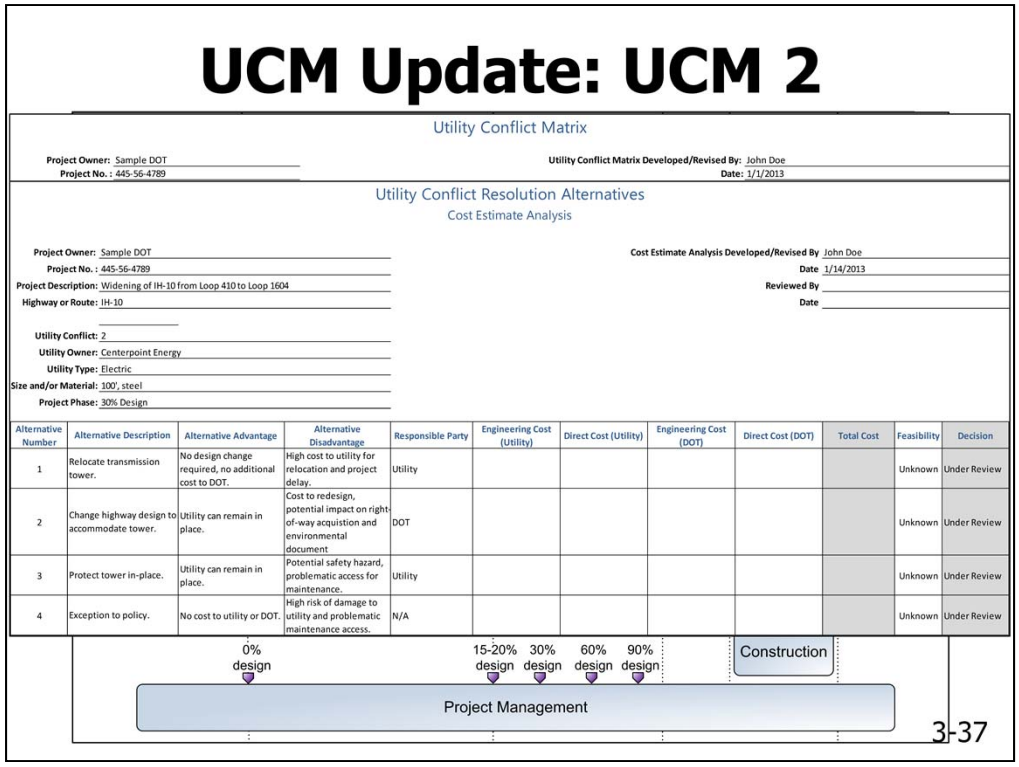
UCM 6: if some utility conflicts continue into the letting or construction phase, or if additional conflicts appear during the construction phase of a project, a sixth version of the UCM would be prepared to manage conflicts at that point.

The following slides provide an example and additional information for each version of the UCM at the stages described previously.



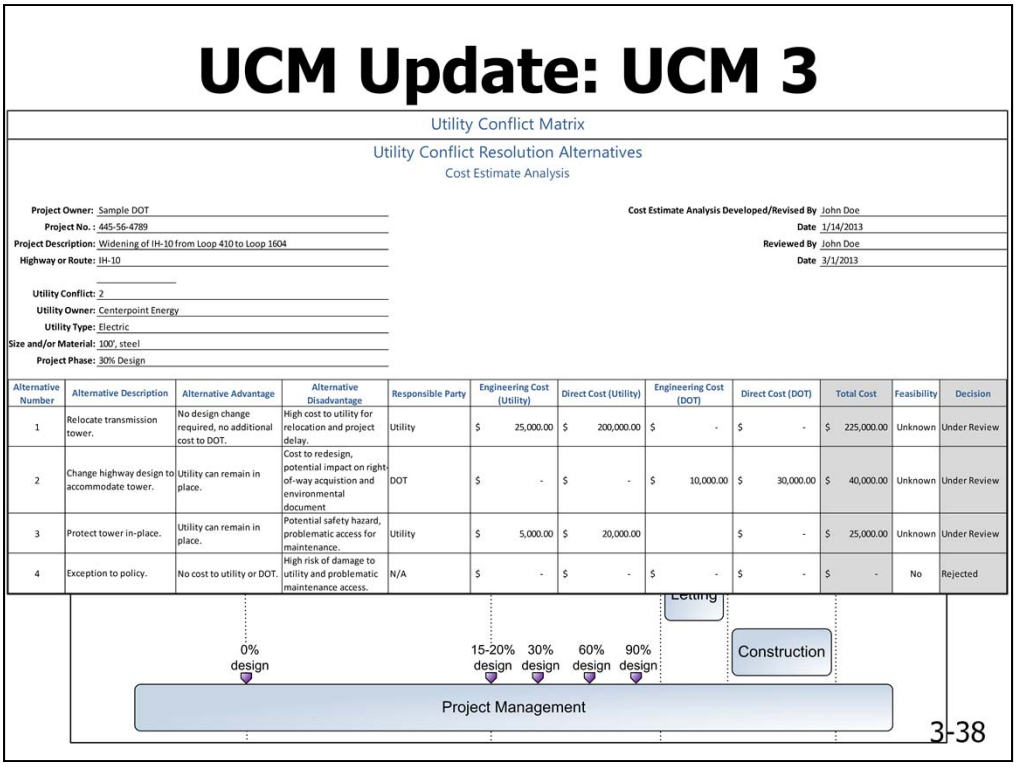
This slide and the following four slides may be hard to read on-screen, therefore ask participants to review their handout material in section D in parallel.

In this example, the utility coordinator found three potential conflicts in connection with an electric transmission tower, transmission lines, and some evidence of an underground electric conduit. The UCM includes a record for each potential conflict. At this point, the owner, material, size, and location of the underground conduit are unknown, hence the recommendation to collect QLC data. Compared to the underground conduit, the transmission tower is above ground, and the utility coordinator has more information such as material and location. However, there is no contact information available for any of the utility conflicts.



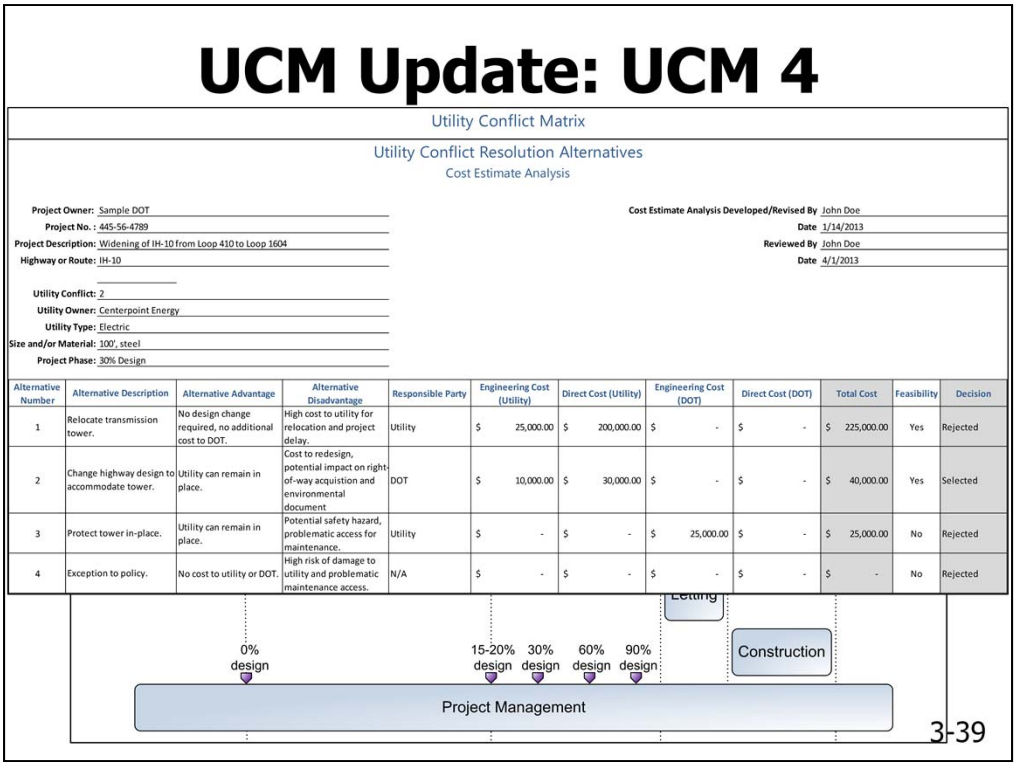
The screenshot shows the UCM at a point when the utility coordinator has confirmed the utility owner and contact information for each utility conflict. Known utility facilities have been plotted on design drawings, so the utility coordinator has added a drawing or sheet number for each conflict. The utility coordinator has information about the approximate location of the underground conduit, but has determined that more data are needed to confirm the utility conflict, as shown in column "Recommended Action or Resolution." In column "Utility Investigation Level Needed," the utility coordinator changed the entry from QLC to QLB for the electric line, and QLD to QLC for the transmission tower. The other utility conflict does not need additional data collection, and data can be forwarded to the utility owner to request cost estimates and arrange a meeting to discuss potential resolution strategies. Finally, the resolution status provided in the last column has been changed to "Utility owner informed of utility conflict."

The last screenshot illustrates the use of the cost estimate analysis subsheet to evaluate different alternatives for the resolution of the transmission tower conflict (which according to the UCM has been confirmed and needs resolution). Ideally, the utility owner should prepare this cost estimate analysis in coordination with the DOT.



The utility conflict analysis found that the conflict with the underground conduit requires exposing the utility facility (i.e., QLA data collection) to gather information about the precise depth of the conduit. The resolution strategies for the transmission tower are under review. For the third utility conflict, a resolution strategy was selected, as shown in the updated resolution status, along with an estimated resolution date.

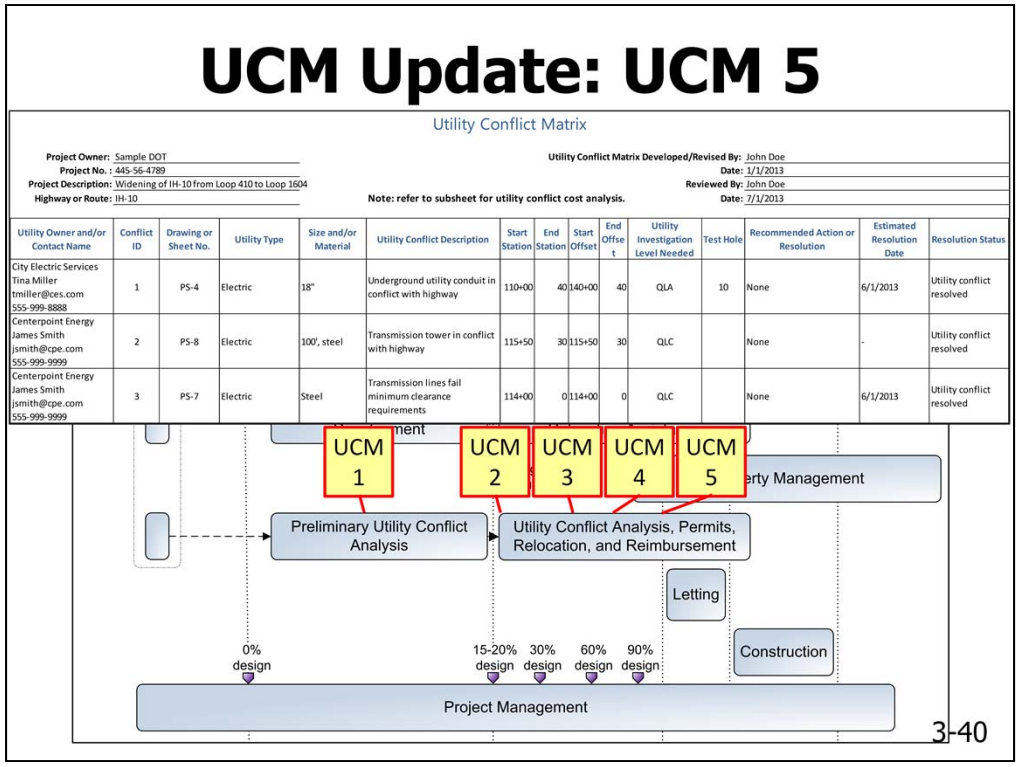
The last screenshot provides an update of the cost estimate analysis for the transmission tower conflict, indicating that the selected resolution strategy is to redesign a section of the highway. The table also shows that the resolution was obtained when the transportation project was at 30 percent design. For the analysis, the utility owner developed a cost estimate for Alternative 1 and 3, and the TxDOT designer developed a cost estimate for Alternative 2. However, it was unclear if it was feasible to proceed with either alternative 1, 2, or 3. Alternative 4 was ruled out, so a cost estimate was not necessary.



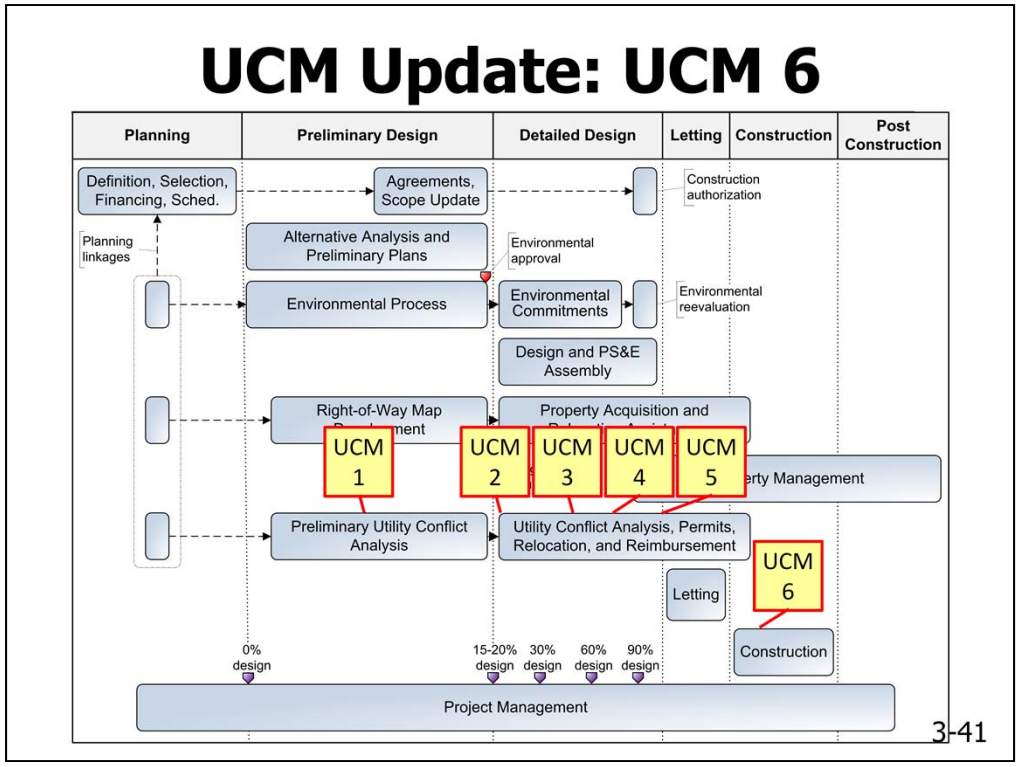
Notice in the screenshot that the updated UCM shows the number of the test hole used to confirm the depth of the underground conduit. Following this assessment, the DOT and the utility owner considered alternative resolution strategies, decided to adjust the facility, and determined an estimated resolution date. The table also shows the updated status associated with the two other conflicts.

The second screenshot shows an update of the resolution alternatives for the transmission tower. The DOT and utility owner reviewed the alternatives and determined that a protect-in-place option was not feasible in this location. The DOT representative determined that a highway design change was feasible, and in light of the high cost and anticipated delay to move the transmission tower, the best alternative.

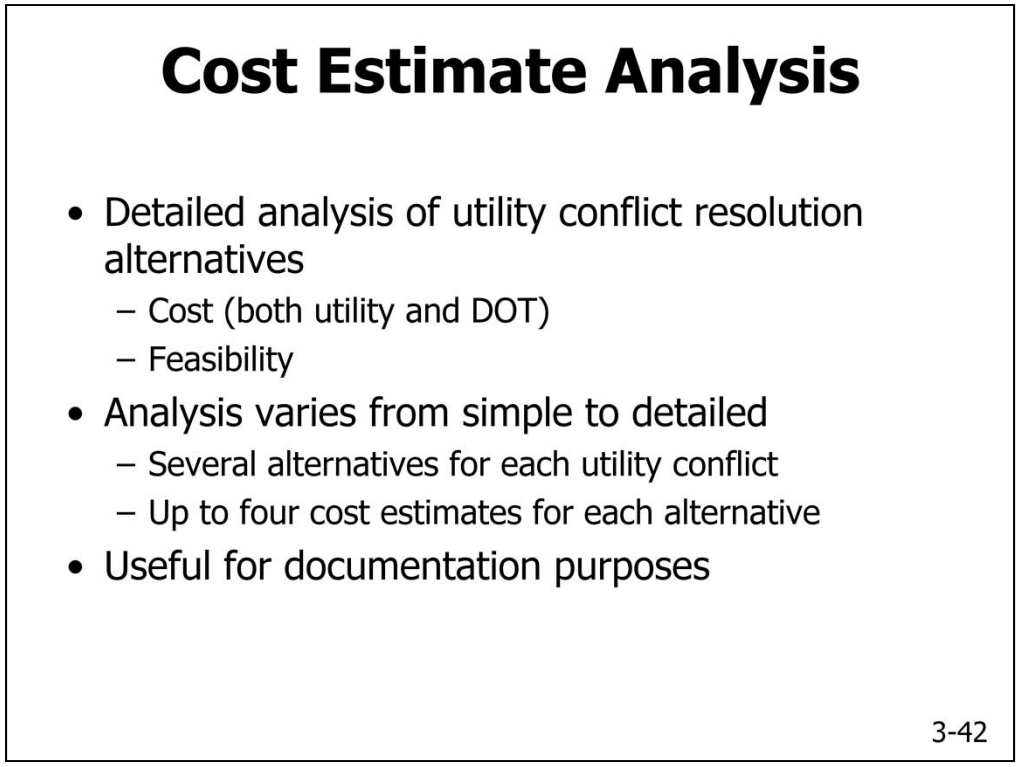
Note: If utilities are faced with high relocation costs that are not reimbursable through state or federal funds, they are often open to the idea of contributing to additional design or construction cost if the utility can avoid the relocation.



In this example, the UCM 5 shows that no further action is needed and all conflicts have been resolved.



Additional updates of the UCM (and a UCM version 6) could be needed if utility conflicts are not resolved before the letting date, or discovered during the construction phase.



There are often many ways to resolve a utility conflict. These alternatives can be analyzed in a subsheet that can be accessed by clicking on the "Detail" button.

The subsheet allows an analysis of costs and feasibility of different alternatives to resolve a utility conflict. Depending on the amount of information this analysis could be simple or highly detailed. An additional benefit of the cost analysis is that it documents how the DOT arrived at the strategy that was chosen to resolve a conflict for future reference.

The following slide shows a sample subreport for a utility conflict.

Cost Estimate Analysis

Conflict ID:	1
Utility Owner:	AT&T
Utility Type:	Telephone
Size and/or Material:	Fiber Optic
Project Phase:	60% Design

Alternative Number	Alternative Description	Alternative Advantage	Alternative Disadvantage	Respons. Party	Engineering Cost (Utility)	Direct Cost (Utility)	Engineering Cost (DOT)	Direct Cost (DOT)	Total Cost	Feasibility	Decision
1	Relocation before construction.	No design change required, no additional cost to DOT.	Cost to utility for relocation.	Utility	$25,000	$200,000	$0	$0	$225,000	Yes	Rejected
2	Protect in-place.	Utility can remain in place.	Access to utility for maintenance problematic.	Utility	$10,000	$30,000	$0	$0	$40,000	No	Rejected
3	Change highway design.	Utility can remain in place.	High cost and project delay.	DOT	$0	$0	$25,000	$0	$25,000	Yes	Selected
4	Exception to policy.	No cost to utility or DOT.	High risk of damage to utility and maintenance problems.	N/A	$0	$0	$0	$0	$0	No	Rejected

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The header of the subsheet provides information about the utility conflict. The main table provides information about four alternatives to resolve the utility conflict. For each alternative, the table shows a description, advantages and disadvantages, engineering and direct cost to the utility company, engineering and direct cost to the DOT, a total of both utility and DOT costs, an indicator if the alternative is feasible, and an indicator about which alternative was selected.

Note that this subtable includes project phase information in the header (e.g., 60%). This structure makes it easy to use the table and update the analysis at several stages of the project development process.

DOTs could use a variety of alternative comparison techniques, including ratings.

UCM Responsibilities

	Data Collection	Impact Assessment	Populate UCM	Coordinate with Utilities	Utility Conflict Management Responsibility
UCM 1	PM, UC, Cons	PM, Cons	PM	UC	PM
UCM 2	UC, Sur, Cons	PM, Cons	PM, UC, Cons	UC	PM
UCM 3	Sur, Cons	PM, Cons	PM, Cons	UC	PM
UCM 4	Sur, Cons	PM, Cons	PM, Cons	UC	PM
UCM 5	n/a	PM, Cons	PM, UC	UC	PM

PM = Project Manager/Designer
UC = Utility Coordinator
Sur = Surveyor
Cons = Consultant

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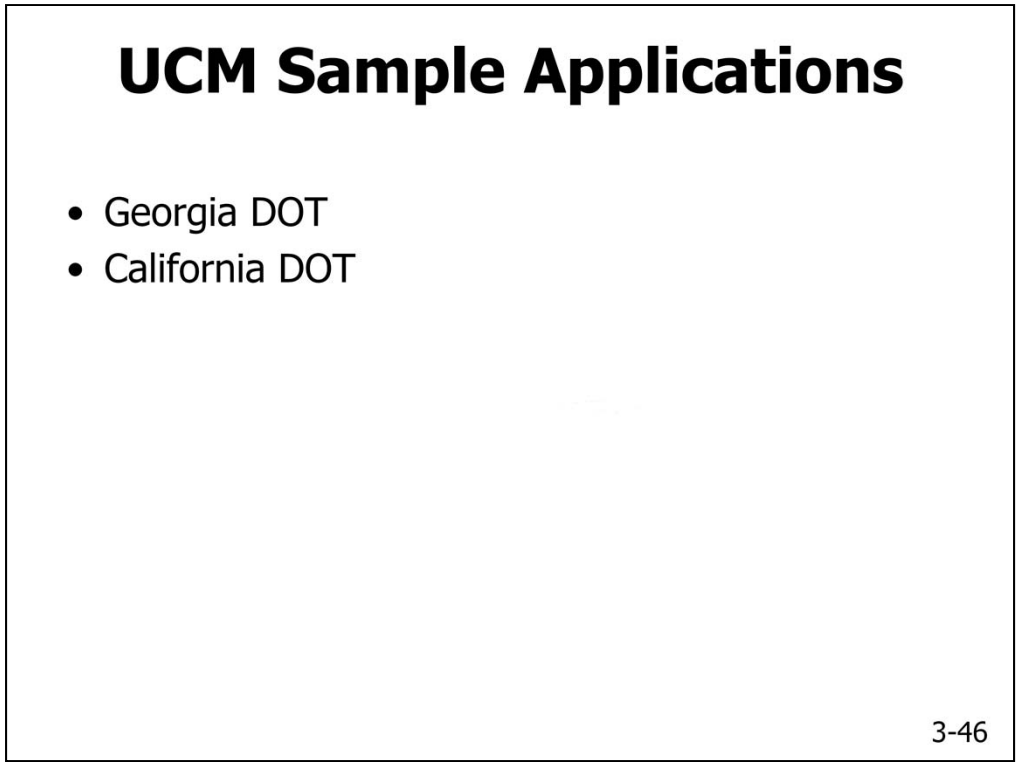
A utility conflict matrix can be used in several different ways, including the following:

• As a tool to provide management reports during project development.

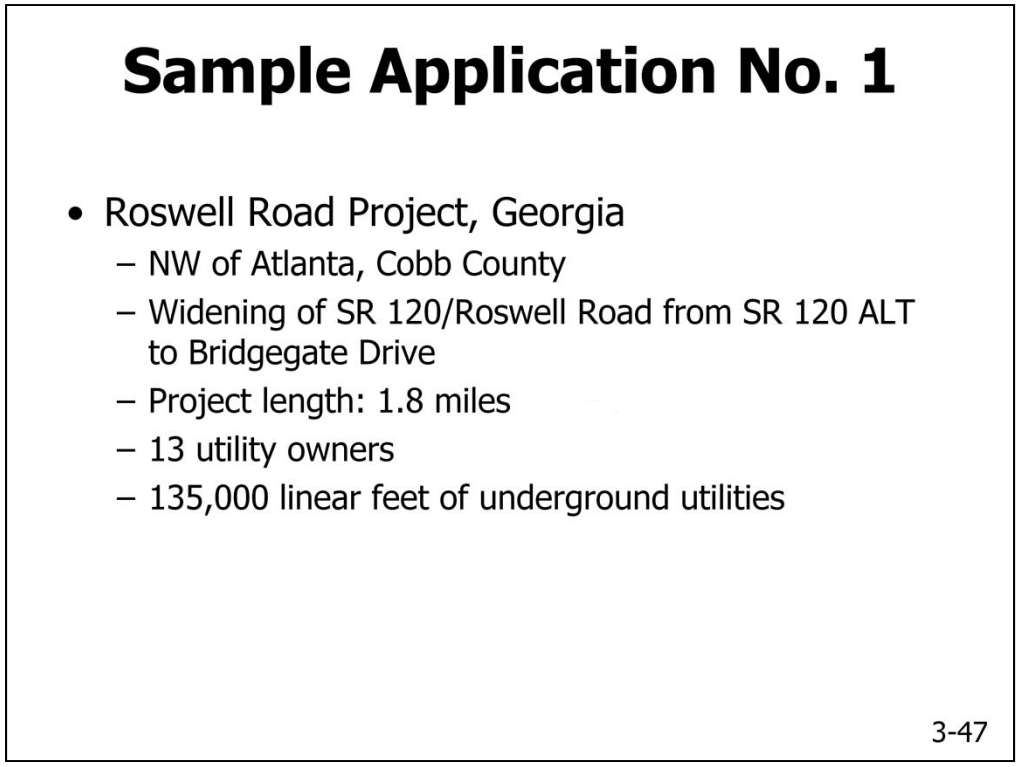
• To provide utility information for highway project bidders included in letting documents. This can either be in form of certification of known utility facilities within project limits, or as special provision for utility relocations.

• As a management tool during construction.

• To develop cost savings reports after construction.



The following slides provide two examples of states that use a UCM approach to manage utility conflicts.



Sample application 1 uses information from a project provided by the Georgia DOT. Relevant project information includes the following:

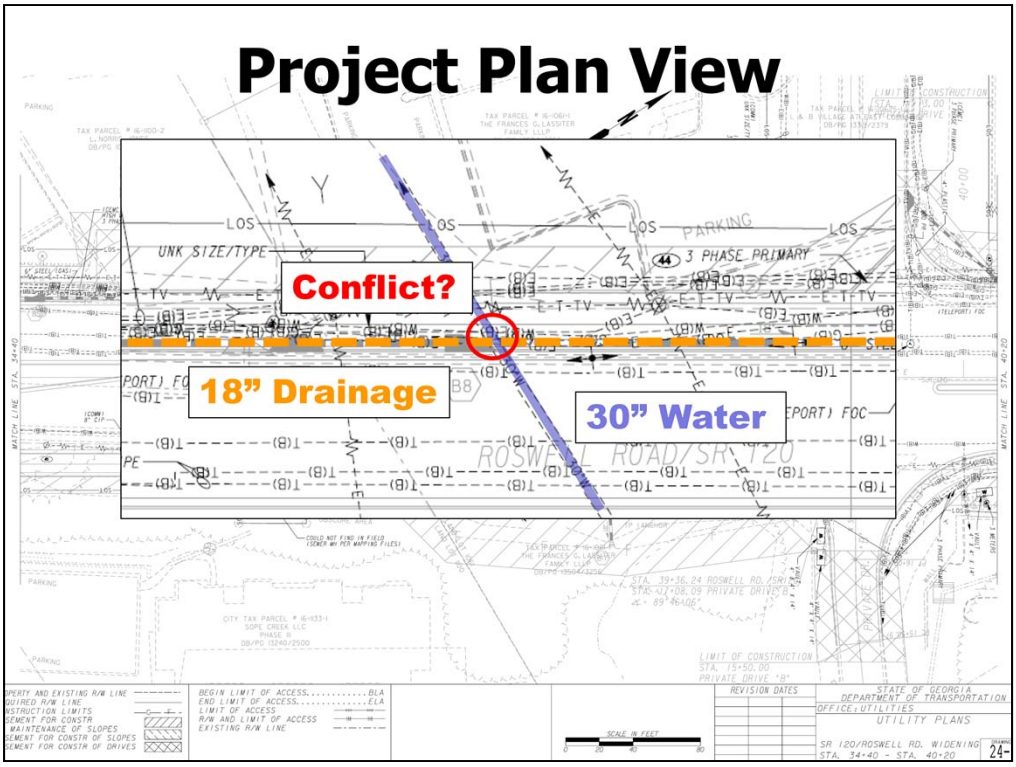
• Project location: Roswell Road Project, Georgia, NW of Atlanta, Cobb County

• Project scope: Widening of SR 120/Roswell Road from SR 120 ALT to Bridgegate Drive

• Project length: 1.8 miles

• Number of utility owners: 13

• Length of underground utilities: 135,000 linear feet



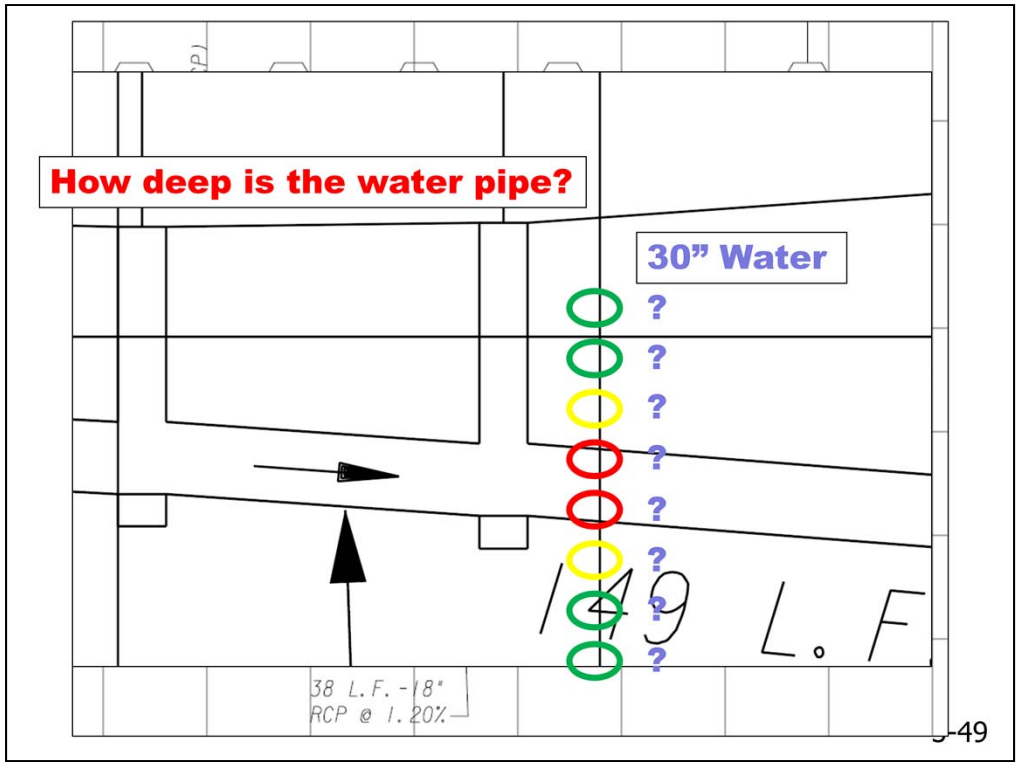
Plan view of the project.

Zoom into the area outlined by the red rectangle.

Zoom-in view of the project plans.

A 30" water line crosses an 18" drainage line.

At the crossing of the two lines could be a utility conflict.



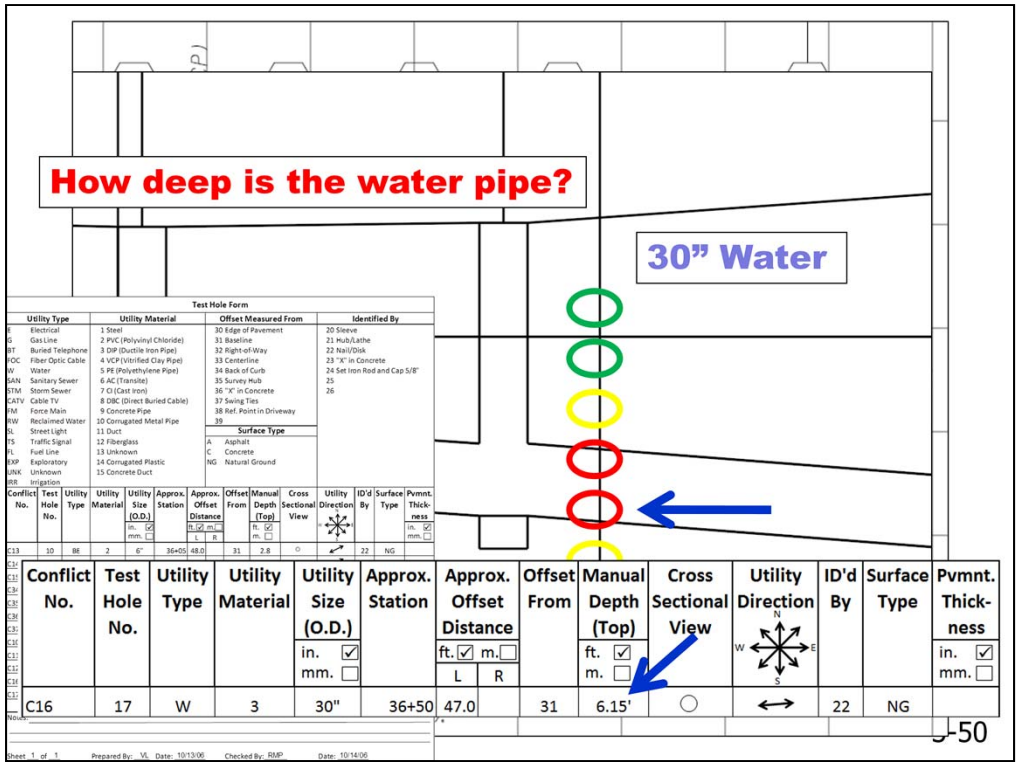
Project cross section. B5-B12 indicates the location of catch basins along the highway facility.

Zoom into the area outlined by the red rectangle.

Zoom-in view of the project cross section.

The question is, how deep is the water pipe?

- If it is located above the drainage line, there is no conflict.
- If it crosses the drainage line, there is a utility conflict.
- If it is located below the drainage line, there is no conflict.



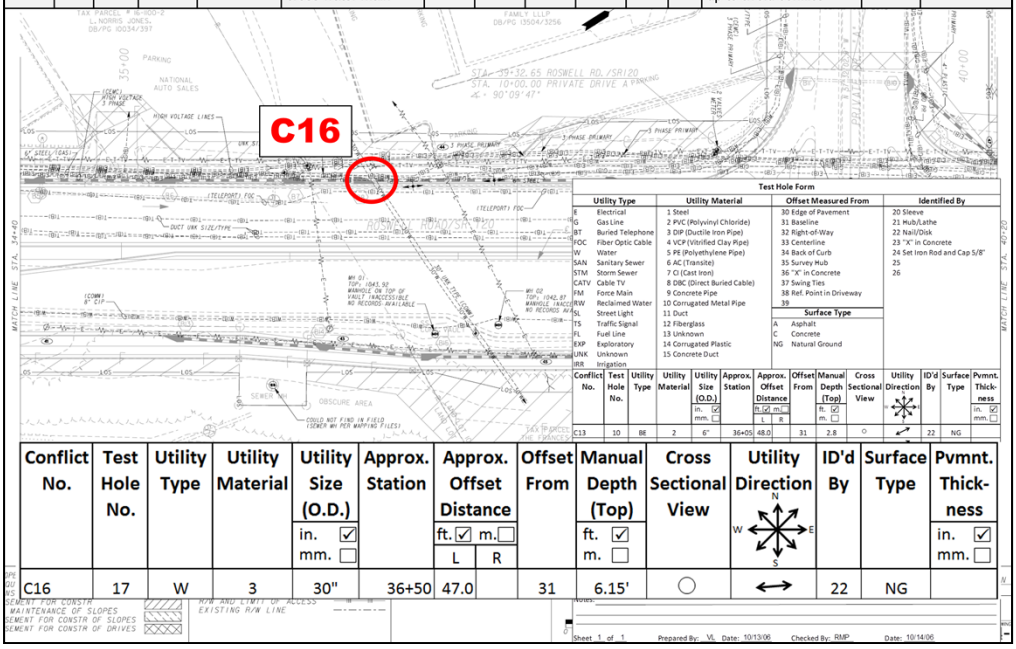
A test hole at this location provides information about the depth of the water pipe.

Zoom-in view of the test hole report record.

The depth at the top of the pipe is 6.15 feet.

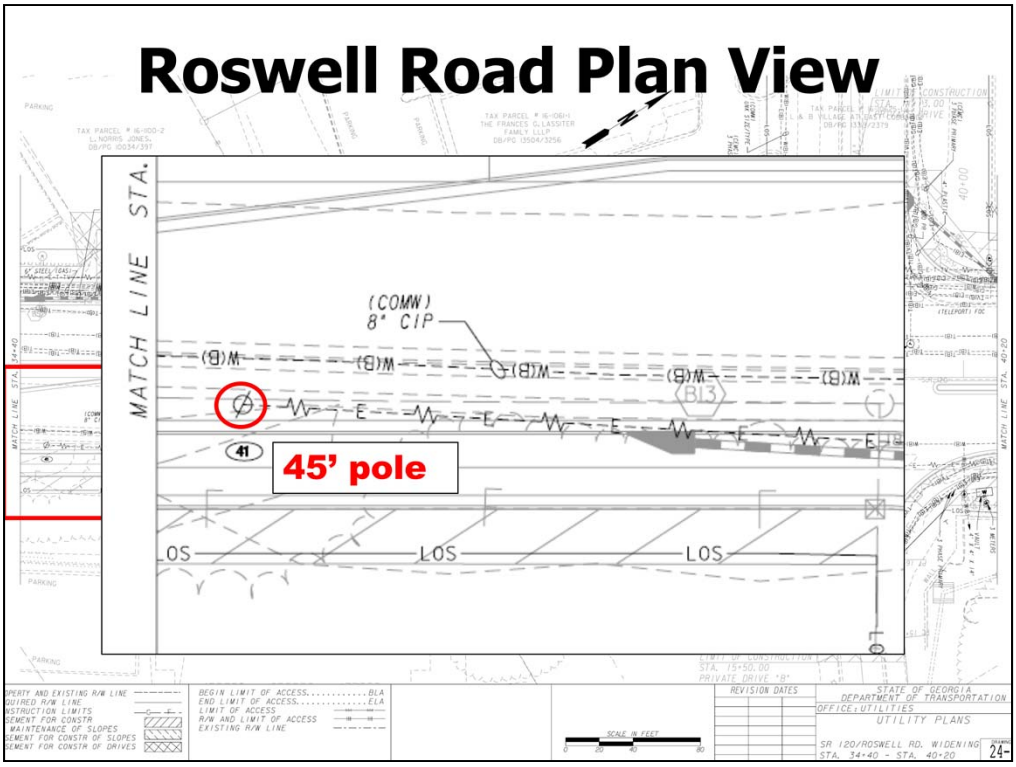
This places the water pipe at a depth where the drainage is located, the water pipe is a utility conflict.

Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action or Resolution	Est. Res. Date	Resolution Status
AWS	C16	1	Water	30" ductile iron pipe	Proposed 18" drainage pipe would cross water main	36+50	36+50	47' LT		QLA	17	Review possibility of adjusting drainage pipe up to avoid conflict	n/a	Utility conflict created



Fill out the first record of the utility conflict matrix with as much information as possible.

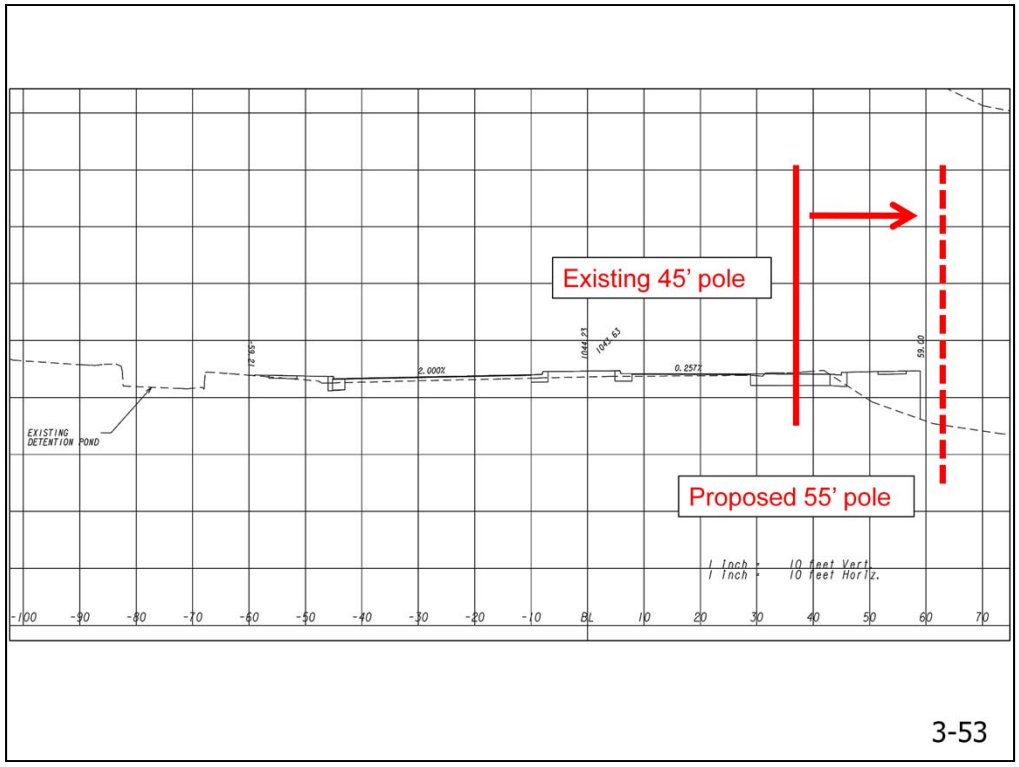
What happened to the conflict: This conflict is currently under review and no decision has been made by the Georgia DOT.



Zoom into the area outlined by the red rectangle.

Zoom-in view of the project cross section.

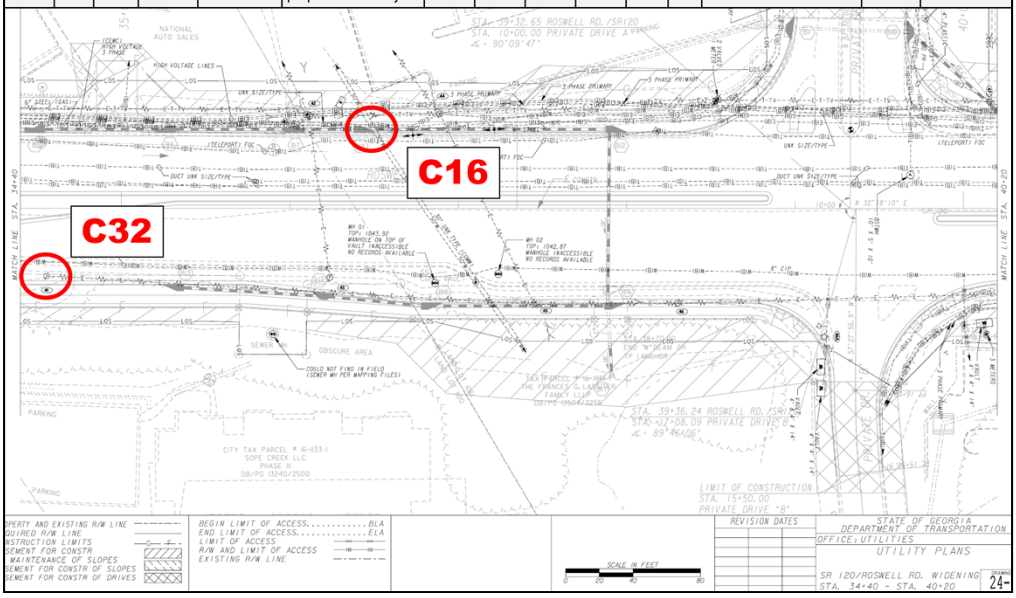
A 45-foot pole is located within the proposed right-of-way.



Project cross section. The pole is located within the sidewalk of the proposed highway.

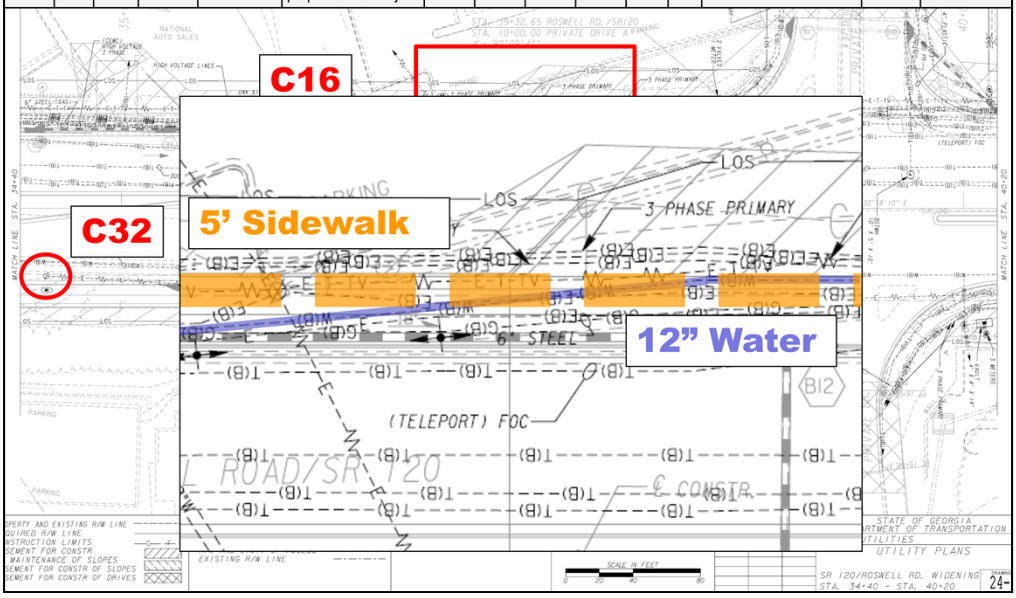
Resolve the utility conflict by moving the pole to the edge of the right-of-way. Because of the grade, the pole must be upgraded to a 55-foot pole.

Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action or Resolution	Est. Res. Date	Resolution Status
AWS	C16	1	Water	30" ductile iron pipe	Proposed 18" drainage pipe would cross water main	36+50	36+50	47' LT		QLA	17	Review possibility of adjusting drainage pipe up to avoid conflict	n/a	Utility conflict created
CPS	C32	1	Electric	45" pole	Existing pole in proposed roadway	34+55		40' RT		QLC		Pole to be relocated	n/a	Utility conflict created



Fill out the first record of the utility conflict matrix with as much information as possible.

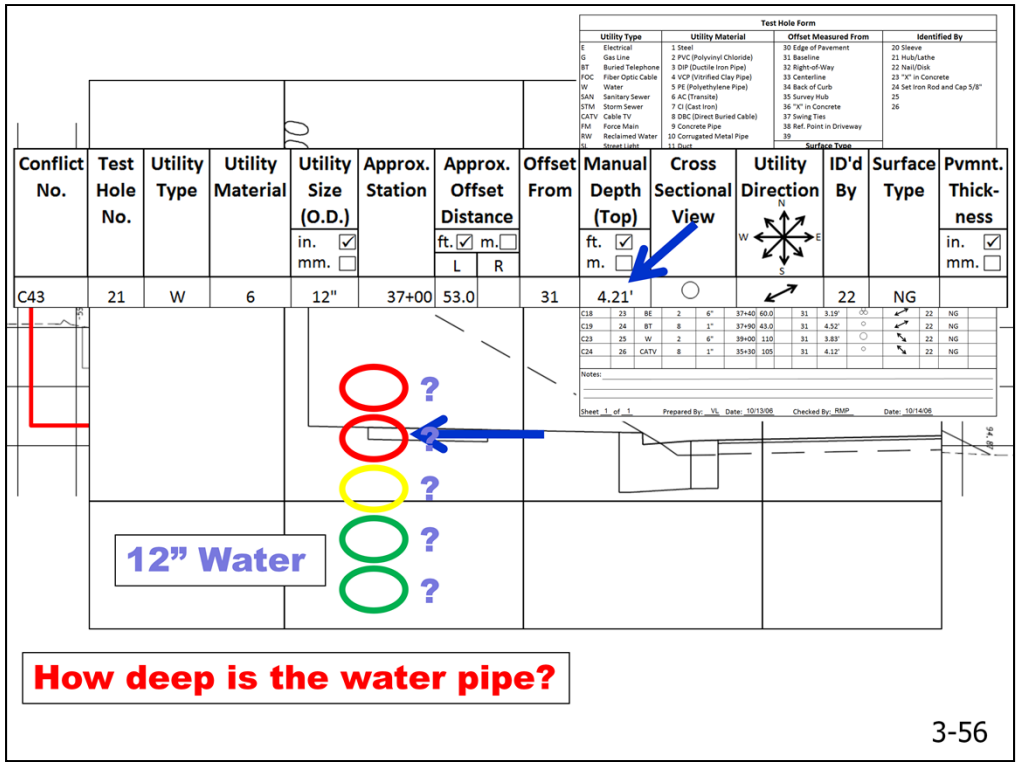
Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action or Resolution	Est. Res. Date	Resolution Status
AWS	C16	1	Water	30" ductile iron pipe	Proposed 18" drainage pipe would cross water main	36+50	36+50	47' LT		QLA	17	Review possibility of adjusting drainage pipe up to avoid conflict	n/a	Utility conflict created
CPS	C32	1	Electric	45" pole	Existing pole in proposed roadway	34+55		40' RT		QLC		Pole to be relocated	n/a	Utility conflict created



Zoom into the area outlined by the red rectangle.

Zoom-in view of the project plan view.

A 12-inch water line overlaps the 5-foot sidewalk. This could be a utility conflict.



Project cross section.

Zoom into the area outlined by the red rectangle.

Zoom-in view of the project cross section.

The question is, how deep is the water pipe?

- If it is located below the sidewalk, there is no conflict.
- If it located to close or above the sidewalk, there is a utility conflict.

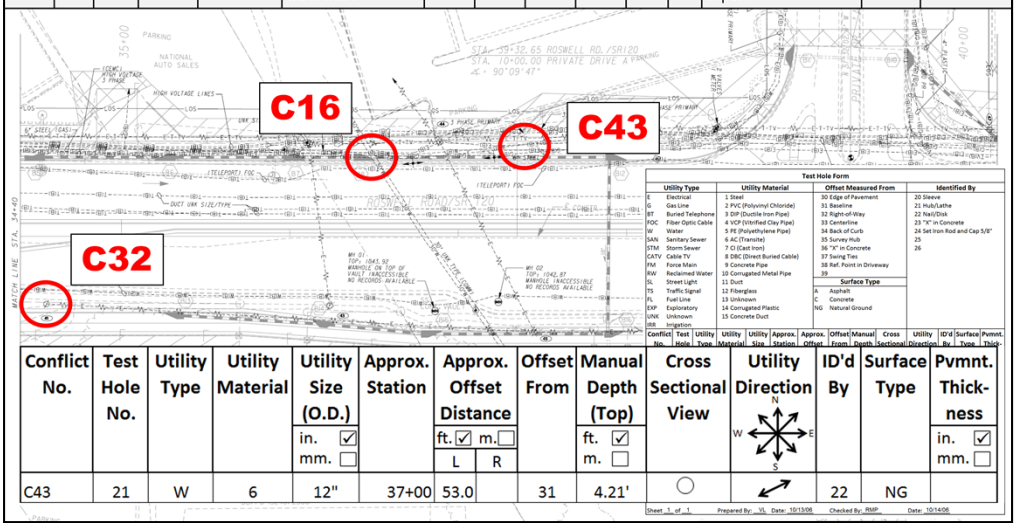
A test hole at this location provides information about the depth of the water pipe.

Zoom-in view of the test hole report record.

The depth at the top of the pipe is 4.21 feet.

This places the water pipe at a depth where the sidewalk is located. The water pipe is a utility conflict.

Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action or Resolution	Est. Res. Date	Resolution Status
AWS	C16	1	Water	30" ductile iron pipe	Proposed 18" drainage pipe would cross water main	36+50	36+50	47' LT		QLA	17	Review possibility of adjusting drainage pipe up to avoid conflict	n/a	Utility conflict created
CPS	C32	1	Electric	45" pole	Existing pole in proposed roadway	34+55		40' RT		QLC		Pole to be relocated	n/a	Utility conflict created
AWS	C43	1	Water	12" water pipe	Proposed sidewalk in conflict with 12" water main	37+00		53' LT		QLA	21	Highway/sidewalk re-design to avoid utility impact	n/a	Utility conflict created



Conflict No.	Test Hole No.	Utility Type	Utility Material	Utility Size (O.D.) in. ☑ mm. ☐	Approx. Station	Approx. Offset Distance ft. ☑ m. ☐ L	Approx. Offset Distance R	Offset From	Manual Depth (Top) ft. ☑ m. ☐	Cross Sectional View	Utility Direction	ID'd By	Surface Type	Pvmnt. Thick-ness in. ☑ mm. ☐
C43	21	W	6	12"	37+00	53.0		31	4.21'	○	↔	22	NG	

Fill out the first record of the utility conflict matrix with as much information as possible.

What happened to the conflict: The sidewalk design was modified to avoid the conflict.

Utility Conflict Matrix

Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action or Resolution	Est. Res. Date	Resolution Status
AWS	C16	1	Water	30" ductile iron pipe	Proposed 18" drainage pipe would cross water main	36+50	36+50	47' LT		QLA	17	Review possibility of adjusting drainage pipe up to avoid conflict	n/a	Utility conflict created
CPS	C32	1	Electric	45" pole	Existing pole in proposed roadway	34+55		40' RT		QLC		Pole to be relocated	n/a	Utility conflict created
AWS	C43	1	Water	12" water pipe	Proposed sidewalk in conflict with 12" water main	37+00		53' LT		QLA	21	Highway/sidewalk re-design to avoid utility impact	n/a	Utility conflict created
CPS	C54	1	Electric	45' pole	Existing pole in proposed curb line	38+30		57' RT		QLC		Pole to be relocated	n/a	Utility conflict created
CPS	C55	1	Electric	45' pole	Existing pole in area of grade cut	38+50		63' RT		QLC		Pole may need to be supported or replaced with taller pole	n/a	Utility conflict created
CPS	C61	1	Electric	45' pole	Existing pole in proposed curb line	40+00		52' RT		QLC		Pole to be relocated	n/a	Utility conflict created
ATT	C28	1	Communication	45' pole	Existing pole in conflict with proposed drainage	40+15		65' LT		QLC		Pole to be relocated	n/a	Utility conflict created

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Final view of the utility conflict matrix.

An explanation of the button "Detail" in the column "Cost Analysis" follows.

Sample Application No. 2

- California DOT project
  - US 91
  - Riverside, east of Los Angeles, Riverside County

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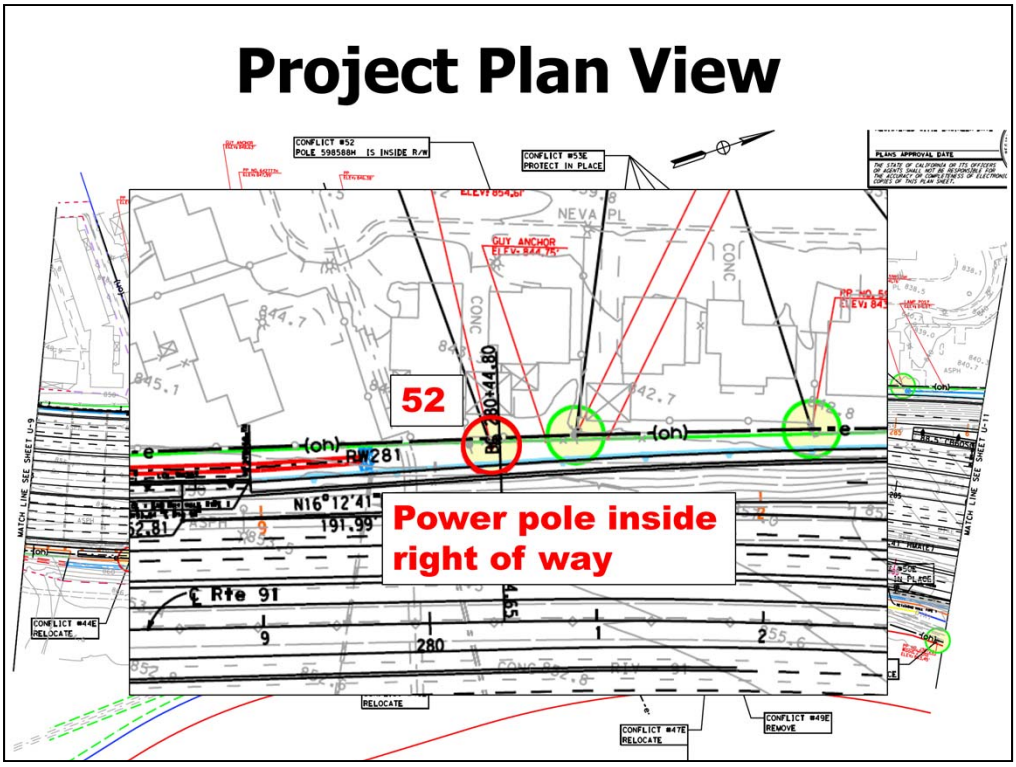
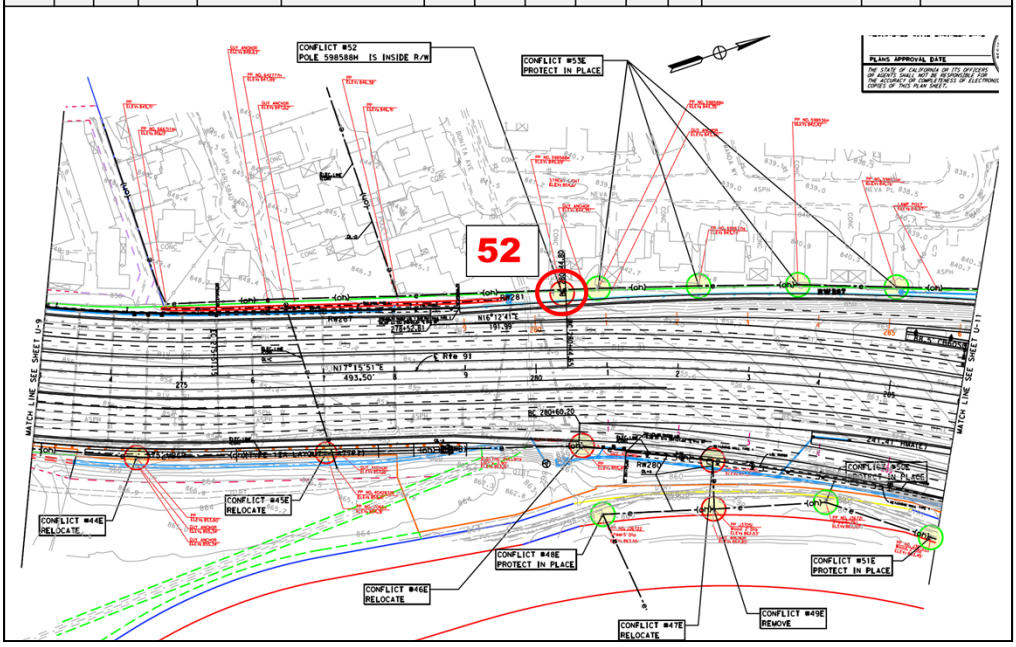


Plan view of the project.

Zoom into the area outlined by the red rectangle.
Zoom-in view of the project plans.

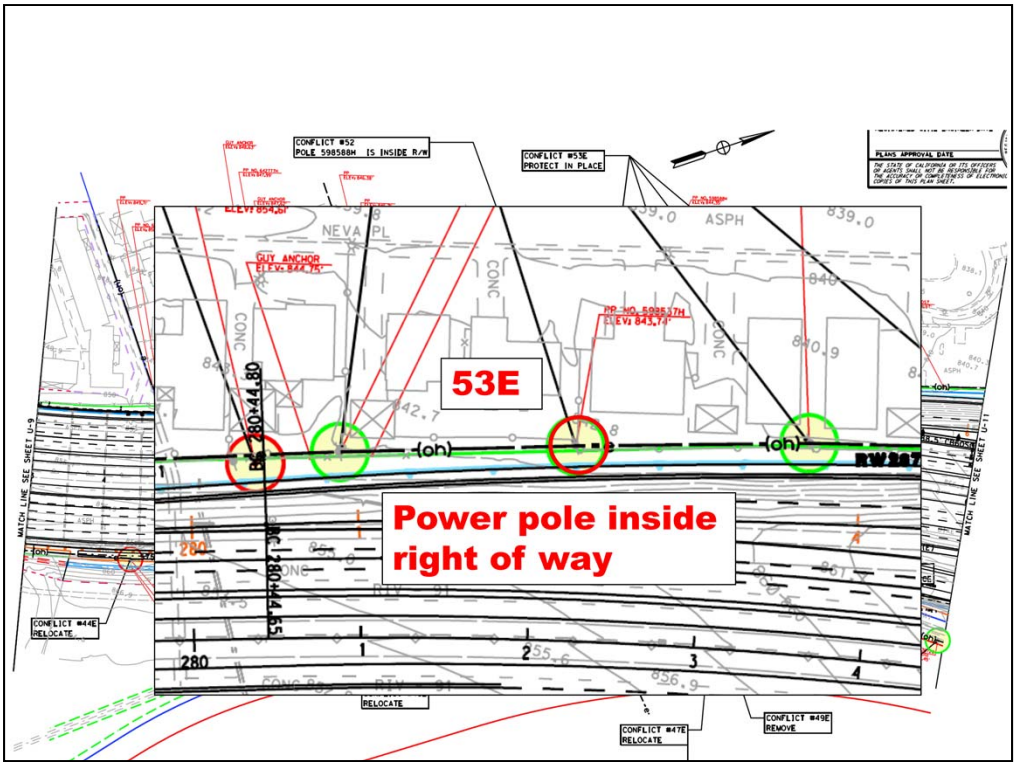
A power pole is within the right-of-way.

Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action or Resolution	Est. Res. Date	Resolution Status
CP	52	U-10	Electric	Pole	Pole is in conflict with retaining wall.	280 +50		80' LT		QLC		Review possibility of modifying retaining wall 281 to avoid conflict	n/a	Utility conflict created



Fill out the first record of the utility conflict matrix with as much information as possible.

Either the pole has to move or the design of the retaining wall has to be modified.

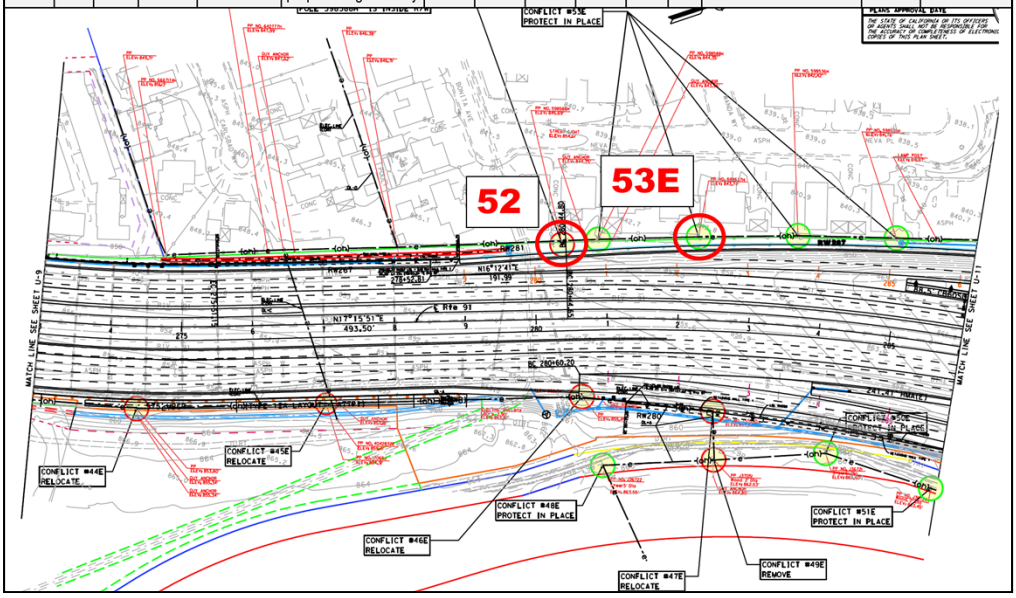


Plan view of the project.

Zoom into the area outlined by the red rectangle.
Zoom-in view of the project plans.

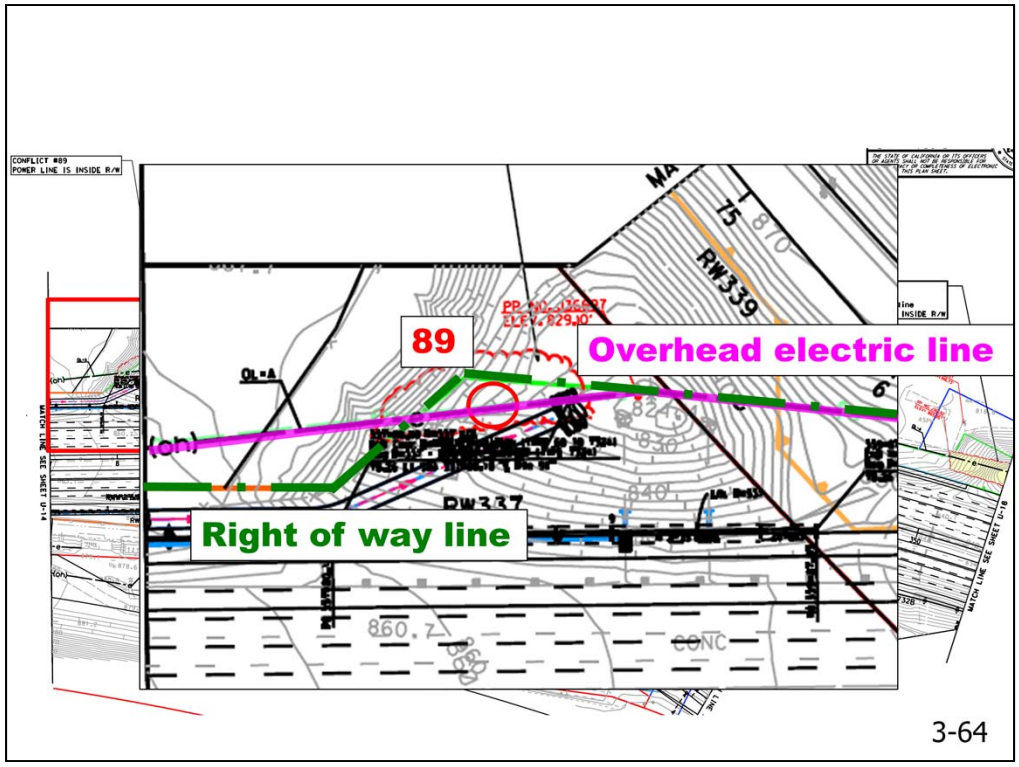
A power pole is within the right-of-way.

Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action or Resolution	Est. Res. Date	Resolution Status
CP	52	U-10	Electric	Pole	Pole is in conflict with retaining wall.	280 +50		80' LT		QLC		Review possibility of modifying retaining wall 281 to avoid conflict	n/a	Utility conflict created
CP	53E	U-10	Electric	Pole	Pole is within the proposed right of way	282+ 50		80' LT		QLC		Protect in place	n/a	Utility conflict created



Fill out the second record of the utility conflict matrix with as much information as possible.

The pole can be protected in place and does not need to move.

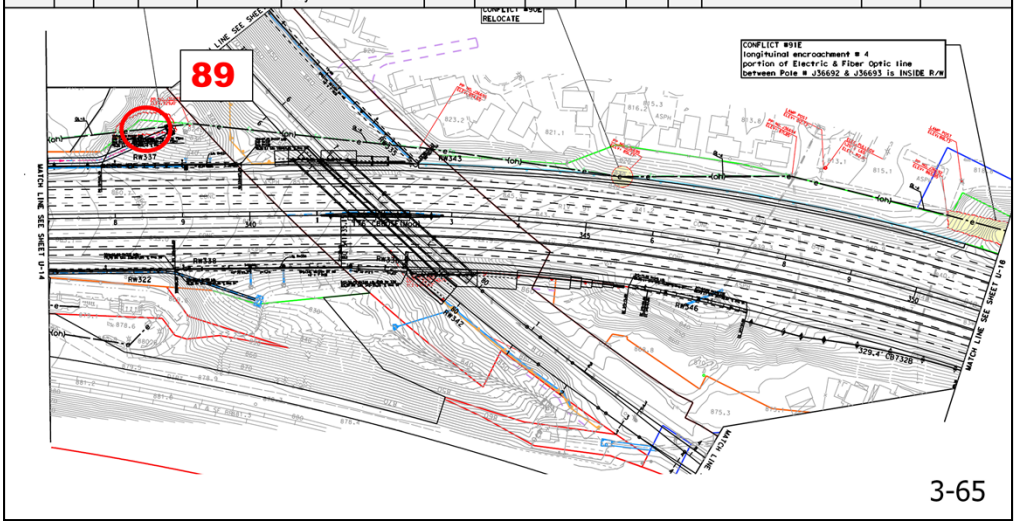


Plan view of the project.

Zoom into the area outlined by the red rectangle.
Zoom-in view of the project plans.

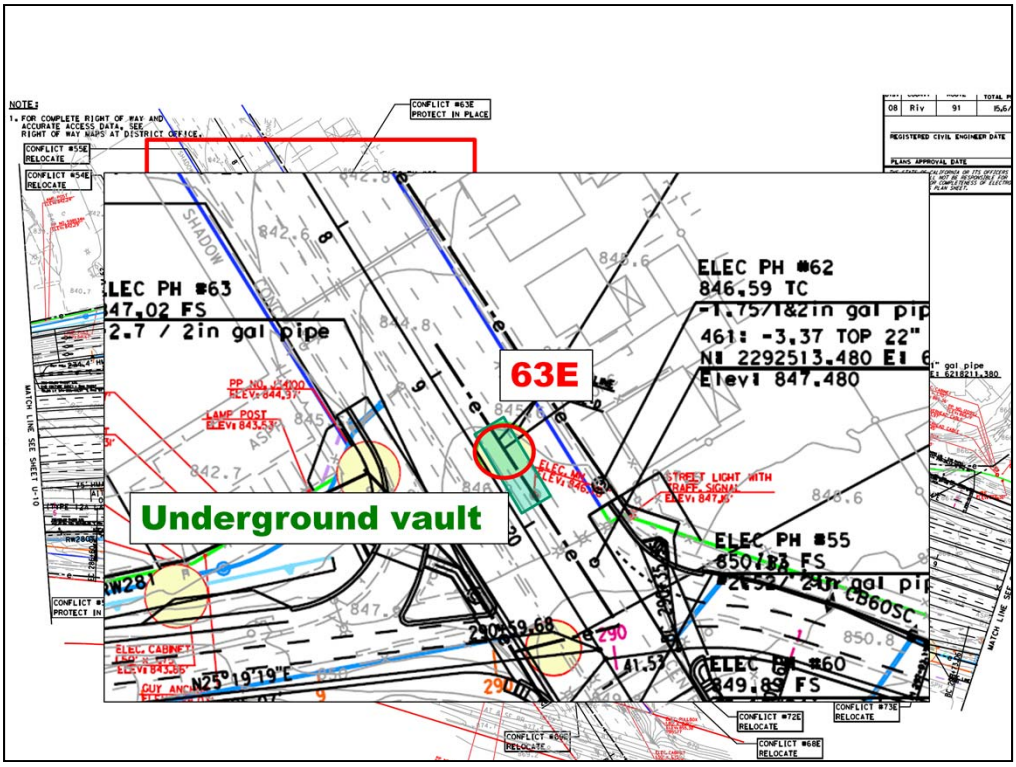
An overhead electric line crosses the right-of-way line and could be in conflict.

Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action or Resolution	Est. Res. Date	Resolution Status
CP	52	U-10	Electric	Pole	Pole is in conflict with retaining wall.	280 +50		80' LT		QLC		Review possibility of modifying retaining wall 281 to avoid conflict	n/a	Utility conflict created
CP	53E	U-10	Electric	Pole	Pole is within the proposed right of way	282+ 50		80' LT		QLC		Protect in place	n/a	Utility conflict created
CP	89	U-15	Electric	Pole	Power line is within the proposed right of way	348 +00	349 +00	75' LT	85' LT	QLC		Relocate utility line	n/a	Utility conflict created



Fill out the third record of the utility conflict matrix with as much information as possible.

The electric line must be relocated.



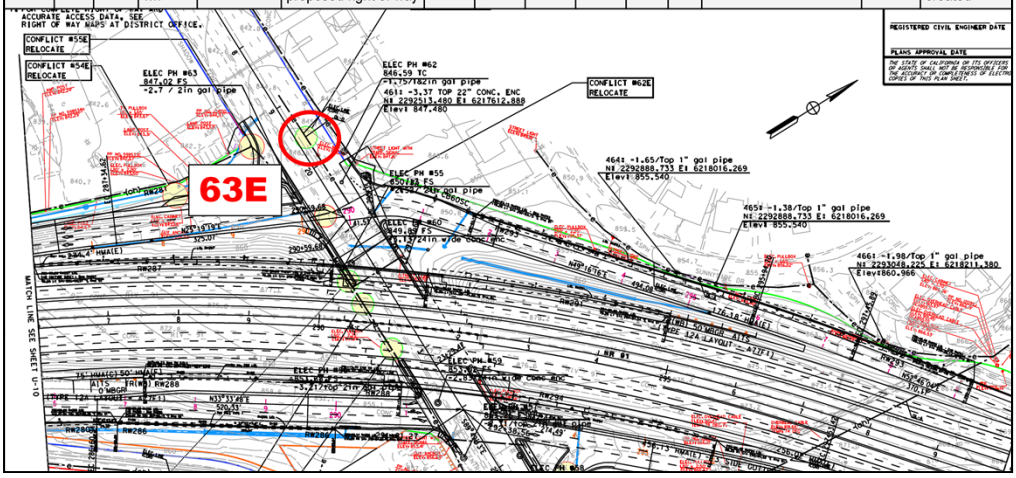
Plan view of the project.

Zoom into the area outlined by the red rectangle.

Zoom-in view of the project plans.

An underground vault is within the right-of-way line. This could be a utility conflict.

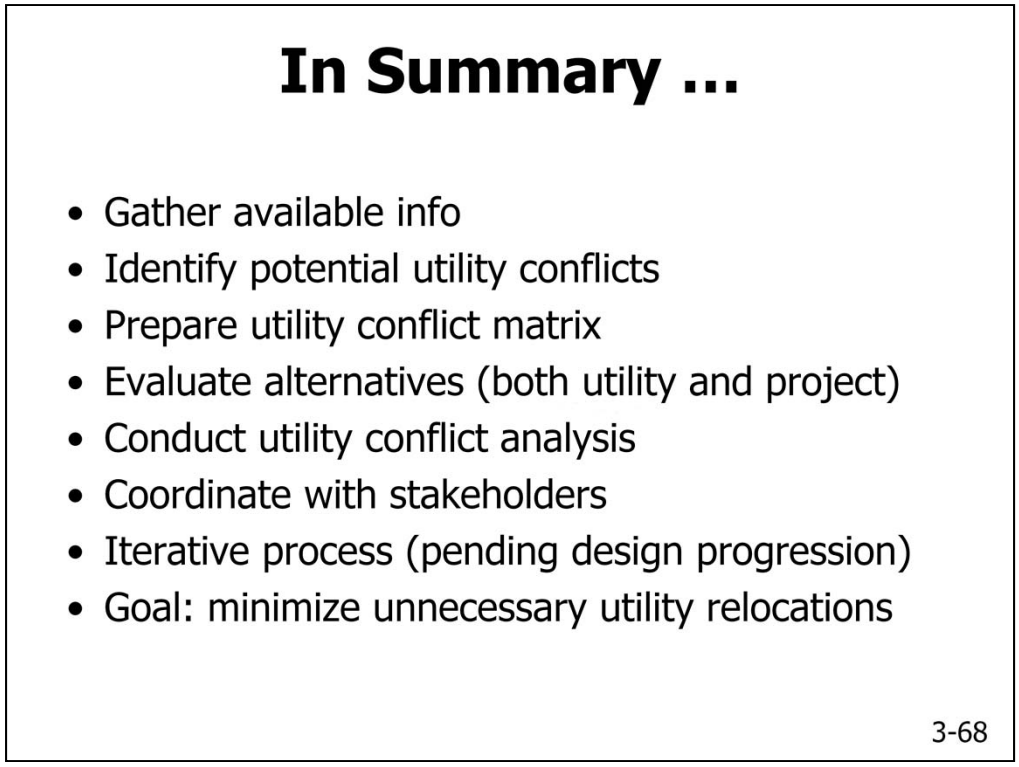
Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action or Resolution	Est. Res. Date	Resolution Status
CP	52	U-10	Electric	Pole	Pole is in conflict with retaining wall.	280 +50		80' LT		QLC		Review possibility of modifying retaining wall 281 to avoid conflict	n/a	Utility conflict created
CP	53E	U-10	Electric	Pole	Pole is within the proposed right of way	282+ 50		80' LT		QLC		Protect in place	n/a	Utility conflict created
CP	89	U-15	Electric	Pole	Power line is within the proposed right of way	348 +00	349 +00	75' LT	85' LT	QLC		Relocate utility line	n/a	Utility conflict created
EPP	63E	U-11	Unknown	Vault	Vault is within the proposed right of way	19+50		0		QLA	14	Protect in place	n/a	Utility conflict created



Fill out the fourth record of the utility conflict matrix with as much information as possible.

The vault may have to move or could be protected in place.

Note: These slides do not include an example of the cost estimate analysis. The slides (with different data) would be very similar to those used for the cost estimate analysis in connection with the Georgia DOT example.



In summary utility conflict management involves the following activities:

• Gather available info
• Identify potential utility conflicts
• Prepare utility conflict matrix
• Evaluate alternatives (both utility and project)
• Conduct utility conflict analysis
• Coordinate with stakeholders

Keep also in mind that

• It is an iterative process (pending design progression)
• The goal is to minimize unnecessary utility relocations

3.2

Discussion, questions, and answers

3-69

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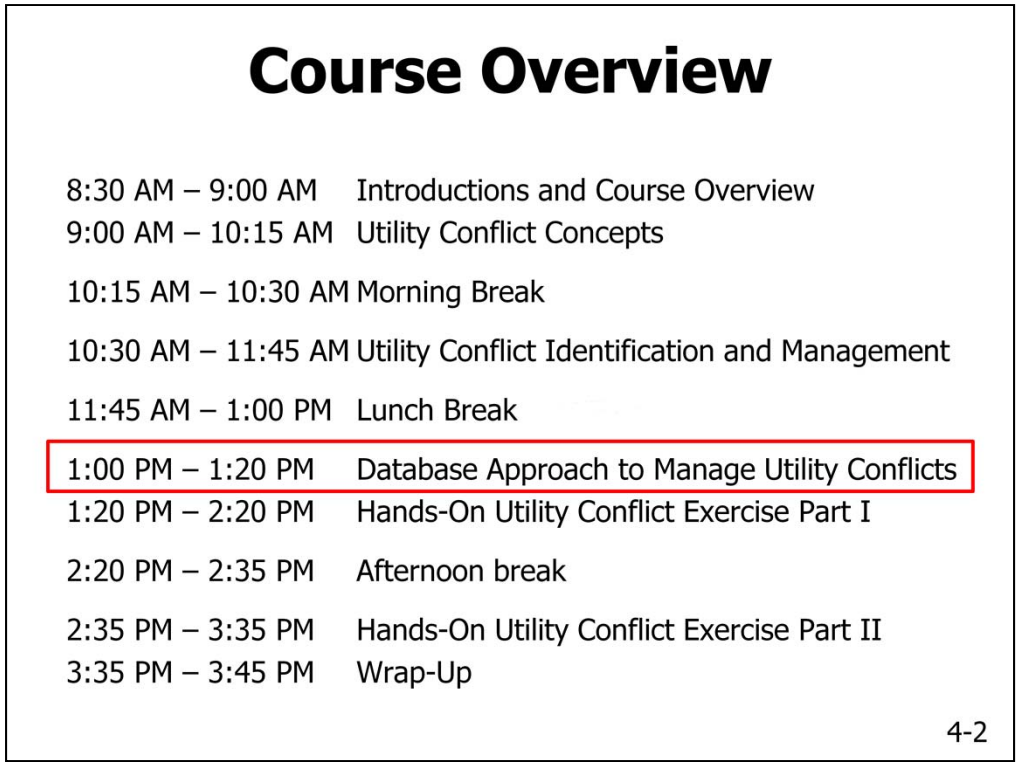
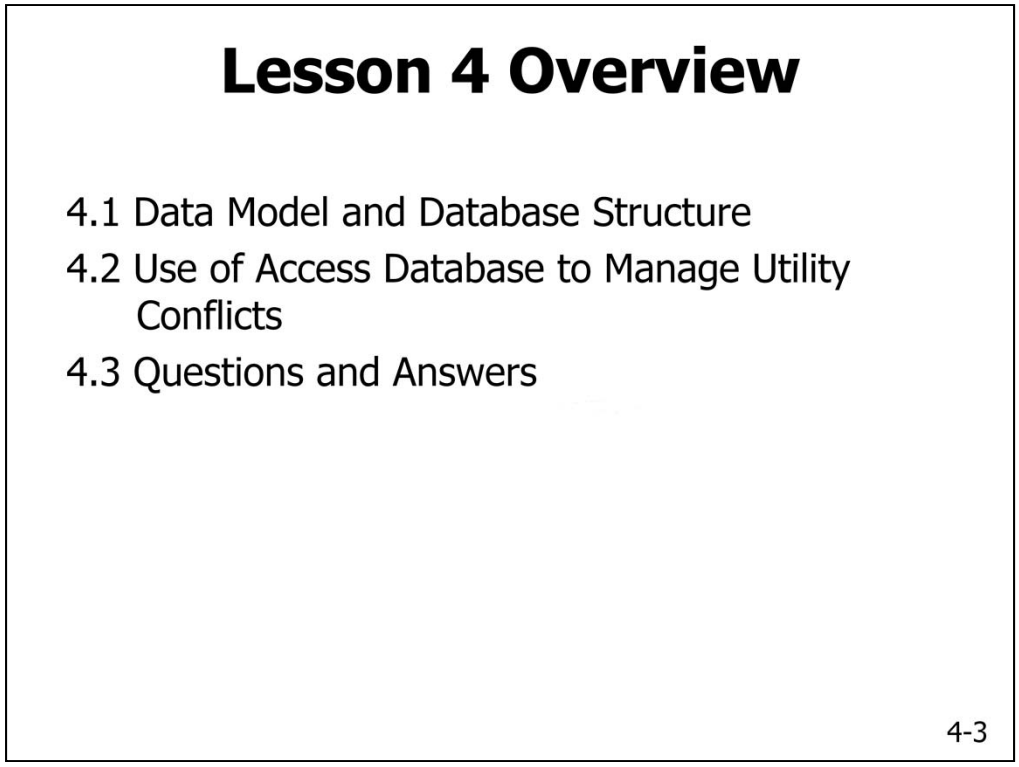
Lesson 4

Use of Database Approach to Manage Utility Conflicts

4-1



This section of the training is Lesson 4, which provides an overview of the database product and use to manage utility conflicts.



Purpose of Lesson 4:

- Provide an overview of the data model structure and capabilities, how to use the database to manage utility conflicts, and provide a review of the access database including examples of data entry and queries.

Acknowledgement: Sample documents provided by the Alaska DOT, California DOT, and the Georgia DOT were used in the development of this lesson.

4.1

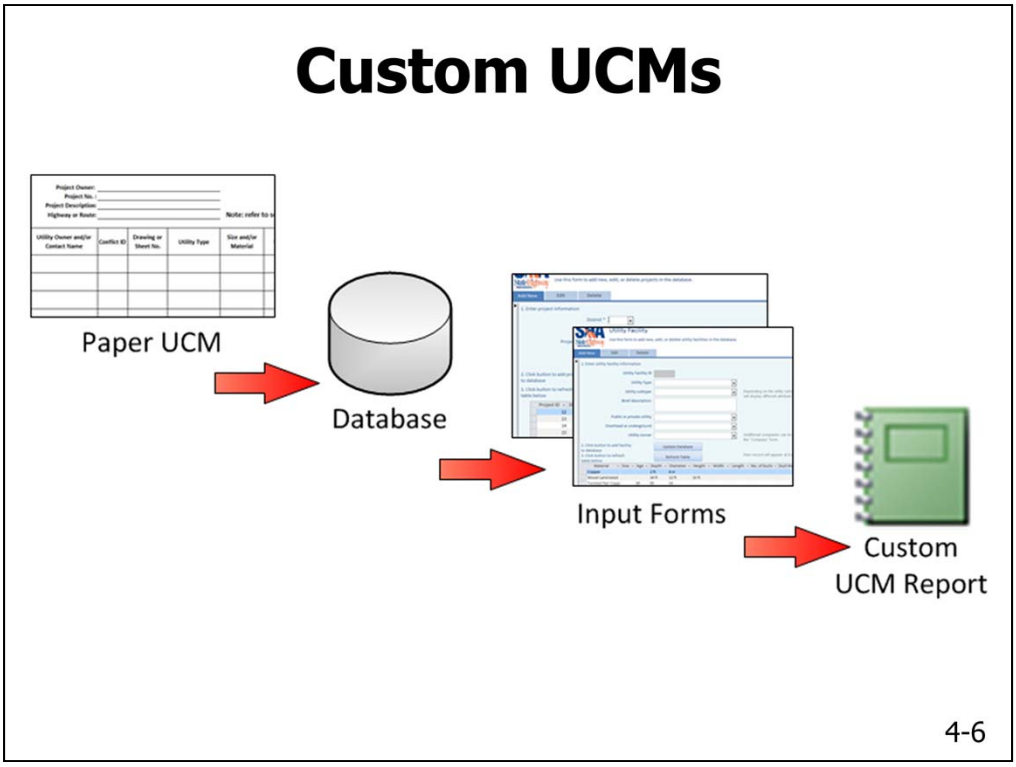
Data Model and Database Structure

4-4

Need for Database Approach

- Problem: "The UCM in Excel is great, but…"
  - I need a column for relocation priority
  - I need to track prior rights
  - I need to track when preliminary plans/semi-final plans/final plans were sent to the utility owner
  - I need to track as-builts, both request date and respond date
  - I have hundreds of utility conflicts to manage.
  - …
- Solution: use database to manage utility conflicts

4-5



These are the steps to implement the UCM in the a database approach:

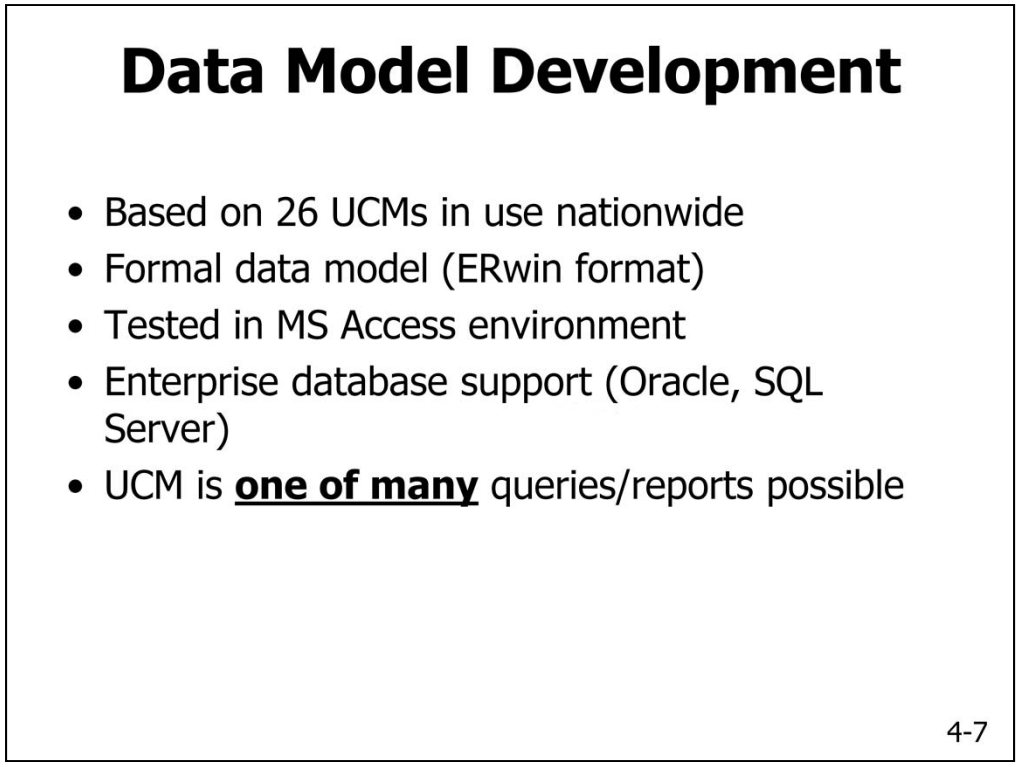
• Determine custom UCM structure, i.e., understand and review the structure of the UCM and other related products.

• Develop and test queries.

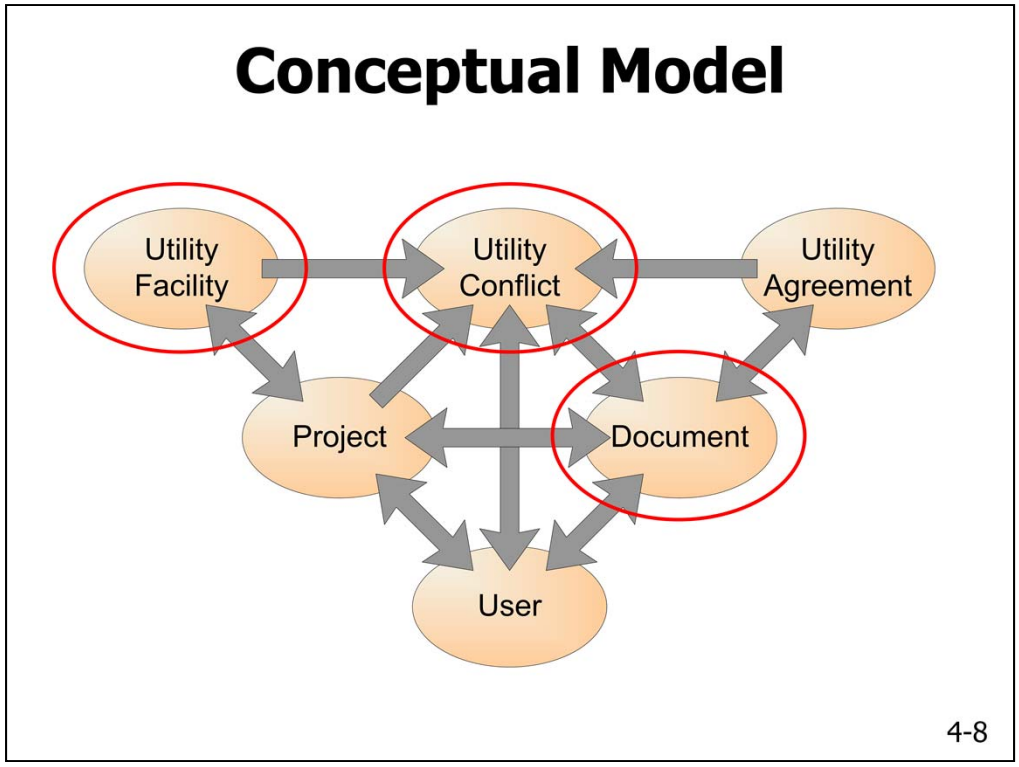
• Develop and test data entry forms.

• Develop and test reports.

• Enter and manage data in the database environment.

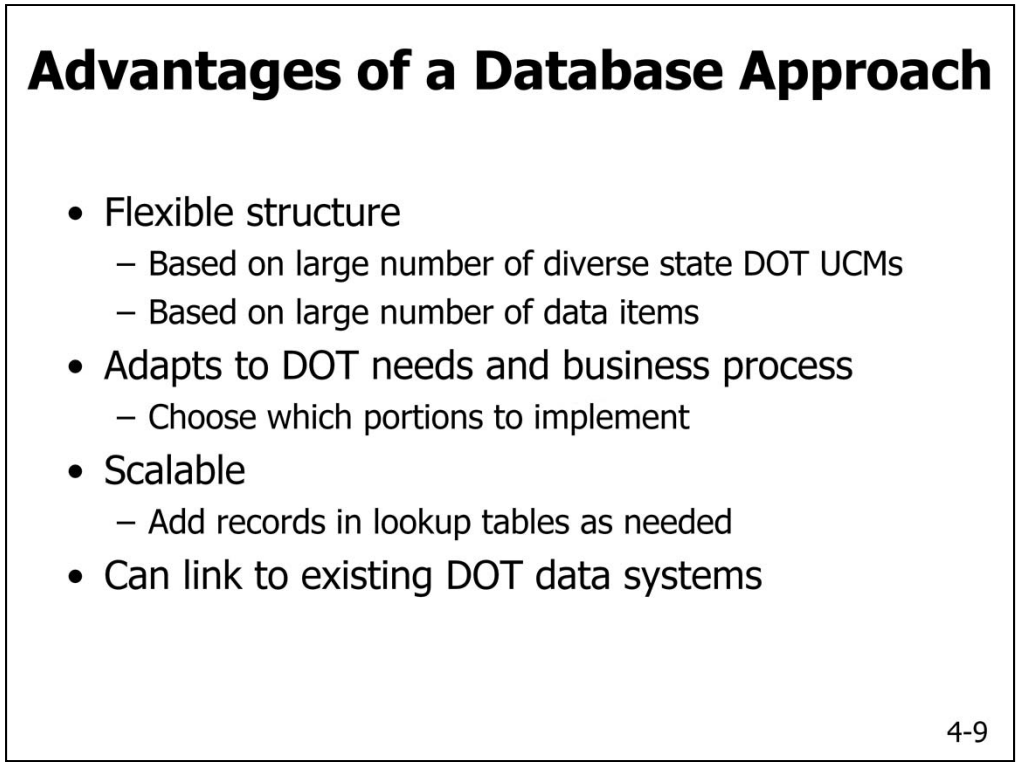


SHRP 2 R15B produced a generic data model and database structure to manage utility conflicts. The data model was based on 26 sample utility conflict matrices from around the nation. The model was tested in Microsoft Access. The data model is generic and can be exported to a variety of database environments (e.g., Oracle, SQL Server). In this case, the UCM is actually one of many queries or reports possible.

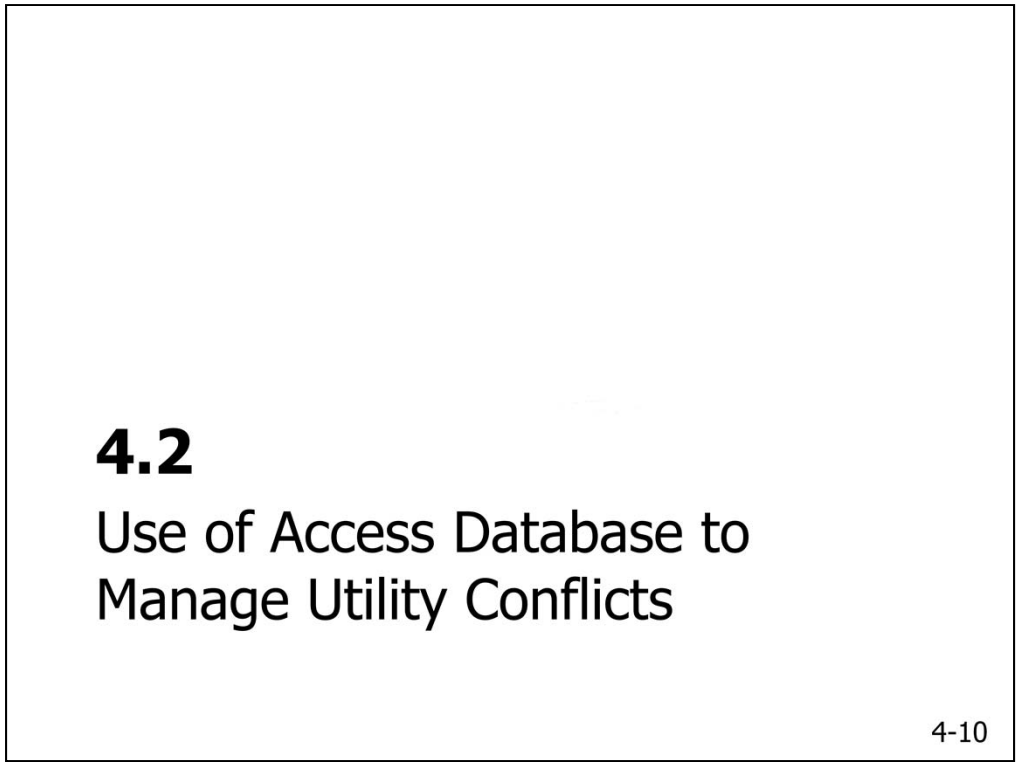


This slide shows a high-level view of the data model in form of a conceptual data model. The conceptual model shows groups of data entities (or subject areas) and the relationships between these data entities. For example, “Project” includes a series of tables related to project data, and “User” includes a series of tables related to system user data. Note that there are different relationships between subject areas. Some subject areas only provide data, for example “Project” to “Utility Conflict,” while other subject areas provide and receive data, for example “Project” to “User.”

Some of these subject areas could be considered placeholders for existing systems. For example, “Project” could be a placeholder for a DOT system that manages project data. The data model focuses on three subject areas that are often not managed by existing DOT information systems: “Utility Facility,” “Utility Conflict,” and “Document.”



The database structure is flexible and can accommodate all 26 state examples plus the UCM version developed during the research. The database can be adapted to a state DOT's business process by choosing which portions of the database to implement. The database is scalable, and expansion is straightforward by adding records as needed to lookup tables. The database can also be linked to existing DOT data systems to avoid data redundancy.



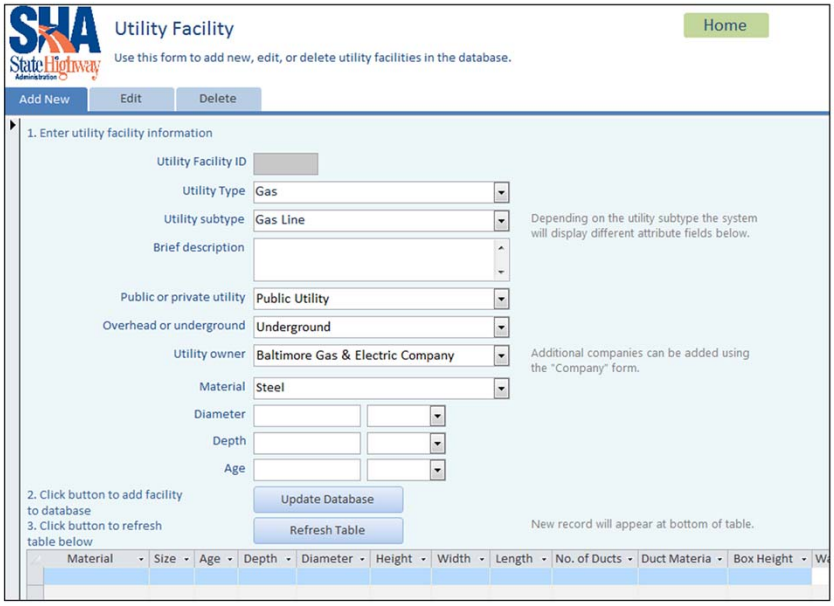
The purpose of this part of Lesson 4 is to demonstrate the use of a database approach to manage utility conflicts.

Sample Data Entry Form

4-11

This slide shows an example switchboard form that allows a user to access a data entry form directly. This form was developed for the Maryland State Highway Administration as part of project SHRP 2 R15C.

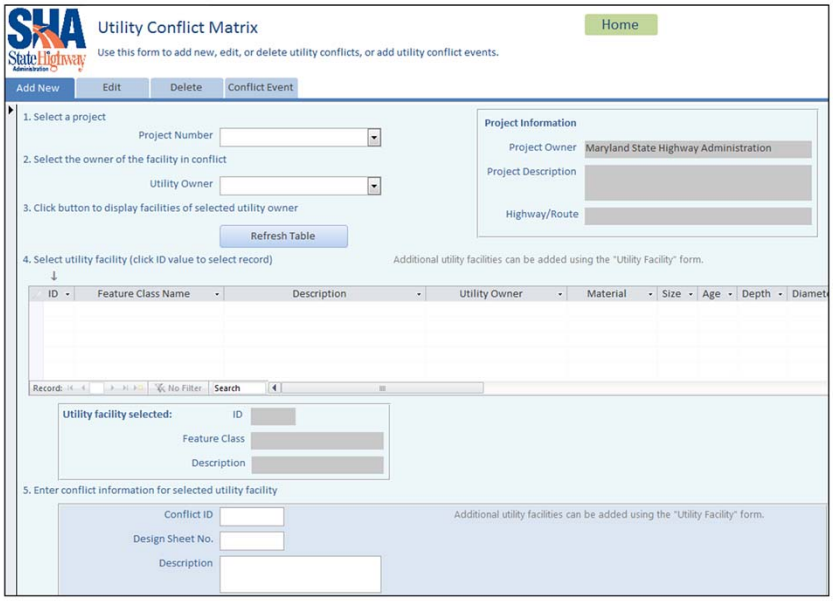
Sample Data Entry Form



4-12

This slide shows an example of a data entry form that could be used to add utility facility records to the database, which in turn could be used to manage those facilities if in conflict. The form has three sub forms to add new, edit existing, and delete existing utility facility records. This utility facility data entry form was developed for the Maryland State Highway Administration as part of project SHRP 2 R15C.

Sample Data Entry Form



4-13

This slide shows an example of a data entry form that could be used to add utility conflict records to the database. The form has four sub forms to add new, edit existing, delete existing, and manage events for utility conflict records. This utility facility data entry form was developed for the Maryland State Highway Administration as part of project SHRP 2 R15C.

Sample UCM Reports

- Standard UCM
- Alaska DOT
- California DOT

4-14

Excel Spreadsheet UCM

Utility Conflict Matrix

Project Owner: Texas Department of Transportation
Project No. : 1234-56-789
Project Description: Road construction project in Houston
Highway or Route: I-10 Katy Freeway

Note: refer to subsheet for utility conflict cost analysis.

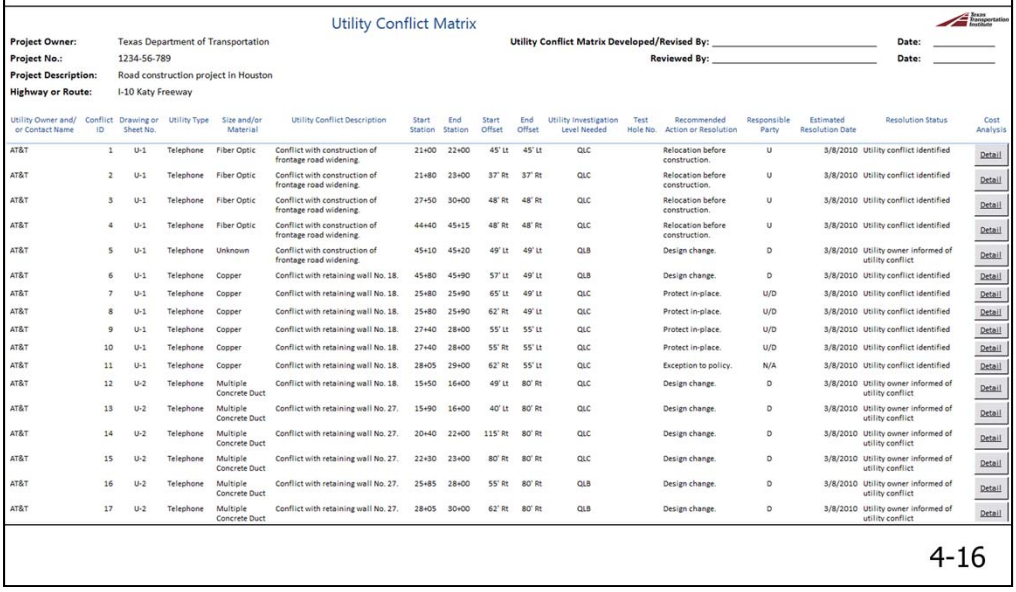
Utility Conflict Matrix Developed/Revised By:
Date:
Reviewed By:
Date:

Utility Owner and/or Contact Name	Conflict ID	Drawing or Sheet No.	Utility Type	Size and/or Material	Utility Conflict Description	Start Station	Start Offset	End Station	End Offset	Utility Investigation Level Needed	Test Hole	Recommended Action or Resolution	Estimated Resolution Date	Resolution Status
AT&T	1	U-1	Communications	Fiber Optic	Conflict with construction of frontage road widening.	21+00	45' Lt	22+00	45' Lt	QLC		Relocation befor construction.	3/8/2010	Utility conflict created
AT&T	2	U-1	Communications	Fiber Optic	Conflict with construction of frontage road widening.	21+80	37' Rt	23+00	37' Rt	QLC		Relocation befor construction.	3/8/2010	Utility conflict created
AT&T	3	U-1	Communications	Fiber Optic	Conflict with construction of frontage road widening.	27+50	48' Rt	30+00	48' Rt	QLC		Relocation befor construction.	3/8/2010	Utility conflict created
AT&T	4	U-1	Communications	Fiber Optic	Conflict with construction of frontage road widening.	44+40	48' Rt	45+15	48' Rt	QLC		Relocation befor construction.	3/8/2010	Utility conflict created
AT&T	5	U-1	Communications	Unknown	Conflict with construction of frontage road widening.	45+10	49' Lt	45+20	49' Lt	QLB		Design change.	3/8/2010	Utility owner informed of utility conflict
AT&T	6	U-1	Communications	Copper	Conflict with retaining wall No. 18.	45+80	57' Lt	45+90	49' Lt	QLB		Design change.	3/8/2010	Utility conflict created
AT&T	7	U-1	Communications	Copper	Conflict with retaining wall No. 18.	25+80	65' Lt	25+90	49' Lt	QLC		Protect in-place.	3/8/2010	Utility conflict created
AT&T	8	U-1	Communications	Copper	Conflict with retaining wall No. 18.	25+80	62' Rt	25+90	49' Lt	QLC		Protect in-place.	3/8/2010	Utility conflict created
AT&T	9	U-1	Communications	Copper	Conflict with retaining wall No. 18.	27+40	55' Lt	28+00	55' Lt	QLC		Protect in-place.	3/8/2010	Utility conflict created
AT&T	10	U-1	Communications	Copper	Conflict with retaining wall No. 18.	27+40	55' Rt	28+00	55' Lt	QLC		Protect in-place.	3/8/2010	Utility conflict created
AT&T	11	U-1	Communications	Copper	Conflict with retaining wall No. 18.	28+05	62' Rt	29+00	55' Lt	QLC		Exception to policy.	3/8/2010	Utility conflict created
AT&T	12	U-2	Communications	Multiple Concrete Duct	Conflict with retaining wall No. 18.	15+50	49' Lt	16+00	80 ' Rt	QLC		Design change.	3/8/2010	Utility owner informed of utility conflict
AT&T	13	U-2	Communications	Multiple Concrete Duct	Conflict with retaining wall No. 27.	15+90	40' Lt	16+00	80 ' Rt	QLC		Design change.	3/8/2010	Utility owner informed of utility conflict
AT&T	14	U-2	Communications	Multiple Concrete Duct	Conflict with retaining wall No. 27.	20+40	115' Rt	22+00	80 ' Rt	QLC		Design change.	3/8/2010	Utility owner informed of utility conflict
AT&T	15	U-2	Communications	Multiple Concrete Duct	Conflict with retaining wall No. 27.	22+30	80' Rt	23+00	80 ' Rt	QLC		Design change.	3/8/2010	Utility owner informed of utility conflict
AT&T	16	U-2	Communications	Multiple Concrete Duct	Conflict with retaining wall No. 27.	25+85	55' Rt	28+00	80 ' Rt	QLB		Design change.	3/8/2010	Utility owner informed of utility conflict
AT&T	17	U-2	Communications	Multiple Concrete Duct	Conflict with retaining wall No. 27.	28+05	62' Rt	30+00	80 ' Rt	QLB		Design change.	3/8/2010	Utility owner informed of utility conflict

4-15

This slide shows a screenshot of the standard UCM (product 1) in Excel with some sample data.

UCM Database Report



Utility Conflict Matrix

Project Owner: Texas Department of Transportation
Project No.: 1234-56-789
Project Description: Road construction project in Houston
Highway or Route: I-10 Katy Freeway

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

Utility Owner and/ or Contact Name	Conflict ID	Drawing or Sheet No.	Utility Type	Size and/or Material	Utility Conflict Description	Start Station	End Station	Start Offset	End Offset	Utility Investigation Level Needed	Test Hole No.	Recommended Action or Resolution	Responsible Party	Estimated Resolution Date	Resolution Status	Cost Analysis
AT&T	1	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	21+00	22+00	45' Lt	45' Lt	QLC		Relocation before construction.	U	3/8/2010	Utility conflict identified	Detail
AT&T	2	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	21+80	23+00	37' Rt	37' Rt	QLC		Relocation before construction.	U	3/8/2010	Utility conflict identified	Detail
AT&T	3	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	27+50	30+00	48' Rt	48' Rt	QLC		Relocation before construction.	U	3/8/2010	Utility conflict identified	Detail
AT&T	4	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	44+40	45+15	48' Rt	48' Rt	QLC		Relocation before construction.	U	3/8/2010	Utility conflict identified	Detail
AT&T	5	U-1	Telephone	Unknown	Conflict with construction of frontage road widening.	45+10	45+20	49' Lt	49' Lt	QLB		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	6	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	45+80	45+90	57' Lt	49' Lt	QLB		Design change.	D	3/8/2010	Utility conflict identified	Detail
AT&T	7	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	25+80	25+90	65' Lt	49' Lt	QLC		Protect in-place.	U/D	3/8/2010	Utility conflict identified	Detail
AT&T	8	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	25+80	25+90	62' Rt	49' Lt	QLC		Protect in-place.	U/D	3/8/2010	Utility conflict identified	Detail
AT&T	9	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	27+40	28+00	55' Lt	55' Lt	QLC		Protect in-place.	U/D	3/8/2010	Utility conflict identified	Detail
AT&T	10	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	27+40	28+00	55' Rt	55' Lt	QLC		Protect in-place.	U/D	3/8/2010	Utility conflict identified	Detail
AT&T	11	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	28+05	29+00	62' Rt	55' Lt	QLC		Exception to policy.	N/A	3/8/2010	Utility conflict identified	Detail
AT&T	12	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 18.	15+50	16+00	49' Lt	80' Rt	QLC		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	13	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	15+90	16+00	40' Lt	80' Rt	QLC		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	14	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	20+40	22+00	115' Rt	80' Rt	QLC		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	15	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	22+30	23+00	80' Rt	80' Rt	QLC		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	16	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	25+85	28+00	55' Rt	80' Rt	QLB		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	17	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	28+05	30+00	62' Rt	80' Rt	QLB		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail

4-16

This slide shows the database report that replicates the previous UCM.

Excel Spreadsheet Sub Sheet

Utility Conflict Resolution Alternatives

Cost Estimate Analysis

Project Owner: Texas Department of Transportation
Project No. : 1234-56-789
Project Description: Road construction project in Houston
Highway or Route: I-10 Katy Freeway

Cost Estimate Analysis Developed/Revised By
Date 11/24/2010
Reviewed By
Date

Utility Conflict: 1
Utility Owner: AT&T
Utility Type: Communications
Size and/or Material: Fiber Optic
Project Phase: 60% Design

Alternative Number	Alternative Description	Alternative Advantage	Alternative Disadvantage	Responsible Party	Engineering Cost (Utility)	Direct Cost (Utility)	Engineering Cost (DOT)	Direct Cost (DOT)	Total Cost	Feasibility	Decision
0	Relocation before construction.	No design change required and no additional cost to DOT.	Cost to utility for relocation.	Utility	$ 10,375.00	$63,875.00	$ -	$ -	$74,250.00	Yes	Selected
1	Protect in-place.			Utility	$ 7,875.00	$32,375.00	$ -	$ -	$40,250.00	No	Rejected
2	Design change.			DOT	$ -	$ -	$95,375.00	$ -	$95,375.00	No	Rejected
3	Exception to policy.			DOT	$ -	$ -	$ -	$ -	$ -	No	Rejected

4-17

This slide shows the cost estimate analysis sub sheet of the standard UCM.

Sub Sheet Database Report

Utility Conflict Resolution Alternatives

Cost Estimate Analysis

Date: 11/24/2010

Project Owner: Texas Department of Transportation
Project No.: 1234-56-789
Project Description: Road construction project in Houston
Highway or Route: I-10 Katy Freeway

Conflict ID:	1
Utility Owner:	AT&T
Utility Type:	Telephone
Size and/or Material:	Fiber Optic
Project Phase:	60% Design

Alternative Number	Alternative Description	Alternative Advantage	Alternative Disadvantage	Responsible Party	Engineering Cost (Utility)	Direct Cost (Utility)	Engineering Cost (DOT)	Direct Cost (DOT)	Total Cost	Feasibility	Decision
0	Relocation before construction.	No design change required and no additional cost to DOT.	Cost to utility for relocation.	Utility Company	$10,375.00	$63,875.00	$0.00	$0.00	$74,250.00	Yes	Selected
1	Protect in-place.			Utility Company	$7,875.00	$32,375.00	$0.00	$0.00	$40,250.00	No	Rejected
2	Design change.			DOT	$0.00	$0.00	$95,375.00	$0.00	$95,375.00	No	Rejected
3	Exception to policy.			DOT	$0.00	$0.00	$0.00	$0.00	$0.00	No	Rejected

4-18

This slide shows the database report that replicates the cost estimate analysis sub sheet.

Alaska DOT: Sample Report

DRAFT Utility Conflict Report
West Dowling Road Phase I

Anchorage, Alaska
DOT&PF No. 50898

Table 2: Chugach Electric Association, Incorporated, Conflicts Summary

Station	Offset	Station	Offset	Size/Type	Length	Conflict	ADJ/REL	Cost	PE/CE Cost	Total Cost
CEA Distribution Relocation Costs										
9+00	150' RT		200' LT	3φ UG	350	FG	REL	52,500	15,750	68,250
16+00	100' LT	42+30	80' LT	3φ UG	2630	FG	REL	394,500	118,350	512,850
16+00	100' LT	15+50	100' RT	3φ UG	250	FG	REL	37,500	11,250	48,750
16+00	100' LT	29+00	75' LT	1φ UG	1650	FG	REL	165,000	49,500	214,500
36+40	80' LT	35+80	350' RT	3φ UG	430	FG	REL	64,500	19,350	83,850
36+60	80' LT	36+70	380' LT	3φ UG	300	FG	REL	45,000	13,500	58,500
	UG Loop to the North			3φ UG	1000	FG	REL	150,000	45,000	195,000
							Subtotal	909,000	272,700	1,181,700
CEA Transmission Relocation Costs										
14+75	55' RT			138 kV OH	1	PWY	REL	30,000	9,000	39,000
32+75	55' RT			138 kV OH	1	EX	REL	50,000	15,000	65,000
36+38	45' RT			138 kV OH	1	EX	REL	50,000	15,000	65,000
							Subtotal	130,000	39,000	169,000
							Total CEA Relocation Costs	**1,039,000**	**311,700**	**1,350,700**

1φ Underground (UG) loop to extend across Dowling Road and along the south side to reconnect existing services.
UG loop provided to the north of the project to accommodate undergrounding.
Removal of existing swamp braces removed and steel piling added, down guys replaced with overhead span guy and down guys.

4-19

This utility conflict matrix was provided by the Alaska DOT. Note the emphasis on cost items (three columns plus total), and that there are separate tables for each utility involved in the project.

[handout]

Alaska DOT: Database Report

Alaska UCM

DRAFT Utility Conflict Report
West Dowling Road Phase 1

Anchorage, Alaska
DOT&PF No. 50898

Start Station	Start Offset	End Station	End Offset	Size	Type	Length	Conflict	ADJ/REL	Cost	PE/CE Cost	Total Cost
CEA Distribution Relocation Costs											
9+00	150' RT		200' LT	3 phi	UG	350	FG	Relocation before construction	$52,500	$15,750	$68,250
16+00	100' LT	42+30	80' LT	3 phi	UG	2,630	FG	Relocation before construction	$394,500	$118,350	$512,850
16+00	100' LT	15+50	100' RT	3 phi	UG	250	FG	Relocation before construction	$37,500	$11,250	$48,750
16+00	100' LT	29+00	75' LT	1 phi	UG	1,650	FG	Relocation before construction	$165,000	$49,500	$214,500
36+40	80' LT	35+80	350' RT	3 phi	UG	430	FG	Relocation before construction	$64,500	$19,350	$83,850
36+60	80' LT	36+70	380' LT	3 phi	UG	300	FG	Relocation before construction	$45,000	$13,500	$58,500
	UG Loop to the North			3 phi	UG	1,000	FG	Relocation before construction	$150,000	$45,000	$195,000
								Subtotal:	$909,000	$272,700	$1,181,700
CEA Transmission Relocation Costs											
14+75	55' RT			138 kV	OH	1	PWY	Relocation before construction	$30,000	$9,000	$39,000
32+75	55' RT			138 kV	OH	1	EX	Relocation before construction	$50,000	$15,000	$65,000
36+38	45' RT			138 kV	OH	1	EX	Relocation before construction	$50,000	$15,000	$65,000
								Subtotal:	$130,000	$39,000	$169,000
								Total Relocation Costs:	**$1,039,000**	**$311,700**	**$1,350,700**

This is the database report that replicates the UCM provided by the Alaska DOT.

California DOT: Sample Report

I-10-EA 122401-Utilities Conflict Status

date of last revision May 30, 2000
this document was prepared by

Conflict No.	Utility Sheet No.	Pothole No. (On Oshemi)	Owner	Utility Description	Pothole/Manhole Location	Conflict Location	Utility Conflict/ Work Description	Investigation			Depth	Impact?		Action			Util. Reloc. A-Abandon RD-Relocate/Delete RD-Relocate/Owner P-Protect in place NC-No conflict	Resp. Party U-Utility Co C-Contractor	Required Completion Date	Comments
								Pothole	Manhole	Overhead	(ft)	Y	N	Remove	Relocate	Other				
1	U-2	1	PACBELL	40 DU Telephone	62 m Rt of I-405 Sta 163+55	49 m Rt and 57 m Rt of I-405 Sta 165+55	conflict with Retaining Walls No. 166 & No. 168	X			4.55 14.40		N				P			
2	U-2	2	PACBELL	40 DU Telephone	45 m Lt of I-405 Sta 165+55	49 m Rt and 57 m Rt of I-405 Sta 165+55	conflict with Retaining Walls No. 166 & No. 168				-		N				P			
3	U-3	3	SCE	25 mm DU	30 m Rt of I-405 Sta 163+01	43 m Rt of I-405 Sta 165+01	conflict with Retaining Wall No. 166				-		N				P			Located in Bristol OC
4	U-3	4	SCE	25 mm DU	46 m Lt of I-405 Sta 163+01	43 m Rt of I-405 Sta 165+01	conflict with Retaining Wall No. 166				-		N				P			Located in Bristol OC
5	U-3	5	MWD	900 mm WSP Water in 380 mL ENC	50 m Rt of I-405 Sta 164+96	44 m Rt of I-405 Sta 164+96	conflict with Retaining Wall No. 166	X			6.70		N				P			
6	U-3	6	MWD	900 mm WSP Water in 380 mL ENC	50 m Lt of I-405 Sta 164+96	44 m Rt of I-405 Sta 164+96	conflict with Retaining Wall No. 166	X			6.50		N				P			
7	U-3	7	Caltrans	600 mm RCP	53 m Rt of I-405 Sta 163+42	53 m Rt of I-405 from Sta 163+29 to Sta 163+42	conflict with Delhi Channel Bridge	X			6.00		N				P			
8	U-3	8	Caltrans	600 mm RCP	53 m Rt of I-405 Sta 163+29	53 m Rt of I-405 from Sta 163+29 to Sta 163+42	conflict with Delhi Channel Bridge	X			9.00		N				P			
9	U-3	9	MCWD	300 mm ACP Water in 119mL, 500mm STL Casing	32 m Rt of I-405 Sta 163+25	30 m Rt of I-405 Sta 163+25	conflict with I-405 Widening & BR1 Line	X			10.30		N				P			
10	U-3	10	MCWD	300 mm ACP Water 119mL, 500mm STL Casing	32 m Lt of I-405 Sta 163+25	33 m Lt of I-405 Sta 163+25	conflict with I-405 Widening & BR1 Line	X			8.75		N				P			
11	U-3	MH 11	CSDOC	Manhole	81 m Rt of I-405 Sta 162+92	35 m Rt of I-405 Sta 162+92	conflict with I-405 Widening & BR1 Line		X		10.40		N				P			
12	U-3	12	CSDOC	380 mm VCP Sewer	36 m Lt of I-405 Sta 162+91	32 m Lt of I-405 Sta 162+90	conflict with I-405 Widening & BR1 Line				-		N				P			
13	U-4	13	MCWD	600mm CCP Water in 94m L 900mm Dia Stl Casing	67 m Rt of I-405 Sta 161+44	56 m Rt of I-405 Sta 161+44	Conflict with Airport Channel	X			4.55	Y			X	X	RB			600 mm Waterline to be Lowered Extend Encasement
14	U-4	14	MCWD	600mm CCP Water in 94m L 900mm Dia Stl Casing	38 m Lt of I-405 Sta 161+40	32 m Lt of I-405 Sta 161+42	conflict with I-405 Widening				-		N				P			
15	U-4	15	MCWD	300 mm ACP Water	70 m Rt of I-405 Sta 160+29	72 m Rt of I-405 from Sta 157+20 to Sta 160+29	Conflict with AOA Line and Retaining Wall No. 268	X			-	Y			X		RD			Encroachment CT R/W and Private Owner Encased under Roadway
16	U-4	16	MCWD	300 mm ACP Water	70 m Rt of I-405 Sta 159+07	72 m Rt of I-405 from Sta 157+20 to Sta 160+29	Conflict with AOA Line and Retaining Wall No. 268	X			-	Y			X		RD			Encroachment CT R/W and Private Owner Encased under Roadway
17	U-5	17	MCWD	300 mm ACP Water	70 m Rt of I-405 Sta 156+87	72 m Rt of I-405 from Sta 157+20 to Sta 160+29	conflict with AOA Line and Retaining Wall No. 268	X			4.35		N				P			
18	U-5	MH 18	CSDOC	Manhole	60 m Rt of I-405 Sta 156+65	28 m Rt of I-405 Sta 156+65	conflict with I-405 Widening		X		16.20		N				P			
19	U-5	19	CSDOC	380 mm VCP Sewer	46 m Lt of I-405 Sta 156+65	25 m Rt of I-405 Sta 156+65	conflict with I-405 Widening	X			18.40		N				P			
20	U-5	20	CSDOC	830 mm VCP Sewer	14 m Rt of B2 Sta 24+96		conflict with construction of B2 Line						N				P			
21	U-5	21	CSDOC	830 mm VCP Sewer	6 m Lt of B2 Sta 25+54		conflict with construction of B2 Line						N				P			
22	U-8	MH 22	CSDOC	Manhole	9m Rt of Main St Sta 102+78				X			Y				X	RB			MH to be Lowered New Top MH Elev= 9.568
23	U-8	MH 23 SCE MH 4503	SCE	Manhole No. 4503	9m Rt of Main St Sta 102+87				X			Y				X	RB			MH to be Lowered New Top MH Elev= 9.583 m
24	U-8	MH 24 SCE MH 4502	SCE	Manhole No. 4502	9m Rt of Main St Sta 104+17				X			Y				X	RB			MH to be Lowered New Top MH Elev= 9.728 m

4-21

This utility conflict matrix was provided by the California DOT. Note the large number of columns and detail provided in the utility conflict matrix.

[handout]

California DOT: Database Rpt.

California UCM

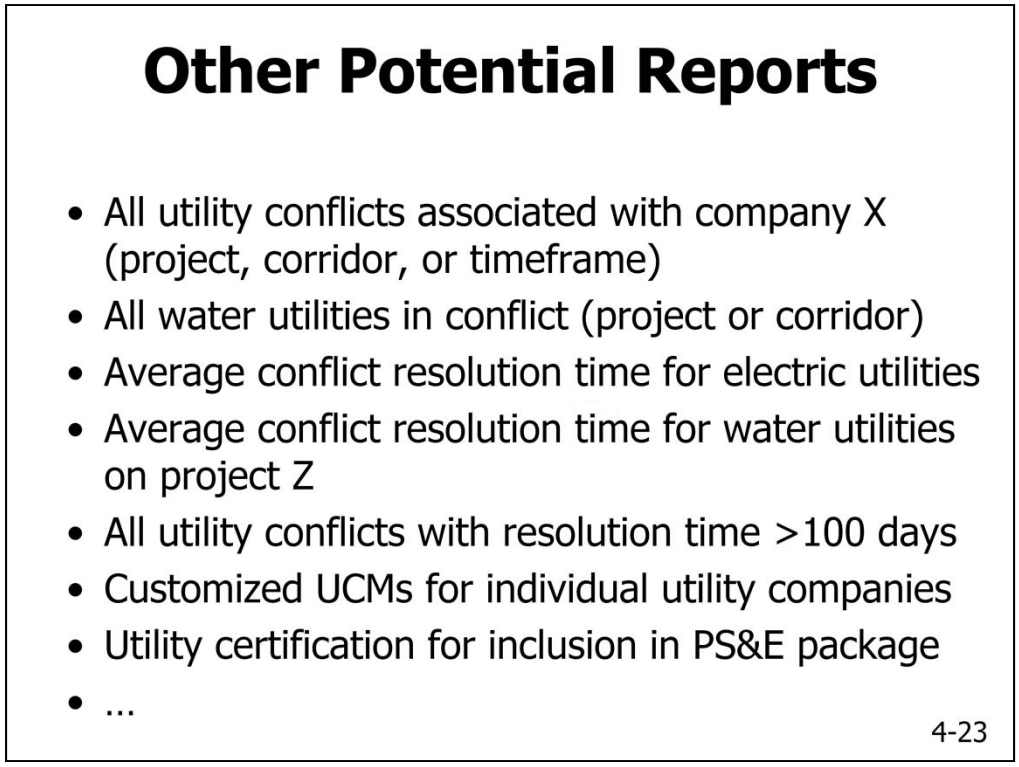
I-10-EA 122401 - Utilities Conflict Status

Date of last revision: 12/4/2009

This document was prepared by: _____

Conflict No.	Utility Sheet No.	Test Hole No.	Owner	Utility Description				Test Hole/ Manhole Location	Start Station	End Station	Offset	Utility Conflict/ Work Description	Utility Conflict Investigation	Depth (ft)	Impact?	Utility Relocation	Resp. Party	Required Completion Date	Comments
1	U-2	1	PACBELL	40 mm	DU	Telephone		62 m Rt of I-405 Sta 165+55	165+55		40 m Rt and 57 m Rt of I-405	Conflict with retaining walls No. 166 and No. 168	QLA	4.55	N	P	U	1/10/2010	
2	U-2	2	PACBELL	40 mm	DU	Telephone		48 m Lt of I-405 Sta 165+55	165+55		40 m Rt and 57 m Rt of I-405	Conflict with retaining walls No. 166 and No. 168		14.40	N	P	U	1/10/2010	
3	U-3	3	SCE	25 mm	DU	Telephone		35 m Rt of I-405 Sta 165+01	165+01		43 m Rt of I-405	Conflict with retaining wall No. 166			N	P	U	1/10/2010	Located in Bristol OC
4	U-3	4	SCE	25 mm	DU	Telephone		46 m Lt of I-405 Sta 165+55	165+01		43 m Rt of I-405	Conflict with retaining wall No. 166			N	P	U		Located in Bristol OC
5	U-3	5	MWD	900 mm		Water	in 380 mL ENC	50 m Rt of I-405 Sta 165+96	164+95		44 m Rt of I-405	Conflict with retaining wall No. 166	QLA	6.70	N	P	U		
6	U-3	6	MWD	900 mm		Water	in 380 mL ENC	50 m Lt of I-405 Sta 165+96	164+95		44 m Rt of I-405	Conflict with retaining wall No. 166	QLA	6.50	N	P	U		
7	U-3	7	Caltrans	600 mm				53 m Rt of I-405 Sta 163+42	163+29	163+24	53 m Rt of I-405	Conflict with Delhi Channel Bridge	QLA	6.00	N	P	U		
8	U-3	8	Caltrans	600 mm				53 m Rt of I-405 Sta 163+29	163+29	163+42	53 m Rt of I-405	Conflict with Delhi Channel Bridge	QLA	9.00	N	P	U		
9	U-3	9	MCWD	300 mm		Water	in 119 mL, 500 mm STL Casing	32 m Rt of I-405 Sta 163+25	163+25		35 m Rt of I-405	Conflict with I-405 widening and BR1 Line	QLA	10.30	N	P	U		
10	U-3	10	MCWD	300 mm		Water	in 119 mL, 500 mm STL Casing	32 m Lt of I-405 Sta 163+25	163+25		33 m Lt of I-405	Conflict with I-405 widening and BR1 Line	QLA	8.75	N	P	U		
11	U-3	MH 11	CSDOC			Manhole		81 m Rt of I-405 Sta 162+92	162+92		35 m Rt of I-405	Conflict with I-405 widening and BR1 Line	QLB	18.40	N	P	U		
12	U-3	12	CSDOC	380 mm		Sewer		36 m Lt of I-405 Sta 162+91	162+92		32 m Lt of I-405	Conflict with I-405 widening and BR1 Line			N	P	U		
13	U-4	13	MCWD	600 mm		Water	in 94 mL, 900 mm STL Casing	67 m Rt of I-405 Sta 161+44	161+44		58 m Rt of I-405	Conflict with airport channel	QLA	4.55	Y	RB	U		600 mm waterline to be lowered, extend encasement
14	U-4	14	MCWD	600 mm		Water	in 94 mL, 900 mm STL Casing	38 m Lt of I-405 Sta 161+40	161+42		32 m Lt of I-405	Conflict with I-405 widening			N	P	U		
15	U-4	15	MCWD	300 mm		Water		70 m Rt of I-405 Sta 160+29	157+20	160+29	72 m Rt of I-405	Conflict with AOA line and retaining wall No. 268	QLA		Y	RD	U		Encroachment CR R/W and private owner, encased under roadway
16	U-4	16	MCWD	300 mm		Water		70 m Rt of I-405 Sta 159+07	157+20	160+29	72 m Rt of I-405	Conflict with AOA line and retaining wall No. 268	QLA		Y	RD	U		Encroachment CR R/W and private owner, encased under roadway
17	U-5	17	MCWD	300 mm		Water		70 m Rt of I-405 Sta 156+87	157+20	160+29	72 m Rt of I-405	Conflict with AOA line and retaining wall No. 268	QLA	4.35	N	P	U		
18	U-5	MH 18	CSDOC			Manhole		60 m Rt of I-405 Sta 156+65	156+65		28 m Rt of I-405	Conflict with I-405 widening	QLB	16.20	N	P	U		

This is the database report that replicates the UCM provided by the California DOT.



One of the advantages of using a database approach for the management of utility conflicts is that it is possible to generate a wide range of reports. This slide shows a sample of additional reports that are possible with the database developed during the research.

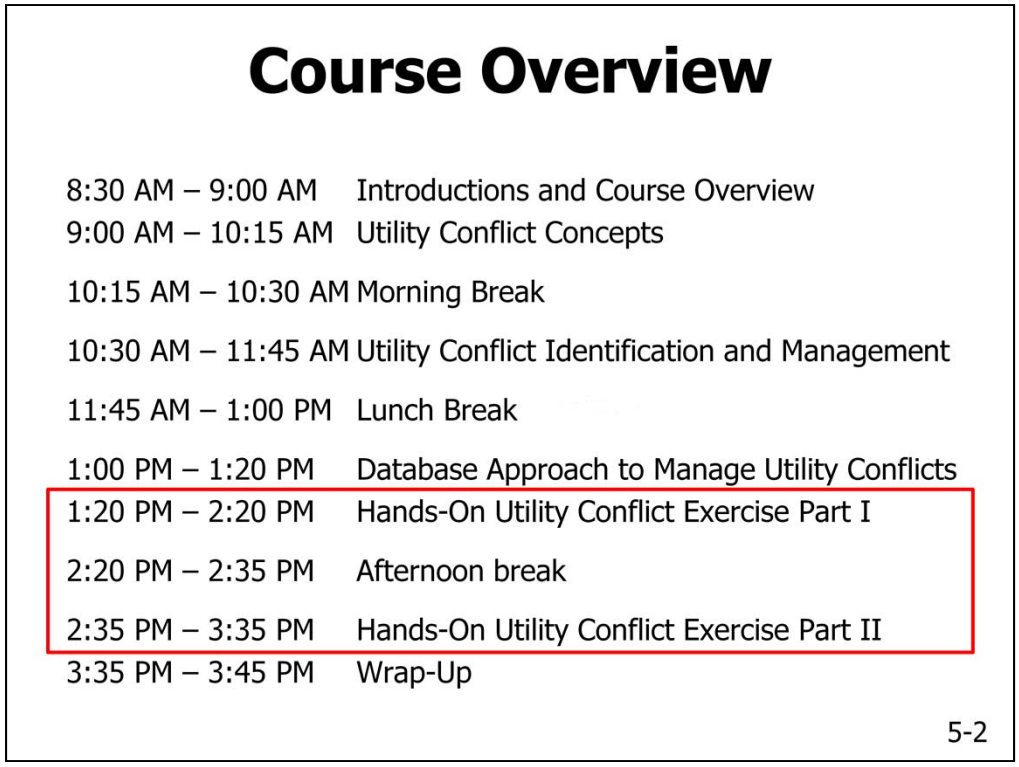
4.3
Questions and Answers

4-24

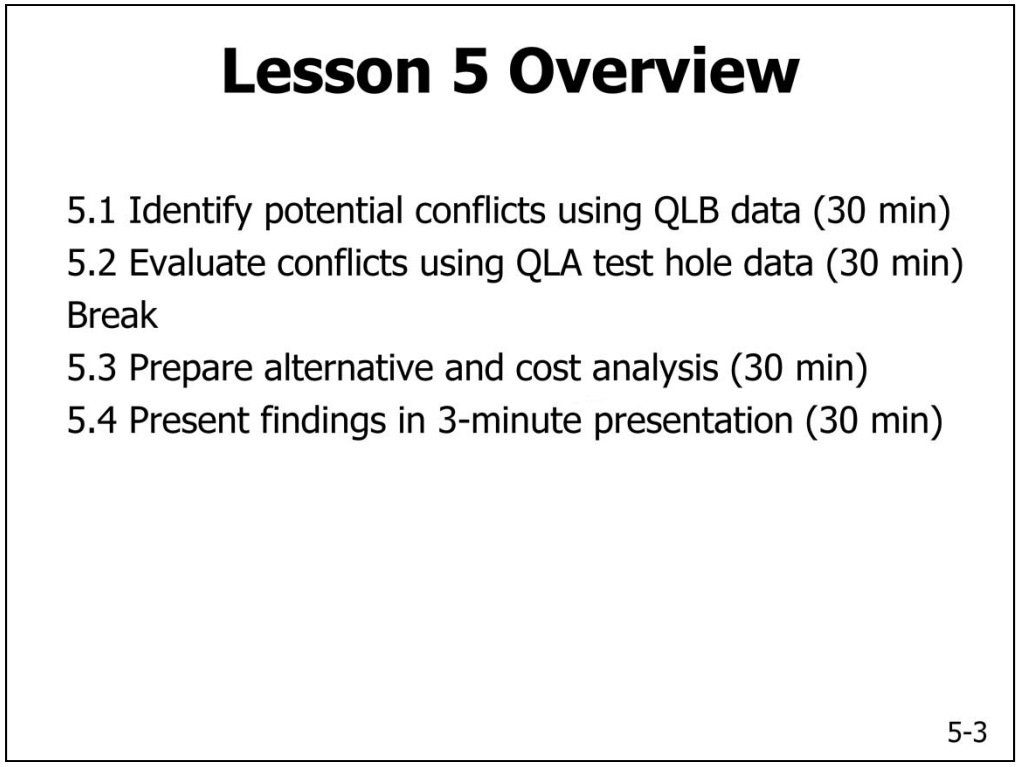
Lesson 5

Hands-on Utility Conflict Management Exercise

5-1



This section of the training is Lesson 5, which provides a hand-on experience to identify utility conflicts and store utility conflict information in a utility conflict matrix.



The purpose of lesson 5 is to provide a hands-on exercise for individuals or small groups that focuses on the identification of utility conflicts on plan sheets.

The exercise has four activities:

- 5.1: Identify all potential conflicts using QLB data.
- 5.2: Evaluate conflicts using QLA test hole data sheets.
- 5.3: Analyze resolution strategies for one or more utility conflicts.
- 5.4: Give groups an opportunity to briefly talk about how they resolved a conflict and other things that they noticed during the exercise.

There will be a 15 minute break between 5.2 and 5.3.

Acknowledgement: Sample project documents provided by the Georgia DOT were used in the development of this lesson.

5.1

Identify Potential Conflicts Using QLB Data

5-4

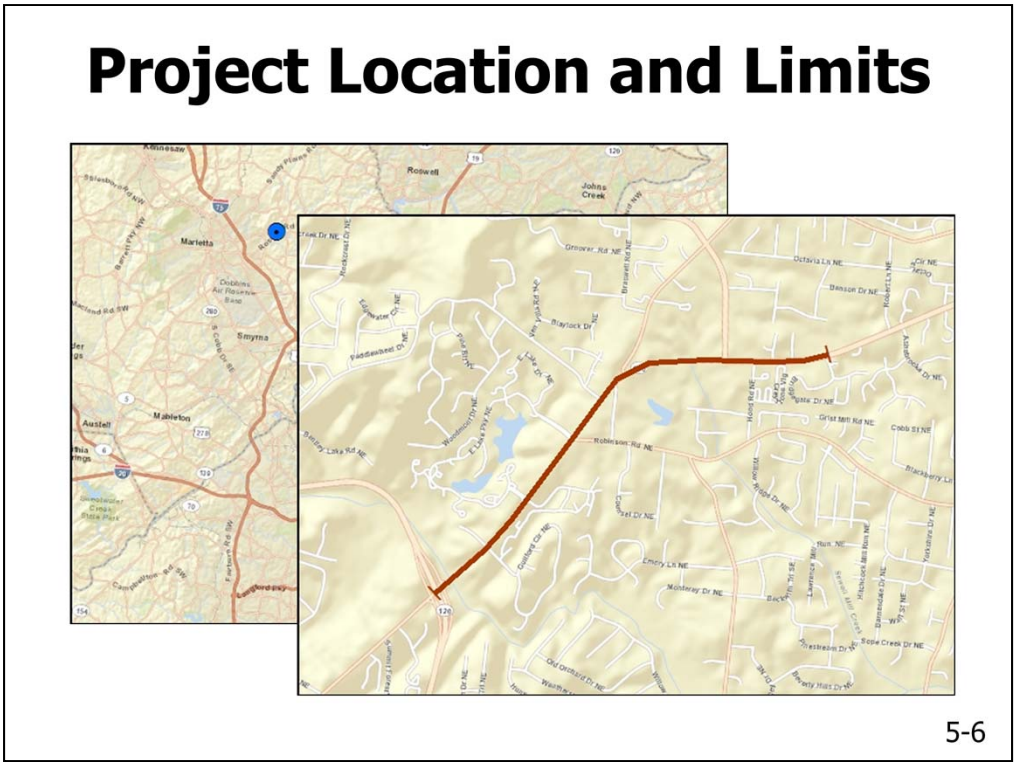
Project Overview

- Widening of SR 120/Roswell Road from SR 120 ALT to Bridgegate Drive
- Located in Marietta, north-west of Atlanta, Georgia
- Suburban, 4-lane and 6-lane divided sections
- Project length: 1.8 miles
- 13 utility owners
- 135,000 linear feet of underground utilities
- $415K estimated utility impact cost (as designed)

5-5

These plan sheets are from a project northwest of Atlanta, Georgia. The Georgia DOT used SUE on the project and received several data sheets with QLA information.

According to Georgia DOT officials, the anticipated utility impact cost was approximately $415K (as designed).



Project was located to the east of Marietta, Georgia. Limits of the project were from SR 120 Loop in the west to Bridgegate Drive in the east.

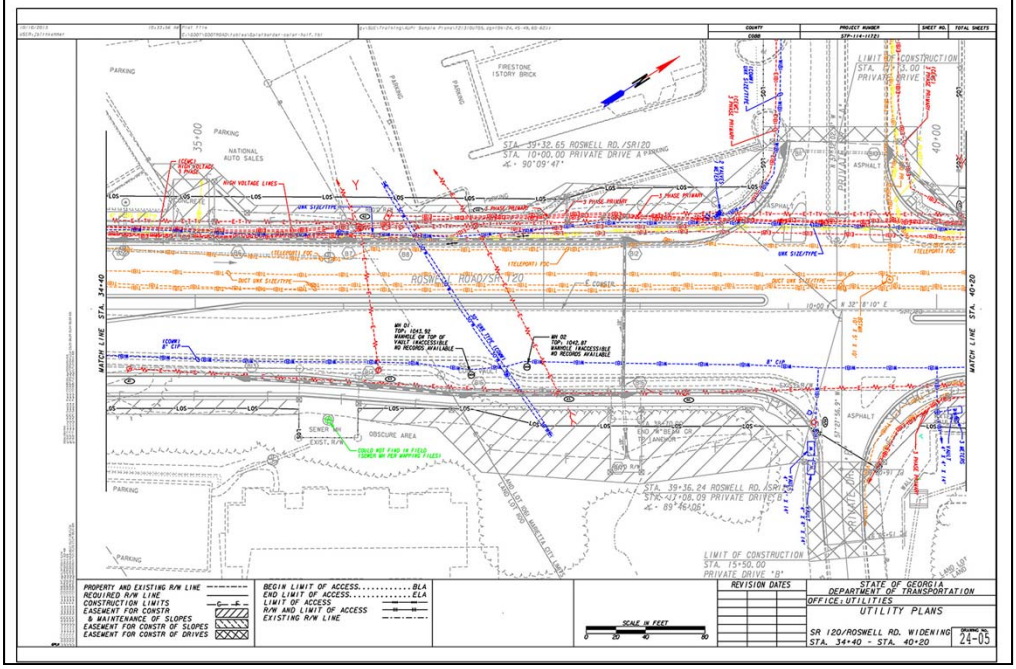
Exercise Materials

- 13 plan sheets
  - Legend
  - Pole data
  - Typical sections
  - 1 plan, 3 stages, 5 cross sections, 1 drainage profile
- Test hole data sheets
- Blank utility conflict matrix
- Cost estimate analysis sheet

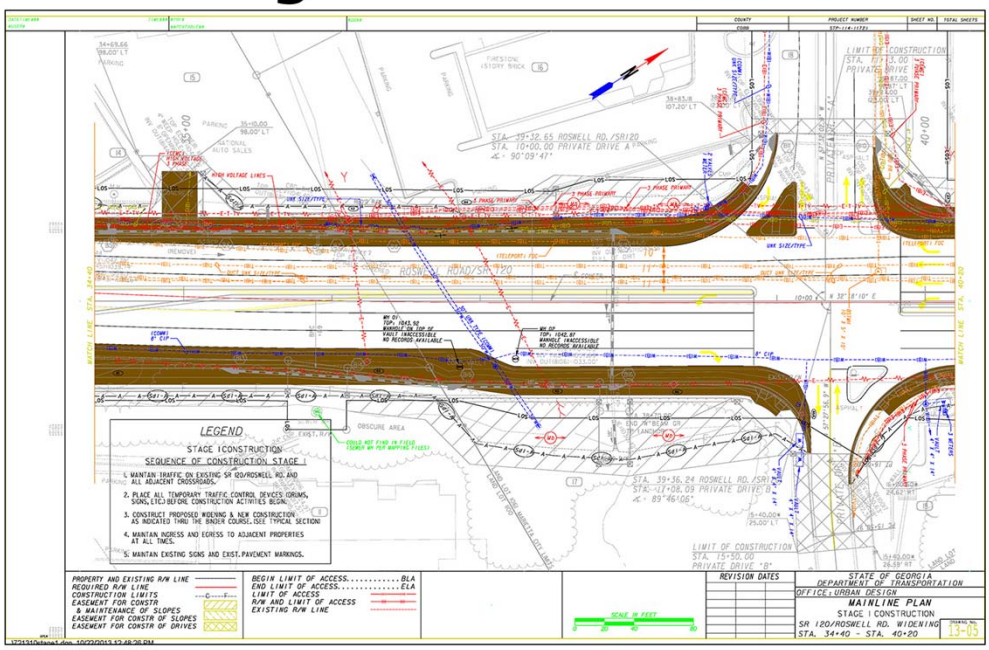
5-7

The exercise materials consist of plan sheets, test hole data sheets, utility conflict matrix, and cost estimate analysis sheet. The following slides show examples of the training materials to familiarize the course participants with the materials.

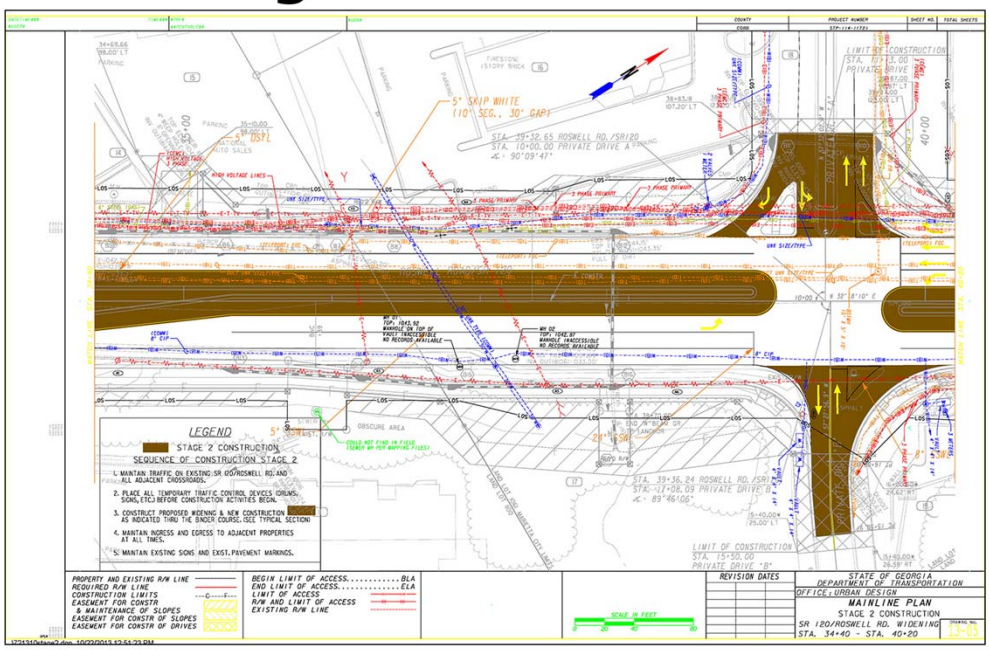
Plan Sheets


PARKING
FIRESTONE
1STORY BRICK
NATIONAL
AUTO SALES
STA. 39+32.65 ROSWELL RD./SR120
STA. 10+00.00 PRIVATE DRIVE A
ROSWELL ROAD/SR 120
LIMIT OF CONSTRUCTION
STA. 7+50.00
PRIVATE DRIVE "A"
ASPHALT
OBSCURE AREA
STA. 39+36.24 ROSWELL RD./SR120
STA. 43+08.09 PRIVATE DRIVE B
LIMIT OF CONSTRUCTION
STA. 15+50.00
PRIVATE DRIVE "B"
PROPERTY AND EXISTING R/W LINE
REQUIRED R/W LINE
CONSTRUCTION LIMITS
EASEMENT FOR CONSTR
& MAINTENANCE OF SLOPES
EASEMENT FOR CONSTR OF SLOPES
EASEMENT FOR CONSTR OF DRIVES
BEGIN LIMIT OF ACCESS.....BLA
END LIMIT OF ACCESS.....ELA
LIMIT OF ACCESS
R/W AND LIMIT OF ACCESS
EXISTING R/W LINE
SCALE IN FEET
REVISION DATES
STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: UTILITIES
UTILITY PLANS
SR 120/ROSWELL RD. WIDENING
STA. 34+40 - STA. 40+20
DRAWING NO.
24-05

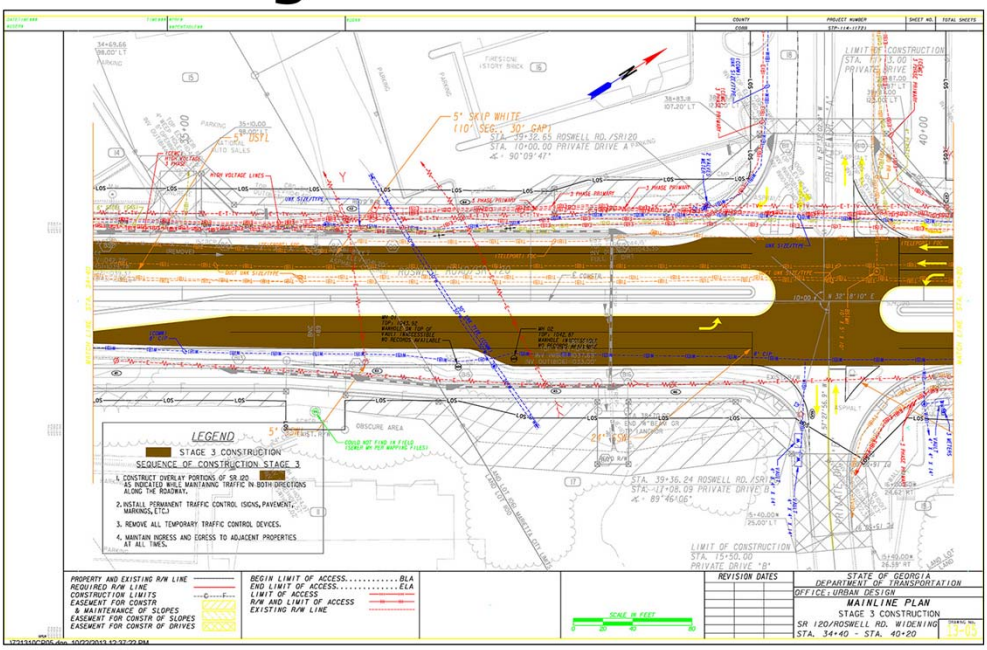
Stage 1 Construction

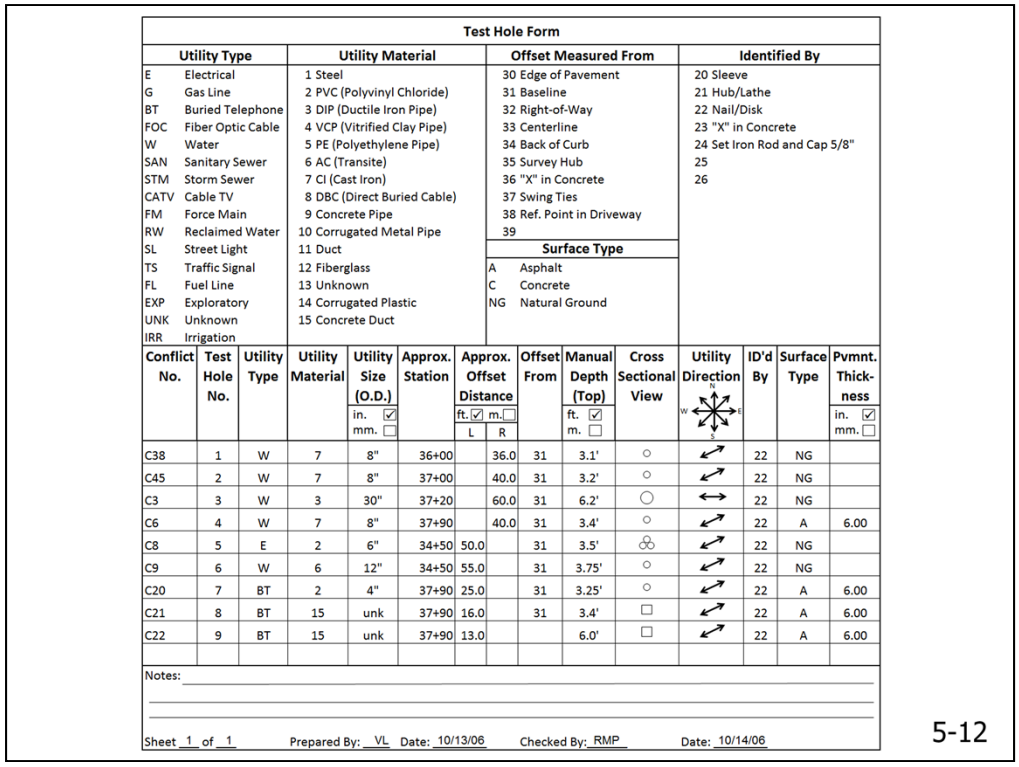


Stage 2 Construction



Stage 3 Construction





Test Hole Form

Utility Type		Utility Material		Offset Measured From		Identified By	
E	Electrical	1	Steel	30	Edge of Pavement	20	Sleeve
G	Gas Line	2	PVC (Polyvinyl Chloride)	31	Baseline	21	Hub/Lathe
BT	Buried Telephone	3	DIP (Ductile Iron Pipe)	32	Right-of-Way	22	Nail/Disk
FOC	Fiber Optic Cable	4	VCP (Vitrified Clay Pipe)	33	Centerline	23	"X" in Concrete
W	Water	5	PE (Polyethylene Pipe)	34	Back of Curb	24	Set Iron Rod and Cap 5/8"
SAN	Sanitary Sewer	6	AC (Transite)	35	Survey Hub	25	
STM	Storm Sewer	7	CI (Cast Iron)	36	"X" in Concrete	26	
CATV	Cable TV	8	DBC (Direct Buried Cable)	37	Swing Ties		
FM	Force Main	9	Concrete Pipe	38	Ref. Point in Driveway		
RW	Reclaimed Water	10	Corrugated Metal Pipe	39			
SL	Street Light	11	Duct	**Surface Type**			
TS	Traffic Signal	12	Fiberglass	A	Asphalt		
FL	Fuel Line	13	Unknown	C	Concrete		
EXP	Exploratory	14	Corrugated Plastic	NG	Natural Ground		
UNK	Unknown	15	Concrete Duct				
IRR	Irrigation						

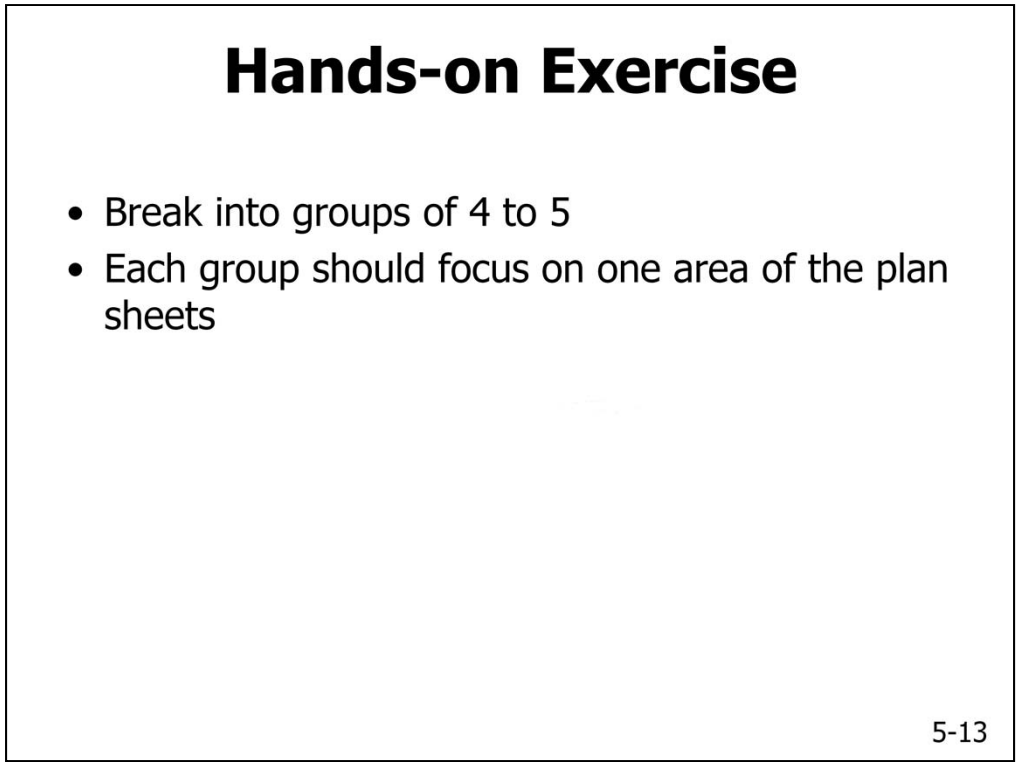
Conflict No.	Test Hole No.	Utility Type	Utility Material	Utility Size (O.D.) in. ☑ mm. ☐	Approx. Station	Approx. Offset Distance ft. ☑ m. ☐ L	R	Offset From	Manual Depth (Top) ft. ☑ m. ☐	Cross Sectional View	Utility Direction	ID'd By	Surface Type	Pvmnt. Thick-ness in. ☑ mm. ☐
C38	1	W	7	8"	36+00		36.0	31	3.1'	○	↙↗	22	NG	
C45	2	W	7	8"	37+00		40.0	31	3.2'	○	↙↗	22	NG	
C3	3	W	3	30"	37+20		60.0	31	6.2'	◯	↔	22	NG	
C6	4	W	7	8"	37+90		40.0	31	3.4'	○	↙↗	22	A	6.00
C8	5	E	2	6"	34+50	50.0		31	3.5'	⁂	↙↗	22	NG	
C9	6	W	6	12"	34+50	55.0		31	3.75'	○	↙↗	22	NG	
C20	7	BT	2	4"	37+90	25.0		31	3.25'	○	↙↗	22	A	6.00
C21	8	BT	15	unk	37+90	16.0		31	3.4'	□	↙↗	22	A	6.00
C22	9	BT	15	unk	37+90	13.0			6.0'	□	↙↗	22	A	6.00

Notes:

Sheet 1 of 1 Prepared By: VL Date: 10/13/06 Checked By: RMP Date: 10/14/06

5-12

Test hole report for test holes 1 through 9.

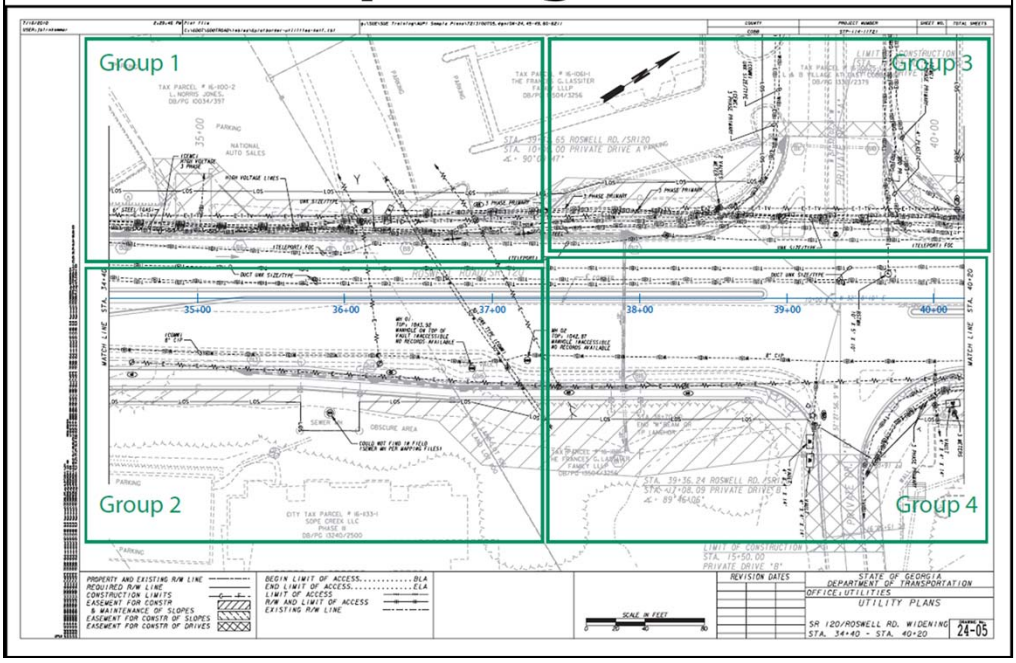


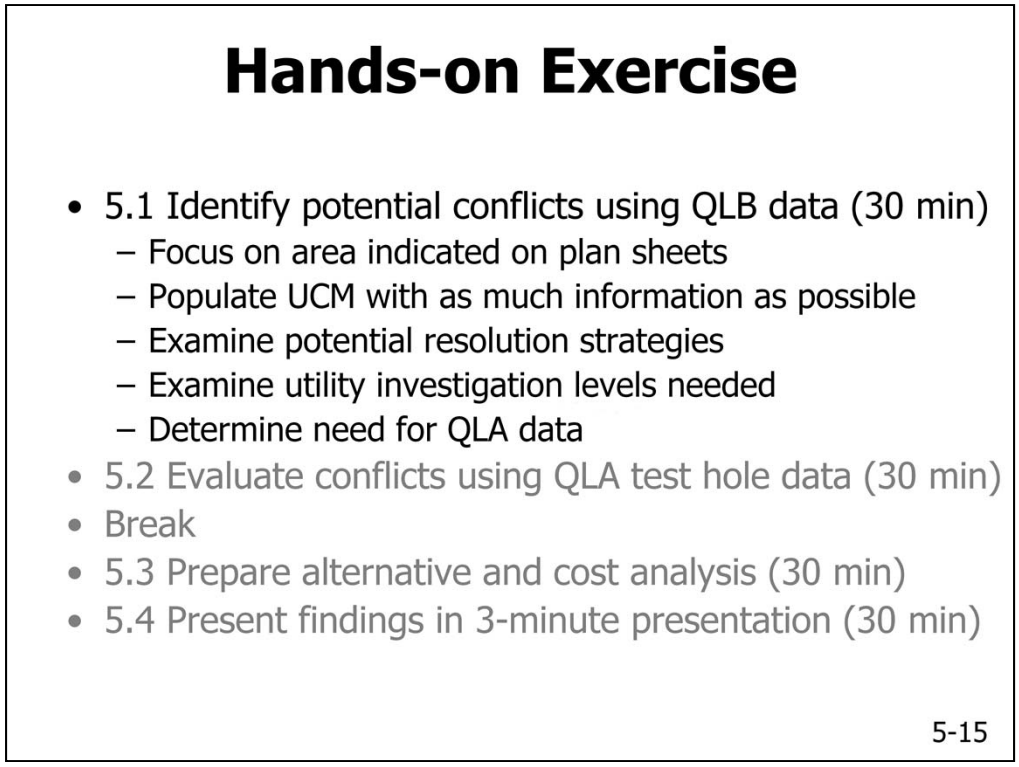
Break into groups of 4 to 5. Each group should receive one set of plans corresponding to one of the quadrants of the entire project.

Tips:

- Increase effectiveness of each group by mixing participants according to skill set and experience.
- Prior to the course, request host to ask participants to bring engineering scales as well as pencils or pens.
- Provide all project plans for completeness but ask participants to focus on a smaller sample of utility conflicts.

Group Assignments





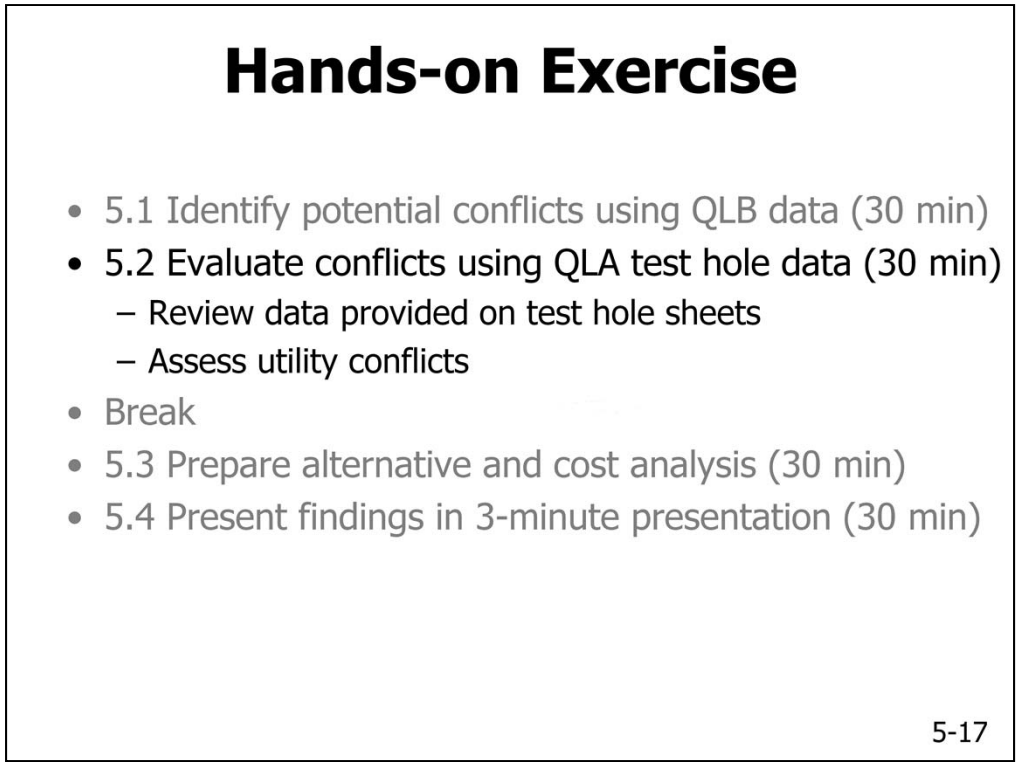
5.1:

- Participants should fill out the utility conflict matrix as much as possible, up to the column that identifies the type of utility investigation needed.
- For each conflict, participants should determine whether there is a need for QLA data.
- At the conclusion of 5.1, provide each group with the “solution” plan sheet that shows all the conflicts identified for the project.

5.2

Evaluate Conflicts Using QLA Test Hole Data Sheets

5-16



5.2:

- At the beginning of 5.2, provide the test hole data sheets to each group.
- Ask participants to use the information to determine whether utilities are in conflict or not.

5.3

Prepare Alternative and Cost Analysis for Conflicts

5-18

Hands-on Exercise

- 5.1 Identify potential conflicts using QLB data (30 min)
- 5.2 Evaluate conflicts using QLA test hole data (30 min)
- Break
- 5.3 Prepare alternative and cost analysis (30 min)
  - Pick one or more conflicts
  - Develop and compare 3-4 resolution alternatives
  - Outline potential costs
  - Select most appropriate resolution alternative
- 5.4 Present findings in 3-minute presentation (30 min)

5-19

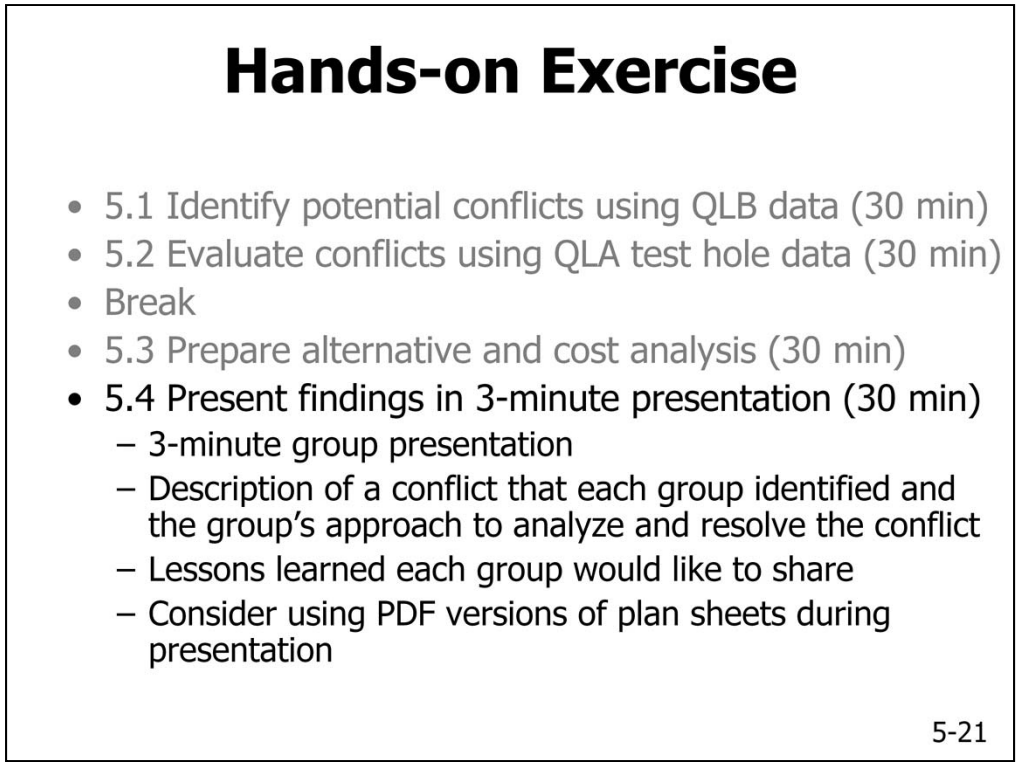
5.3:

- The analysis should include an analysis of estimated costs for the alternatives considered.
- Each group should come up with their own set of alternatives on how to resolve the conflict.
- If group finishes early, work on additional conflicts.

5.4

Present Findings in 3-Minute Presentation

5-20



5.4:

- Ask each group to give a short presentation of their experience including utility conflicts discovered, solutions considered, and lessons learned in the process.
- Check time that is left available for this section and ensure that all groups have equal time to discuss issues and experiences.
- Typically, there should be 2-3 minutes for each group if the training includes 6 groups.

Tips:

- Allow groups to spend more than 30 minutes per part, as needed.
- Do not exceed 2 hours and 15 minutes in total to keep group focus and momentum.
- Have PDF versions of project plans ready so that each group can use them during their presentations.
- Have PDF versions of test holes and cross sections ready.

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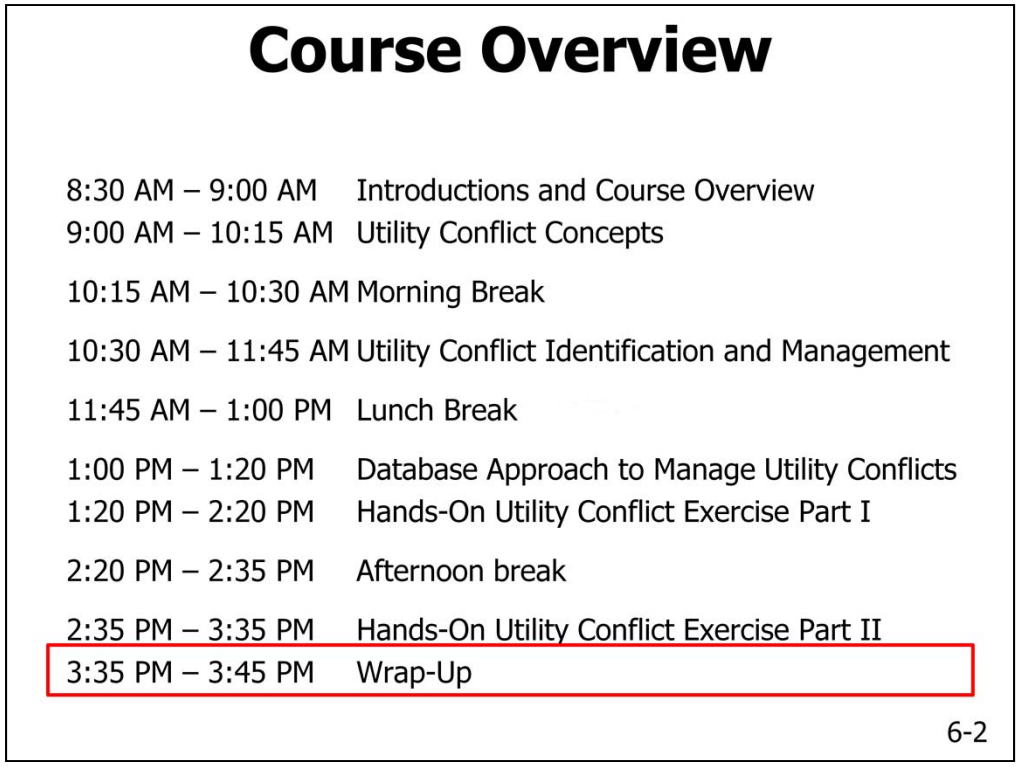
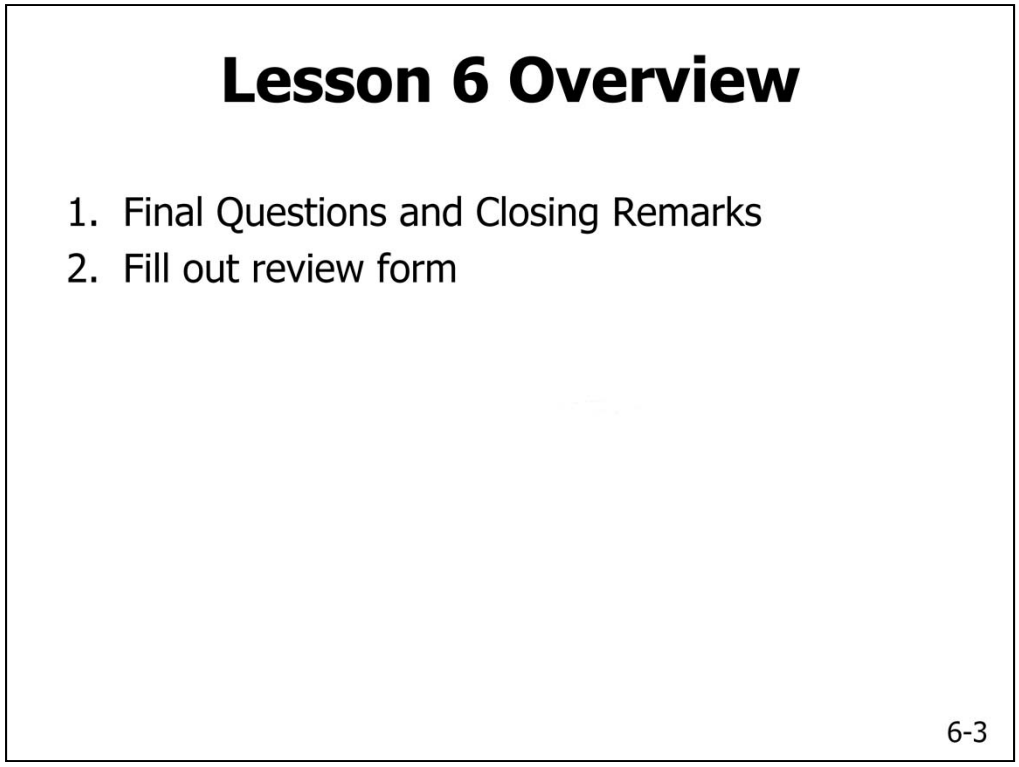
Lesson 6

Wrap-Up

6-1



This section of the training is Lesson 6, which is intended to wrap-up the training session.



Ask participants to fill out the review form in section H of the participant binder.

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PARTICIPANT HANDOUT

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Lesson 1

Introductions and Course Overview

1-1

Lesson 1 Overview

1.1 Introductions
1.2 Course overview
1.3 Training objectives
1.4 Participant workbook
1.5 Housekeeping

1-2

Introductions

- Your name
- Where do you work?
- Experience with the utility process?
- Expectations for this course?

1-3

Course Overview

8:30 AM – 9:00 AM	Introductions and Course Overview
9:00 AM – 10:15 AM	Utility Conflict Concepts
10:15 AM – 10:30 AM	Morning Break
10:30 AM – 11:45 AM	Utility Conflict Identification and Management
11:45 AM – 1:00 PM	Lunch Break
1:00 PM – 1:20 PM	Database Approach to Manage Utility Conflicts
1:20 PM – 2:20 PM	Hands-On Utility Conflict Exercise Part I
2:20 PM – 2:35 PM	Afternoon break
2:35 PM – 3:35 PM	Hands-On Utility Conflict Exercise Part II
3:35 PM – 3:45 PM	Wrap-Up

1-4

Training Objectives

- Review concepts related to the management of utility conflicts within the project development and delivery process
- Describe the process to develop and maintain utility conflict matrices
- Review reporting options when using a database to manage utility conflicts
- Identify utility conflicts on sample design sheets
- Develop utility conflict resolution strategies

1-5

Participant Workbook

- Section A: Course overview
- Section B: Instructor materials
- Section C: Participant handout
- Section D: Utility Conflict Matrix Update Process
- Section E: Utility Conflict Matrices
- Section F: Sample project files
- Section G: Selected database lookup tables
- Section H: Course forms

1-6

Housekeeping

- Make course time as productive as possible
  - Turn off cell phones
  - Return from breaks and lunch on time
  - Stay on task during activities
- Ask questions
- Use sign-in sheet
- Use course feedback form
- Miscellaneous

1-7

Lesson 2

Utility Conflict Concepts

2-1

Course Overview

8:30 AM – 9:00 AM	Introductions and Course Overview
9:00 AM – 10:15 AM	Utility Conflict Concepts
10:15 AM – 10:30 AM	Morning Break
10:30 AM – 11:45 AM	Utility Conflict Identification and Management
11:45 AM – 1:00 PM	Lunch Break
1:00 PM – 1:20 PM	Database Approach to Manage Utility Conflicts
1:20 PM – 2:20 PM	Hands-On Utility Conflict Exercise Part I
2:20 PM – 2:35 PM	Afternoon break
2:35 PM – 3:35 PM	Hands-On Utility Conflict Exercise Part II
3:35 PM – 3:45 PM	Wrap-Up

2-2

Lesson 2 Overview

2.1 Utility conflicts and project development and delivery

2.2 SHRP 2 R15B research findings

2.3 Questions and answers

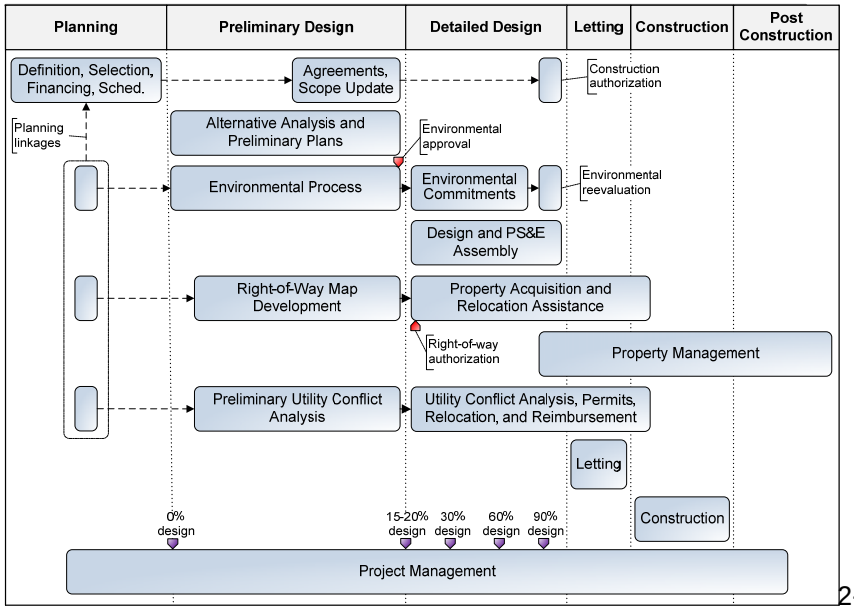
2-3

2.1

Utility Conflicts and Project Development and Delivery

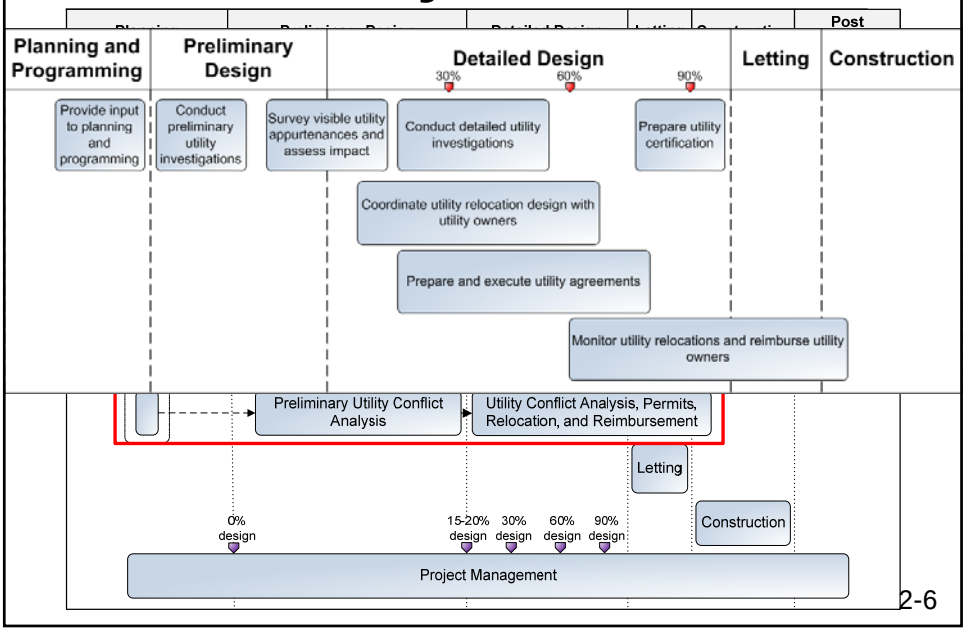
2-4

Project Development Process



2-5

Utility Process



2-6

Reality Check …

- Frequently cited reasons for project delays (DOT perspective):
  - Short timeframe for developing projects
  - Project design changes
  - Environmental process delays
  - Utility-related inefficiencies
    - Inaccurate location and marking of existing utility facilities
    - Identifying utility conflicts late in the design phase
    - Disagreements on recommended utility-related solutions
    - Utility relocation costs not handled properly
    - …

2-7

Reality Check …

- Frequently cited reasons for project delays (utility owner perspective):
  - Limited resources (financial and personnel)
  - Internal demands (maintenance, service upgrades)
  - Utility owner's project development process protocols
  - Coordination with other stakeholders during design
  - Coordination with other stakeholders during construction
  - Changes in DOT design and schedules
  - Unrealistic schedule by DOT for utility relocations

2-8

Inefficient Management of Utility Issues

- Lack of accurate, complete utility data
- Resolution and management of utility conflicts
- Negative impacts:
  - Disruptions during construction
  - Damage to utility installations
  - Delays and project overruns
  - Unplanned environmental corrective actions
  - Unnecessary utility relocations

2-9

Utility Conflict Scenarios

- Utility facility vs. transportation design feature (existing or proposed)
- Utility facility vs. transportation construction activity or phasing
- Planned utility facility vs. existing utility facility
- Noncompliance with:
  - Utility accommodation statutes, regulations, and policies
  - Safety or accessibility regulations

2-10

2-11

2-12

Solution Strategies

- Remove, abandon, or relocate utilities in conflict
  - Relocating utilities NOT NECESSARILY OR ALWAYS the best or most cost-effective solution
- Modify transportation facility
- Protect-in-place utility installation
- Accept an exception to policy

2-13

Transportation Design Changes

- Geometric alignment (horizontal/vertical):
  - Change grade
  - Offset centerline, widen one side of highway
  - Move ramps, driveways
- Structure dimensions, other characteristics:
  - Change embankment slope
  - Add/modify retaining wall to reduce slope encroachment
  - Redesign bridge footings and abutments, move pilings
  - Redesign drainage structures

2-14

Example: Widening Both Sides vs. One Side of Highway

- Issues to consider:
  - Widening both sides of highway impacts everyone (no one is spared!)
  - Widening one side can reduce utility impacts
  - Depends on what kind of utilities are affected

2-15

Example: Gas Line

- Highway widening project on MD 32, Maryland, to accommodate center turn lane
- Identified 114 potential conflicts using UCM
  - Discovered gas line in conflict with drainage design
  - Discovered all conflicts were on one side of the road
- Changed design and construction sequence to avoid most conflicts
- Estimated cost savings: $500,000
- Estimated time savings: 4-6 months
- Improved goodwill with utilities: priceless

2-16

Example: Embankment

- Due to interstate widening, embankment had to be raised 50-60 feet
- Major gas and water facilities in the area
- Large soil settlement expected
- Modified project to protect-in-place utilities:
  - Foam layer
  - Thin concrete cap
- Costly utility relocation was avoided

2-17

Example: Bridge

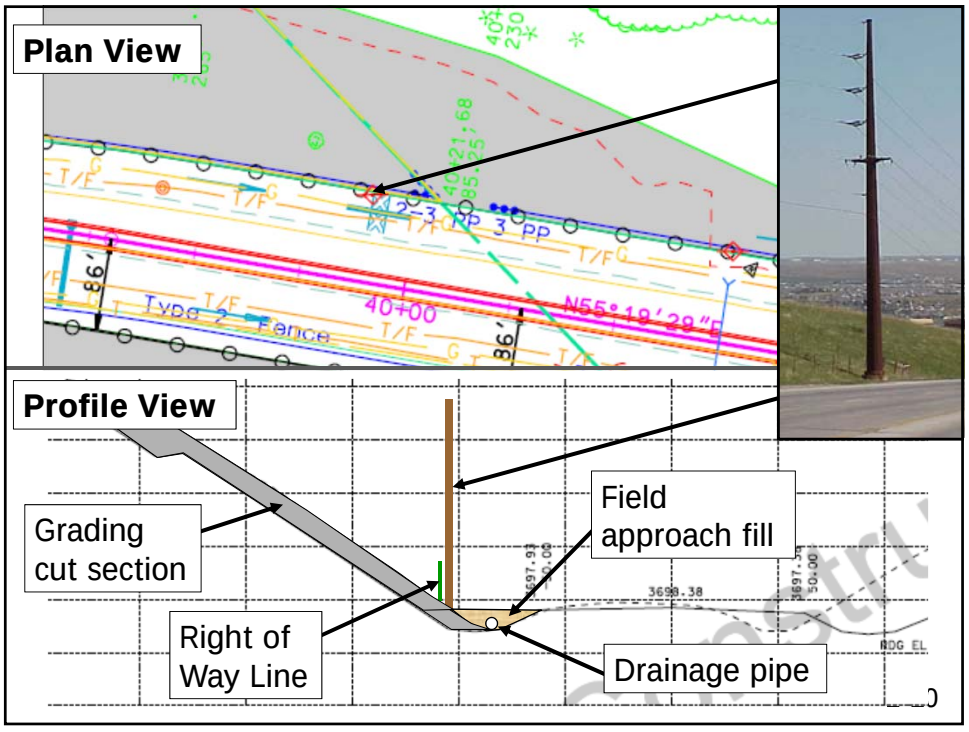
- Bridge project affected multiple utilities (power, water, sewer, etc.)
- Modifying horizontal bridge alignment slightly
  - Would have avoided any utility impact
  - Would not have impacted right-of-way
  - Would not have compromised bridge construction
- Discovered during construction… too late!
- Utility relocation costs = $5,000,000

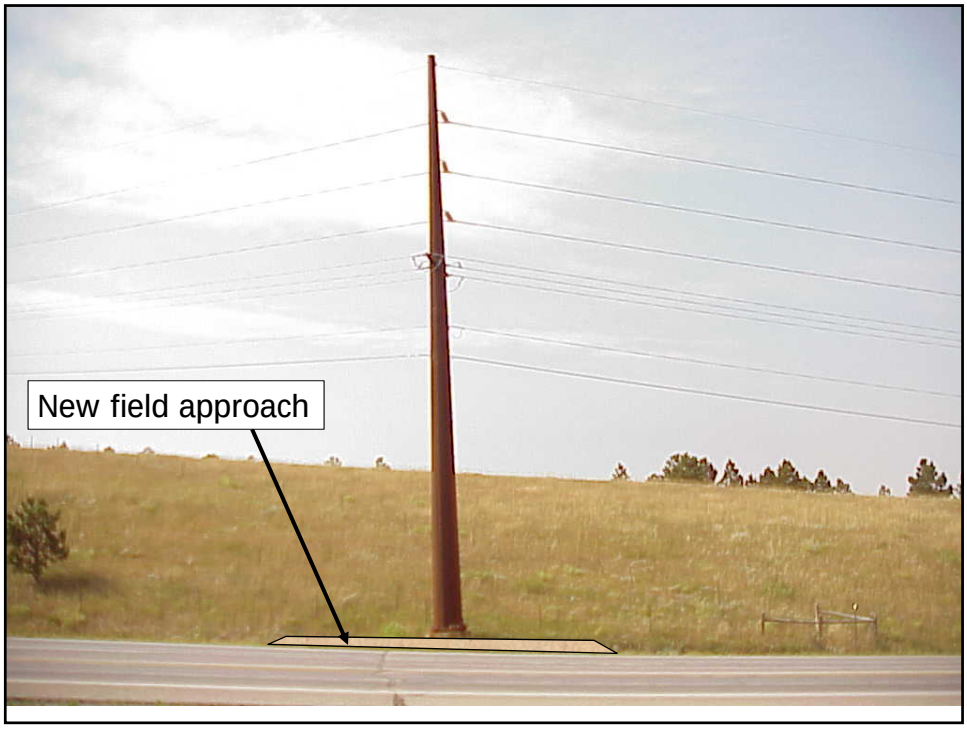
2-18

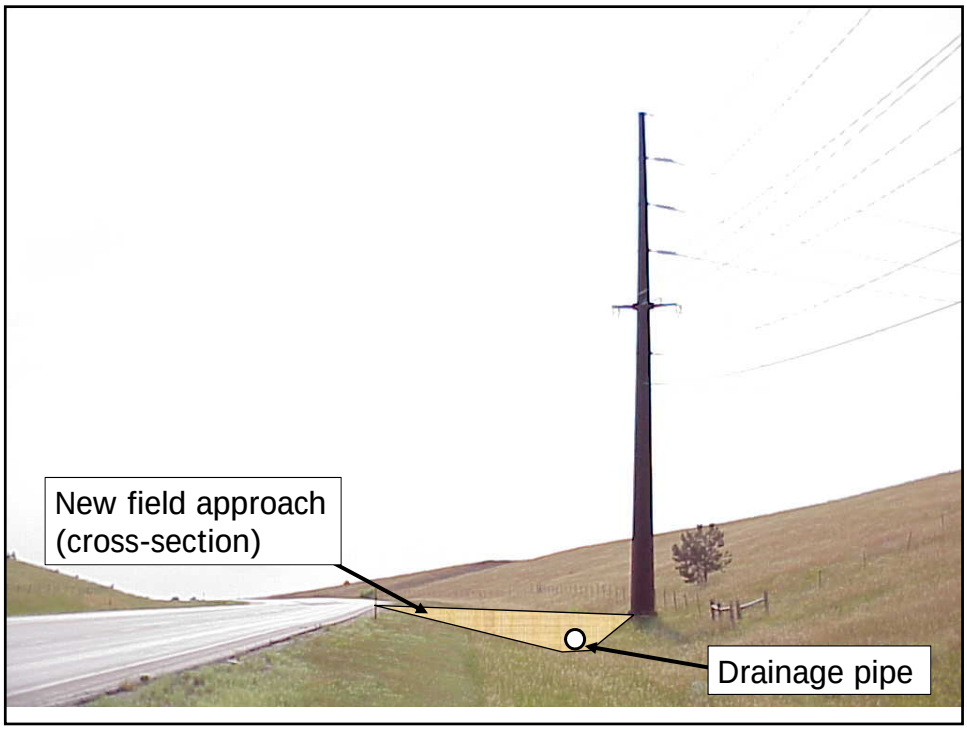
Example: Power Pole

- Rapid City, South Dakota
- Conflict discovered at 30% coordination meeting discussion
- Redesign avoided utility adjustment
- Additional costs were paid by utility

2-19




New field approach


New field approach
(cross-section)
Drainage pipe

Summary of Cost Savings

- BHP&L estimate to relocate 69-kV corner structure $60,000
- Additional cost to add field approach - $3,000

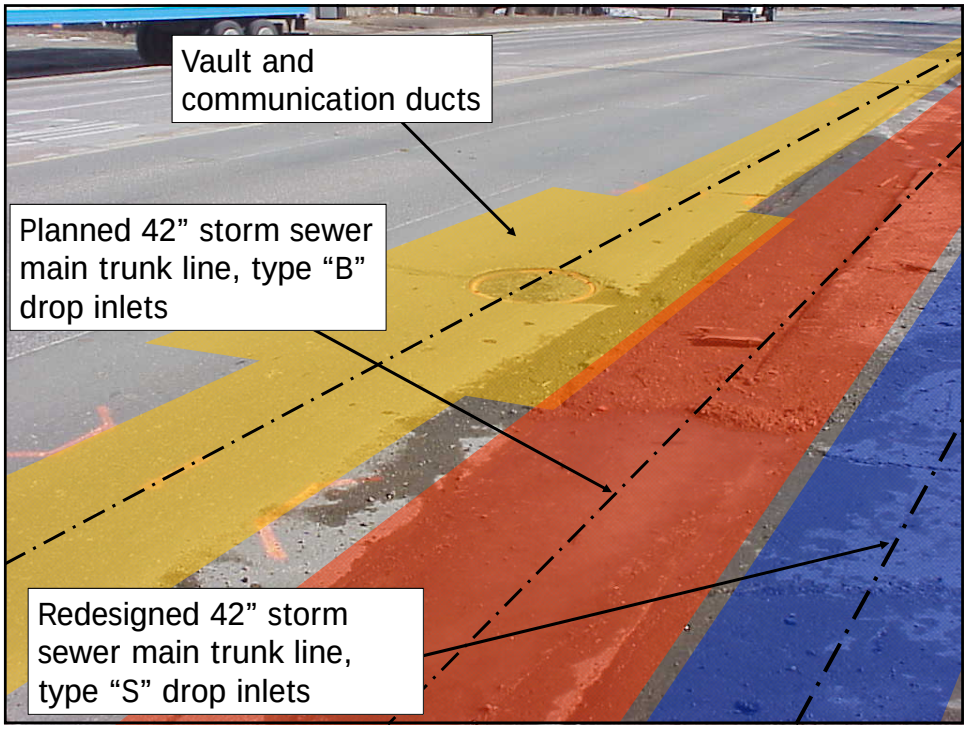
- Cost savings to BHP&L consumers/ taxpayers $57,000

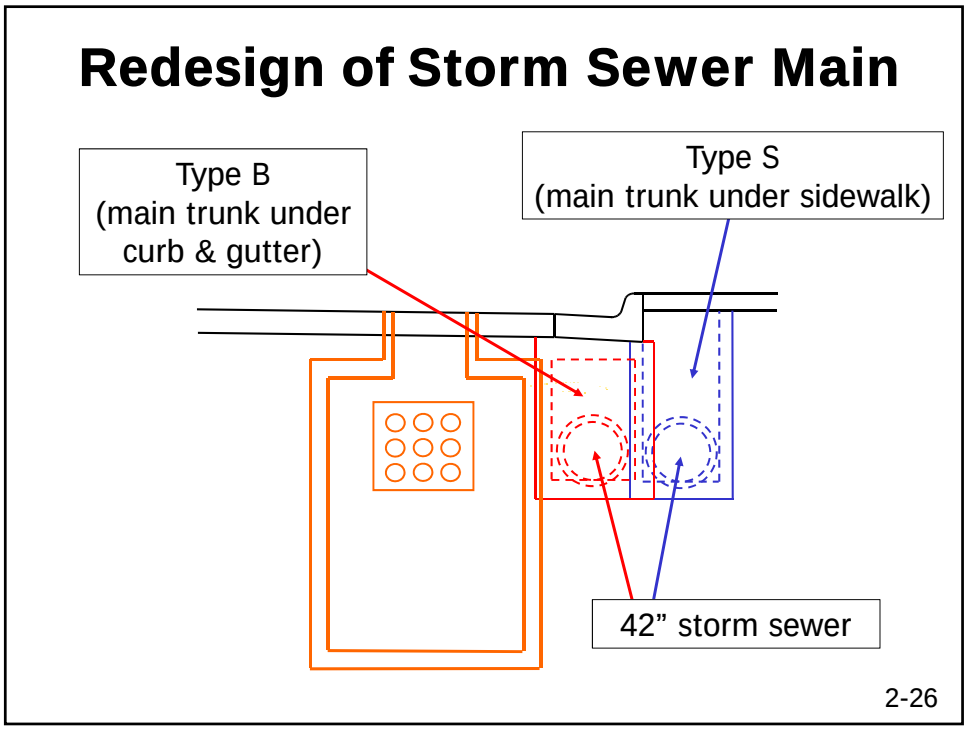
2-23

Example: Storm Sewer and Communication Duct System

- Aberdeen, South Dakota
- Communication ducts along 5 blocks of city streets
- 5 vaults (5 feet x 7 feet x 12 feet) connected with 9 4-inch ducts encased in concrete
- In conflict with planned storm sewer

2-24


Vault and communication ducts
Planned 42” storm sewer main trunk line, type “B” drop inlets
Redesigned 42” storm sewer main trunk line, type “S” drop inlets


Redesign of Storm Sewer Main
Type B (main trunk under curb & gutter)
Type S (main trunk under sidewalk)
42” storm sewer
2-26

Summary of Cost Savings

- Qwest estimate to relocate 9-way duct system $750,000
- Additional cost to re-design storm sewer - $37,270

- Cost savings to consumers/ taxpayers $712,730

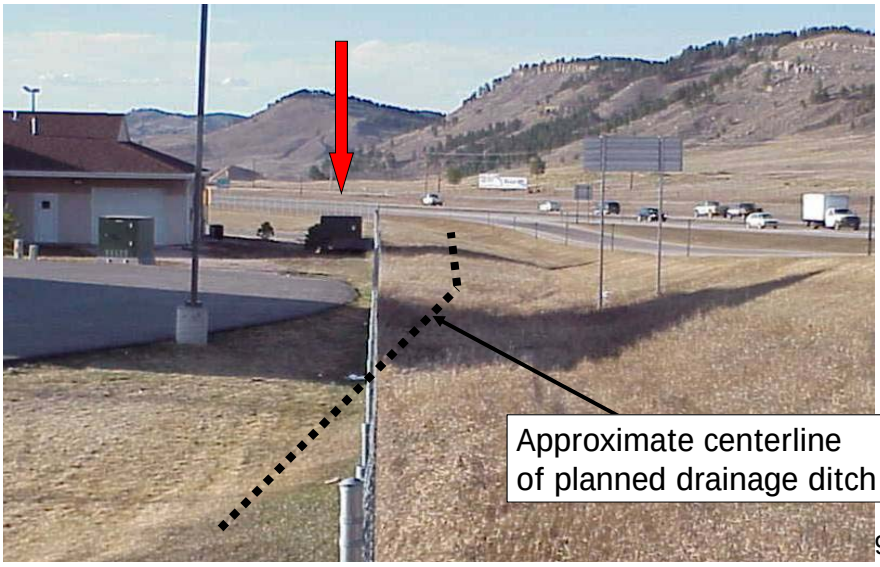
2-27

Example: Drainage Channel

- Rapid City, South Dakota
- Impact discovered during preliminary project scoping phase
- Typical concrete lined drainage ditch would have affected electrical cabinet and cables
- Recommendation: redesign sloped ditch to vertical wall
- Additional benefit: elimination of some real property acquisition

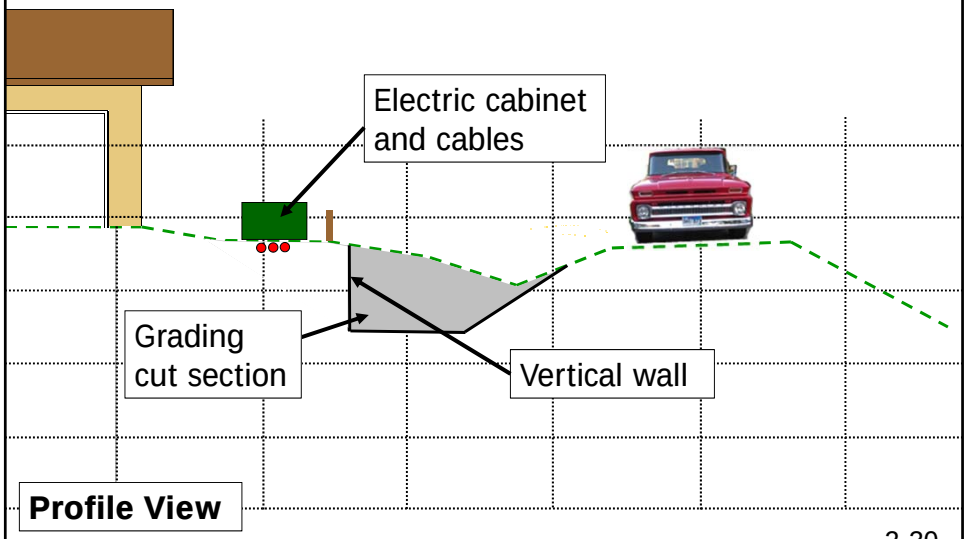
2-28

Example: Drainage Channel



9

Recommended Redesign



2-30

2-31

2-32

2-33

Example: Traffic Signal Footing

- Deadwood, South Dakota
- Pole to be placed in close proximity to existing utilities
- Pole location surveyed on ground by DOT
- Utilities in vicinity identified by One Call
- High cost to relocate existing utilities
- QLA utility investigation
- Recommendation: Reduce pole footing diameter from 36” to 30”

2-34

Vacuum excavation

Example: Traffic Signal Footing

3 conduits interfere with 36” pole footing diameter

Redesign using 30” sonotube (longer, narrower footing)

2-36

Summary of Cost Savings

- Cost to relocate power facilities $95,000
- Cost to collect QLA data - $5,785

- Cost savings to consumers/ taxpayers $89,215

2-37

Key Concepts

- Utility conflict management:
  - Should start before 60% design
  - Does not end at letting
- Goal: Avoid or minimize utility impacts
- Strategies:
  - Involve utility owner early and often
  - Avoid unnecessary utility relocations
  - Evaluate design alternatives
  - Conduct utility conflict analysis
  - Not all strategies apply to all conflicts
- Not all projects or locations need QLB/QLA data

2-38

General References

- ASCE Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data (CI/ASCE 38-02)
- AASHTO Guide for Accommodating Utilities Within Highway Right-of-Way
- AASHTO Policy on the Accommodation of Utilities Within Freeway Right-of-Way
- AASHTO Right of Way and Utilities Guidelines and Best Practices
- FHWA Program Guide
- SHRP 2 R15B Report

2-39

2.2

SHRP 2 R15B Research Findings

2-40

Background and Objectives

- Utility conflict matrix (UCM) an important tool for managing utility conflicts
- Objectives:
  - Review trends and identify best practices for the use of UCMs
  - Develop a recommended UCM approach and document related processes
  - Develop training materials for implementing UCM product

2-41

SHRP 2 R15B Products

- Product 1: Compact, standalone UCM
  - Low number of data items
  - Spreadsheet (MS Excel)
- Product 2: Utility conflict database
  - Formal data model (ERwin)
  - Tested in MS Access
  - Enterprise database support (e.g., Oracle, SQL Server)
  - UCM is one of many queries/reports possible
- Product 3: One-day UCM training course

2-42

UCM State of the Practice

- Many states use tables or spreadsheets to manage utility conflicts (26 sample tables collected)
- Different categories of data tracked
- Wide range of styles and content
  - 144 different data items in total
  - Range of data items per table: 4 – 39
  - Average number of data items per table: 14
  - One size does not fit all
  - Different ideas about “consensus” tables

2-43

Sample (Alaska)

DRAFT Utility Conflict Report
West Dowling Road Phase I

Anchorage, Alaska
DOT&PF No. 50898

Table 2: Chugach Electric Association, Incorporated, Conflicts Summary

Station	Offset	Station	Offset	Size/Type	Length	Conflict	ADJ/REL	Cost	PE/CE Cost	Total Cost
CEA Distribution Relocation Costs										
9+00	150' RT		200' LT	3φ UG	350	FG	REL	52,500	15,750	68,250
16+00	100' LT	42+30	80' LT	3φ UG	2630	FG	REL	394,500	118,350	512,850
16+00	100' LT	15+50	100' RT	3φ UG	250	FG	REL	37,500	11,250	48,750
16+00	100' LT	29+00	75' LT	1φ UG	1650	FG	REL	165,000	49,500	214,500
36+40	80' LT	35+80	350' RT	3φ UG	430	FG	REL	64,500	19,350	83,850
36+60	80' LT	36+70	380' LT	3φ UG	300	FG	REL	45,000	13,500	58,500
	UG Loop to the North			3φ UG	1000	FG	REL	150,000	45,000	195,000
							Subtotal	909,000	272,700	1,181,700
CEA Transmission Relocation Costs										
14+75	55' RT			138 kV OH	1	PWY	REL	30,000	9,000	39,000
32+75	55' RT			138 kV OH	1	EX	REL	50,000	15,000	65,000
36+38	45' RT			138 kV OH	1	EX	REL	50,000	15,000	65,000
							Subtotal	130,000	39,000	169,000
							Total CEA Relocation Costs	**1,039,000**	**311,700**	**1,350,700**

1φ Underground (UG) loop to extend across Dowling Road and along the south side to reconnect existing services.
UG loop provided to the north of the project to accommodate undergrounding.
Removal of existing swamp braces removed and steel piling added, down guys replaced with overhead span guy and down guys.

2-44

Sample (California)

I-10-EA 122401-Utilities Conflict Status

date of last revision:May 30, 2000
this document was prepared by

Conflict No.	Utility Sheet No.	Pothole No. (Do Outlined)	Owner	Utility Description	Pothole/Manhole Location	Conflict Location	Utility Conflict/ Work Description	Investigation: Pothole	Investigation: Manhole	Investigation: Overhead	Depth (ft)	Impact? Y	Impact? N	Action: Remove	Action: Relocate/	Action: Other	UW_Reloc. A-Abandon RD-Relocate/Delay P-Protect-in-place NC-No conflict	Resp. Party D-Utility Co. C-Contractor	Required Completion Date	Comments
1	U-2	1	PACBELL	40 DU Telephone	62 m Rt of I-405 Sta 165+55	40 m Rt and 57 m Rt of I-405 Sta 165+55	conflict with Retaining Walls No. 166 & No. 168	X			4.55 14.40		N				P			
2	U-2	2	PACBELL	40 DU Telephone	45 m Lt of I-405 Sta 165+55	40 m Rt and 57 m Rt of I-405 Sta 165+55	conflict with Retaining Walls No. 166 & No. 168				- -		N				P			
3	U-3	3	SCE	25 mm DU	35 m Rt of I-405 Sta 163+01	43 m Rt of I-405 Sta 165+01	conflict with Retaining Wall No. 166				-		N				P			Located in Untold OC
4	U-3	4	SCE	25 mm DU	46 m Lt of I-405 Sta 165+01	43 m Rt of I-405 Sta 165+01	conflict with Retaining Wall No. 166				-		N				P			Located in Untold OC
5	U-3	5	MWD	900 mm WSP Water in 380 mL ENC	50 m Rt of I-405 Sta 164+96	44 m Rt of I-405 Sta 164+95	conflict with Retaining Wall No. 166	X			6.70		N				P			
6	U-3	6	MWD	900 mm WSP Water in 380 mL ENC	50 m Lt of I-405 Sta 164+96	44 m Rt of I-405 Sta 164+95	conflict with Retaining Wall No. 166	X			6.50		N				P			
7	U-3	7	Caltrans	600 mm RCP	53 m Rt of I-405 Sta 163+42	53 m Rt of I-405 from Sta 163+29 to Sta 163+42	conflict with Delhi Channel Bridge	X			6.00		N				P			
8	U-3	8	Caltrans	600 mm RCP	53 m Rt of I-405 Sta 163+29	53 m Rt of I-405 from Sta 163+29 to Sta 163+42	conflict with Delhi Channel Bridge	X			9.00		N				P			
9	U-3	9	MCWD	300 mm ACP Water in	32 m Rt of I-405 Sta 163+25	35 m Rt of I-405 Sta 163+25	conflict with I-405 Widening & BR1 Line	X			10.30		N				P			
10	U-3	10	MCWD	300 mm ACP Water in	32 m Lt of I-405 Sta 163+25	33 m Lt of I-405 Sta 163+25	conflict with I-405 Widening & BR1 Line	X			8.75		N				P			
11	U-3	MH 11	CSDOC	Manhole	81 m Rt of I-405 Sta 162+92	35 m Rt of I-405 Sta 162+92	conflict with I-405 Widening & BR1 Line		X		15.40		N				P			
12	U-3	12	CSDOC	300 mm VCP Sewer	36 m Lt of I-405 Sta 162+91	32 m Lt of I-405 Sta 162+90	conflict with I-405 Widening & BR1 Line				-		N				P			
13	U-4	13	MCWD	600mm CCP Water in 94m L 900mm Dia SS Casing	67 m Rt of I-405 Sta 161+44	58 m Rt of I-405 Sta 161+44	Conflict with Airport Channel	X			4.55	Y			X	X	RB			600 mm Waterline to be Lowered Extend Encasement
14	U-4	14	MCWD	600mm CCP Water in 94m L 900mm Dia SS Casing	38 m Lt of I-405 Sta 161+40	32 m Lt of I-405 Sta 161+42	conflict with I-405 Widening				-		N				P			
15	U-4	15	MCWD	300 mm ACP Water	70 m Rt of I-405 Sta 160+29	72 m Rt of I-405 from Sta 157+20 to Sta 160+29	Conflict with AOA Line and Retaining Wall No. 268	X			-	Y			X		RD			Encroachment CT R/W and Private Owner Encased under Roadway
16	U-4	16	MCWD	300 mm ACP Water	70 m Rt of I-405 Sta 159+07	72 m Rt of I-405 from Sta 157+20 to Sta 160+29	Conflict with AOA Line and Retaining Wall No. 268	X			-	Y			X		RD			Encroachment CT R/W and Private Owner Encased under Roadway
17	U-5	17	MCWD	300 mm ACP Water	70 m Rt of I-405 Sta 156+67	72 m Rt of I-405 from Sta 157+20 to Sta 160+29	conflict with AOA Line and Retaining Wall No. 268	X			4.35		N				P			
18	U-5	MH 18	CSDOC	Manhole	60 m Rt of I-405 Sta 156+65	28 m Rt of I-405 Sta 156+65	conflict with I-405 Widening		X		16.20		N				P			
19	U-5	19	CSDOC	300 mm VCP Sewer	46 m Lt of I-405 Sta 156+65	25 m Rt of I-405 Sta 156+65	conflict with I-405 Widening	X			18.40		N				P			
20	U-5	20	CSDOC	830 mm VCP Sewer	14 m Rt of B2 Sta 24+96		conflict with construction of B2 Line						N				P			
21	U-5	21	CSDOC	830 mm VCP Sewer	4 m Lt of B2 Sta 25+54		conflict with construction of B2 Line						N				P			
22	U-6	MH 22	CSDOC	Manhole	6m Rt of Main St Sta 102+78				X			Y				X	RB			MH to be Lowered New Top MH Elev= 9.585
23	U-6	MH 23 SCE MH 4503	SCE	Manhole No. 4503	6m Rt of Main St Sta 102+87				X			Y				X	RB			MH to be Lowered New Top MH Elev= 9.583 m
24	U-6	MH 24 SCE MH 4502	SCE	Manhole No. 4502	6m Rt of Main St Sta 104+17				X			Y				X	RB			MH to be Lowered New Top MH Elev= 9.726 m

Sample (Florida)

FPID: 1 Description: 2

Phase #: 4 Plans Date: 5

Reviewer: 6

Date: 7

This matrix was created by 3 to assist the UAO's in identifying conflicts between the UAO's facilities and proposed roadway construction. 3 accepts no liability for conflicts overlooked for this report. Each UAO or designee is responsible to perform a detailed and comprehensive plans review for conflict analysis.

Conflict #	Utility Agency/ Owner (UAO)	Station/Offset (From C/L)	Facility Description (Material, Type, Number, Size)	Conflict Description (Possible or Actual)	VVH (Y/N)	VVH #	Recommended Conflict Resolution	Resolved Status
8	9	10	11	12	13	14	15	16

Consider using the form from the beginning of a project as a tool for monitoring areas of concern with UAO facilities. That is the reason for the Phase Number space. The form is set up to: 1. Print legal size and have the header information on each page. 2. The cells where the conflicts are listed are set to word wrap automatically. 3. The footer is to number the pages 1 of ??.

1 Project number.
2 Project description.
3 Disclaimer that the reviewer and their firm is not responsible for any missed conflicts. The blanks are for the name of the design firm.
4 Phase that the plans represent.
5 The date should be on the plans Key Sheet. The phase and plans date should keep everyone working on the same plans.
6 That would be you, the person that wrote the conflict matrix.
7 The date the matrix was completed.
8 For ease of discussion the conflicts are numbered, plan sheet numbers are not used because they change from Phase to Phase which has caused confusion in the past.
9 Owner of the underground line.
10 The standard reference used on FDOT plans is the Centerline of Construction, it is used for all components of the proposed roadway construction.
11 Describe the facility. What is it? Water main? Force main? Cable? Conduit? Overhead electric? Overhead cable? Manhole? Handhold? What's the size? How many? What's it made of?
12 What is it the facility perceived to be in conflict with? It a possible conflict or actually in conflict with proposed work. Consider the trench and hole size required to place pipe and drainage structures. Don't forget aerial facilities when there are signals and large signs in the project.
13 SUE work can be used to if a conflict is considered a possibility. This entry area is a tool to determine areas where test holes should be taken for confirmation or exclusion of a conflict.
14 Entry area for the test hole number. Test holes should be numbered consecutively to avoid confusion.
15 What can be done to remove the conflict? Don't forget to consult with the Designer for alternatives to the proposed construction.
16 Examples of entries could be "Cleared", "Pending", "No Conflict". It's suggested to keep the entries determined as "No Conflict" in the matrix so other reviewers will know a perceived conflict has been noted and determined to not be an issue.

Sample (Georgia)

Conflic	Station and Offset	Utility	Identified Conflict	Testhole Needed	Utility Impact with Cost ("As-designed")	Recommended Resolution	*Benefit of Resolution
C1	100+05, 21'L 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO	No	Relocate 1150LF of BFO-DUCT ($91,000)	Relocate proposed storm drainage into street. Use DI's that drain toward roadway.	Save Cost to Relocate BFO-DUCT ($91,000)
C2	100+66, 21'L 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO	No	See C1		
C3	100+38, 24'R 14th St Constr. BL	UNK@Tee	Proposed 18" storm and unknown utility tee	TH 1	Relocate unknown type and function utility	TH to identify utility and conflict	Eliminate possible delay during construction
C4	100+56, 25'R 14th St Constr. BL	8"W	Proposed 18" storm and existing 8"W	TH 2	Relocate 8"W ($7,500)	TH on 8"W, adjust depth of proposed storm drainage	Save Cost to Relocate 8"W ($6,000)
C5	100+61, 25R 14th St Constr. BL	8"W	Proposed 18" storm and existing 8"W	TH 3	Relocate 8"W ($7,500)	TH on 8"W, adjust depth of proposed storm drainage	Save Cost to Relocate 8"W ($6,000)
C6	100+82, 28R 14th St Constr. BL	4"G	Proposed storm structure and existing 4"G	TH 4	Relocate 20 LF of 4"G ($6,000)	TH on 4"G, adjust depth of proposed storm structure	Save Cost to Relocate 4"G ($4,500)
C7	101+22 27'R 14th St Constr. BL	4"G	Proposed 18" storm and existing 4"x2" gas tee	TH 5	Relocate 2"G & 4"G Tee ($12,500)	TH on G lines, adjust depth of proposed storm structure	Save Cost to Relocate G lines ($11,000)
C8	101+01 28'L 14th St Constr. BL	16"G	Proposed 18" storm and existing 16"G	TH 6	Relocate 16"G ($10,000)	TH on 16"G, adjust depth of proposed storm structure	Save Cost to Relocate 16"G ($8,500)
C9	101+25 41'L 14th St Constr. BL	BT-DUCT 2"G	Proposed storm structure and two BT-ducts	TH 7	Relocate BT-DUCT & 2"G ($11,000)	TH on BT-DUCT & 2"G, adjust depth of proposed storm structure	Save Cost to Relocate BT-DUCT & 2"G ($10,500)
C10	101+37, 41'L 14th St Constr. BL	6"W	Proposed 18" storm and existing 6"W	TH 8	Relocate 6"W ($5,000)	TH on 6"W, adjust depth of proposed storm drainage	Save Cost to Relocate 6"W ($3,500)
C11	101+57, 27'L 14th St Constr. BL	16"G	Proposed 18" storm and existing 16"G	TH 9	Relocate 16"G ($10,000)	TH on 16"G, adjust depth of proposed storm structure	Save Cost to Relocate 16"G ($8,500)
C12	101+58, 22'L 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO	No	See C1		
C13	101+90, 22'L 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO	No	See C1		
C14	102+20, 27'R 14th St Constr. BL	4"G	Proposed storm structure and existing 4"G	No	Relocate 4"G ($4,500)	Relocate 4"G	Elimnate conflict with proposed DI
C15	102+36, 24'L 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO	No	See C1		

***Please include all benefits incurred including time, costs, and safety improvements.**

Key:

AC - Asbestos Concrete
BE - Buried Electric
BFO - Buried Fiber Optic
BT - Buried Telephone
G - Gas
L - Left
MES - Mitered End Section
OE - Overhead Electric
OT - Overhead Telephone
R - Right
RCP - Reinforce Concrete Pipe
W - Water
WM - Water Main
TH - Test Hole, verify vert. and horiz
UNK - Unknown Type
SAN - Sanitary Sewer

Utility Owner:

AGL Atlanta Gas Light
BE Georgia Power
BT Bell South
L3 Level 3 Communications
MFN Metromedia Fiber Network
SAN Fulton County Public Works
W City of Atlanta
UNK Unknown Owner

2-47

Sample (Michigan)

M-6 (South Beltline) from I-196 to West of Eastern Avenue
South of Grand Rapids, Michigan

Utility Log - Electric

CS 70025 - JN 33330

Item #	Utility Owner / Operator	Conflict Location	Segment	Date Relocation Plan must be submitted	Relocation Plan submitted to Design Team	Design Team Review / Comment / Approval	Permit Application Submitted to MDOT	MDOT Permit Number / Approval Date	Relocation Scheduled	Action Items
1	Consumers Energy Transmission	Consumers Power Transmission Overhead – 8th Ave	1			7/6/2000	7/27/00 rev.	41064-0125-00-0174	4/1/2001	Final permit approval from MDOT.
2	Consumers Energy Transmission	West of Kenowa Ave.	1			7/6/2000	7/27/00 rev.	41064-0125-00-0174	4/1/2001	Final permit approval from MDOT.
3	Consumers Energy Distribution	Aerial Lines at Jackson and Angling Road	1							Design in process.
4	Consumers Energy Distribution	Aerial Lines at Kenowa and 64th St.	2							Design in process.
5	Consumers Energy Transmission	64th at Wilson and East and West of Wilson– Overhead	2			7/6/2000	7/27/00 rev.	41064-0125-00-0174	4/1/2001	Final permit approval from MDOT.
6	Consumers Energy Transmission	East and West of Ivanrest	2			7/6/2000	7/27/00 rev.	41064-0125-00-0174	10/15/2000	Final permit approval from MDOT.
7	**Consumers Energy Distribution**	**along Ivanrest**	**2**							**Permit to be submitted the week of August 14, 2000.**
8	Consumers Energy Transmission	East and West of Byron Center - overhead	3			7/6/2000	7/27/00 rev.	41064-0125-00-0174	4/1/2001	Final permit approval from MDOT. Schedule Relocation

Sample (South Dakota)

Picture No.	PCN	Picture Looking	City or Town	Hwy. No.	Description
6.JPG	02BF	N	Platte	44	Water valve in the SE quadrant of Hwy 44 & Indiana
7.JPG	02BF	W	Platte	44	Power Pole in the SW quadrant of Hwy 44 & Indiana
8.JPG	02BF	N	Platte	44	Power Pole in the SW quadrant of Hwy 44 & Indiana
9.JPG	02BF	N	Platte	44	Power Pole in the SW quadrant of Hwy 44 & Indiana
10.JPG	02BF	E	Platte	44	Power Pole (Transmission w/ riser) in the SE quadrant of Hwy 44 & Ohio
11.JPG	02BF	E	Platte	44	Power Pole (Transmission w/ riser) in the SE quadrant of Hwy 44 & Ohio
12.JPG	02BF	N	Platte	44	Power Pole, Fire hydrant & water valve in the SE quadrant of Hwy 44 & Ohio
13.JPG	02BG	S	Platte	45	Light Pole in the SW quadrant of Hwy 45 & 4th St
14.JPG	02BG	E	Platte	45	Light Pole in the NE quadrant of Hwy 45 & 4th St
15.JPG	02BG	S	Platte	45	Light Pole in the SW quadrant of Hwy 45 & 6th St
16.JPG	02BG	E	Platte	45	Power Pole in the NE quadrant of Hwy 45 & 6th St
17.JPG	02BG	E	Platte	45	Power Pole in the NE quadrant of Hwy 45 & 6th St
18.JPG	02BG	W	Platte	45	Power Pole & Fire hydrant in the NW quadrant of Hwy 45 & 6th St
19.JPG	02BG	W	Platte	45	Power Pole w/ riser in the NW quadrant of Hwy 45 & 6th St

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Sample (Texas)

PARIS DISTRICT
UTILITY ADJUSTMENT REPORT

As Of: August 19, 2009
Changes since last update in RED

County Highway ROW CSJ	Name of Utility	Reimbursable?	Location of Agreement Package	Packet Status?	Current Action	Adjustment Status	Responsible TxDOT Employee	Amount Approved	Amount Billed	90% Payment	Audit Exceptions	10% Retainage	Outstanding Balance
HOPKINS SH 11 ROW CSJ 0083-03-046 SH 19 0108-09-039	Verizon	No	ROW	Approved	U11114: Relocation is complete. NR	Complete	Keith Hollje						
	TXU Electric	Yes	ROW	Approved	U11655: Relocation & Reimbursement is complete	Complete	Keith Hollje	$ 74,397.96	$ 62,850.69	$ 56,565.62	$ -	$ 6,285.07	$ -
	Atmos Energy (Trans)	Yes	ROW	Approved	U12208: Relocation & Reimbursement is complete	Complete	Mike Powers	$ 235,912.59	$ 184,436.76	$ 165,993.08	$ -	$ 18,443.68	$ -
	Atmos Energy (Distribution)	No	ROW	Approved	U12446: Relocation is complete. NR	Complete	Mike Powers						
	SS Water & Sewer	No	ROW	Approved	U12450: Relocation is complete. NR	Complete	Mike Powers						
	TXU Distribution	No	ROW	Approved	U12614: Relocation is complete. NR	Complete	Mike Powers						
	Sudden Link Communication	No	AO	Approved	Relocation is complete by Permit. NR	Complete	Tim Taylor						
	People's Telephone	No	AO	Approved	Relocation is complete by Permit. NR	Complete	Tim Taylor						
	Shady Grove WSC	No	AO	Approved	Relocation is complete by Permit. NR	Complete	Tim Taylor						
								$ 310,310.55	$ 247,287.45	$ 222,558.70	$ -	$ 24,728.75	$ -
HUNT US 380 ROW CSJ: 0135-06-022	Caddo Basin	Yes	ROW	Approved	U11423: Relocation & Reimbursement is complete.	Complete	Mike Powers	$ 853,746.47	$ 783,618.01	$ 705,256.21	$ -	$ 78,361.80	$ -
	Verizon	No	ROW	Approved	U11450: Relocation is complete. NR	Complete	Mike Powers						
	One OK Pipeline	Yes	ROW	Approved	U11523: Relocation is complete. Reimbursement has not been submitted.	Complete	Keith Hollje	$ 229,170.00	$ -	$ -	$ -	$ -	$ 229,170.00
	Cap Rock Energy	Yes	ROW	Approved	U11524: Relocation & Reimbursement is complete.	Complete	Mike Powers	$ 741,668.69	$ 741,668.69	$ 667,388.42	$(27,771.80)	$ 46,508.47	$ -
	AT&T	No	ROW	Approved	U11526: Relocation is complete. NR	Complete	Mike Powers						
	Explorer	Yes	ROW	Approved	U11534: Relocation & Reimbursement is complete.	Complete	Keith Hollje	$ 191,805.22	$ 201,206.44	$ 181,085.80	$ -	$ 20,120.64	$ -
	Energy Transfer (Gas)	Yes	ROW	Approved	U11695: Relocation is complete. Reimbursement returned to Utility 4/29/09. No Coorespondence!	Complete	Mike Powers	$ 370,006.39	$ 420,136.25	$ -	$ -	$ -	$ 370,006.39
	GEUS	No	ROW	Approved	U11850: Relocation is complete. NR	Complete	Mike Powers						
	AT&T	No	ROW	Approved	U12358: Relocation is complete. NR	Complete	Mike Powers						
	TMPA	No	n/a	n/a	No effect (no adjustment required)	n/a	Mike Powers						
	Comcast	No	n/a	n/a	No effect (no adjustment required)	n/a	Mike Powers						
	Kinder-Morgan	No	n/a	n/a	No effect (no adjustment required)	n/a	Mike Powers						
								$ 2,386,396.77	$2,146,629.39	$ 1,553,730.43	$(27,771.80)	$144,990.91	$ 599,176.39
HUNT US 380 ROW CSJ: 0135-07-037	AT&T	No	ROW	Approved	U11525: Relocation is complete. NR	Complete	Mike Powers						
	Atmos Energy (Pipeline)	Yes	ROW	Approved	U12012: Relocation & Reimbursement is complete.	Complete	Mike Powers	$ 193,912.59	$ 73,187.29	$ 65,868.56	$ -	$ 7,318.73	$ -
	Atmos Energy (Distribution)	No	ROW	Approved	U12013: Relocation is complete. NR	Complete	Mike Powers						
	Caddo Basin	Yes	ROW	Approved	U12026: Relocation & Reimbursement is complete.	Complete	Mike Powers	$ 651,005.00	$ 383,518.60	$ 345,166.74	$ -	$ 38,351.86	$ -
	TMPA	Yes	ROW	Approved	U12076: Relocation is complete. Supplemental Agreement approved 9/06/09.	Complete	Mike Powers	$ 514,097.06	$ 516,702.66	$ 462,196.85	$ -	$ 51,355.21	$ 51,355.21
	GEUS	No	ROW	Approved	U12077: Relocation is complete. NR	Complete	Mike Powers						
	TXU Electric(Transmission)	No	ROW	Approved	U12079: Relocation is complete. NR	Complete	Mike Powers						
	GEUS	Yes	ROW	No	U12445: Utility Package approved 5/19/09. Utility working on relocation.	35%	Mike Powers	$ 88,073.29	$ -	$ -			$ 88,073.29
	City of Greenville (Water)	No	AO	n/a	City has already moved utility on private easement. (no agreement required)	n/a	Mike Powers						
	City of Greenville (Sewer)	No	AO	n/a	City has already moved utility on private easement. (no agreement required)	n/a	Mike Powers						
	Cap Rock Energy	No	AO	n/a	No effect (no adjustment required)	n/a	Mike Powers						
								$ 1,447,087.94	$ 973,408.55	$ 873,232.15	$ -	$ 97,025.80	$ 139,428.50

State DOT Recommendations for Utility Conflict Matrix

- Track utility conflicts at facility level
- Maintain and update UCM regularly
- Develop UCM reports for utility companies
- Keep UCMs simple
- Use 11x17-inch page size for UCM
- Start UCM during preliminary design phase
- Include data from UCM in PS&E assembly

2-51

State DOT Recommendations for Utility Conflict Management

- Use document management systems to support utility conflict management process
- Conduct “plan-in-hand” field trips with utilities
- Use One-Call to identify utilities early in the PDP
- Use RFID tags for damage prevention during construction
- Provide 3-D design details to utility owners early in the design phase

2-52

Other State DOT Recommendations

- Involve stakeholders in review of utility conflicts and solutions
- Develop effective communications with utility owners regardless of reimbursement eligibility
- Provide training to utility coordination stakeholders

2-53

Product 1: Utility Conflict Matrix

- UCM header: 8 data items
- UCM body: 15 data items
- MS Excel format
- Includes drop-down lists

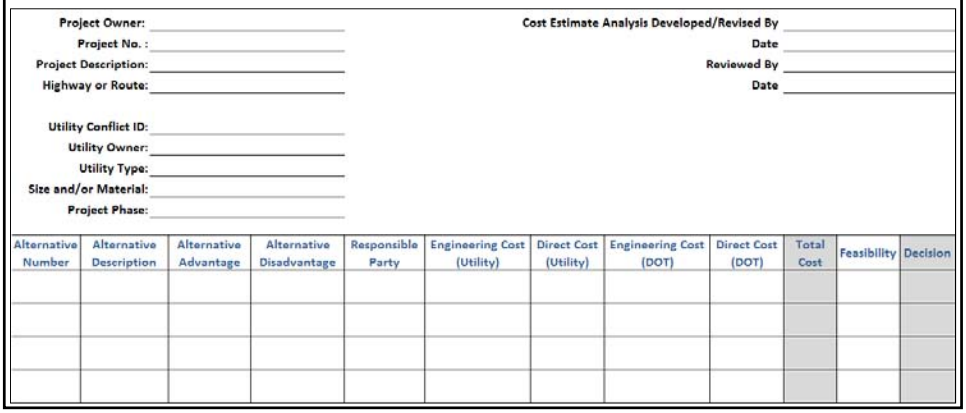
Project Owner: _____ Utility Conflict Matrix Developed/Revised By: _____
Project No. : _____ Date: _____
Project Description: _____ Reviewed By: _____
Highway or Route: _____ Note: refer to subsheet for utility conflict cost analysis. Date: _____

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

2-54

Product 1: Cost Estimate Analysis (Optional for Minor Utility Conflicts)

- Cost Estimate Analysis header: 13 data items
- Cost Estimate Analysis body: 12 data items
- MS Excel format, includes drop-down lists



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

Utility Conflict ID: _____
Utility Owner: _____
Utility Type: _____
Size and/or Material: _____
Project Phase: _____

Cost Estimate Analysis Developed/Revised By _____
Date _____
Reviewed By _____
Date _____

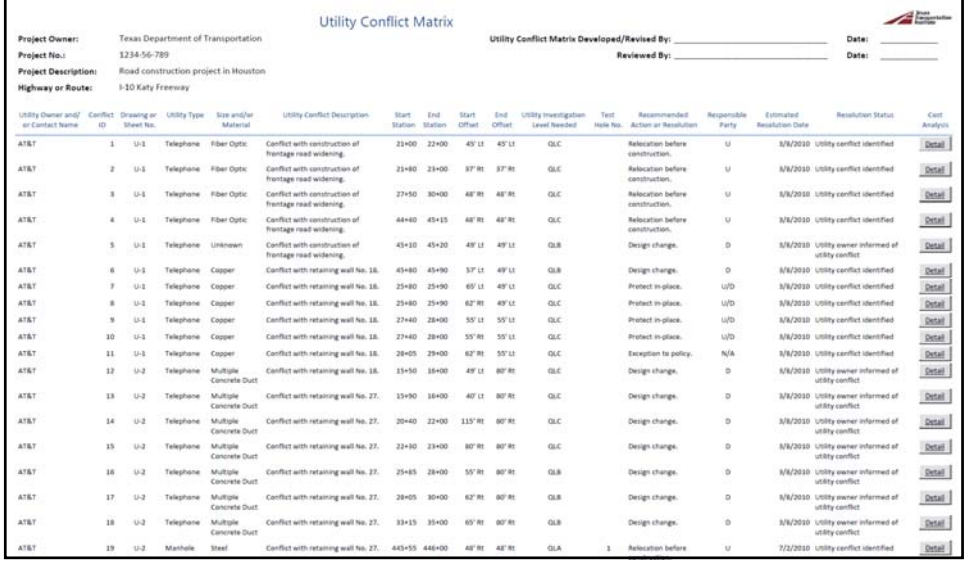
Alternative Number	Alternative Description	Alternative Advantage	Alternative Disadvantage	Responsible Party	Engineering Cost (Utility)	Direct Cost (Utility)	Engineering Cost (DOT)	Direct Cost (DOT)	Total Cost	Feasibility	Decision

Product 2: Development

- Formal data model (ERwin)
- Tested in MS Access
- Enterprise database support (Oracle, SQL Server)
- UCM is one of many queries/reports possible

2-56

Product 2: UCM Report



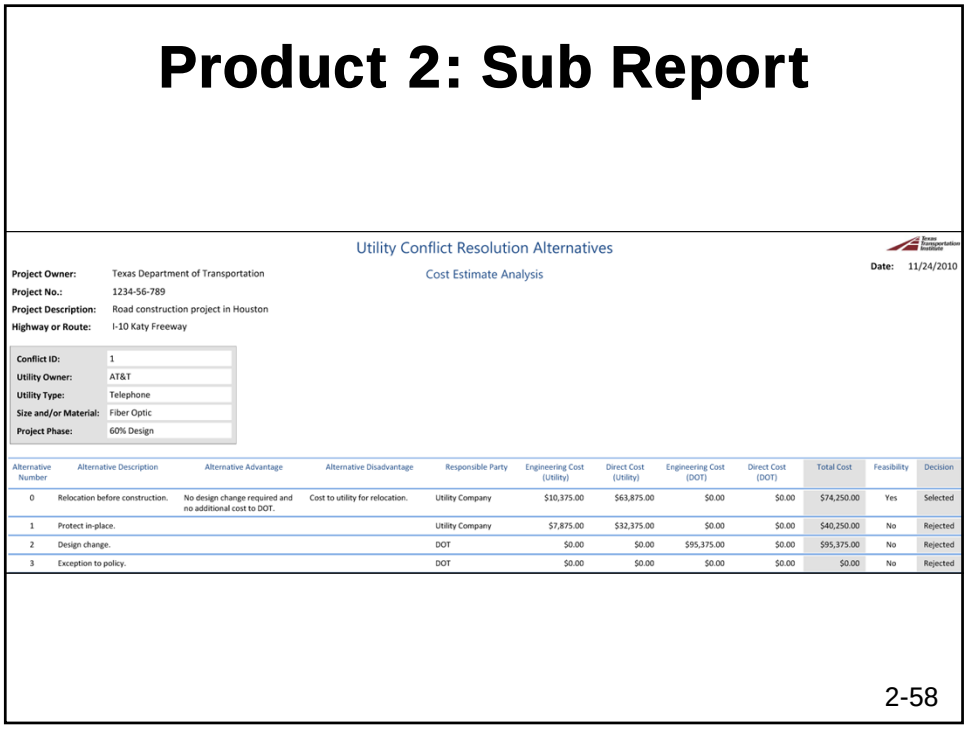
Utility Conflict Matrix

Project Owner: Texas Department of Transportation
Project No.: 1234-56-789
Project Description: Road construction project in Houston
Highway or Route: I-10 Katy Freeway

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

Utility Owner and/or Contact Name	Conflict ID	Drawing or Sheet No.	Utility Type	Size and/or Material	Utility Conflict Description	Start Station	End Station	Start Offset	End Offset	Utility Investigation Level Needed	Test Hole No.	Recommended Action or Resolution	Responsible Party	Estimated Resolution Date	Resolution Status	Cost Analysis
AT&T	1	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	21+00	22+00	45' Lt	45' Lt	QLC		Relocation before construction.	U	3/8/2010	Utility conflict identified	Detail
AT&T	2	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	21+80	23+00	37' Rt	37' Rt	QLC		Relocation before construction.	U	3/8/2010	Utility conflict identified	Detail
AT&T	3	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	27+50	30+00	48' Rt	48' Rt	QLC		Relocation before construction.	U	3/8/2010	Utility conflict identified	Detail
AT&T	4	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	44+40	45+15	48' Rt	48' Rt	QLC		Relocation before construction.	U	3/8/2010	Utility conflict identified	Detail
AT&T	5	U-1	Telephone	Unknown	Conflict with construction of frontage road widening.	45+10	45+20	49' Lt	49' Lt	QLB		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	6	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	45+80	45+90	57' Lt	49' Lt	QLB		Design change.	D	3/8/2010	Utility conflict identified	Detail
AT&T	7	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	25+80	25+90	65' Lt	49' Lt	QLC		Protect in-place.	U/D	3/8/2010	Utility conflict identified	Detail
AT&T	8	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	25+80	25+90	62' Rt	49' Lt	QLC		Protect in-place.	U/D	3/8/2010	Utility conflict identified	Detail
AT&T	9	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	27+40	28+00	55' Lt	55' Lt	QLC		Protect in-place.	U/D	3/8/2010	Utility conflict identified	Detail
AT&T	10	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	27+40	28+00	55' Rt	55' Lt	QLC		Protect in-place.	U/D	3/8/2010	Utility conflict identified	Detail
AT&T	11	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	28+05	29+00	62' Rt	55' Lt	QLC		Exception to policy.	N/A	3/8/2010	Utility conflict identified	Detail
AT&T	12	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 18.	15+50	16+00	49' Lt	80' Rt	QLC		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	13	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	15+90	16+00	40' Lt	80' Rt	QLC		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	14	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	20+40	22+00	115' Rt	80' Rt	QLC		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	15	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	22+90	23+00	80' Rt	80' Rt	QLC		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	16	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	25+85	28+00	55' Rt	80' Rt	QLB		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	17	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	28+05	30+00	62' Rt	80' Rt	QLB		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	18	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	33+15	35+00	65' Rt	80' Rt	QLB		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	19	U-2	Manhole	Steel	Conflict with retaining wall No. 27.	445+55	446+00	48' Rt	48' Rt	QLA	1	Relocation before	U	7/2/2010	Utility conflict identified	Detail

Product 2: Sub Report



Utility Conflict Resolution Alternatives

Cost Estimate Analysis

Date: 11/24/2010

Project Owner: Texas Department of Transportation
Project No.: 1234-56-789
Project Description: Road construction project in Houston
Highway or Route: I-10 Katy Freeway

Conflict ID:	1
Utility Owner:	AT&T
Utility Type:	Telephone
Size and/or Material:	Fiber Optic
Project Phase:	60% Design

Alternative Number	Alternative Description	Alternative Advantage	Alternative Disadvantage	Responsible Party	Engineering Cost (Utility)	Direct Cost (Utility)	Engineering Cost (DOT)	Direct Cost (DOT)	Total Cost	Feasibility	Decision
0	Relocation before construction.	No design change required and no additional cost to DOT.	Cost to utility for relocation.	Utility Company	$10,375.00	$63,875.00	$0.00	$0.00	$74,250.00	Yes	Selected
1	Protect in-place.			Utility Company	$7,875.00	$32,375.00	$0.00	$0.00	$40,250.00	No	Rejected
2	Design change.			DOT	$0.00	$0.00	$95,375.00	$0.00	$95,375.00	No	Rejected
3	Exception to policy.			DOT	$0.00	$0.00	$0.00	$0.00	$0.00	No	Rejected

In Summary ...

- UCM practices vary widely across the country
- SHRP 2 R15-B products:
  - Product 1: Compact, standalone UCM
  - Product 2: Utility conflict data model and database
  - Product 3: One-day UCM training course

2-59

2.3

Questions and Answers

2-60

Lesson 3

Utility Conflict Identification and Management

3-1

Course Overview

8:30 AM – 9:00 AM	Introductions and Course Overview
9:00 AM – 10:15 AM	Utility Conflict Concepts
10:15 AM – 10:30 AM	Morning Break
10:30 AM – 11:45 AM	Utility Conflict Identification and Management
11:45 AM – 1:00 PM	Lunch Break
1:00 PM – 1:20 PM	Database Approach to Manage Utility Conflicts
1:20 PM – 2:20 PM	Hands-On Utility Conflict Exercise Part I
2:20 PM – 2:35 PM	Afternoon break
2:35 PM – 3:35 PM	Hands-On Utility Conflict Exercise Part II
3:35 PM – 3:45 PM	Wrap-Up

3-2

Lesson 3 Overview

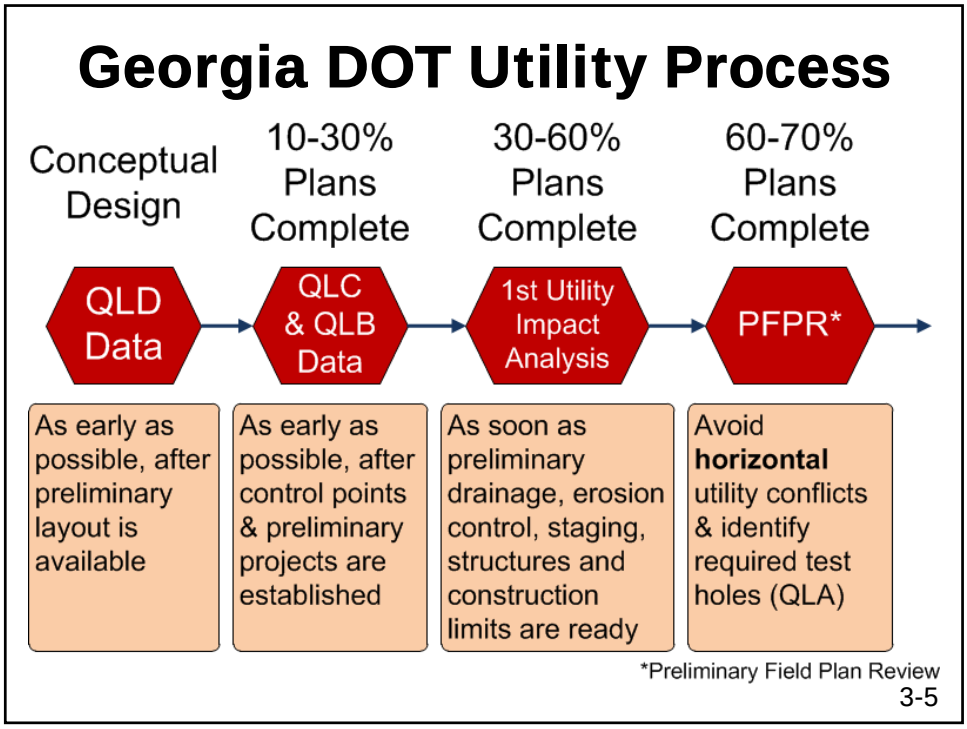
3.1 Utility conflict management and use of UCM
3.2 Discussion, questions, and answers

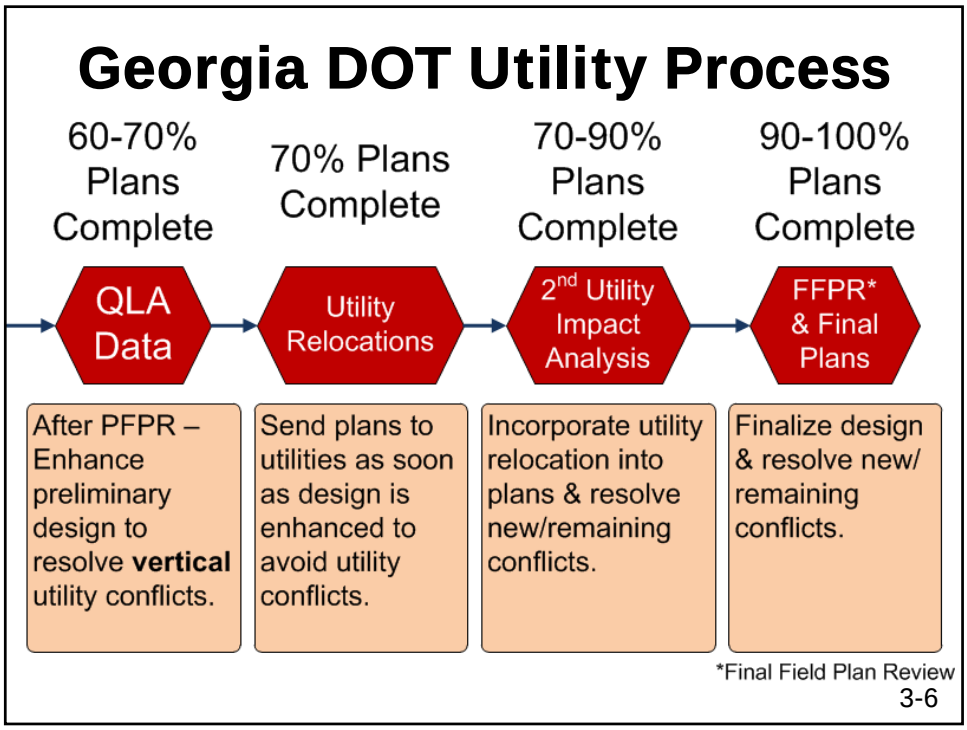
3-3

3.1

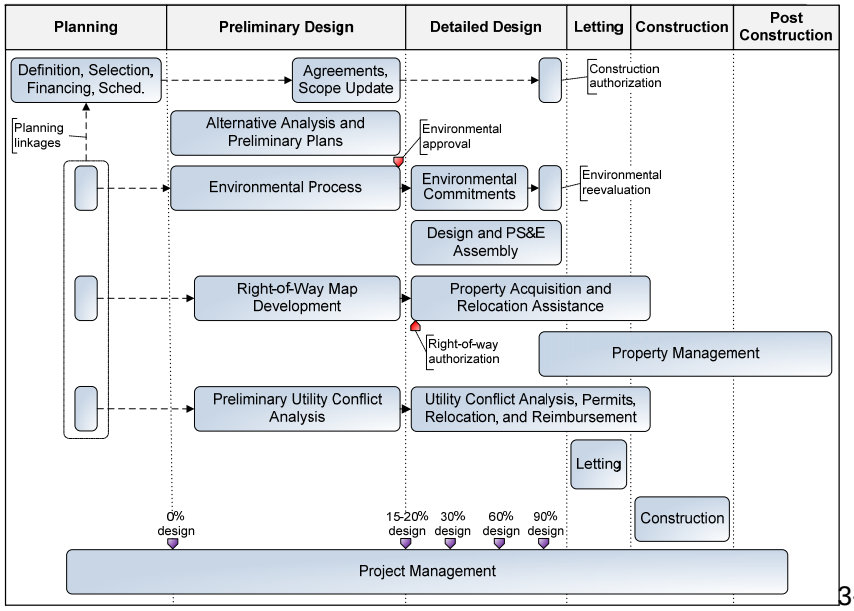
Utility Conflict Management and Use of UCM

3-4


Georgia DOT Utility Process
Conceptual Design
10-30% Plans Complete
30-60% Plans Complete
60-70% Plans Complete
QLD Data
QLC & QLB Data
1st Utility Impact Analysis
PFPR*
As early as possible, after preliminary layout is available
As early as possible, after control points & preliminary projects are established
As soon as preliminary drainage, erosion control, staging, structures and construction limits are ready
Avoid horizontal utility conflicts & identify required test holes (QLA)
*Preliminary Field Plan Review
3-5

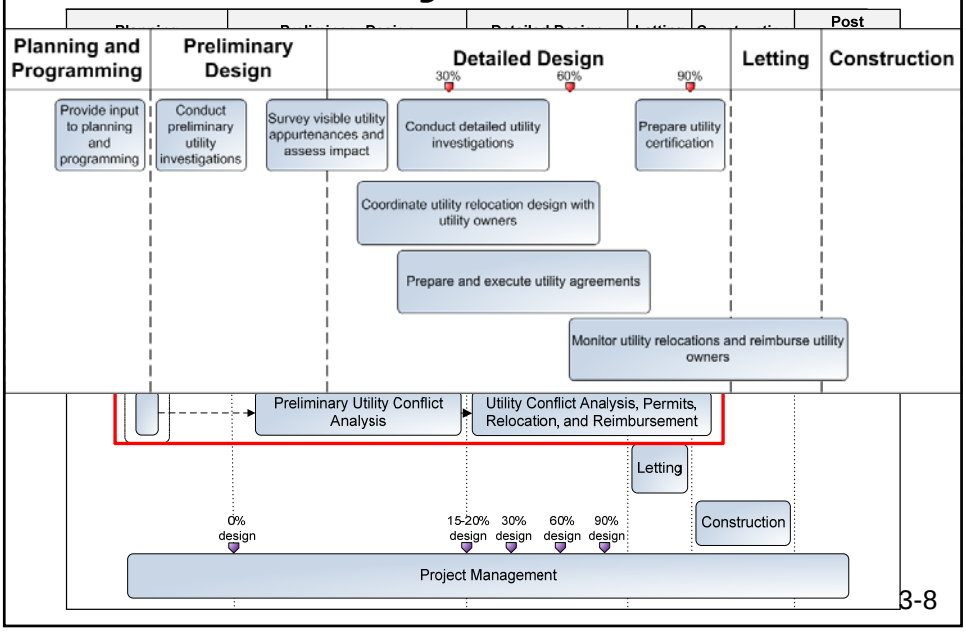

Georgia DOT Utility Process
60-70% Plans Complete
70% Plans Complete
70-90% Plans Complete
90-100% Plans Complete
QLA Data
Utility Relocations
2nd Utility Impact Analysis
FFPR* & Final Plans
After PFPR – Enhance preliminary design to resolve vertical utility conflicts.
Send plans to utilities as soon as design is enhanced to avoid utility conflicts.
Incorporate utility relocation into plans & resolve new/remaining conflicts.
Finalize design & resolve new/ remaining conflicts.
*Final Field Plan Review
3-6

Project Development Process



3-7

Utility Process



3-8

Utility Process Activities

- **Utility investigations**
- Utility conflict analysis and resolution
- Utility coordination
- Utility construction management

3-9

Utility Investigations

- Characterization of subsurface and above ground utility installations
- Quality levels of utility information
  - QLD
  - QLC
  - QLB
  - QLA
- ASCE Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data (ASCE/CI 38-02)

3-10

Quality Level D (QLD)

- Data collection from existing records or oral recollections
  - Utility owner records (marked up drawings, cable records, service records, as-builts), GIS databases, oral histories, one call markings, field notes
  - Information sources (utility owners, county clerk's office, visual site inspections, one-call notification centers, public service commissions, land owners, and database searches)
  - Deliverables: Composite drawing (QLD)

3-11

Quality Level C (QLC)

- Surveying and plotting visible utility appurtenances and making inferences about underground linear utility facilities that connect those appurtenances
  - Survey using project datum and specifications (e.g., valve covers, junction boxes, and manhole covers)
  - Correlate utility records to surveyed features
  - Resolve discrepancies
  - Deliverables: Composite drawings (QLC and QLD)

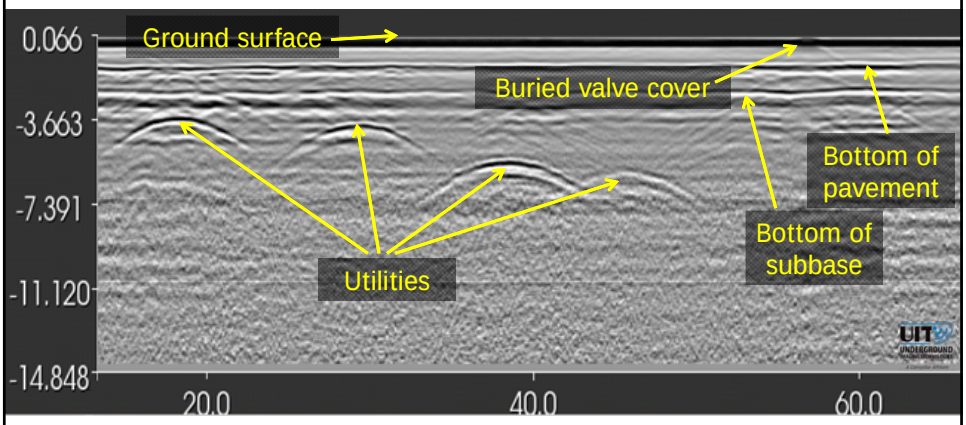
3-12

Quality Level B (QLB)

- Surface geophysical methods to determine the approximate horizontal position of subsurface utilities
  - Mark indications of utilities on the ground surface
  - Accuracy depends on geophysical method, soil conditions
  - Survey markings using project datum and specifications
  - No vertical positions reported
  - Correlate utility records to surveyed features
  - Resolve discrepancies
  - Deliverables: Composite drawings (QLB, QLC, QLD)

3-13

QLB Example: Ground Penetrating Radar



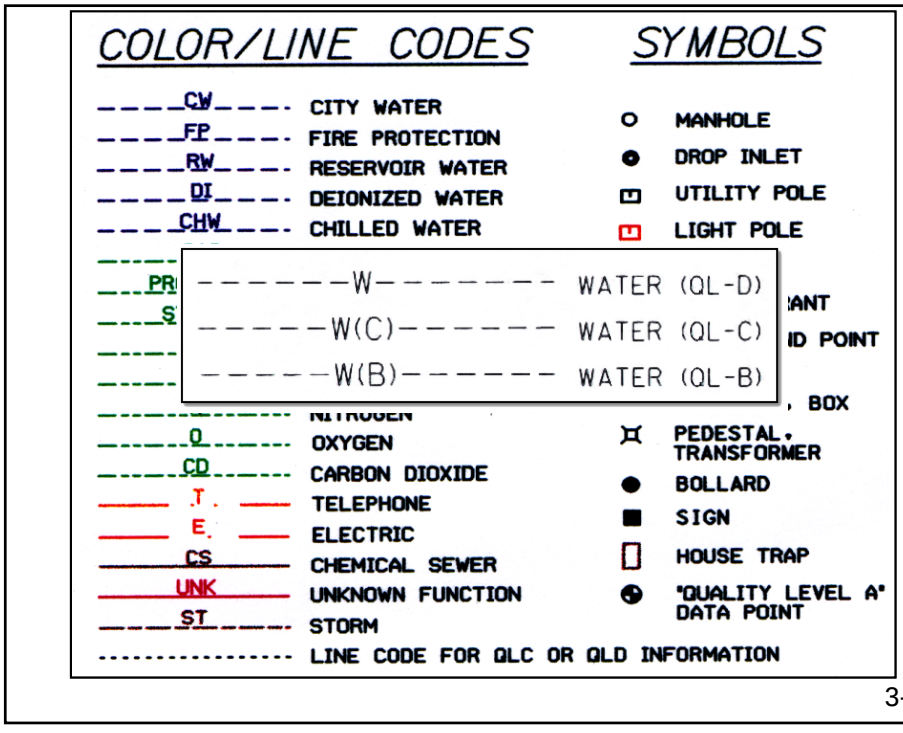
3-14

Quality Level A (QLA)

- Accurate *horizontal* and *vertical* utility locations through exposure of underground utility facilities at certain locations
  - Test hole excavation (minimally intrusive)
  - Data gathered during construction (in some cases)
  - Survey exposed facilities using project datum (*horizontal* and *vertical*) and specifications
  - Resolve discrepancies
  - Deliverables: Composite drawings (QLA, QLB, QLC, QLD), test hole reports

3-16

7


COLOR/LINE CODES
SYMBOLS
CW
CITY WATER
FP
FIRE PROTECTION
RW
RESERVOIR WATER
DI
DEIONIZED WATER
CHW
CHILLED WATER
W
WATER (QL-D)
W(C)
WATER (QL-C)
W(B)
WATER (QL-B)
O
OXYGEN
CD
CARBON DIOXIDE
T
TELEPHONE
E
ELECTRIC
CS
CHEMICAL SEWER
UNK
UNKNOWN FUNCTION
ST
STORM
LINE CODE FOR QLC OR QLD INFORMATION
MANHOLE
DROP INLET
UTILITY POLE
LIGHT POLE
PEDESTAL, TRANSFORMER
BOLLARD
SIGN
HOUSE TRAP
"QUALITY LEVEL A" DATA POINT

3-18

ABBREVIATIONS

F.O.	FIBER OPTIC
EOI	END OF SURFACE GEOPHYSICAL INFORMATION
EORI	END OF RECORD INFORMATION
AATUR	UTILITY ABANDONED ACCORDING TO UTILITY RECORDS
AATFI	UTILITY ABANDONED ACCORDING TO FIELD INSPECTION
EATUR	EMPTY ACCORDING TO UTILITY RECORDS
NAP	NO ASSOCIATED PIPING FOUND FROM STRUCTURE
NAC	NO ASSOCIATED CABLES FOUND FROM STRUCTURE

NOTES

NOTE 1: "QUALITY LEVEL A" DATA POINTS INDICATED BY SYMBOL ⊕. SEE QLA SUPPLEMENTAL DATA FORM FOR ADDITIONAL UTILITY INFORMATION.

NOTE 2: ALL "QUALITY LEVEL A" ELEVATIONS ARE FOR THE TOP OF THE UTILITY UNLESS OTHERWISE NOTED.

NOTE 3: ALL UTILITIES DEPICTED AT "QUALITY LEVEL B" UNLESS INDICATED BY DOTTED LINE CODE (.....) AND LABELED "QLC" OR "QLD".

3-19

All Utilities depicted at QL B unless otherwise noted.

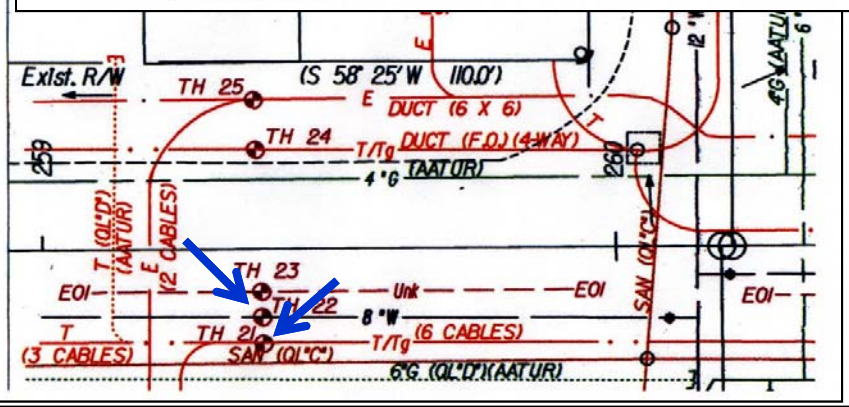
QL A Data Summary (see QL A Supplemental Data Sheets for additional information):

TH 21: 6 non-encased telephone cables

elevation top of cable configuration: 186.15'
elevation bottom of configuration: 183.43'
Coords: N 441987.8011
E 3640280.1310

TH 22: 8 3/4" C.I. water

elevation top of water line: 184.67'
Coords: N 441992.7925
E 3640280.0092



3-20

Test Hole Form

Utility Type		Utility Material	Offset Measured From	Identified By
E	Electrical	1 Steel	30 Edge of Pavement	20 Sleeve
G	Gas Line	2 PVC (Polyvinyl Chloride)	31 Baseline	21 Hub/Lathe
BT	Buried Telephone	3 DIP (Ductile Iron Pipe)	32 Right-of-Way	22 Nail/Disk
FOC	Fiber Optic Cable	4 VCP (Vitrified Clay Pipe)	33 Centerline	23 "X" in Concrete
W	Water	5 PE (Polyethylene Pipe)	34 Back of Curb	24 Set Iron Rod and Cap 5/8"
SAN	Sanitary Sewer	6 AC (Transite)	35 Survey Hub	25
STM	Storm Sewer	7 CI (Cast Iron)	36 "X" in Concrete	26
CATV	Cable TV	8 DBC (Direct Buried Cable)	37 Swing Ties	
FM	Force Main	9 Concrete Pipe	38 Ref. Point in Driveway	
RW	Reclaimed Water	10 Corrugated Metal Pipe	39	
SL	Street Light	11 Duct	**Surface Type**	
TS	Traffic Signal	12 Fiberglass	A Asphalt	
FL	Fuel Line	13 Unknown	C Concrete	
EXP	Exploratory	14 Corrugated Plastic	NG Natural Ground	
UNK	Unknown	15 Concrete Duct		
IRR	Irrigation			

Conflict No.	Test Hole No.	Utility Type	Utility Material	Utility Size (O.D.) in. ☑ mm. ☐	Approx. Station	Approx. Offset Distance ft. ☑ m. ☐ L	R	Offset From	Manual Depth (Top) ft. ☑ m. ☐	Cross Sectional View	Utility Direction	ID'd By	Surface Type	Pvmnt. Thick-ness in. ☑ mm. ☐
C40	19	BE	2	6"	37+00	62.0		31	3.16'			22	NG	
C42	20	BE	2	6"	37+00	57.0		31	3.33'			22	NG	
C43	21	W	6	12"	37+00	53.0		31	4.21'			22	NG	
C44	22	G	1	6"	37+00	48.0		31	3.56'			22	NG	
C18	23	BE	2	6"	37+40	60.0		31	3.19'			22	NG	
C19	24	BT	8	1"	37+90	43.0		31	4.52'			22	NG	
C23	25	W	2	6"	39+00	110		31	3.83'			22	NG	
C24	26	CATV	8	1"	35+30	105		31	4.12'			22	NG	

Notes:

Sheet 1 of 1 Prepared By: VL Date: 10/13/06 Checked By: RMP Date: 10/14/06

3-21

Main Utility Process Activities

- Utility investigations
- **Utility conflict analysis and resolution**
- Utility coordination
- Utility construction management

3-22

Utility Conflict Analysis and Resolution

- Processes:
  - Utility conflict analysis at critical milestones
  - Evaluation of alternatives (utility and project)
  - Meetings, discussions with stakeholders
- Tools:
  - Utility layouts (plan sheets, cross sections, details)
  - Utility conflict matrix
  - Project schedules
  - Project and utility specifications

3-23

Utility Conflict Analysis and Resolution

- Outcomes:
  - Alternatives for utility conflict resolution
  - Utility construction phasing
  - Constructability recommendations
  - Traffic control plan
  - Project management reports during design
  - Project management reports during construction
  - Plans, schedules, and estimates
  - Certifications/special provisions in PS&E assembly

3-24

Main Utility Process Activities

- Utility investigations
- Utility conflict analysis and resolution
- **Utility coordination**
- Utility construction management

3-25

Utility Coordination

- Coordination and liaison with utility owners, consultants, designers, other stakeholders
- Scope of work could include:
  - Coordination of utility relocations
  - Notifications, meetings, and work plans
  - Permits and rights of entry
  - Utility agreement assemblies
  - Funding and escrow agreements
  - Processing of as-built information

3-26

Main Utility Process Activities

- Utility investigations
- Utility conflict analysis and resolution
- Utility coordination
- **Utility construction management**

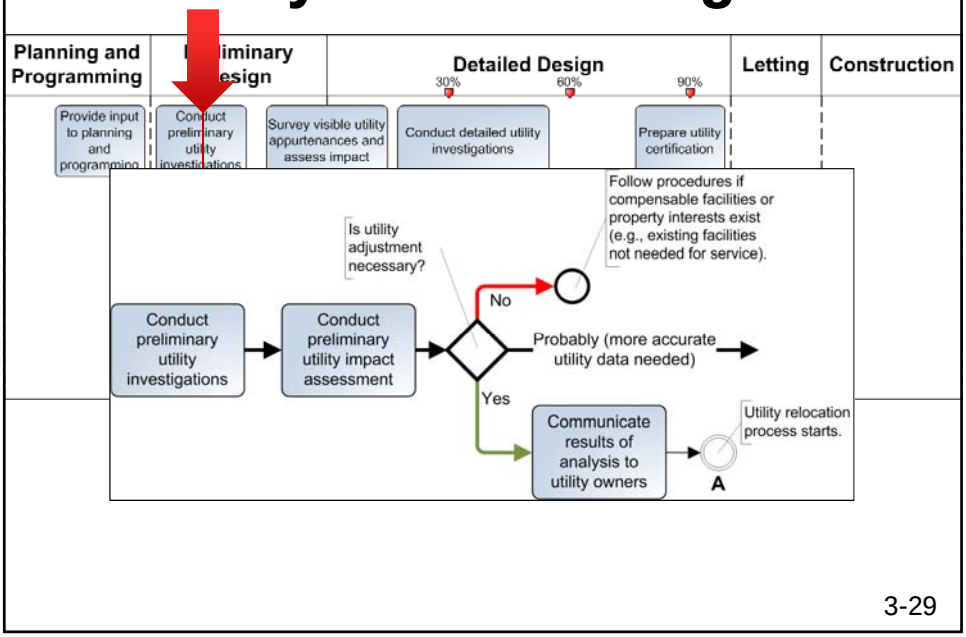
3-27

Utility Construction Management

- Coordination of utility construction
  - Pre and post letting
- Inspection and verification
- Compliance with policies (e.g., utility accommodation policy, traffic control, SW3P, OSHA, etc.)
- Payment request reviews
- Gathering or preparing as-built plans

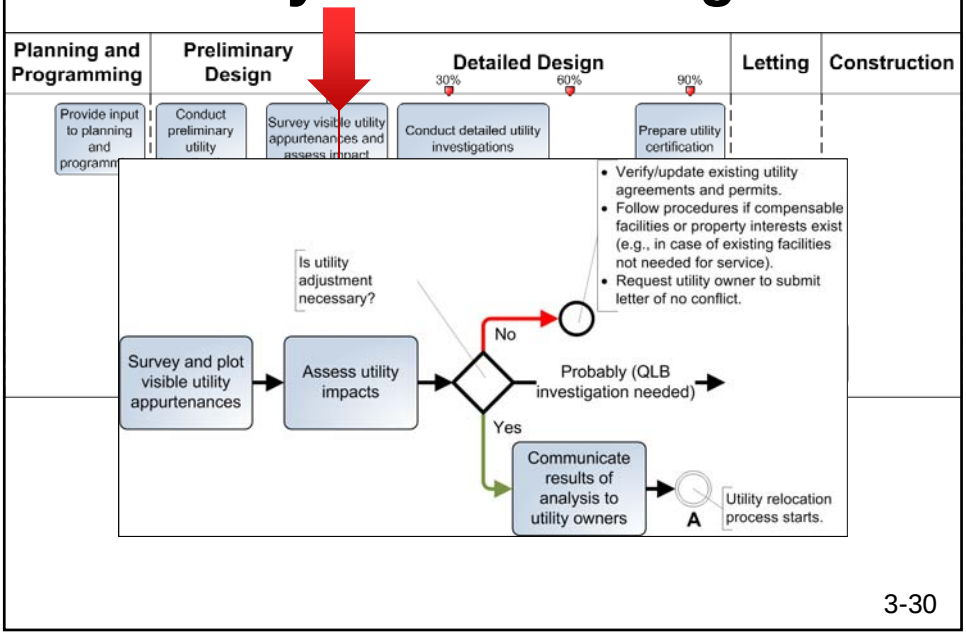
3-28

Utility Process: Stage 1



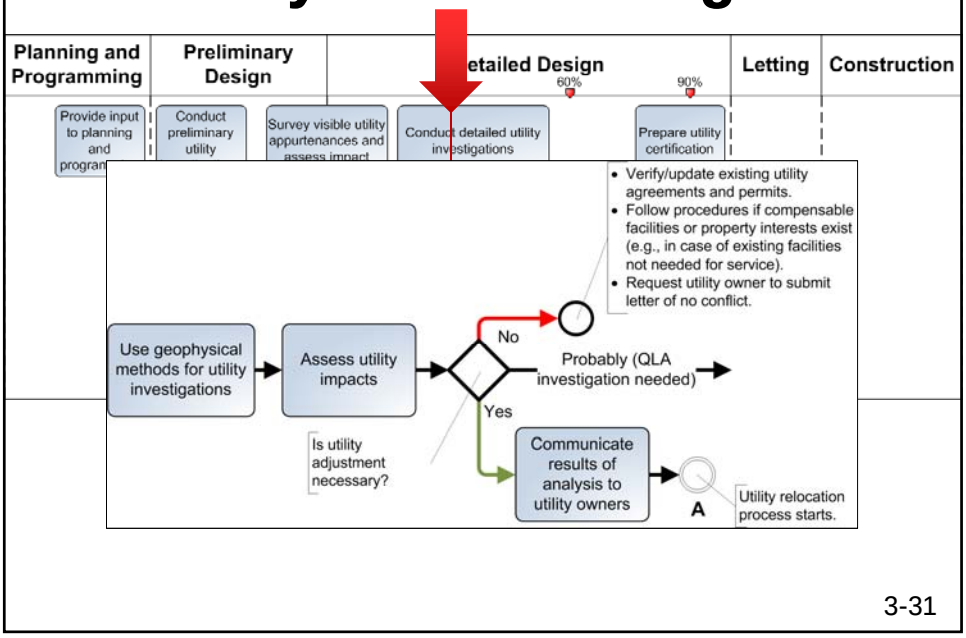
3-29

Utility Process: Stage 2



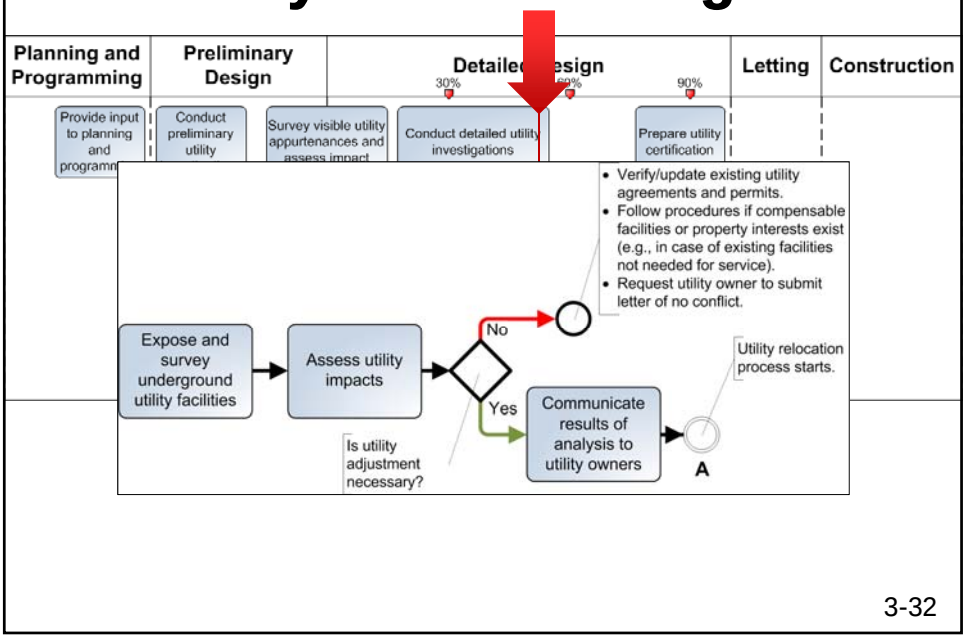
3-30

Utility Process: Stage 3



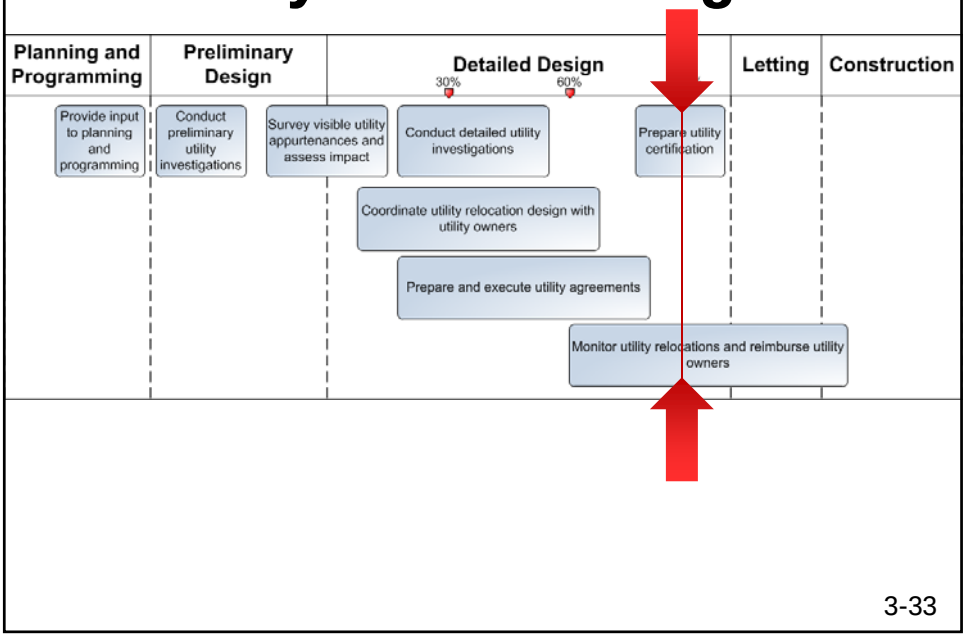
3-31

Utility Process: Stage 4



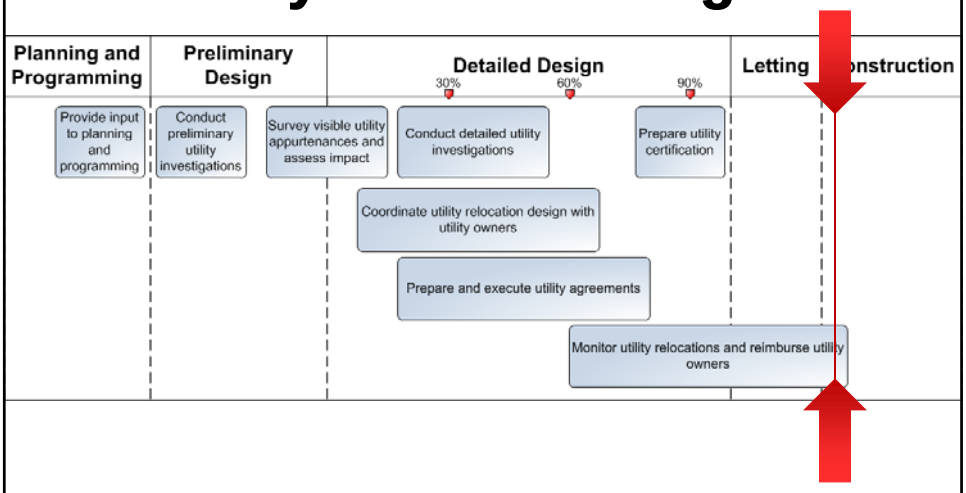
3-32

Utility Process: Stage 5



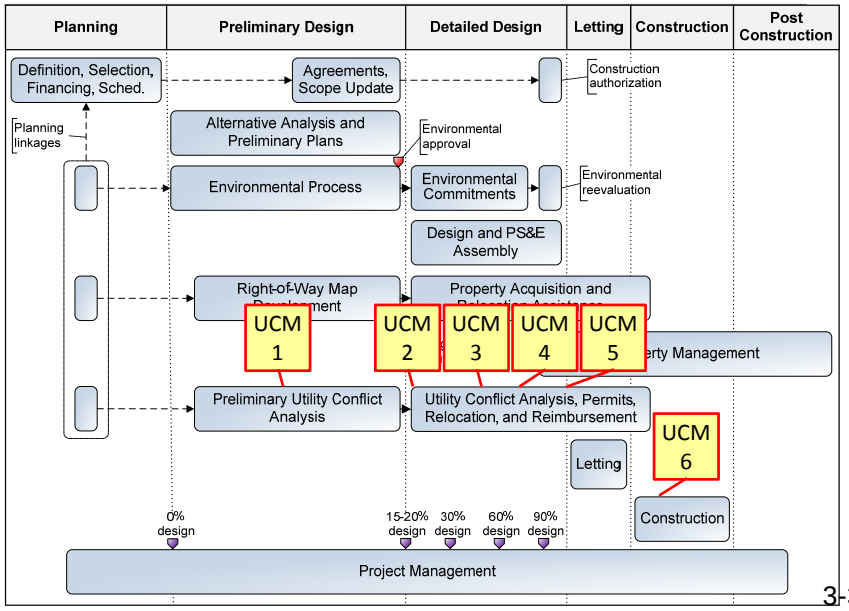
3-33

Utility Process: Stage 6



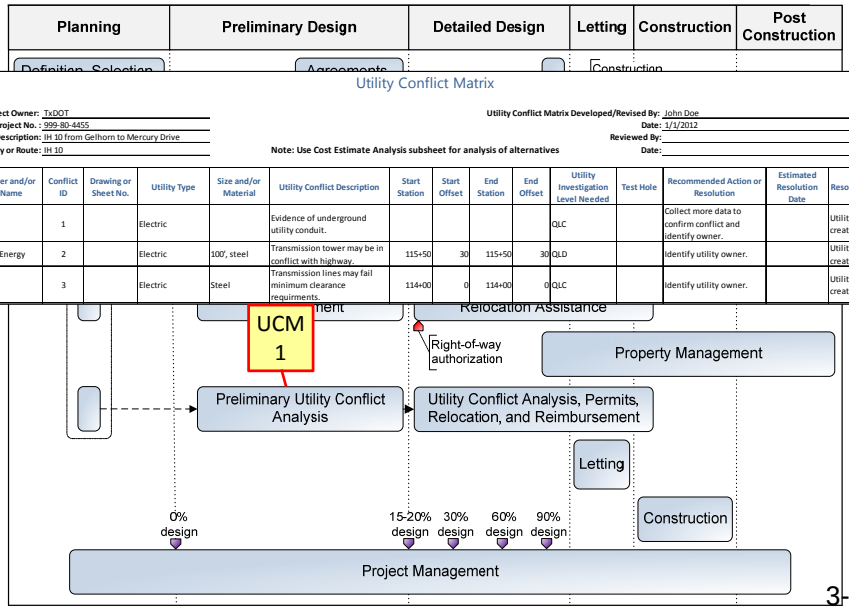
3-34

UCM Update



3-35

UCM Update: UCM 1



3-36

UCM Update: UCM 2

Utility Conflict Matrix

Project Owner: Sample DOT
Project No. : 445-56-4789
Utility Conflict Matrix Developed/Revised By: John Doe
Date: 1/1/2013

Utility Conflict Resolution Alternatives

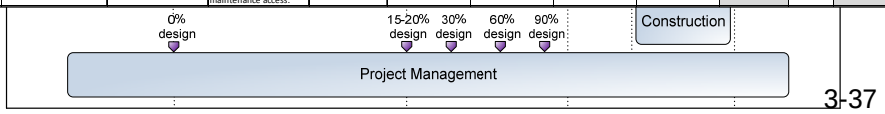
Cost Estimate Analysis

Project Owner: Sample DOT
Project No. : 445-56-4789
Project Description: Widening of IH-10 from Loop 410 to Loop 1604
Highway or Route: IH-10

Utility Conflict: 2
Utility Owner: Centerpoint Energy
Utility Type: Electric
Size and/or Material: 100', steel
Project Phase: 30% Design

Cost Estimate Analysis Developed/Revised By John Doe
Date 1/14/2013
Reviewed By
Date

Alternative Number	Alternative Description	Alternative Advantage	Alternative Disadvantage	Responsible Party	Engineering Cost (Utility)	Direct Cost (Utility)	Engineering Cost (DOT)	Direct Cost (DOT)	Total Cost	Feasibility	Decision
1	Relocate transmission tower.	No design change required, no additional cost to DOT.	High cost to utility for relocation and project delay.	Utility						Unknown	Under Review
2	Change highway design to accommodate tower.	Utility can remain in place.	Cost to redesign, potential impact on right-of-way acquistion and environmental document	DOT						Unknown	Under Review
3	Protect tower in-place.	Utility can remain in place.	Potential safety hazard, problematic access for maintenance.	Utility						Unknown	Under Review
4	Exception to policy.	No cost to utility or DOT.	High risk of damage to utility and problematic maintenance access.	N/A						Unknown	Under Review



3-37

UCM Update: UCM 3

Utility Conflict Matrix

Utility Conflict Resolution Alternatives

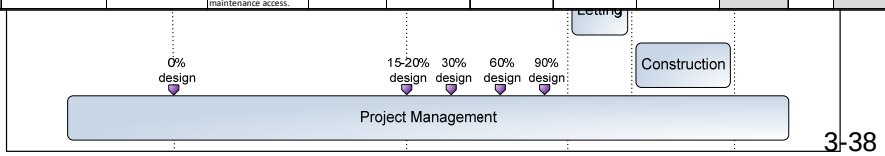
Cost Estimate Analysis

Project Owner: Sample DOT
Project No. : 445-56-4789
Project Description: Widening of IH-10 from Loop 410 to Loop 1604
Highway or Route: IH-10

Utility Conflict: 2
Utility Owner: Centerpoint Energy
Utility Type: Electric
Size and/or Material: 100', steel
Project Phase: 30% Design

Cost Estimate Analysis Developed/Revised By John Doe
Date 1/14/2013
Reviewed By John Doe
Date 3/1/2013

Alternative Number	Alternative Description	Alternative Advantage	Alternative Disadvantage	Responsible Party	Engineering Cost (Utility)	Direct Cost (Utility)	Engineering Cost (DOT)	Direct Cost (DOT)	Total Cost	Feasibility	Decision
1	Relocate transmission tower.	No design change required, no additional cost to DOT.	High cost to utility for relocation and project delay.	Utility	$ 25,000.00	$ 200,000.00	$ -	$ -	$ 225,000.00	Unknown	Under Review
2	Change highway design to accommodate tower.	Utility can remain in place.	Cost to redesign, potential impact on right-of-way acquistion and environmental document	DOT	$ -	$ -	$ 10,000.00	$ 30,000.00	$ 40,000.00	Unknown	Under Review
3	Protect tower in-place.	Utility can remain in place.	Potential safety hazard, problematic access for maintenance.	Utility	$ 5,000.00	$ 20,000.00		$ -	$ 25,000.00	Unknown	Under Review
4	Exception to policy.	No cost to utility or DOT.	High risk of damage to utility and problematic maintenance access.	N/A	$ -	$ -	$ -	$ -	$ -	No	Rejected



3-38

UCM Update: UCM 4

Utility Conflict Matrix

Utility Conflict Resolution Alternatives

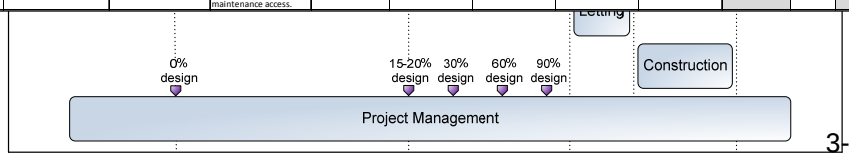
Cost Estimate Analysis

Project Owner: Sample DOT
Project No. : 445-56-4789
Project Description: Widening of IH-10 from Loop 410 to Loop 1604
Highway or Route: IH-10

Utility Conflict: 2
Utility Owner: Centerpoint Energy
Utility Type: Electric
Size and/or Material: 100', steel
Project Phase: 30% Design

Cost Estimate Analysis Developed/Revised By John Doe
Date 1/14/2013
Reviewed By John Doe
Date 4/1/2013

Alternative Number	Alternative Description	Alternative Advantage	Alternative Disadvantage	Responsible Party	Engineering Cost (Utility)	Direct Cost (Utility)	Engineering Cost (DOT)	Direct Cost (DOT)	Total Cost	Feasibility	Decision
1	Relocate transmission tower.	No design change required, no additional cost to DOT.	High cost to utility for relocation and project delay.	Utility	$ 25,000.00	$ 200,000.00	$ -	$ -	$ 225,000.00	Yes	Rejected
2	Change highway design to accommodate tower.	Utility can remain in place.	Cost to redesign, potential impact on right-of-way acquistion and environmental document	DOT	$ 10,000.00	$ 30,000.00	$ -	$ -	$ 40,000.00	Yes	Selected
3	Protect tower in-place.	Utility can remain in place.	Potential safety hazard, problematic access for maintenance.	Utility	$ -	$ -	$ 25,000.00	$ -	$ 25,000.00	No	Rejected
4	Exception to policy.	No cost to utility or DOT.	High risk of damage to utility and problematic maintenance access.	N/A	$ -	$ -	$ -	$ -	$ -	No	Rejected



3-39

UCM Update: UCM 5

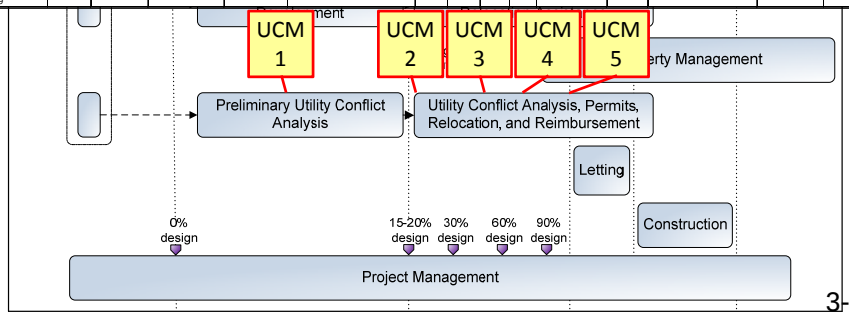
Utility Conflict Matrix

Project Owner: Sample DOT
Project No. : 445-56-4789
Project Description: Widening of IH-10 from Loop 410 to Loop 1604
Highway or Route: IH-10

Utility Conflict Matrix Developed/Revised By: John Doe
Date: 1/1/2013
Reviewed By: John Doe
Date: 7/1/2013

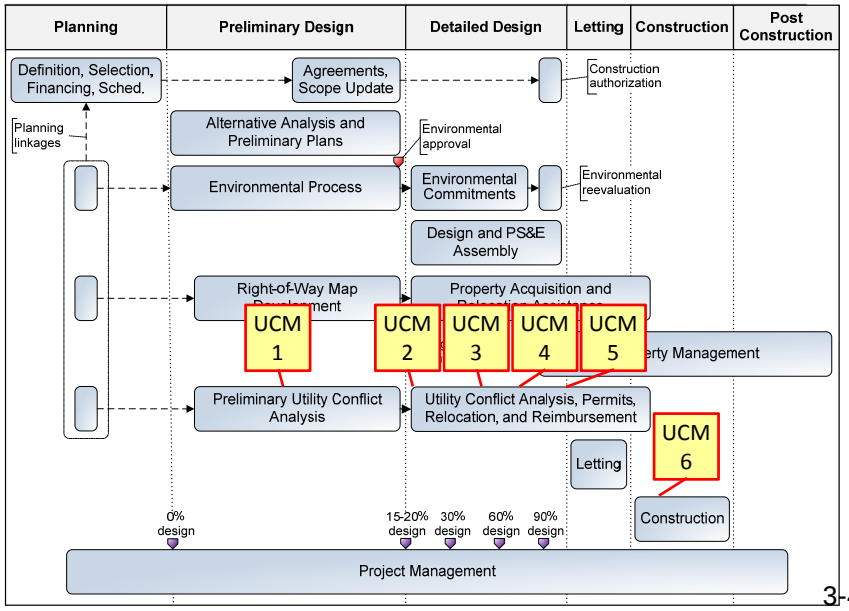
Note: refer to subsheet for utility conflict cost analysis.

Utility Owner and/or Contact Name	Conflict ID	Drawing or Sheet No.	Utility Type	Size and/or Material	Utility Conflict Description	Start Station	End Station	Start Offset	End Offset	Utility Investigation Level Needed	Test Hole	Recommended Action or Resolution	Estimated Resolution Date	Resolution Status
City Electric Services Tina Miller tmiller@ces.com 555-999-8888	1	PS-4	Electric	18"	Underground utility conduit in conflict with highway	110+00	40	140+00	40	QLA	10	None	6/1/2013	Utility conflict resolved
Centerpoint Energy James Smith jsmith@cpe.com 555-999-9999	2	PS-8	Electric	100', steel	Transmission tower in conflict with highway	115+50	30	115+50	30	QLC		None	-	Utility conflict resolved
Centerpoint Energy James Smith jsmith@cpe.com 555-999-9999	3	PS-7	Electric	Steel	Transmission lines fail minimum clearance requirements	114+00	0	114+00	0	QLC		None	6/1/2013	Utility conflict resolved



3-40

UCM Update: UCM 6



3-41

Cost Estimate Analysis

- Detailed analysis of utility conflict resolution alternatives
  - Cost (both utility and DOT)
  - Feasibility
- Analysis varies from simple to detailed
  - Several alternatives for each utility conflict
  - Up to four cost estimates for each alternative
- Useful for documentation purposes

3-42

Cost Estimate Analysis

Conflict ID:	1
Utility Owner:	AT&T
Utility Type:	Telephone
Size and/or Material:	Fiber Optic
Project Phase:	60% Design

Alternative Number	Alternative Description	Alternative Advantage	Alternative Disadvantage	Respons. Party	Engineering Cost (Utility)	Direct Cost (Utility)	Engineering Cost (DOT)	Direct Cost (DOT)	Total Cost	Feasibility	Decision
1	Relocation before construction.	No design change required, no additional cost to DOT.	Cost to utility for relocation.	Utility	$25,000	$200,000	$0	$0	$225,000	Yes	Rejected
2	Protect in-place.	Utility can remain in place.	Access to utility for maintenance problematic.	Utility	$10,000	$30,000	$0	$0	$40,000	No	Rejected
3	Change highway design.	Utility can remain in place.	High cost and project delay.	DOT	$0	$0	$25,000	$0	$25,000	Yes	Selected
4	Exception to policy.	No cost to utility or DOT.	High risk of damage to utility and maintenance problems.	N/A	$0	$0	$0	$0	$0	No	Rejected

3-43

UCM Responsibilities

	Data Collection	Impact Assessment	Populate UCM	Coordinate with Utilities	Utility Conflict Management Responsibility
UCM 1	PM, UC, Cons	PM, Cons	PM	UC	PM
UCM 2	UC, Sur, Cons	PM, Cons	PM, UC, Cons	UC	PM
UCM 3	Sur, Cons	PM, Cons	PM, Cons	UC	PM
UCM 4	Sur, Cons	PM, Cons	PM, Cons	UC	PM
UCM 5	n/a	PM, Cons	PM, UC	UC	PM

PM = Project Manager/Designer
UC = Utility Coordinator
Sur = Surveyor
Cons = Consultant

3-44

Utility Conflict Matrix Uses

- Management report during project development
- Utility information for highway project bidders included in letting documents
  - Certification of known utility facilities within project limits
  - Special provision for utility relocations
- Management report during construction
- Cost savings report after construction

3-45

UCM Sample Applications

- Georgia DOT
- California DOT

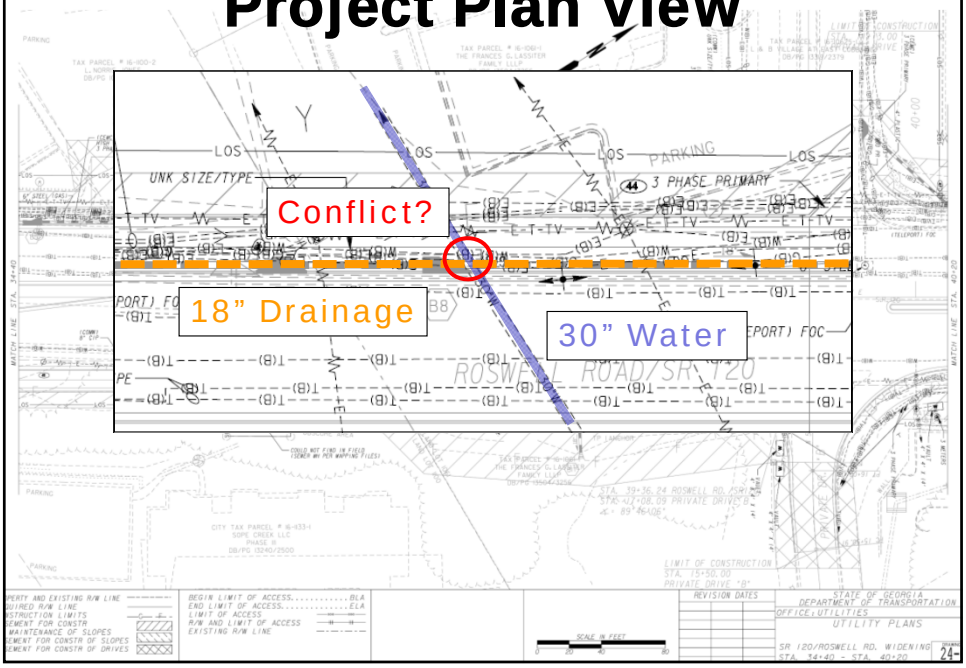
3-46

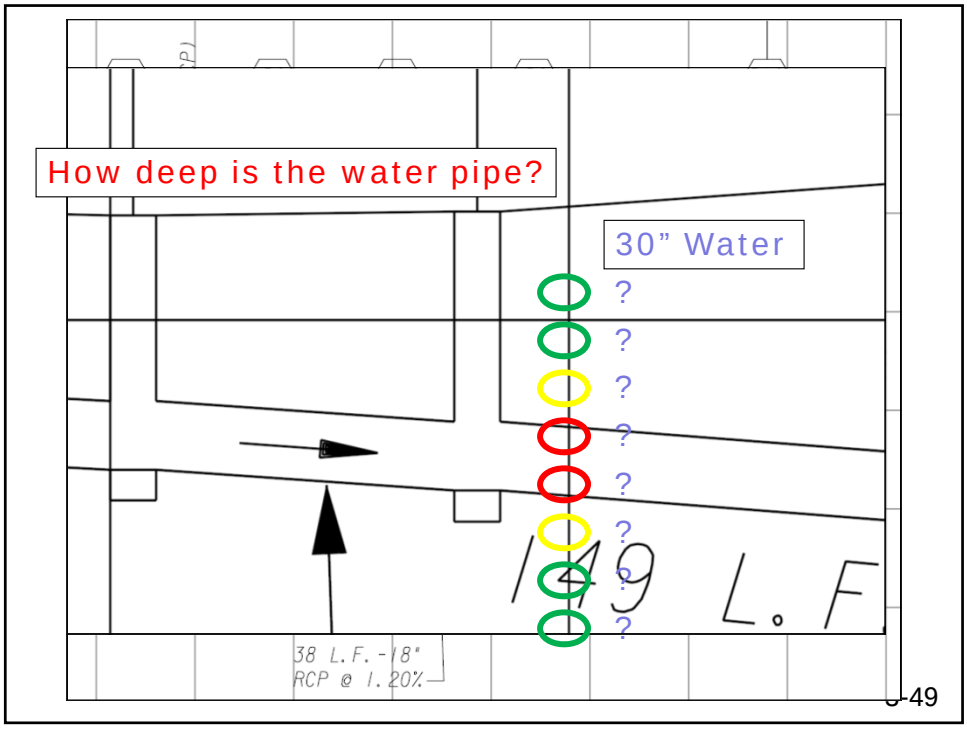
Sample Application No. 1

- Roswell Road Project, Georgia
  - NW of Atlanta, Cobb County
  - Widening of SR 120/Roswell Road from SR 120 ALT to Bridgegate Drive
  - Project length: 1.8 miles
  - 13 utility owners
  - 135,000 linear feet of underground utilities

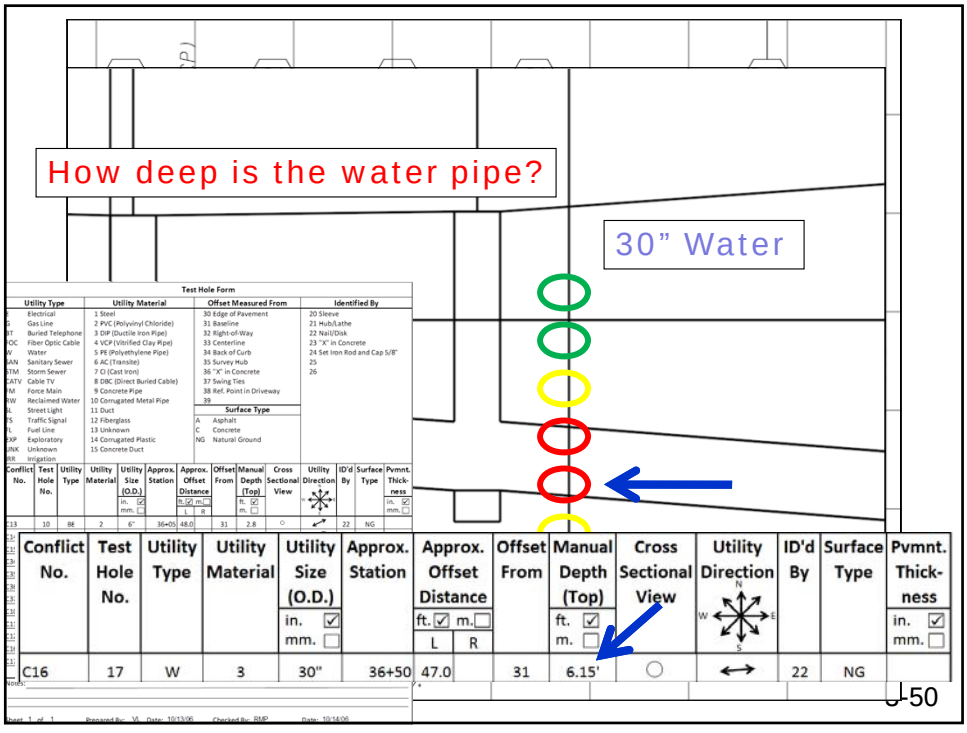
3-47

Project Plan View



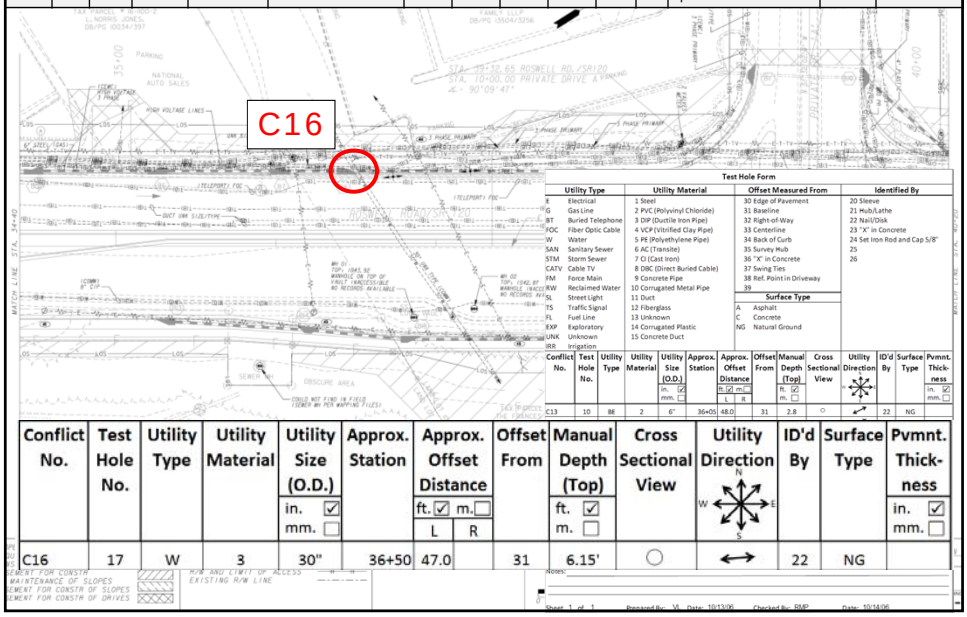

How deep is the water pipe?
30" Water
?
?
?
?
?
?
?
?
149 L.F.
38 L.F. - 18" RCP @ 1.20%

C-49

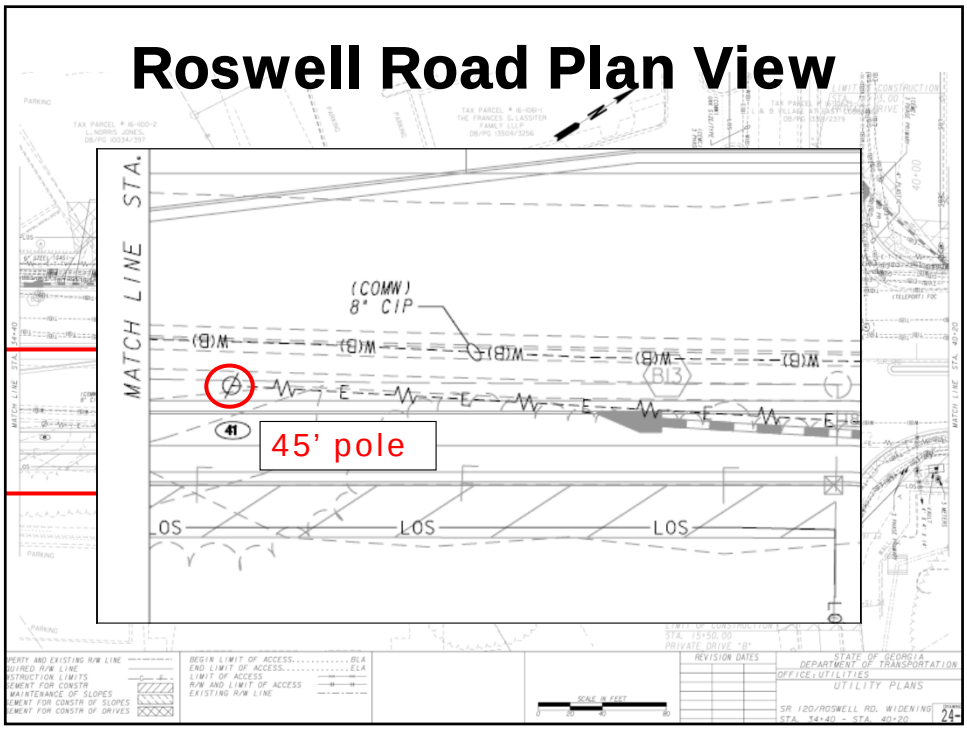

How deep is the water pipe?
30" Water
Test Hole Form
Conflict No.
Test Hole No.
Utility Type
Utility Material
Utility Size (O.D.)
Approx. Station
Approx. Offset Distance
Offset From
Manual Depth (Top)
Cross Sectional View
Utility Direction
ID'd By
Surface Type
Pvmnt. Thick-ness
C16
17
W
3
30"
36+50
47.0
31
6.15'
22
NG

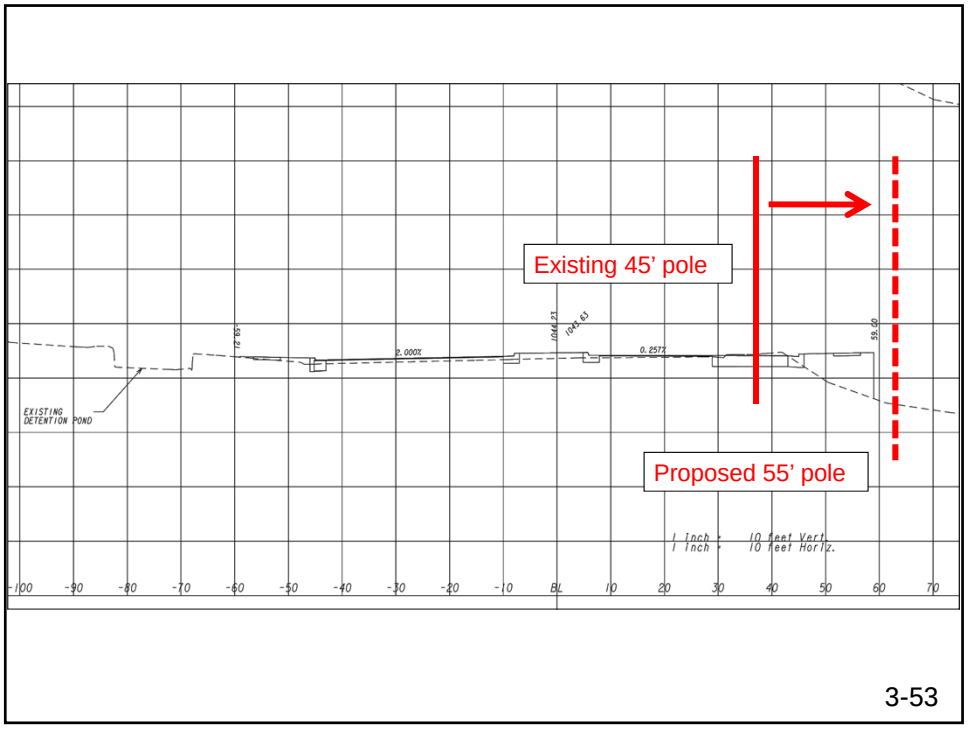
C-50

Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action or Resolution	Est. Res. Date	Resolution Status
AWS	C16	1	Water	30" ductile iron pipe	Proposed 18" drainage pipe would cross water main	36+50	36+50	47' LT		QLA	17	Review possibility of adjusting drainage pipe up to avoid conflict	n/a	Utility conflict created



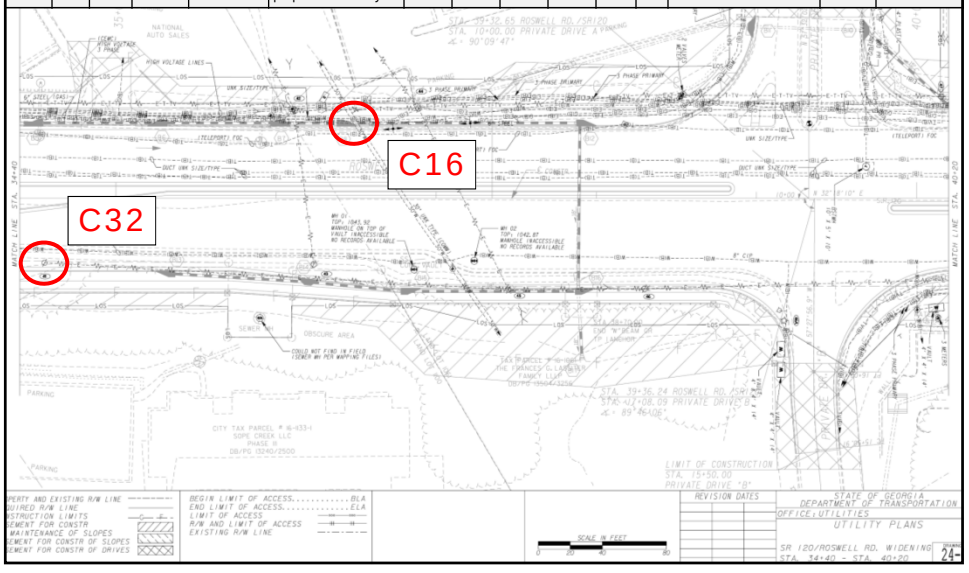
Conflict No.	Test Hole No.	Utility Type	Utility Material	Utility Size (O.D.)	Approx. Station	Approx. Offset Distance	Offset From	Manual Depth (Top)	Cross Sectional View	Utility Direction	ID'd By	Surface Type	Pvmnt. Thick-ness
				in. ☑ mm. ☐		ft. ☑ m. ☐ L R		ft. ☑ m. ☐					in. ☑ mm. ☐
C16	17	W	3	30"	36+50	47.0	31	6.15'	○	↔	22	NG	



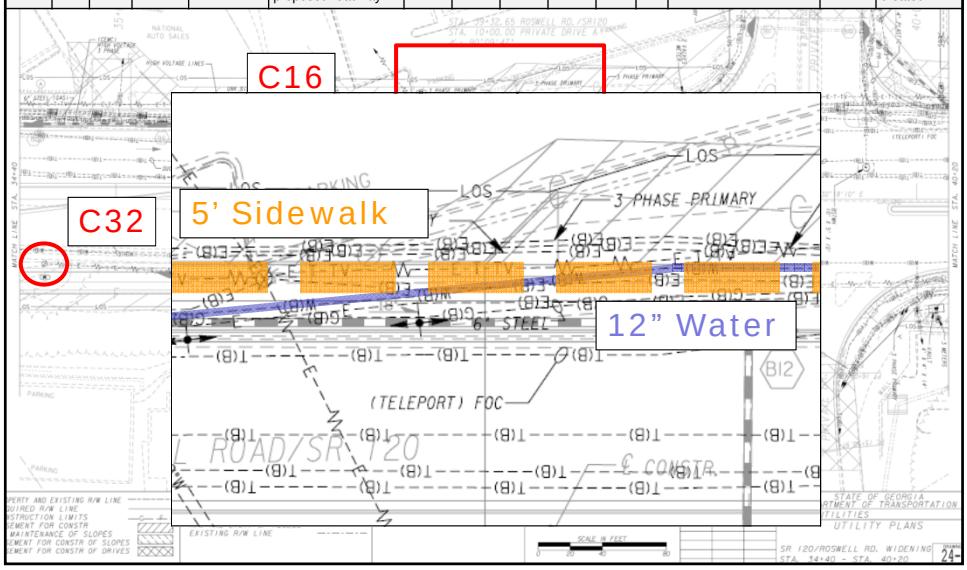


3-53

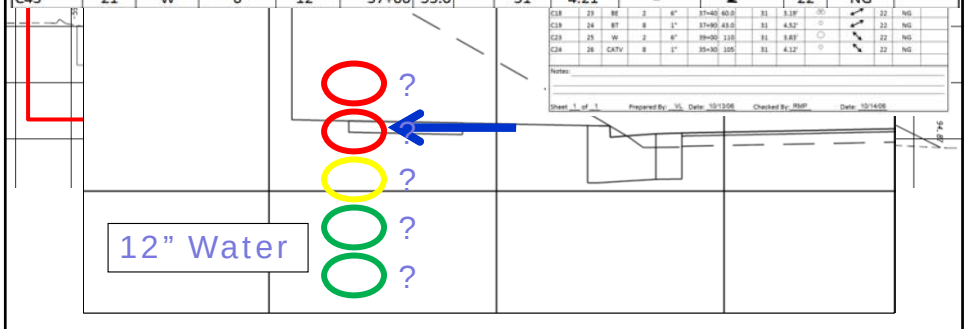
Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action or Resolution	Est. Res. Date	Resolution Status
AWS	C16	1	Water	30" ductile iron pipe	Proposed 18" drainage pipe would cross water main	36+50	36+50	47' LT		QLA	17	Review possibility of adjusting drainage pipe up to avoid conflict	n/a	Utility conflict created
CPS	C32	1	Electric	45" pole	Existing pole in proposed roadway	34+55		40' RT		QLC		Pole to be relocated	n/a	Utility conflict created



Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action or Resolution	Est. Res. Date	Resolution Status
AWS	C16	1	Water	30" ductile iron pipe	Proposed 18" drainage pipe would cross water main	36+50	36+50	47' LT		QLA	17	Review possibility of adjusting drainage pipe up to avoid conflict	n/a	Utility conflict created
CPS	C32	1	Electric	45" pole	Existing pole in proposed roadway	34+55		40' RT		QLC		Pole to be relocated	n/a	Utility conflict created



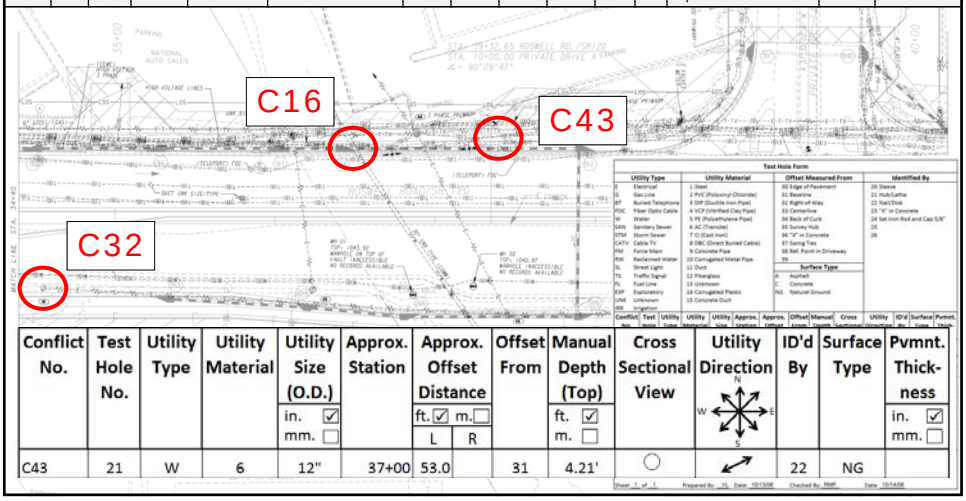
Conflict No.	Test Hole No.	Utility Type	Utility Material	Utility Size (O.D.) in. / mm.	Approx. Station	Approx. Offset Distance ft. / m. L	R	Offset From	Manual Depth (Top) ft. / m.	Cross Sectional View	Utility Direction	ID'd By	Surface Type	Pvmnt. Thick-ness in. / mm.
C43	21	W	6	12"	37+00	53.0		31	4.21'			22	NG	



How deep is the water pipe?

3-56

Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action or Resolution	Est. Res. Date	Resolution Status
AWS	C16	1	Water	30" ductile iron pipe	Proposed 18" drainage pipe would cross water main	36+50	36+50	47' LT		QLA	17	Review possibility of adjusting drainage pipe up to avoid conflict	n/a	Utility conflict created
CPS	C32	1	Electric	45" pole	Existing pole in proposed roadway	34+55		40' RT		QLC		Pole to be relocated	n/a	Utility conflict created
AWS	C43	1	Water	12" water pipe	Proposed sidewalk in conflict with 12" water main	37+00		53' LT		QLA	21	Highway/sidewalk re-design to avoid utility impact	n/a	Utility conflict created



Conflict No.	Test Hole No.	Utility Type	Utility Material	Utility Size (O.D.) in. ☑ mm. ☐	Approx. Station	Approx. Offset Distance ft. ☑ m. ☐ L	R	Offset From	Manual Depth (Top) ft. ☑ m. ☐	Cross Sectional View	Utility Direction	ID'd By	Surface Type	Pvmnt. Thick-ness in. ☑ mm. ☐
C43	21	W	6	12"	37+00	53.0		31	4.21'	○	↔	22	NG	

Utility Conflict Matrix

Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action or Resolution	Est. Res. Date	Resolution Status
AWS	C16	1	Water	30" ductile iron pipe	Proposed 18" drainage pipe would cross water main	36+50	36+50	47' LT		QLA	17	Review possibility of adjusting drainage pipe up to avoid conflict	n/a	Utility conflict created
CPS	C32	1	Electric	45" pole	Existing pole in proposed roadway	34+55		40' RT		QLC		Pole to be relocated	n/a	Utility conflict created
AWS	C43	1	Water	12" water pipe	Proposed sidewalk in conflict with 12" water main	37+00		53' LT		QLA	21	Highway/sidewalk re-design to avoid utility impact	n/a	Utility conflict created
CPS	C54	1	Electric	45' pole	Existing pole in proposed curb line	38+30		57' RT		QLC		Pole to be relocated	n/a	Utility conflict created
CPS	C55	1	Electric	45' pole	Existing pole in area of grade cut	38+50		63' RT		QLC		Pole may need to be supported or replaced with taller pole	n/a	Utility conflict created
CPS	C61	1	Electric	45' pole	Existing pole in proposed curb line	40+00		52' RT		QLC		Pole to be relocated	n/a	Utility conflict created
ATT	C28	1	Commu nication	45' pole	Existing pole in conflict with proposed drainage	40+15		65' LT		QLC		Pole to be relocated	n/a	Utility conflict created

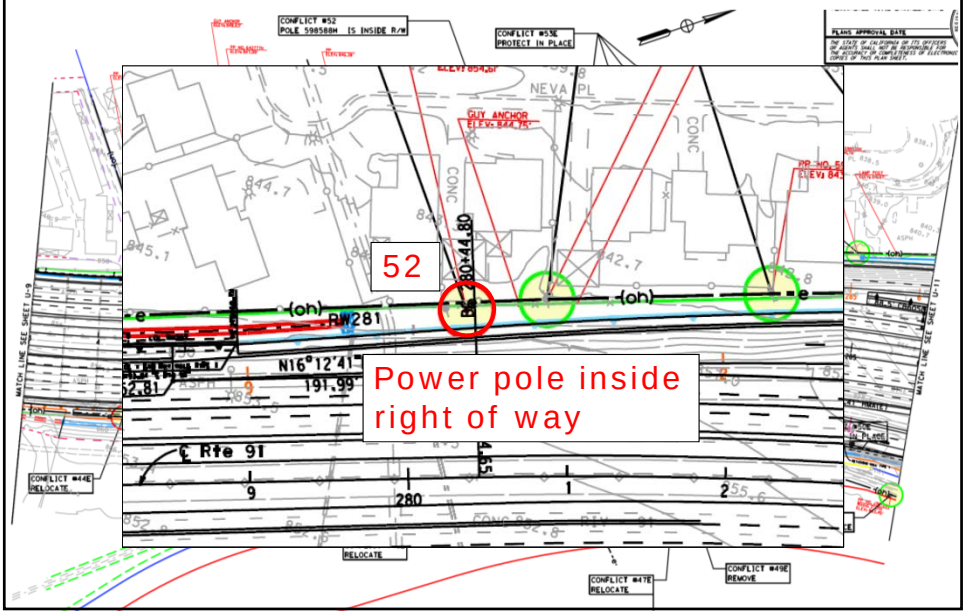
3-58

Sample Application No. 2

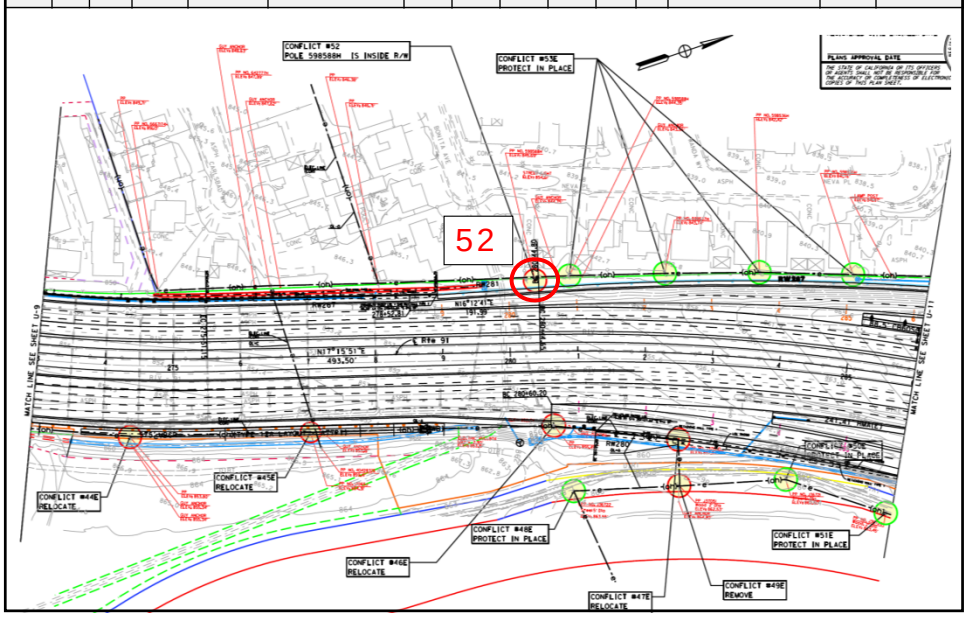
- California DOT project
  - US 91
  - Riverside, east of Los Angeles, Riverside County

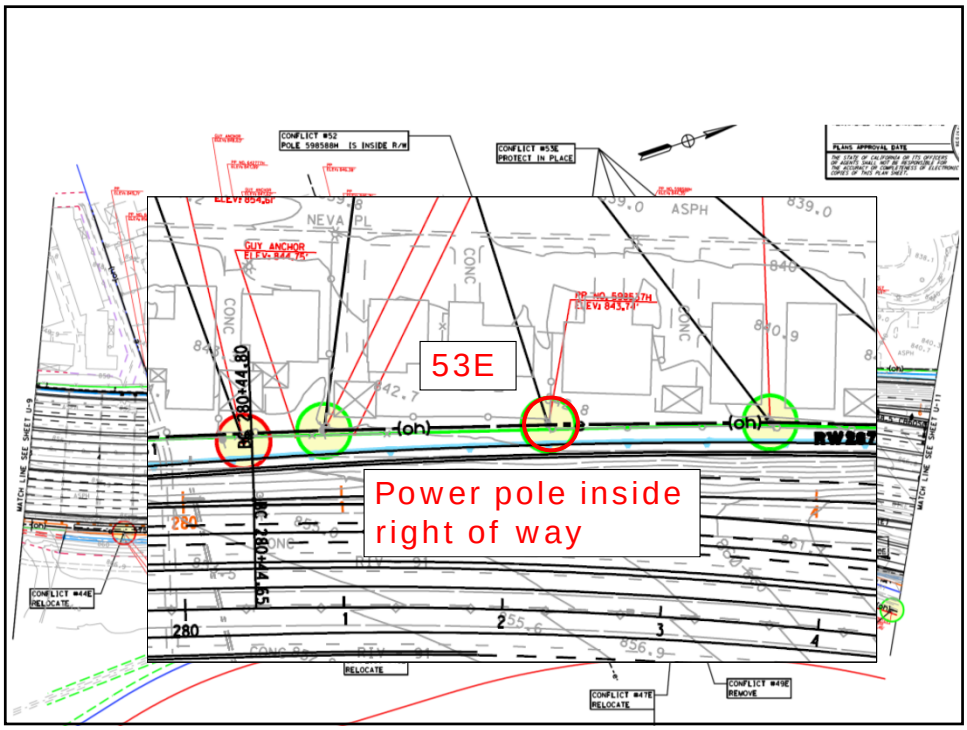
3-59

Project Plan View

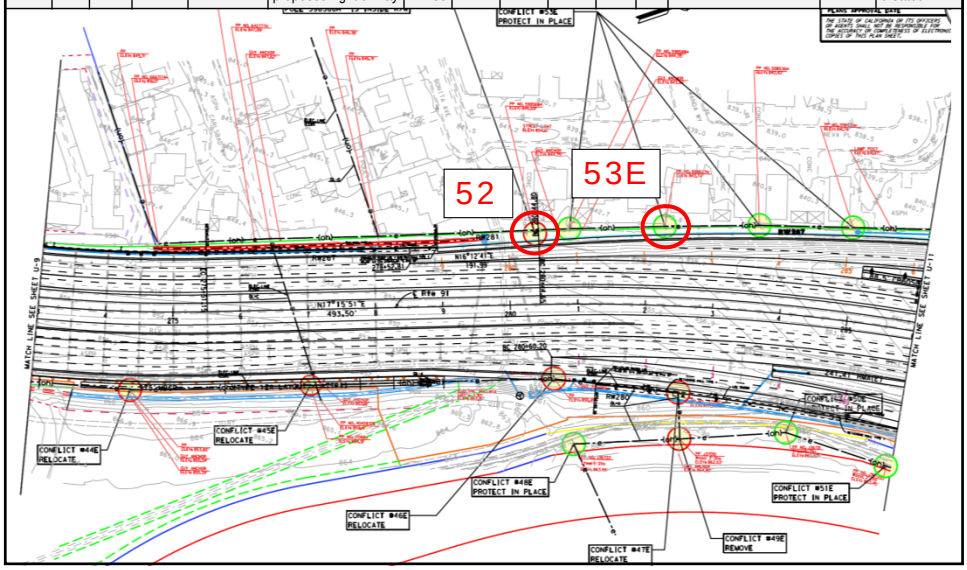


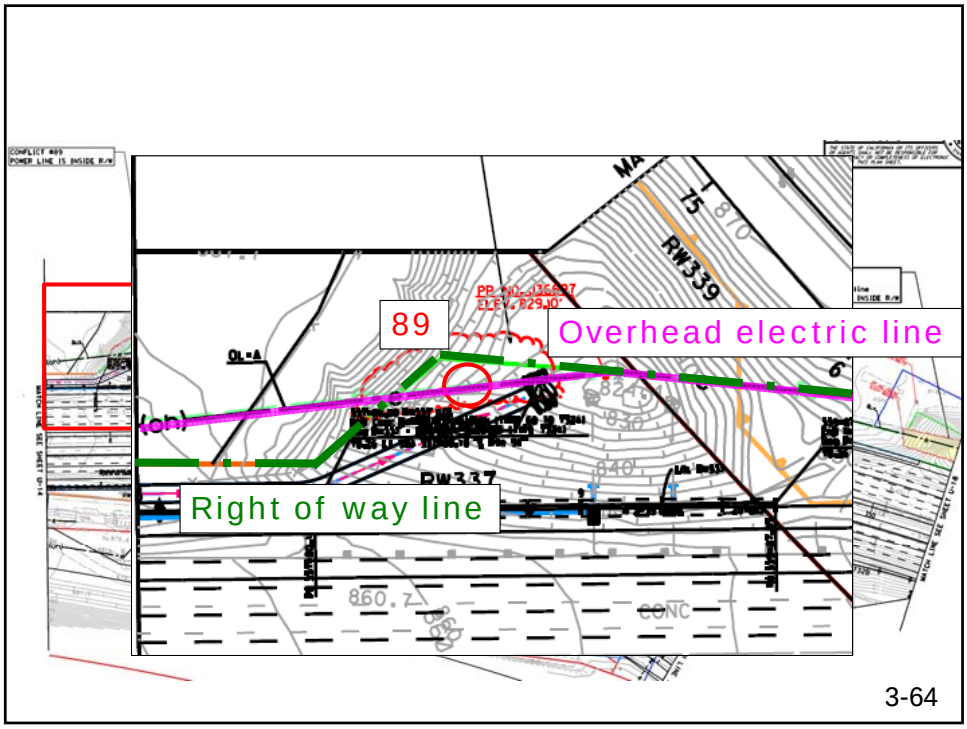
Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action or Resolution	Est. Res. Date	Resolution Status
CP	52	U-10	Electric	Pole	Pole is in conflict with retaining wall.	280 +50		80' LT		QLC		Review possibility of modifying retaining wall 281 to avoid conflict	n/a	Utility conflict created



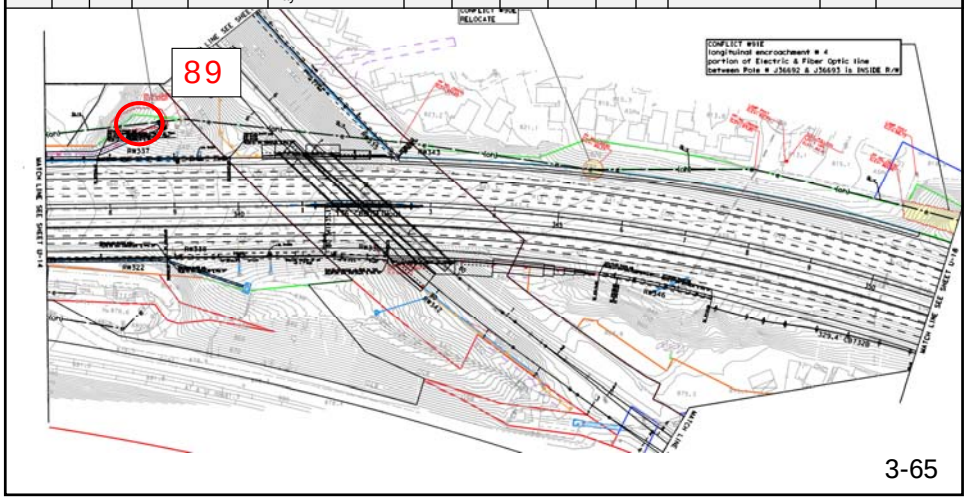


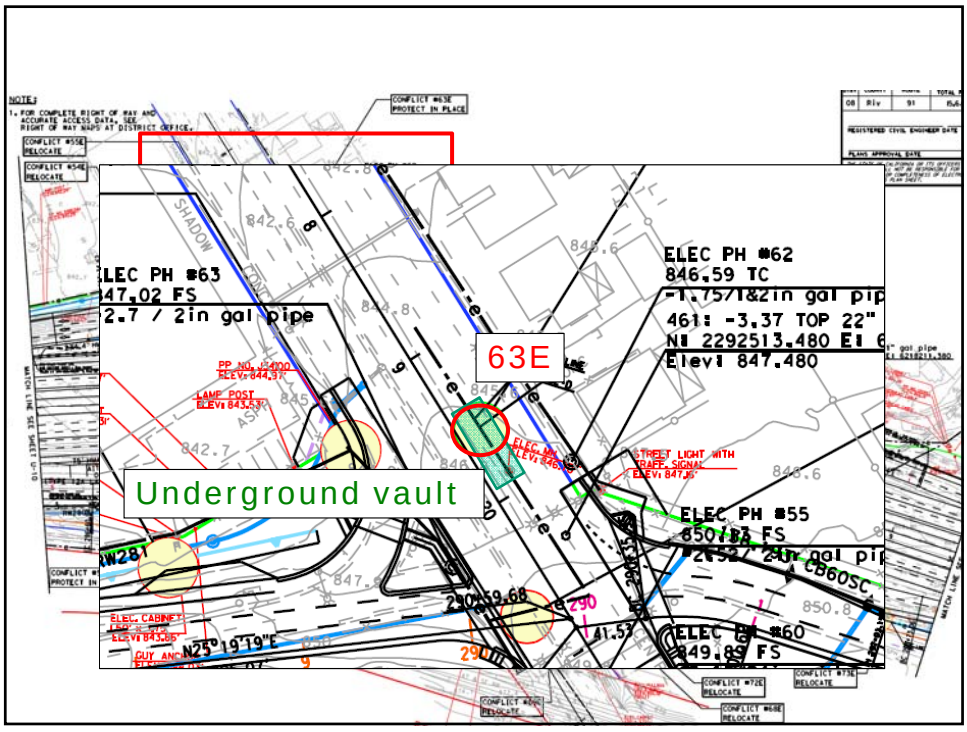
Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action or Resolution	Est. Res. Date	Resolution Status
CP	52	U-10	Electric	Pole	Pole is in conflict with retaining wall.	280 +50		80' LT		QLC		Review possibility of modifying retaining wall 281 to avoid conflict	n/a	Utility conflict created
CP	53E	U-10	Electric	Pole	Pole is within the proposed right of way	282+ 50		80' LT		QLC		Protect in place	n/a	Utility conflict created



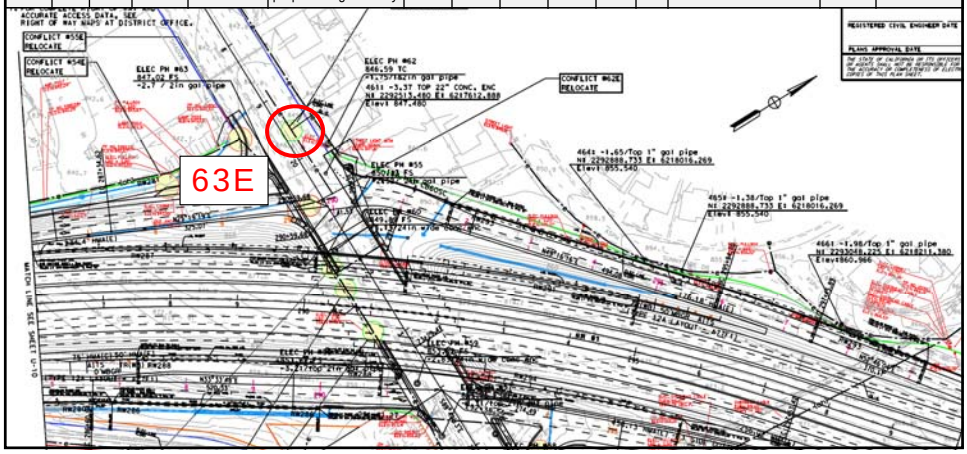


Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action or Resolution	Est. Res. Date	Resolution Status
CP	52	U-10	Electric	Pole	Pole is in conflict with retaining wall.	280 +50		80' LT		QLC		Review possibility of modifying retaining wall 281 to avoid conflict	n/a	Utility conflict created
CP	53E	U-10	Electric	Pole	Pole is within the proposed right of way	282+ 50		80' LT		QLC		Protect in place	n/a	Utility conflict created
CP	89	U-15	Electric	Pole	Power line is within the proposed right of way	348 +00	349 +00	75' LT	85' LT	QLC		Relocate utility line	n/a	Utility conflict created





Utility Owner	ID	Sheet No.	Utility Type	Size/ Material	Utility Conflict Description	Start Sta.	End Sta.	Start Offset	End Offset	Inv. Need	Test Hole	Recommended Action or Resolution	Est. Res. Date	Resolution Status
CP	52	U-10	Electric	Pole	Pole is in conflict with retaining wall.	280 +50		80' LT		QLC		Review possibility of modifying retaining wall 281 to avoid conflict	n/a	Utility conflict created
CP	53E	U-10	Electric	Pole	Pole is within the proposed right of way	282+ 50		80' LT		QLC		Protect in place	n/a	Utility conflict created
CP	89	U-15	Electric	Pole	Power line is within the proposed right of way	348 +00	349 +00	75' LT	85' LT	QLC		Relocate utility line	n/a	Utility conflict created
EPP	63E	U-11	Unkno wn	Vault	Vault is within the proposed right of way	19+50		0		QLA	14	Protect in place	n/a	Utility conflict created



In Summary ...

- Gather available info
- Identify potential utility conflicts
- Prepare utility conflict matrix
- Evaluate alternatives (both utility and project)
- Conduct utility conflict analysis
- Coordinate with stakeholders
- Iterative process (pending design progression)
- Goal: minimize unnecessary utility relocations

3-68

3.2

Discussion, questions, and answers

3-69

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Lesson 4

Use of Database Approach to Manage Utility Conflicts

4-1

Course Overview

8:30 AM – 9:00 AM	Introductions and Course Overview
9:00 AM – 10:15 AM	Utility Conflict Concepts
10:15 AM – 10:30 AM	Morning Break
10:30 AM – 11:45 AM	Utility Conflict Identification and Management
11:45 AM – 1:00 PM	Lunch Break
1:00 PM – 1:20 PM	Database Approach to Manage Utility Conflicts
1:20 PM – 2:20 PM	Hands-On Utility Conflict Exercise Part I
2:20 PM – 2:35 PM	Afternoon break
2:35 PM – 3:35 PM	Hands-On Utility Conflict Exercise Part II
3:35 PM – 3:45 PM	Wrap-Up

4-2

Lesson 4 Overview

4.1 Data Model and Database Structure

4.2 Use of Access Database to Manage Utility Conflicts

4.3 Questions and Answers

4-3

4.1

Data Model and Database Structure

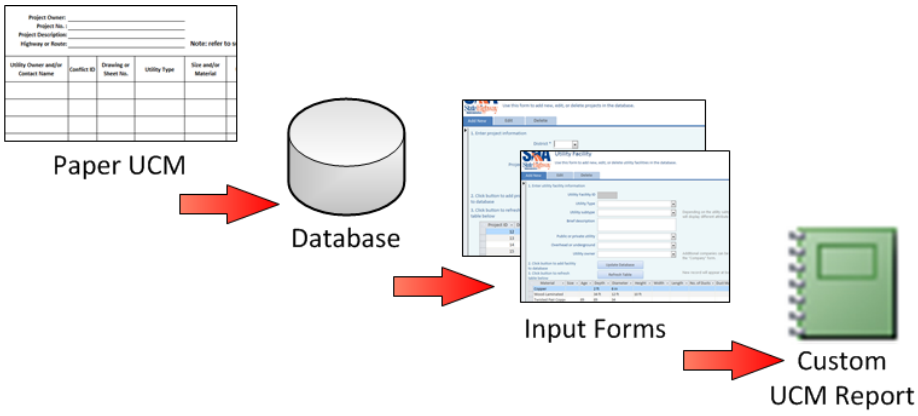
4-4

Need for Database Approach

- Problem: "The UCM in Excel is great, but…"
  - I need a column for relocation priority
  - I need to track prior rights
  - I need to track when preliminary plans/semi-final plans/final plans were sent to the utility owner
  - I need to track as-builts, both request date and respond date
  - I have hundreds of utility conflicts to manage.
  - …
- Solution: use database to manage utility conflicts

4-5

Custom UCMs



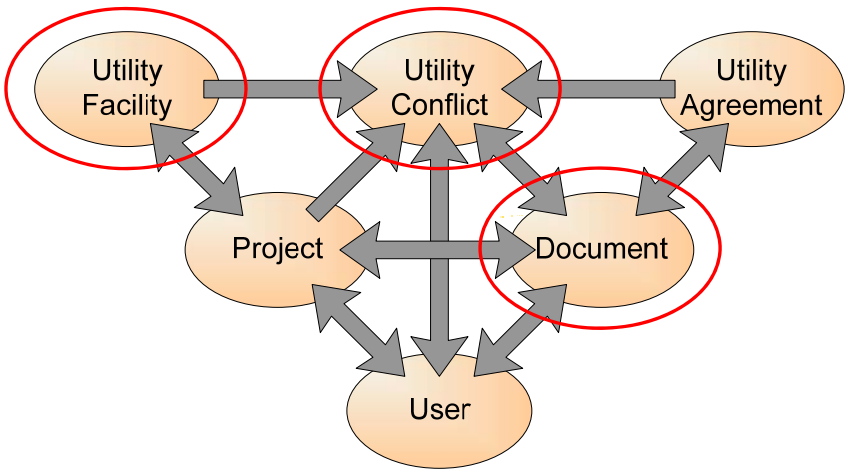
4-6

Data Model Development

- Based on 26 UCMs in use nationwide
- Formal data model (ERwin format)
- Tested in MS Access environment
- Enterprise database support (Oracle, SQL Server)
- UCM is **one of many** queries/reports possible

4-7

Conceptual Model



4-8

Advantages of a Database Approach

- Flexible structure
  - Based on large number of diverse state DOT UCMs
  - Based on large number of data items
- Adapts to DOT needs and business process
  - Choose which portions to implement
- Scalable
  - Add records in lookup tables as needed
- Can link to existing DOT data systems

4-9

4.2

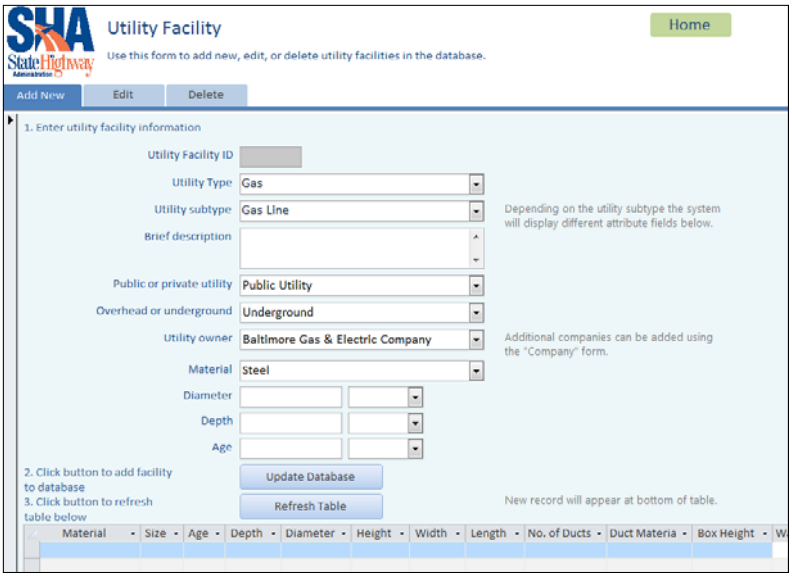
Use of Access Database to Manage Utility Conflicts

4-10

Sample Data Entry Form

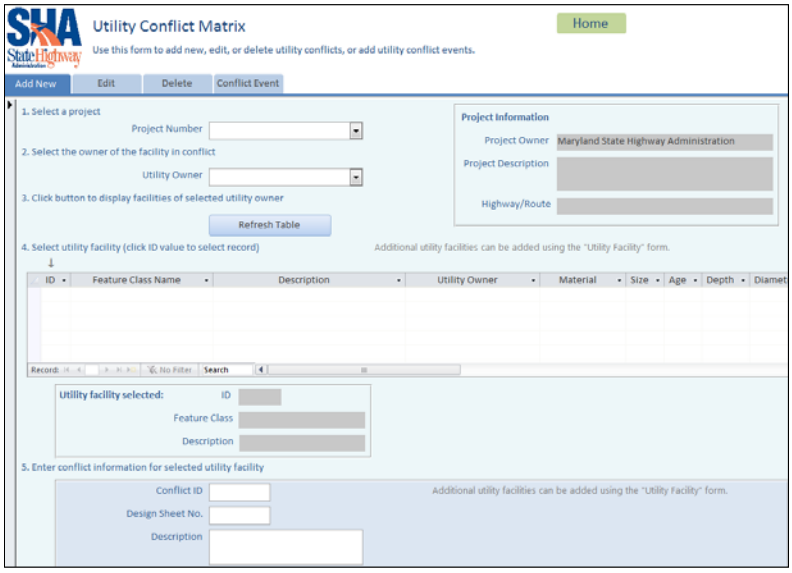
4-11

Sample Data Entry Form



4-12

Sample Data Entry Form



4-13

Sample UCM Reports

- Standard UCM
- Alaska DOT
- California DOT

4-14

Excel Spreadsheet UCM

Utility Conflict Matrix

Project Owner: Texas Department of Transportation
Project No. : 1234-56-789
Project Description: Road construction project in Houston
Highway or Route: I-10 Katy Freeway

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

Note: refer to subsheet for utility conflict cost analysis.

Utility Owner and/or Contact Name	Conflict ID	Drawing or Sheet No.	Utility Type	Size and/or Material	Utility Conflict Description	Start Station	Start Offset	End Station	End Offset	Utility Investigation Level Needed	Test Hole	Recommended Action or Resolution	Estimated Resolution Date	Resolution Status
AT&T	1	U-1	Communications	Fiber Optic	Conflict with construction of frontage road widening.	21+00	45' Lt	22+00	45' Lt	QLC		Relocation befor construction.	3/8/2010	Utility conflict created
AT&T	2	U-1	Communications	Fiber Optic	Conflict with construction of frontage road widening.	21+80	37' Rt	23+00	37' Rt	QLC		Relocation befor construction.	3/8/2010	Utility conflict created
AT&T	3	U-1	Communications	Fiber Optic	Conflict with construction of frontage road widening.	27+50	48' Rt	30+00	48' Rt	QLC		Relocation befor construction.	3/8/2010	Utility conflict created
AT&T	4	U-1	Communications	Fiber Optic	Conflict with construction of frontage road widening.	44+40	48' Rt	45+15	48' Rt	QLC		Relocation befor construction.	3/8/2010	Utility conflict created
AT&T	5	U-1	Communications	Unknown	Conflict with construction of frontage road widening.	45+10	49' Lt	45+20	49' Lt	QLB		Design change.	3/8/2010	Utility owner informed of utility conflict
AT&T	6	U-1	Communications	Copper	Conflict with retaining wall No. 18.	45+80	57' Lt	45+90	49' Lt	QLB		Design change.	3/8/2010	Utility conflict created
AT&T	7	U-1	Communications	Copper	Conflict with retaining wall No. 18.	25+80	65' Lt	25+90	49' Lt	QLC		Protect in-place.	3/8/2010	Utility conflict created
AT&T	8	U-1	Communications	Copper	Conflict with retaining wall No. 18.	25+80	62' Rt	25+90	49' Lt	QLC		Protect in-place.	3/8/2010	Utility conflict created
AT&T	9	U-1	Communications	Copper	Conflict with retaining wall No. 18.	27+40	55' Lt	28+00	55' Lt	QLC		Protect in-place.	3/8/2010	Utility conflict created
AT&T	10	U-1	Communications	Copper	Conflict with retaining wall No. 18.	27+40	55' Rt	28+00	55' Lt	QLC		Protect in-place.	3/8/2010	Utility conflict created
AT&T	11	U-1	Communications	Copper	Conflict with retaining wall No. 18.	28+05	62' Rt	29+00	55' Lt	QLC		Exception to policy.	3/8/2010	Utility conflict created
AT&T	12	U-2	Communications	Multiple Concrete Duct	Conflict with retaining wall No. 18.	15+50	49' Lt	16+00	80 ' Rt	QLC		Design change.	3/8/2010	Utility owner informed of utility conflict
AT&T	13	U-2	Communications	Multiple Concrete Duct	Conflict with retaining wall No. 27.	15+90	40' Lt	16+00	80 ' Rt	QLC		Design change.	3/8/2010	Utility owner informed of utility conflict
AT&T	14	U-2	Communications	Multiple Concrete Duct	Conflict with retaining wall No. 27.	20+40	115' Rt	22+00	80 ' Rt	QLC		Design change.	3/8/2010	Utility owner informed of utility conflict
AT&T	15	U-2	Communications	Multiple Concrete Duct	Conflict with retaining wall No. 27.	22+30	80' Rt	23+00	80 ' Rt	QLC		Design change.	3/8/2010	Utility owner informed of utility conflict
AT&T	16	U-2	Communications	Multiple Concrete Duct	Conflict with retaining wall No. 27.	25+85	55' Rt	28+00	80 ' Rt	QLB		Design change.	3/8/2010	Utility owner informed of utility conflict
AT&T	17	U-2	Communications	Multiple Concrete Duct	Conflict with retaining wall No. 27.	28+05	62' Rt	30+00	80 ' Rt	QLB		Design change.	3/8/2010	Utility owner informed of utility conflict

4-15

UCM Database Report

Utility Conflict Matrix

Project Owner: Texas Department of Transportation
Project No.: 1234-56-789
Project Description: Road construction project in Houston
Highway or Route: I-10 Katy Freeway

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

Utility Owner and/or Contact Name	Conflict ID	Drawing or Sheet No.	Utility Type	Size and/or Material	Utility Conflict Description	Start Station	End Station	Start Offset	End Offset	Utility Investigation Level Needed	Test Hole No.	Recommended Action or Resolution	Responsible Party	Estimated Resolution Date	Resolution Status	Cost Analysis
AT&T	1	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	21+00	22+00	45' Lt	45' Lt	QLC		Relocation before construction.	U	3/8/2010	Utility conflict identified	Detail
AT&T	2	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	21+80	23+00	37' Rt	37' Rt	QLC		Relocation before construction.	U	3/8/2010	Utility conflict identified	Detail
AT&T	3	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	27+50	30+00	48' Rt	48' Rt	QLC		Relocation before construction.	U	3/8/2010	Utility conflict identified	Detail
AT&T	4	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	44+40	45+15	48' Rt	48' Rt	QLC		Relocation before construction.	U	3/8/2010	Utility conflict identified	Detail
AT&T	5	U-1	Telephone	Unknown	Conflict with construction of frontage road widening.	45+10	45+20	49' Lt	49' Lt	QLB		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	6	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	45+80	45+90	57' Lt	49' Lt	QLB		Design change.	D	3/8/2010	Utility conflict identified	Detail
AT&T	7	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	25+80	25+90	65' Lt	49' Lt	QLC		Protect in-place.	U/D	3/8/2010	Utility conflict identified	Detail
AT&T	8	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	25+80	25+90	62' Rt	49' Lt	QLC		Protect in-place.	U/D	3/8/2010	Utility conflict identified	Detail
AT&T	9	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	27+40	28+00	55' Lt	55' Lt	QLC		Protect in-place.	U/D	3/8/2010	Utility conflict identified	Detail
AT&T	10	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	27+40	28+00	55' Rt	55' Lt	QLC		Protect in-place.	U/D	3/8/2010	Utility conflict identified	Detail
AT&T	11	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	28+05	29+00	62' Rt	55' Lt	QLC		Exception to policy.	N/A	3/8/2010	Utility conflict identified	Detail
AT&T	12	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 18.	15+50	16+00	49' Lt	80' Rt	QLC		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	13	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	15+90	16+00	40' Lt	80' Rt	QLC		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	14	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	20+40	22+00	115' Rt	80' Rt	QLC		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	15	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	22+30	23+00	80' Rt	80' Rt	QLC		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	16	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	25+85	28+00	55' Rt	80' Rt	QLB		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	17	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	28+05	30+00	62' Rt	80' Rt	QLB		Design change.	D	3/8/2010	Utility owner informed of utility conflict	Detail

4-16

Excel Spreadsheet Sub Sheet

Utility Conflict Resolution Alternatives
Cost Estimate Analysis

Project Owner: Texas Department of Transportation
Project No. : 1234-56-789
Project Description: Road construction project in Houston
Highway or Route: I-10 Katy Freeway

Cost Estimate Analysis Developed/Revised By
Date 11/24/2010
Reviewed By
Date

Utility Conflict: 1
Utility Owner: AT&T
Utility Type: Communications
Size and/or Material: Fiber Optic
Project Phase: 60% Design

Alternative Number	Alternative Description	Alternative Advantage	Alternative Disadvantage	Responsible Party	Engineering Cost (Utility)	Direct Cost (Utility)	Engineering Cost (DOT)	Direct Cost (DOT)	Total Cost	Feasibility	Decision
0	Relocation before construction.	No design change required and no additional cost to DOT.	Cost to utility for relocation.	Utility	$ 10,375.00	$63,875.00	$ -	$ -	$74,250.00	Yes	Selected
1	Protect in-place.			Utility	$ 7,875.00	$32,375.00	$ -	$ -	$40,250.00	No	Rejected
2	Design change.			DOT	$ -	$ -	$95,375.00	$ -	$95,375.00	No	Rejected
3	Exception to policy.			DOT	$ -	$ -	$ -	$ -	$ -	No	Rejected

4-17

Sub Sheet Database Report

Utility Conflict Resolution Alternatives
Cost Estimate Analysis

Date: 11/24/2010

Project Owner: Texas Department of Transportation
Project No.: 1234-56-789
Project Description: Road construction project in Houston
Highway or Route: I-10 Katy Freeway

Conflict ID: 1
Utility Owner: AT&T
Utility Type: Telephone
Size and/or Material: Fiber Optic
Project Phase: 60% Design

Alternative Number	Alternative Description	Alternative Advantage	Alternative Disadvantage	Responsible Party	Engineering Cost (Utility)	Direct Cost (Utility)	Engineering Cost (DOT)	Direct Cost (DOT)	Total Cost	Feasibility	Decision
0	Relocation before construction.	No design change required and no additional cost to DOT.	Cost to utility for relocation.	Utility Company	$10,375.00	$63,875.00	$0.00	$0.00	$74,250.00	Yes	Selected
1	Protect in-place.			Utility Company	$7,875.00	$32,375.00	$0.00	$0.00	$40,250.00	No	Rejected
2	Design change.			DOT	$0.00	$0.00	$95,375.00	$0.00	$95,375.00	No	Rejected
3	Exception to policy.			DOT	$0.00	$0.00	$0.00	$0.00	$0.00	No	Rejected

4-18

Alaska DOT: Sample Report

DRAFT Utility Conflict Report
West Dowling Road Phase I

Anchorage, Alaska
DOT&PF No. 50898

Table 2: Chugach Electric Association, Incorporated, Conflicts Summary

Station	Offset	Station	Offset	Size/Type	Length	Conflict	ADJ/REL	Cost	PE/CE Cost	Total Cost
CEA Distribution Relocation Costs										
9+00	150' RT		200' LT	3φ UG	350	FG	REL	52,500	15,750	68,250
16+00	100' LT	42+30	80' LT	3φ UG	2630	FG	REL	394,500	118,350	512,850
16+00	100' LT	15+50	100' RT	3φ UG	250	FG	REL	37,500	11,250	48,750
16+00	100' LT	29+00	75' LT	1φ UG	1650	FG	REL	165,000	49,500	214,500
36+40	80' LT	35+80	350' RT	3φ UG	430	FG	REL	64,500	19,350	83,850
36+60	80' LT	36+70	380' LT	3φ UG	300	FG	REL	45,000	13,500	58,500
	UG Loop to the North			3φ UG	1000	FG	REL	150,000	45,000	195,000
							Subtotal	909,000	272,700	1,181,700
CEA Transmission Relocation Costs										
14+75	55' RT			138 kV OH	1	PWY	REL	30,000	9,000	39,000
32+75	55' RT			138 kV OH	1	EX	REL	50,000	15,000	65,000
36+38	45' RT			138 kV OH	1	EX	REL	50,000	15,000	65,000
							Subtotal	130,000	39,000	169,000
							Total CEA Relocation Costs	**1,039,000**	**311,700**	**1,350,700**

1φ Underground (UG) loop to extend across Dowling Road and along the south side to reconnect existing services.
UG loop provided to the north of the project to accommodate undergrounding.
Removal of existing swamp braces removed and steel piling added, down guys replaced with overhead span guy and down guys.

4-19

Alaska DOT: Database Report

Alaska UCM

DRAFT Utility Conflict Report
West Dowling Road Phase 1

Anchorage, Alaska
DOT&PF No. 50898

Start Station	Start Offset	End Station	End Offset	Size	Type	Length	Conflict	ADJ/REL	Cost	PE/CE Cost	Total Cost
CEA Distribution Relocation Costs											
9+00	150' RT		200' LT	3 phi	UG	350	FG	Relocation before construction	$52,500	$15,750	$68,250
16+00	100' LT	42+30	80' LT	3 phi	UG	2,630	FG	Relocation before construction	$394,500	$118,350	$512,850
16+00	100' LT	15+50	100' RT	3 phi	UG	250	FG	Relocation before construction	$37,500	$11,250	$48,750
16+00	100' LT	29+00	75' LT	1 phi	UG	1,650	FG	Relocation before construction	$165,000	$49,500	$214,500
36+40	80' LT	35+80	350' RT	3 phi	UG	430	FG	Relocation before construction	$64,500	$19,350	$83,850
36+60	80' LT	36+70	380' LT	3 phi	UG	300	FG	Relocation before construction	$45,000	$13,500	$58,500
	UG Loop to the North			3 phi	UG	1,000	FG	Relocation before construction	$150,000	$45,000	$195,000
								Subtotal:	$909,000	$272,700	$1,181,700
CEA Transmission Relocation Costs											
14+75	55' RT			138 kV	OH	1	PWY	Relocation before construction	$30,000	$9,000	$39,000
32+75	55' RT			138 kV	OH	1	EX	Relocation before construction	$50,000	$15,000	$65,000
36+38	45' RT			138 kV	OH	1	EX	Relocation before construction	$50,000	$15,000	$65,000
								Subtotal:	$130,000	$39,000	$169,000
								Total Relocation Costs:	**$1,039,000**	**$311,700**	**$1,350,700**

California DOT: Sample Report

I-10-EA 122401-Utilities Conflict Status

date of last revision May 30, 2000

this document was prepared by

Conflict No.	Utility Sheet No.	Pothole No. (On U-sheets)	Owner	Utility Description	Pothole/Manhole Location	Conflict Location	Utility Conflict/ Work Description	Investigation: Pothole	Investigation: Manhole	Investigation: Overhead	Depth (ft)	Impact? Y	Impact? N	Action: Remove	Action: Relocate	Action: Other	Util. Reloc. A- Abandon RB- Reloc.Before RD- Reloc.During P- Protect in place NC- No conflict	Resp. Party U- UtilityCo C- Contractor	Required Completion Date	Comments
1	U-2	1	PACBELL	40 DU Telephone	62 m Rt of I-405 Sta 165+55	40 m Rt and 57 m Rt of I-405 Sta 165+55	conflict with Retaining Walls No. 166 & No. 168	X			4.55 14.40		N				P			
2	U-2	2	PACBELL	40 DU Telephone	48 m Lt of I-405 Sta 165+55	40 m Rt and 57 m Rt of I-405 Sta 165+55	conflict with Retaining Walls No. 166 & No. 168				-		N				P			
3	U-3	3	SCE	25 mm DU	35 m Rt of I-405 Sta 165+01	43 m Rt of I-405 Sta 165+01	conflict with Retaining Wall No. 166				-		N				P			Located in Bristol OC
4	U-3	4	SCE	25 mm DU	46 m Lt of I-405 Sta 165+01	43 m Rt of I-405 Sta 165+01	conflict with Retaining Wall No. 166				-		N				P			Located in Bristol OC
5	U-3	5	MWD	900 mm WSP Water in 380 mL ENC	50 m Rt of I-405 Sta 164+96	44 m Rt of I-405 Sta 164+95	conflict with Retaining Wall No. 166	X			6.70		N				P			
6	U-3	6	MWD	900 mm WSP Water in 380 mL ENC	50 m Lt of I-405 Sta 164+96	44 m Rt of I-405 Sta 164+95	conflict with Retaining Wall No. 166	X			6.50		N				P			
7	U-3	7	Caltrans	600 mm RCP	53 m Rt of I-405 Sta 163+42	53 m Rt of I-405 from Sta 163+29 to Sta 163+42	conflict with Delhi Channel Bridge	X			6.00		N				P			
8	U-3	8	Caltrans	600 mm RCP	53 m Rt of I-405 Sta 163+29	53 m Rt of I-405 from Sta 163+29 to Sta 163+42	conflict with Delhi Channel Bridge	X			9.00		N				P			
9	U-3	9	MCWD	300 mm ACP Water in 119mL, 500mm STL Casing	32 m Rt of I-405 Sta 163+25	35 m Rt of I-405 Sta 163+25	conflict with I-405 Widening & BR1 Line	X			10.30		N				P			
10	U-3	10	MCWD	300 mm ACP Water 119mL, 500mm STL Casing	32 m Lt of I-405 Sta 163+25	33 m Lt of I-405 Sta 163+25	conflict with I-405 Widening & BR1 Line	X			8.75		N				P			
11	U-3	MH 11	CSDOC	Manhole	81 m Rt of I-405 Sta 162+92	35 m Rt of I-405 Sta 162+92	conflict with I-405 Widening & BR1 Line		X		18.40		N				P			
12	U-3	12	CSDOC	380 mm VCP Sewer	36 m Lt of I-405 Sta 162+91	32 m Lt of I-405 Sta 162+90	conflict with I-405 Widening & BR1 Line				-		N				P			
13	U-4	13	MCWD	600mm CCP Water in 94m L 900mm Dia Stl Casing	67 m Rt of I-405 Sta 161+44	58 m Rt of I-405 Sta 161+44	Conflict with Airport Channel	X			4.55	Y			X	X	RB			600 mm Waterline to be Lowered Extend Encasement
14	U-4	14	MCWD	600mm CCP Water in 94m L 900mm Dia Stl Casing	38 m Lt of I-405 Sta 161+40	32 m Lt of I-405 Sta 161+42	conflict with I-405 Widening				-		N				P			
15	U-4	15	MCWD	300 mm ACP Water	70 m Rt of I-405 Sta 160+29	72 m Rt of I-405 from Sta 157+20 to Sta 160+29	Conflict with AOA Line and Retaining Wall No. 268	X			-	Y			X		RD			Enchroachment CT R/W and Private Owne Encased under Roadway
16	U-4	16	MCWD	300 mm ACP Water	70 m Rt of I-405 Sta 159+07	72 m Rt of I-405 from Sta 157+20 to Sta 160+29	Conflict with AOA Line and Retaining Wall No. 268	X			-	Y			X		RD			Enchroachment CT R/W and Private Owne Encased under Roadway
17	U-5	17	MCWD	300 mm ACP Water	70 m Rt of I-405 Sta 156+87	72 m Rt of I-405 from Sta 157+20 to Sta 160+29	conflict with AOA Line and Retaining Wall No. 268	X			4.35		N				P			
18	U-5	MH 18	CSDOC	Manhole	60 m Rt of I-405 Sta 156+65	28 m Rt of I-405 Sta 156+65	conflict with I-405 Widening		X		16.20		N				P			
19	U-5	19	CSDOC	380 mm VCP Sewer	46 m Lt of I-405 Sta 156+65	25 m Rt of I-405 Sta 156+65	conflict with I-405 Widening	X			18.40		N				P			
20	U-5	20	CSDOC	830 mm VCP Sewer	14 m Rt of B2 Sta 24+96		conflict with construction of B2 Line						N				P			
21	U-5	21	CSDOC	830 mm VCP Sewer	6 m Lt of B2 Sta 25+54		conflict with construction of B2 Line						N				P			
22	U-8	MH 22	CSDOC	Manhole	8m Rt of Main St Sta 102+78				X			Y				X	RB			MH to be Lowered New Top MH Elev= 9.588
23	U-8	MH 23 SCE MH 4503	SCE	Manhole No. 4503	8m Rt of Main St Sta 102+87				X			Y				X	RB			MH to be Lowered New Top MH Elev= 9.583 m
24	U-8	MH 24 SCE MH 4502	SCE	Manhole No. 4502	8m Rt of Main St Sta 104+17				X			Y				X	RB			MH to be Lowered New Top MH Elev= 9.728 m

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California DOT: Database Rpt.

California UCM

I-10-EA 122401 - Utilities Conflict Status

Date of last revision: 12/4/2009

This document was prepared by: ____________________

Conflict No.	Utility Sheet No.	Test Hole No.	Owner	Utility Description				Test Hole/ Manhole Location	Start Station	End Station	Offset	Utility Conflict/ Work Description	Utility Conflict Investigation	Depth (ft)	Impact?	Utility Relocation	Resp. Party	Required Completion Date	Comments
1	U-2	1	PACBELL	40 mm	DU	Telephone		62 m Rt of I-405 Sta 165+55	165+55		40 m Rt and 57 m Rt of I-405	Conflict with retaining walls No. 166 and No. 168	QLA	4.55	N	P	U	1/10/2010	
2	U-2	2	PACBELL	40 mm	DU	Telephone		48 m Lt of I-405 Sta 165+55	165+55		40 m Rt and 57 m Rt of I-405	Conflict with retaining walls No. 166 and No. 168		14.40	N	P	U	1/10/2010	
3	U-3	3	SCE	25 mm	DU	Telephone		35 m Rt of I-405 Sta 165+01	165+01		43 m Rt of I-405	Conflict with retaining wall No. 166			N	P	U	1/10/2010	Located in Bristol OC
4	U-3	4	SCE	25 mm	DU	Telephone		46 m Lt of I-405 Sta 165+55	165+01		43 m Rt of I-405	Conflict with retaining wall No. 166			N	P	U		Located in Bristol OC
5	U-3	5	MWD	900 mm		Water	in 380 mL ENC	50 m Rt of I-405 Sta 165+96	164+95		44 m Rt of I-405	Conflict with retaining wall No. 166	QLA	6.70	N	P	U		
6	U-3	6	MWD	900 mm		Water	in 380 mL ENC	50 m Lt of I-405 Sta 165+96	164+95		44 m Rt of I-405	Conflict with retaining wall No. 166	QLA	6.50	N	P	U		
7	U-3	7	Caltrans	600 mm				53 m Rt of I-405 Sta 163+42	163+29	163+24	53 m Rt of I-405	Conflict with Delhi Channel Bridge	QLA	6.00	N	P	U		
8	U-3	8	Caltrans	600 mm				53 m Rt of I-405 Sta 163+29	163+29	163+42	53 m Rt of I-405	Conflict with Delhi Channel Bridge	QLA	9.00	N	P	U		
9	U-3	9	MCWD	300 mm		Water	in 119 mL, 500 mm STL Casing	32 m Rt of I-405 Sta 163+25	163+25		35 m Rt of I-405	Conflict with I-405 widening and BR1 Line	QLA	10.30	N	P	U		
10	U-3	10	MCWD	300 mm		Water	in 119 mL, 500 mm STL Casing	32 m Lt of I-405 Sta 163+25	163+25		33 m Lt of I-405	Conflict with I-405 widening and BR1 Line	QLA	8.75	N	P	U		
11	U-3	MH 11	CSDOC			Manhole		81 m Rt of I-405 Sta 162+92	162+92		35 m Rt of I-405	Conflict with I-405 widening and BR1 Line	QLB	18.40	N	P	U		
12	U-3	12	CSDOC	380 mm		Sewer		36 m Lt of I-405 Sta 162+91	162+92		32 m Lt of I-405	Conflict with I-405 widening and BR1 Line			N	P	U		
13	U-4	13	MCWD	600 mm		Water	in 94 mL, 900 mm STL Casing	67 m Rt of I-405 Sta 161+44	161+44		58 m Rt of I-405	Conflict with airport channel	QLA	4.55	Y	RB	U		600 mm waterline to be lowered, extend encasement
14	U-4	14	MCWD	600 mm		Water	in 94 mL, 900 mm STL Casing	38 m Lt of I-405 Sta 161+40	161+42		32 m Lt of I-405	Conflict with I-405 widening			N	P	U		
15	U-4	15	MCWD	300 mm		Water		70 m Rt of I-405 Sta 160+29	157+20	160+29	72 m Rt of I-405	Conflict with AOA line and retaining wall No. 268	QLA		Y	RD	U		Encroachment CR R/W and private owner, encased under roadway
16	U-4	16	MCWD	300 mm		Water		70 m Rt of I-405 Sta 159+07	157+20	160+29	72 m Rt of I-405	Conflict with AOA line and retaining wall No. 268	QLA		Y	RD	U		Encroachment CR R/W and private owner, encased under roadway
17	U-5	17	MCWD	300 mm		Water		70 m Rt of I-405 Sta 156+87	157+20	160+29	72 m Rt of I-405	Conflict with AOA line and retaining wall No. 268	QLA	4.35	N	P	U		
18	U-5	MH 18	CSDOC			Manhole		60 m Rt of I-405 Sta 156+65	156+65		28 m Rt of I-405	Conflict with I-405 widening	QLB	16.20	N	P	U		

Other Potential Reports

- All utility conflicts associated with company X (project, corridor, or timeframe)
- All water utilities in conflict (project or corridor)
- Average conflict resolution time for electric utilities
- Average conflict resolution time for water utilities on project Z
- All utility conflicts with resolution time >100 days
- Customized UCMs for individual utility companies
- Utility certification for inclusion in PS&E package
- ...

4-23

4.3

Questions and Answers

4-24

Lesson 5

Hands-on Utility Conflict Management Exercise

5-1

Course Overview

8:30 AM – 9:00 AM	Introductions and Course Overview
9:00 AM – 10:15 AM	Utility Conflict Concepts
10:15 AM – 10:30 AM	Morning Break
10:30 AM – 11:45 AM	Utility Conflict Identification and Management
11:45 AM – 1:00 PM	Lunch Break
1:00 PM – 1:20 PM	Database Approach to Manage Utility Conflicts
1:20 PM – 2:20 PM	Hands-On Utility Conflict Exercise Part I
2:20 PM – 2:35 PM	Afternoon break
2:35 PM – 3:35 PM	Hands-On Utility Conflict Exercise Part II
3:35 PM – 3:45 PM	Wrap-Up

5-2

Lesson 5 Overview

5.1 Identify potential conflicts using QLB data (30 min)
5.2 Evaluate conflicts using QLA test hole data (30 min)
Break
5.3 Prepare alternative and cost analysis (30 min)
5.4 Present findings in 3-minute presentation (30 min)

5-3

5.1

Identify Potential Conflicts Using QLB Data

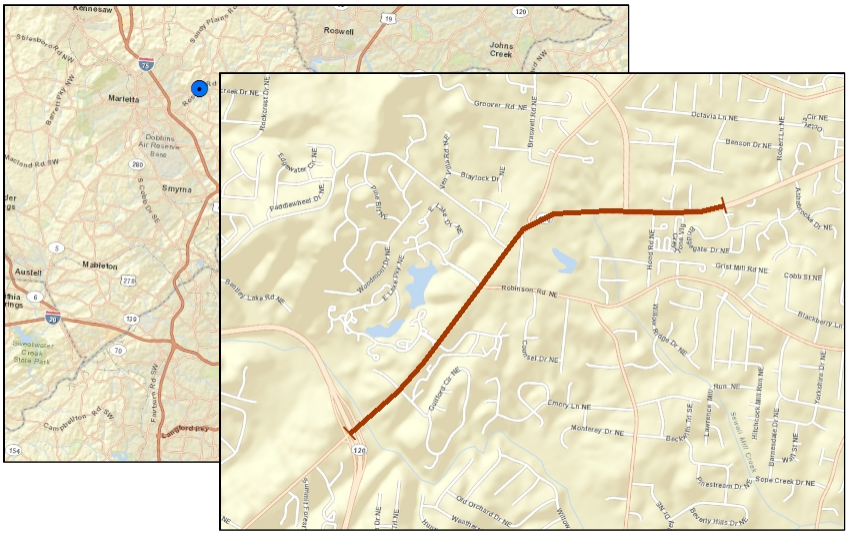
5-4

Project Overview

- Widening of SR 120/Roswell Road from SR 120 ALT to Bridgegate Drive
- Located in Marietta, north-west of Atlanta, Georgia
- Suburban, 4-lane and 6-lane divided sections
- Project length: 1.8 miles
- 13 utility owners
- 135,000 linear feet of underground utilities
- $415K estimated utility impact cost (as designed)

5-5

Project Location and Limits



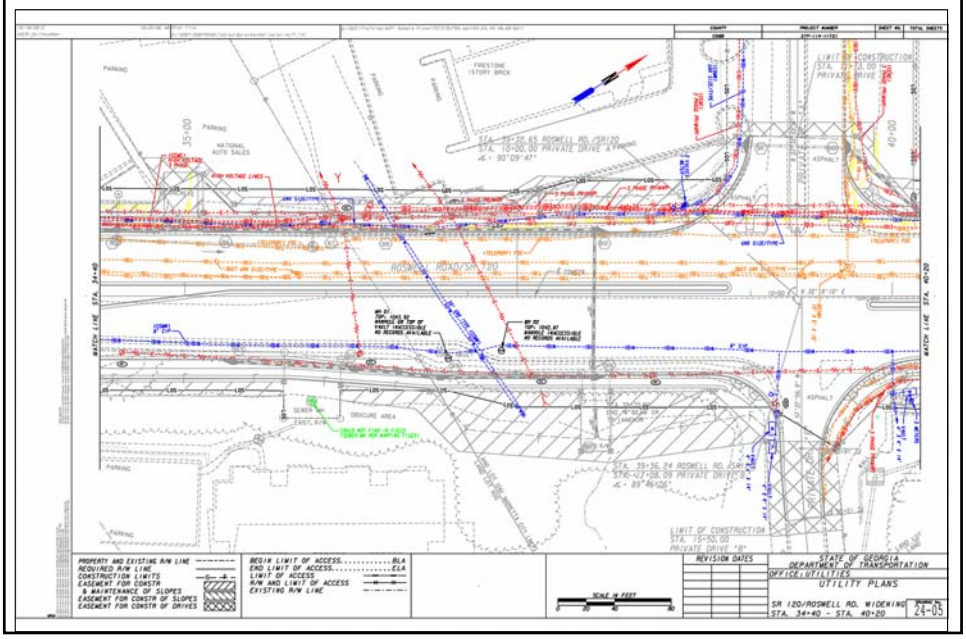
5-6

Exercise Materials

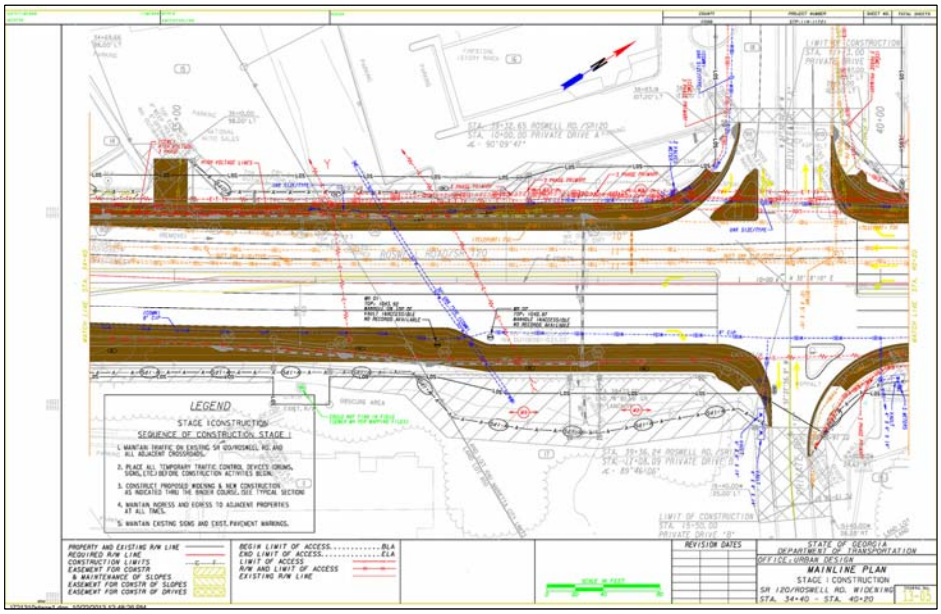
- 13 plan sheets
  - Legend
  - Pole data
  - Typical sections
  - 1 plan, 3 stages, 5 cross sections, 1 drainage profile
- Test hole data sheets
- Blank utility conflict matrix
- Cost estimate analysis sheet

5-7

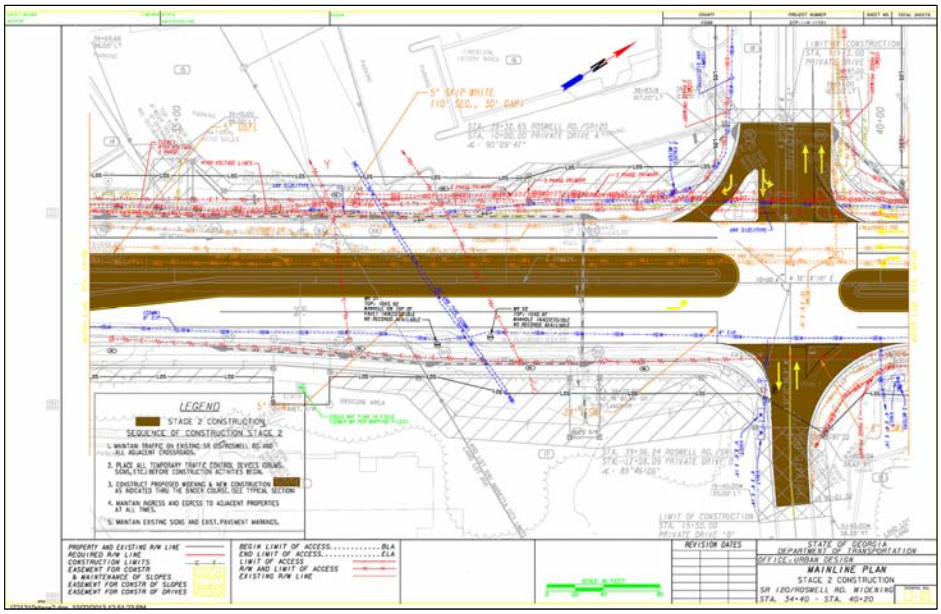
Plan Sheets



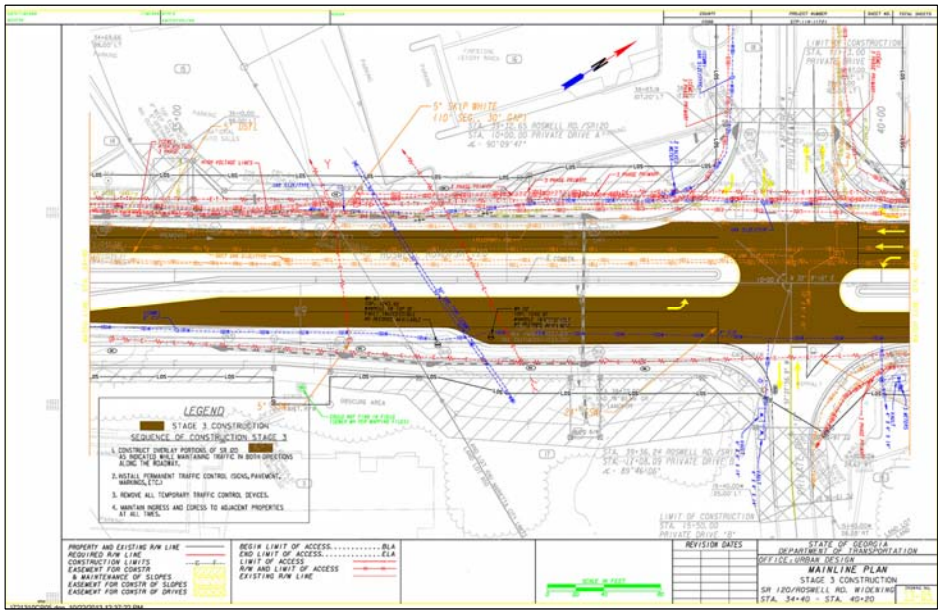
Stage 1 Construction



Stage 2 Construction



Stage 3 Construction



Test Hole Form

Utility Type		Utility Material		Offset Measured From		Identified By	
E	Electrical	1	Steel	30	Edge of Pavement	20	Sleeve
G	Gas Line	2	PVC (Polyvinyl Chloride)	31	Baseline	21	Hub/Lathe
BT	Buried Telephone	3	DIP (Ductile Iron Pipe)	32	Right-of-Way	22	Nail/Disk
FOC	Fiber Optic Cable	4	VCP (Vitrified Clay Pipe)	33	Centerline	23	"X" in Concrete
W	Water	5	PE (Polyethylene Pipe)	34	Back of Curb	24	Set Iron Rod and Cap 5/8"
SAN	Sanitary Sewer	6	AC (Transite)	35	Survey Hub	25	
STM	Storm Sewer	7	CI (Cast Iron)	36	"X" in Concrete	26	
CATV	Cable TV	8	DBC (Direct Buried Cable)	37	Swing Ties		
FM	Force Main	9	Concrete Pipe	38	Ref. Point in Driveway		
RW	Reclaimed Water	10	Corrugated Metal Pipe	39			
SL	Street Light	11	Duct	**Surface Type**			
TS	Traffic Signal	12	Fiberglass	A	Asphalt		
FL	Fuel Line	13	Unknown	C	Concrete		
EXP	Exploratory	14	Corrugated Plastic	NG	Natural Ground		
UNK	Unknown	15	Concrete Duct				
IRR	Irrigation						

Conflict No.	Test Hole No.	Utility Type	Utility Material	Utility Size (O.D.) in. ☑ mm. ☐	Approx. Station	Approx. Offset Distance ft. ☑ m. ☐ L	R	Offset From	Manual Depth (Top) ft. ☑ m. ☐	Cross Sectional View	Utility Direction	ID'd By	Surface Type	Pvmnt. Thick-ness in. ☑ mm. ☐
C38	1	W	7	8"	36+00		36.0	31	3.1'	○		22	NG	
C45	2	W	7	8"	37+00		40.0	31	3.2'	○		22	NG	
C3	3	W	3	30"	37+20		60.0	31	6.2'	◯		22	NG	
C6	4	W	7	8"	37+90		40.0	31	3.4'	○		22	A	6.00
C8	5	E	2	6"	34+50	50.0		31	3.5'	⁂		22	NG	
C9	6	W	6	12"	34+50	55.0		31	3.75'	○		22	NG	
C20	7	BT	2	4"	37+90	25.0		31	3.25'	○		22	A	6.00
C21	8	BT	15	unk	37+90	16.0		31	3.4'	□		22	A	6.00
C22	9	BT	15	unk	37+90	13.0			6.0'	□		22	A	6.00

Notes:

Sheet 1 of 1 Prepared By: VL Date: 10/13/06 Checked By: RMP Date: 10/14/06

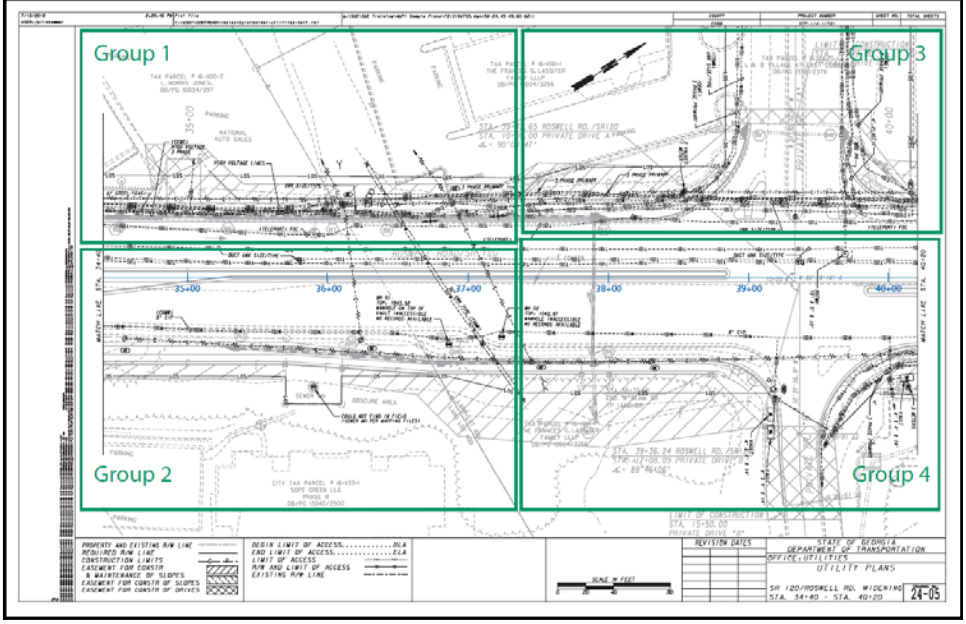
5-12

Hands-on Exercise

- Break into groups of 4 to 5
- Each group should focus on one area of the plan sheets

5-13

Group Assignments



Hands-on Exercise

- 5.1 Identify potential conflicts using QLB data (30 min)
  - Focus on area indicated on plan sheets
  - Populate UCM with as much information as possible
  - Examine potential resolution strategies
  - Examine utility investigation levels needed
  - Determine need for QLA data
- 5.2 Evaluate conflicts using QLA test hole data (30 min)
- Break
- 5.3 Prepare alternative and cost analysis (30 min)
- 5.4 Present findings in 3-minute presentation (30 min)

5-15

5.2

Evaluate Conflicts Using QLA Test Hole Data Sheets

5-16

Hands-on Exercise

- 5.1 Identify potential conflicts using QLB data (30 min)
- 5.2 Evaluate conflicts using QLA test hole data (30 min)
  - Review data provided on test hole sheets
  - Assess utility conflicts
- Break
- 5.3 Prepare alternative and cost analysis (30 min)
- 5.4 Present findings in 3-minute presentation (30 min)

5-17

5.3

Prepare Alternative and Cost Analysis for Conflicts

5-18

Hands-on Exercise

- 5.1 Identify potential conflicts using QLB data (30 min)
- 5.2 Evaluate conflicts using QLA test hole data (30 min)
- Break
- 5.3 Prepare alternative and cost analysis (30 min)
  - Pick one or more conflicts
  - Develop and compare 3-4 resolution alternatives
  - Outline potential costs
  - Select most appropriate resolution alternative
- 5.4 Present findings in 3-minute presentation (30 min)

5-19

5.4

Present Findings in 3-Minute Presentation

5-20

Hands-on Exercise

- 5.1 Identify potential conflicts using QLB data (30 min)
- 5.2 Evaluate conflicts using QLA test hole data (30 min)
- Break
- 5.3 Prepare alternative and cost analysis (30 min)
- 5.4 Present findings in 3-minute presentation (30 min)
  - 3-minute group presentation
  - Description of a conflict that each group identified and the group's approach to analyze and resolve the conflict
  - Lessons learned each group would like to share
  - Consider using PDF versions of plan sheets during presentation

5-21

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Lesson 6

Wrap-Up

6-1

Course Overview

8:30 AM – 9:00 AM	Introductions and Course Overview
9:00 AM – 10:15 AM	Utility Conflict Concepts
10:15 AM – 10:30 AM	Morning Break
10:30 AM – 11:45 AM	Utility Conflict Identification and Management
11:45 AM – 1:00 PM	Lunch Break
1:00 PM – 1:20 PM	Database Approach to Manage Utility Conflicts
1:20 PM – 2:20 PM	Hands-On Utility Conflict Exercise Part I
2:20 PM – 2:35 PM	Afternoon break
2:35 PM – 3:35 PM	Hands-On Utility Conflict Exercise Part II
3:35 PM – 3:45 PM	Wrap-Up

6-2

Lesson 6 Overview

1. Final Questions and Closing Remarks
2. Fill out review form

6-3

UTILITY CONFLICT MATRIX UPDATE PROCESS

The following screenshots provide an example of how a utility conflict matrix could be updated at four stages of a typical project development process. These screenshots are provided to make it easier for participants to follow the presentation during Lesson 3.

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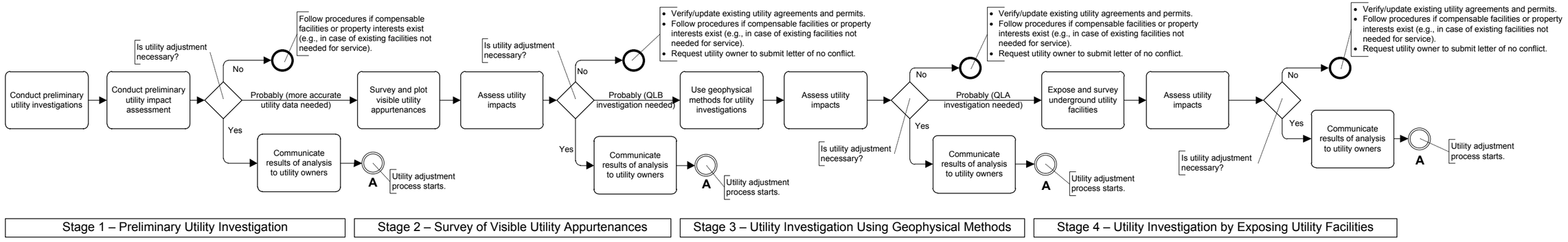

Figure D1. Utility Data Collection and Impact Assessment Activities.

Utility Conflict Matrix

Project Owner: Sample DOT
Project No. : 445-56-4789
Project Description: Widening of IH-10 from Loop 410 to Loop 1604
Highway or Route: IH-10

Utility Conflict Matrix Developed/Revised By: John Doe
Date: 1/1/2013
Reviewed By:
Date:

Note: refer to subsheet for utility conflict cost analysis.

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

Figure D2. UCM 1 – at the Beginning of the Preliminary Utility Investigation Phase.

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Utility Conflict Matrix

Project Owner: Sample DOT
Project No. : 445-56-4789
Project Description: Widening of IH-10 from Loop 410 to Loop 1604
Highway or Route: IH-10

Note: refer to subsheet for utility conflict cost analysis.

Utility Conflict Matrix Developed/Revised By: John Doe
Date: 1/1/2013
Reviewed By: John Doe
Date: 1/14/2013

Utility Owner and/or Contact Name	Conflict ID	Drawing or Sheet No.	Utility Type	Size and/or Material	Utility Conflict Description	Start Station	End Station	Start Offset	End Offset	Utility Investigation Level Needed	Test Hole	Recommended Action or Resolution	Estimated Resolution Date	Resolution Status
City Electric Services Tina Miller tmiller@ces.com 555-999-8888	1	PS-4	Electric	18"	Underground utility conduit in potential conflict with highway	110+00	40	140+00	40	QLB		Collect more data to confirm conflict		Utility owner informed of utility conflict
Centerpoint Energy James Smith jsmith@cpe.com 555-999-9999	2	PS-8	Electric	100', steel	Transmission tower might be in conflict with highway	115+50	30	115+50	30	QLC		Send UCM and cost estimate analysis to utility owner. Meet with utility owner to discuss potential resolution strategy.		Utility owner informed of utility conflict
Centerpoint Energy James Smith jsmith@cpe.com 555-999-9999	3	PS-7	Electric	Steel	Transmission lines fail minimum clearance requirements	114+00	0	114+00	0	QLC		Send UCM and cost estimate analysis to utility owner. Meet with utility owner to discuss potential resolution strategy.		Utility owner informed of utility conflict

Figure D3. UCM 2 – after Surveying and Plotting Visible Utility Appurtenances.

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Utility Conflict Resolution Alternatives

Cost Estimate Analysis

Project Owner: Sample DOT
Project No. : 445-56-4789
Project Description: Widening of IH-10 from Loop 410 to Loop 1604
Highway or Route: IH-10

Utility Conflict: 2
Utility Owner: Centerpoint Energy
Utility Type: Electric
Size and/or Material: 100', steel
Project Phase: 30% Design

Cost Estimate Analysis Developed/Revised By John Doe
Date 1/14/2013
Reviewed By
Date

Alternative Number	Alternative Description	Alternative Advantage	Alternative Disadvantage	Responsible Party	Engineering Cost (Utility)	Direct Cost (Utility)	Engineering Cost (DOT)	Direct Cost (DOT)	Total Cost	Feasibility	Decision
1	Relocate transmission tower.	No design change required, no additional cost to DOT.	High cost to utility for relocation and project delay.	Utility						Unknown	Under Review
2	Change highway design to accommodate tower.	Utility can remain in place.	Cost to redesign, potential impact on right-of-way acquistion and environmental document	DOT						Unknown	Under Review
3	Protect tower in-place.	Utility can remain in place.	Potential safety hazard, problematic access for maintenance.	Utility						Unknown	Under Review
4	Exception to policy.	No cost to utility or DOT.	High risk of damage to utility and problematic maintenance access.	N/A						Unknown	Under Review

Figure D4. UCM 2 – Cost Estimate Analysis for the Transmission Tower Conflict.

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Utility Conflict Matrix

Project Owner: Sample DOT
Project No. : 445-56-4789
Project Description: Widening of IH-10 from Loop 410 to Loop 1604
Highway or Route: IH-10

Utility Conflict Matrix Developed/Revised By: John Doe
Date: 1/1/2013
Reviewed By: John Doe
Date: 3/1/2013

Note: refer to subsheet for utility conflict cost analysis.

Utility Owner and/or Contact Name	Conflict ID	Drawing or Sheet No.	Utility Type	Size and/or Material	Utility Conflict Description	Start Station	End Station	Start Offset	End Offset	Utility Investigation Level Needed	Test Hole	Recommended Action or Resolution	Estimated Resolution Date	Resolution Status
City Electric Services Tina Miller tmiller@ces.com 555-999-8888	1	PS-4	Electric	18"	Underground utility conduit in potential conflict with highway	110+00	40	140+00	40	QLA		Collect more data to confirm conflict		Utility owner informed of utility conflict
Centerpoint Energy James Smith jsmith@cpe.com 555-999-9999	2	PS-8	Electric	100', steel	Transmission tower might be in conflict with highway	115+50	30	115+50	30	QLC		Review conflict resolution strategies		Utility owner informed of utility conflict
Centerpoint Energy James Smith jsmith@cpe.com 555-999-9999	3	PS-7	Electric	Steel	Transmission lines fail minimum clearance requirements	114+00	0	114+00	0	QLC		Adjust facility as discussed during coordination meeting		Utility conflict resolution strategy selected

Figure D5. UCM 3 – after Using Geophysical Methods to Collect Data about Underground Conduit.

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Utility Conflict Resolution Alternatives

Cost Estimate Analysis

Project Owner: Sample DOT
Project No. : 445-56-4789
Project Description: Widening of IH-10 from Loop 410 to Loop 1604
Highway or Route: IH-10

Utility Conflict: 2
Utility Owner: Centerpoint Energy
Utility Type: Electric
Size and/or Material: 100', steel
Project Phase: 30% Design

Cost Estimate Analysis Developed/Revised By John Doe
Date 1/14/2013
Reviewed By John Doe
Date 3/1/2013

Alternative Number	Alternative Description	Alternative Advantage	Alternative Disadvantage	Responsible Party	Engineering Cost (Utility)	Direct Cost (Utility)	Engineering Cost (DOT)	Direct Cost (DOT)	Total Cost	Feasibility	Decision
1	Relocate transmission tower.	No design change required, no additional cost to DOT.	High cost to utility for relocation and project delay.	Utility	$ 25,000.00	$ 200,000.00	$ -	$ -	$ 225,000.00	Unknown	Under Review
2	Change highway design to accommodate tower.	Utility can remain in place.	Cost to redesign, potential impact on right-of-way acquistion and environmental document	DOT	$ -	$ -	$ 10,000.00	$ 30,000.00	$ 40,000.00	Unknown	Under Review
3	Protect tower in-place.	Utility can remain in place.	Potential safety hazard, problematic access for maintenance.	Utility	$ 5,000.00	$ 20,000.00		$ -	$ 25,000.00	Unknown	Under Review
4	Exception to policy.	No cost to utility or DOT.	High risk of damage to utility and problematic maintenance access.	N/A	$ -	$ -	$ -	$ -	$ -	No	Rejected

Figure D6. UCM 3 – Updated Cost Estimate Analysis for the Transmission Tower Conflict.

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Utility Conflict Matrix

Project Owner: Sample DOT
Project No. : 445-56-4789
Project Description: Widening of IH-10 from Loop 410 to Loop 1604
Highway or Route: IH-10

Note: refer to subsheet for utility conflict cost analysis.

Utility Conflict Matrix Developed/Revised By: John Doe
Date: 1/1/2013
Reviewed By: John Doe
Date: 4/1/2013

Utility Owner and/or Contact Name	Conflict ID	Drawing or Sheet No.	Utility Type	Size and/or Material	Utility Conflict Description	Start Station	End Station	Start Offset	End Offset	Utility Investigation Level Needed	Test Hole	Recommended Action or Resolution	Estimated Resolution Date	Resolution Status
City Electric Services Tina Miller tmiller@ces.com 555-999-8888	1	PS-4	Electric	18"	Underground utility conduit in conflict with highway	110+00	40	140+00	40	QLA	10	Adjust facility as discussed during coordination meeting	6/1/2013	Utility conflict resolution strategy selected
Centerpoint Energy James Smith jsmith@cpe.com 555-999-9999	2	PS-8	Electric	100', steel	Transmission tower might be in conflict with highway	115+50	30	115+50	30	QLC		Change design to accommodate utility	-	Utility conflict resolution strategy selected
Centerpoint Energy James Smith jsmith@cpe.com 555-999-9999	3	PS-7	Electric	Steel	Transmission lines fail minimum clearance requirements	114+00	0	114+00	0	QLC		Adjust facility as discussed during coordination meeting	6/1/2013	Utility conflict resolution strategy selected

Figure D7. UCM 4 – after Exposing Underground Conduit (QLA Data Collection).

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Utility Conflict Resolution Alternatives

Cost Estimate Analysis

Project Owner: Sample DOT
Project No. : 445-56-4789
Project Description: Widening of IH-10 from Loop 410 to Loop 1604
Highway or Route: IH-10

Utility Conflict: 2
Utility Owner: Centerpoint Energy
Utility Type: Electric
Size and/or Material: 100', steel
Project Phase: 30% Design

Cost Estimate Analysis Developed/Revised By John Doe
Date 1/14/2013
Reviewed By John Doe
Date 4/1/2013

Alternative Number	Alternative Description	Alternative Advantage	Alternative Disadvantage	Responsible Party	Engineering Cost (Utility)	Direct Cost (Utility)	Engineering Cost (DOT)	Direct Cost (DOT)	Total Cost	Feasibility	Decision
1	Relocate transmission tower.	No design change required, no additional cost to DOT.	High cost to utility for relocation and project delay.	Utility	$ 25,000.00	$ 200,000.00	$ -	$ -	$ 225,000.00	Yes	Rejected
2	Change highway design to accommodate tower.	Utility can remain in place.	Cost to redesign, potential impact on right-of-way acquistion and environmental document	DOT	$ -	$ -	$ 10,000.00	$ 30,000.00	$ 40,000.00	Yes	Selected
3	Protect tower in-place.	Utility can remain in place.	Potential safety hazard, problematic access for maintenance.	Utility	$ 5,000.00	$ 20,000.00		$ -	$ 25,000.00	No	Rejected
4	Exception to policy.	No cost to utility or DOT.	High risk of damage to utility and problematic maintenance access.	N/A	$ -	$ -	$ -	$ -	$ -	No	Rejected

Figure D8. UCM 4 – Selected Conflict Resolution Alternative for the Transmission Tower Conflict.

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Utility Conflict Matrix

Project Owner: Sample DOT
Project No. : 445-56-4789
Project Description: Widening of IH-10 from Loop 410 to Loop 1604
Highway or Route: IH-10

Utility Conflict Matrix Developed/Revised By: John Doe
Date: 1/1/2013
Reviewed By: John Doe
Date: 7/1/2013

Note: refer to subsheet for utility conflict cost analysis.

Utility Owner and/or Contact Name	Conflict ID	Drawing or Sheet No.	Utility Type	Size and/or Material	Utility Conflict Description	Start Station	End Station	Start Offset	End Offset	Utility Investigation Level Needed	Test Hole	Recommended Action or Resolution	Estimated Resolution Date	Resolution Status
City Electric Services Tina Miller tmiller@ces.com 555-999-8888	1	PS-4	Electric	18"	Underground utility conduit in conflict with highway	110+00	40	140+00	40	QLA	10	None	6/1/2013	Utility conflict resolved
Centerpoint Energy James Smith jsmith@cpe.com 555-999-9999	2	PS-8	Electric	100', steel	Transmission tower in conflict with highway	115+50	30	115+50	30	QLC		None	-	Utility conflict resolved
Centerpoint Energy James Smith jsmith@cpe.com 555-999-9999	3	PS-7	Electric	Steel	Transmission lines fail minimum clearance requirements	114+00	0	114+00	0	QLC		None	6/1/2013	Utility conflict resolved

Figure 9. UCM 5 – All Utility Conflicts Have Been Resolved.

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UTILITY CONFLICT MATRICES

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SAMPLE UTILITY CONFLICT MATRICES

The following are original UCMs of several states (Alaska, Michigan, South Dakota, California, Florida, Georgia, and Texas) that illustrate the diverse structure of UCMs used by state DOTs.

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DRAFT Utility Conflict Report
West Dowling Road Phase I

Anchorage, Alaska
DOT&PF No. 50898

Table 2: Chugach Electric Association, Incorporated, Conflicts Summary

Station	Offset	Station	Offset	Size/Type	Length	Conflict	ADJ/REL	Cost	PE/CE Cost	Total Cost
CEA Distribution Relocation Costs										
9+00	150' RT		200' LT	3φ UG	350	FG	REL	52,500	15,750	68,250
16+00	100' LT	42+30	80' LT	3φ UG	2630	FG	REL	394,500	118,350	512,850
16+00	100' LT	15+50	100' RT	3φ UG	250	FG	REL	37,500	11,250	48,750
16+00	100' LT	29+00	75' LT	1φ UG	1650	FG	REL	165,000	49,500	214,500
36+40	80' LT	35+80	350' RT	3φ UG	430	FG	REL	64,500	19,350	83,850
36+60	80' LT	36+70	380' LT	3φ UG	300	FG	REL	45,000	13,500	58,500
	UG Loop to the North			3φ UG	1000	FG	REL	150,000	45,000	195,000
							Subtotal	909,000	272,700	1,181,700
CEA Transmission Relocation Costs										
14+75	55' RT			138 kV OH	1	PWY	REL	30,000	9,000	39,000
32+75	55' RT			138 kV OH	1	EX	REL	50,000	15,000	65,000
36+38	45' RT			138 kV OH	1	EX	REL	50,000	15,000	65,000
							Subtotal	130,000	39,000	169,000
							Total CEA Relocation Costs	**1,039,000**	**311,700**	**1,350,700**

1φ Underground (UG) loop to extend across Dowling Road and along the south side to reconnect existing services.

UG loop provided to the north of the project to accommodate undergrounding.

Removal of existing swamp braces removed and steel piling added, down guys replaced with overhead span guy and down guys.

Figure E1. Alaska DOT&PF Sample Utility Conflict Report.

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M-6 (South Beltline) from I-196 to West of Eastern Avenue
South of Grand Rapids, Michigan

Utility Log - Electric

CS 70025 - JN 33330

Item #	Utility Owner / Operator	Conflict Location	Segment	Date Relocation Plan must be submitted	Relocation Plan submitted to Design Team	Design Team Review / Comment / Approval	Permit Application Submitted to MDOT	MDOT Permit Number / Approval Date	Relocation Scheduled	Action Items
1	Consumers Energy Transmission	Consumers Power Transmission Overhead – 8th Ave	1			7/6/2000	7/27/00 rev.	41064-0125-00-0174	4/1/2001	Final permit approval from MDOT.
2	Consumers Energy Transmission	West of Kenowa Ave.	1			7/6/2000	7/27/00 rev.	41064-0125-00-0174	4/1/2001	Final permit approval from MDOT.
3	Consumers Energy Distribution	Aerial Lines at Jackson and Angling Road	1							Design in process.
4	Consumers Energy Distribution	Aerial Lines at Kenowa and 64th St.	2							Design in process.
5	Consumers Energy Transmission	64th at Wilson and East and West of Wilson– Overhead	2			7/6/2000	7/27/00 rev.	41064-0125-00-0174	4/1/2001	Final permit approval from MDOT.
6	Consumers Energy Transmission	East and West of Ivanrest	2			7/6/2000	7/27/00 rev.	41064-0125-00-0174	10/15/2000	Final permit approval from MDOT.
7	**Consumers Energy Distribution**	**along Ivanrest**	**2**							**Permit to be submitted the week of August 14, 2000.**
8	Consumers Energy Transmission	East and West of Byron Center - overhead	3			7/6/2000	7/27/00 rev.	41064-0125-00-0174	4/1/2001	Final permit approval from MDOT. Schedule Relocation
9	**Consumers Energy Transmission**	**At Burlingame - overhead**	**3**			**6/5/2000**		**41064-0124-00-173**	**10/15/2000**	**Final permit approval from MDOT.**
10	**Consumers Energy Distribution**	**along Burlingame**	**3**						**11/14/2000**	**Permit for relocation has been submitted. Need design team approval.**
11	Consumers Energy Transmission	East and West of Clyde Park - overhead	3			7/6/2000	7/27/00 rev.	41064-0125-00-0174	12/1/2000	Final permit approval from MDOT.
12	**Consumers Energy Transmission**	**East and West of US131 - overhead**	**4**			7/6/2000	7/27/00 rev.	**41064-0125-00-0174**	**12/1/2000**	**Final permit approval from MDOT.**
13	**Consumers Energy Transmission**	**East and West of Norfolk Southern - overhead**	**4**			7/6/2000	7/27/00 rev.	**41064-0125-00-0174**	**12/1/2000**	**Final permit approval from MDOT.**
14	Consumers Energy Transmission	Clyde Park and M-6 - temporary	4						Coordination Clause	Design team approval.
15	Consumers Energy Transmission	US 131/Norfolk Southern and M-6 - temporary	4						Coordination Clause	Design team approval.
16	Consumers Energy Transmission	Buck Creek @ M-6 - temporary	4						Coordination Clause	Design team approval.
17	**Consumers Energy Distribution**	**Clyde Park and 64th – Overhead**	**4**			**7/6/2000**	**6/1/2000**	**41604-0085-00-0117**		**Permit approval required.**

Figure E2. Michigan DOT Sample Utility Log.

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Picture No.	PCN	Picture Looking	City or Town	Hwy. No.	Description
6.JPG	02BF	N	Platte	44	Water valve in the SE quadrant of Hwy 44 & Indiana
7.JPG	02BF	W	Platte	44	Power Pole in the SW quadrant of Hwy 44 & Indiana
8.JPG	02BF	N	Platte	44	Power Pole in the SW quadrant of Hwy 44 & Indiana
9.JPG	02BF	N	Platte	44	Power Pole in the SW quadrant of Hwy 44 & Indiana
10.JPG	02BF	E	Platte	44	Power Pole (Transmission w/ riser) in the SE quadrant of Hwy 44 & Ohio
11.JPG	02BF	E	Platte	44	Power Pole (Transmission w/ riser) in the SE quadrant of Hwy 44 & Ohio
12.JPG	02BF	N	Platte	44	Power Pole, Fire hydrant & water valve in the SE quadrant of Hwy 44 & Ohio
13.JPG	02BG	S	Platte	45	Light Pole in the SW quadrant of Hwy 45 & 4th St
14.JPG	02BG	E	Platte	45	Light Pole in the NE quadrant of Hwy 45 & 4th St
15.JPG	02BG	S	Platte	45	Light Pole in the SW quadrant of Hwy 45 & 6th St
16.JPG	02BG	E	Platte	45	Power Pole in the NE quadrant of Hwy 45 & 6th St
17.JPG	02BG	E	Platte	45	Power Pole in the NE quadrant of Hwy 45 & 6th St
18.JPG	02BG	W	Platte	45	Power Pole & Fire hydrant in the NW quadrant of Hwy 45 & 6th St
19.JPG	02BG	W	Platte	45	Power Pole w/ riser in the NW quadrant of Hwy 45 & 6th St

Figure E3. South Dakota DOT Sample Utility Conflict Matrix.

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I-10-EA 122401-Utilities Conflict Status

date of last revision May 30, 2000
this document was prepared by

Conflict No.	Utility Sheet No.	Pothole No. *(On U-sheets)*	Owner	Utility Description	Pothole/Manhole Location	Conflict Location	Utility Conflict/ Work Description	Investigation			Depth	Impact?		Action			***Util. Reloc.*** ***A*** - Abandon ***RB***- Reloc.Before ***RD***- Reloc.During ***P***- Protect in place ***NC***- No conflict	***Resp. Party*** ***U***- Utility Co ***C***- Contractor	***Required Completion Date***	Comments
								Pothole	Manhole	Overhead	**(ft)**	Y	N	Remove	Relocate	Other				
1	U-2	1	PACBELL	40 DU Telephone	62 m Rt of I-405 Sta 165+55	40 m Rt and 57 m Rt of I-405 Sta 165+55	conflict with Retaining Walls No. 166 & No. 168	X			4.55 14.40		N				***P***			
2	U-2	2	PACBELL	40 DU Telephone	48 m Lt of I-405 Sta 165+55	40 m Rt and 57 m Rt of I-405 Sta 165+55	conflict with Retaining Walls No. 166 & No. 168				-		N				***P***			
3	U-3	3	SCE	25 mm DU	35 m Rt of I-405 Sta 165+01	43 m Rt of I-405 Sta 165+01	conflict with Retaining Wall No. 166				-		N				***P***			Located in Bristol OC
4	U-3	4	SCE	25 mm DU	46 m Lt of I-405 Sta 165+01	43 m Rt of I-405 Sta 165+01	conflict with Retaining Wall No. 166				-		N				***P***			Located in Bristol OC
5	U-3	5	MWD	900 mm WSP Water in 380 mL ENC	50 m Rt of I-405 Sta 164+96	44 m Rt of I-405 Sta 164+95	conflict with Retaining Wall No. 166	X			6.70		N				***P***			
6	U-3	6	MWD	900 mm WSP Water in 380 mL ENC	50 m Lt of I-405 Sta 164+96	44 m Rt of I-405 Sta 164+95	conflict with Retaining Wall No. 166	X			6.50		N				***P***			
7	U-3	7	Caltrans	600 mm RCP	53 m Rt of I-405 Sta 163+42	53 m Rt of I-405 from Sta 163+29 to Sta 163+42	conflict with Delhi Channel Bridge	X			6.00		N				***P***			
8	U-3	8	Caltrans	600 mm RCP	53 m Rt of I-405 Sta 163+29	53 m Rt of I-405 from Sta 163+29 to Sta 163+42	conflict with Delhi Channel Bridge	X			9.00		N				***P***			
9	U-3	9	MCWD	300 mm ACP Water in 119mL, 500mm STL Casing	32 m Rt of I-405 Sta 163+25	35 m Rt of I-405 Sta 163+25	conflict with I-405 Widening & BR1 Line	X			10.30		N				***P***			
10	U-3	10	MCWD	300 mm ACP Water 119mL, 500mm STL Casing	32 m Lt of I-405 Sta 163+25	33 m Lt of I-405 Sta 163+25	conflict with I-405 Widening & BR1 Line	X			8.75		N				***P***			
11	U-3	MH 11	CSDOC	Manhole	81 m Rt of I-405 Sta 162+92	35 m Rt of I-405 Sta 162+92	conflict with I-405 Widening & BR1 Line		X		18.40		N				***P***			
12	U-3	12	CSDOC	380 mm VCP Sewer	36 m Lt of I-405 Sta 162+91	32 m Lt of I-405 Sta 162+90	conflict with I-405 Widening & BR1 Line				-		N				***P***			
13	U-4	13	MCWD	600mm CCP Water in 94m L 900mm Dia Stl Casing	67 m Rt of I-405 Sta 161+44	58 m Rt of I-405 Sta 161+44	Conflict with Airport Channel	X			4.55	Y			X	X	***RB***			600 mm Waterline to be Lowered Extend Encasement
14	U-4	14	MCWD	600mm CCP Water in 94m L 900mm Dia Stl Casing	38 m Lt of I-405 Sta 161+40	32 m Lt of I-405 Sta 161+42	conflict with I-405 Widening				-		N				***P***			
15	U-4	15	MCWD	300 mm ACP Water	70 m Rt of I-405 Sta 160+29	72 m Rt of I-405 from Sta 157+20 to Sta 160+29	Conflict with AOA Line and Retaining Wall No. 268	X			-	Y			X		***RD***			Enchroachment CT R/W and Private Owne Encased under Roadway
16	U-4	16	MCWD	300 mm ACP Water	70 m Rt of I-405 Sta 159+07	72 m Rt of I-405 from Sta 157+20 to Sta 160+29	Conflict with AOA Line and Retaining Wall No. 268	X			-	Y			X		***RD***			Enchroachment CT R/W and Private Owne Encased under Roadway
17	U-5	17	MCWD	300 mm ACP Water	70 m Rt of I-405 Sta 156+87	72 m Rt of I-405 from Sta 157+20 to Sta 160+29	conflict with AOA Line and Retaining Wall No. 268	X			4.35		N				***P***			
18	U-5	MH 18	CSDOC	Manhole	60 m Rt of I-405 Sta 156+65	28 m Rt of I-405 Sta 156+65	conflict with I-405 Widening		X		16.20		N				***P***			
19	U-5	19	CSDOC	380 mm VCP Sewer	46 m Lt of I-405 Sta 156+65	25 m Rt of I-405 Sta 156+65	conflict with I-405 Widening	X			18.40		N				***P***			
20	U-5	20	CSDOC	830 mm VCP Sewer	14 m Rt of B2 Sta 24+96		conflict with construction of B2 Line						N				***P***			
21	U-5	21	CSDOC	830 mm VCP Sewer	6 m Lt of B2 Sta 25+54		conflict with construction of B2 Line						N				***P***			
22	U-8	MH 22	CSDOC	Manhole	8m Rt of Main St Sta 102+78				X			Y				X	***RB***			MH to be Lowered New Top MH Elev= 9.588
23	U-8	MH 23 SCE MH 4503	SCE	Manhole No. 4503	8m Rt of Main St Sta 102+87				X			Y				X	***RB***			MH to be Lowered New Top MH Elev= 9.583 m
24	U-8	MH 24 SCE MH 4502	SCE	Manhole No. 4502	8m Rt of Main St Sta 104+17				X			Y				X	***RB***			MH to be Lowered New Top MH Elev= 9.728 m

Figure E4. Caltrans Sample Utility Conflict Matrix.

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FPID:	1	Description:	2	This matrix was created by _____3_____ to assist the UAO's in identifying conflicts between the UAO's facilities and proposed roadway construction. _____ accepts no liability for conflicts overlooked for this report. Each UAO or designee is responsible to perform a detailed and comprehensive plans review for conflict analysis.
Phase #:	4	Plans Date:	5	
Reviewer:	6			
Date:	7			

Conflict #	Utility Agency/ Owner (UAO)	Station/Offset (From C/L)	Facility Description (Material, Type, Number, Size)	Conflict Description (Possible or Actual)	VVH (Y/N)	VVH #	Recommended Conflict Resolution	Resolved Status
8	9	10	11	12	13	14	15	16

Consider using the form from the beginning of a project as a tool for monitoring areas of concern with UAO facilities. That is the reason for the Phase Number space. The form is set up to: 1. Print legal size and have the header information on each page. 2. The cells where the conflicts are listed are set to word wrap automatically. 3. The footer is set to number the pages 1 of ??.

1	Project number.
2	Project description.
3	Disclaimer that the reviewer and their firm is not responsible for any missed conflicts. The blanks are for the name of the design firm.
4	Phase that the plans represent.
5	The date should be on the plans Key Sheet. The phase and plans date should keep everyone working on the same plans.
6	That would be you, the person that wrote the conflict matrix.
7	The date the matrix was completed.
8	For ease of discussion the conflicts are numbered, plan sheet numbers are not used because they change from Phase to Phase which has caused confusion in the past.
9	Owner of the underground line.
10	The standard reference used on FDOT plans is the Centerline of Construction, it is used for all components of the proposed roadway construction.
11	Describe the facility. What is it? Water main? Force main? Cable? Conduit? Overhead electric? Overhead cable? Manhole? Handhold? What's the size? How many? What's it made of?
12	What is it the facility perceived to be in conflict with? It a possible conflict or actually in conflict with proposed work. Consider the trench and hole size required to place pipe and drainage structures. Don't forget aerial facilities when there are signals and large signs in the project.
13	SUE work can be used to if a conflict is considered a possibility. This entry area is a tool to determine areas where test holes should be taken for confirmation or exclusion of a conflict.
14	Entry area for the test hole number. Test holes should be numbered consecutively to avoid confusion.
15	What can be done to remove the conflict? Don't forget to consult with the Designer for alternatives to the proposed construction.
16	Examples of entries could be "Cleared", "Pending", "No Conflict". It's suggested to keep the entries determined as "No Conflict" in the matrix so other reviewers will know a perceived conflict has been noted and determined to not be an issue.

Figure E5. Florida DOT Sample Utility Conflict Matrix.

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Conflict #	Station and Offset	Dwg. No.	*Utility	Identified Conflict	TH	Utility Impact with Cost ("As-designed")	Recommended Resolution	**Benefit of Resolution

*** Please fill the cell with the color code for the utility as shown below. The color code can be found on the Georgia Utilities Protection Center website at www.gaupc.com in the tab "LAWS/POLICIES" in the section "APWA COLOR CODE REQUIREMENTS."**

****Please include all benefits incurred including time, costs, and safety improvements.**

UTILITY KEY

Underground	Overhead
E - Electric	OE - Overhead Electric
G - Gas	OGW - Overhead Guy Wire
NW - Non-Potable Water	OT - Overhead Telecommunications
P - Petroleum	OTC - Overhead Traffic Control
SFM - Sanitary Sewer	OTV - Overhead Cable TV
SS - Sanitary Sewer	
STM -Steam	
T - Telecommunications	
TC - Traffic Control	
TV - Cable TV	
UNK - Unknown Type	
W - Water	

ABBREVIATIONS

Material

AC - Asbestos Concrete
FO - Fiber Optic
MES - Mitered End Section
RCP - Reinforce Concrete Pipe

Other

BL - Baseline
L - Left
R - Right
TH - Test Hole

UTILITY OWNERS

AGL - Atlanta Gas Light
GP - Georgia Power
ATT - AT&T (formerly BellSouth)
L3 - Level 3 Communications
MFN - Metromedia Fiber Network
FCPW - Fulton County Public Works
CoA - City of Atlanta
UNK - Unknown Owner

INSTRUCTIONS:

1. **Please fill in the header information for the GREEN items, then change the color back to BLACK.**
2. **For conflicts involving combination overhead lines, please provide a separate entry for each utility.**
3. **For places where there are multiple utilities at one point of conflict, please provide a separate entry for each utility .**
4. **The Abbreviations listed are examples only. Please provide abbreviations as appropriate for this project.**
5. **The Utility Owners listed are examples only. Please provide abbreviations for each Utility Owner as appropriate for this project.**
6. **Please add tabs as needed. See tab 2, "Sample Sheet 2".**

Figure E6. Georgia DOT Sample Utility Conflict Matrix.

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PARIS DISTRICT
UTILITY ADJUSTMENT REPORT

As Of: **August 19, 2009**
Changes since last update in RED

County Highway ROW CSJ	Name of Utility	Reimbursable?	Location of Agreement Package	Packet Status?	Current Action	Adjustment Status	Responsible TxDOT Employee	Amount Approved	Amount Billed	90% Payment	Audit Exceptions	10% Retainage	Outstanding Balance
HOPKINS SH 11 ROW CSJ: **0083-03-046** SH 19 **0108-09-039**	Verizon	No	ROW	Approved	U11114: Relocation is complete. NR	Complete	Keith Hollje						
	TXU Electric	Yes	ROW	Approved	U11655: Relocation & Reimbursement is complete	Complete	Keith Hollje	$ 74,397.96	$ 62,850.69	$ 56,565.62	$ -	$ 6,285.07	$ -
	Atmos Energy (Trans)	Yes	ROW	Approved	U12208: Relocation & Reimbursement is complete	Complete	Mike Powers	$ 235,912.59	$ 184,436.76	$ 165,993.08	$ -	$ 18,443.68	$ -
	Atmos Energy (Distribution)	No	ROW	Approved	U12446: Relocation is complete. NR	Complete	Mike Powers						
	SS Water & Sewer	No	ROW	Approved	U12450: Relocation is complete. NR	Complete	Mike Powers						
	TXU Distribution	No	ROW	Approved	U12614: Relocation is complete. NR	Complete	Mike Powers						
	Sudden Link Communication	No	AO	Approved	Relocation is complete by Permit. NR	Complete	Tim Taylor						
	People's Telephone	No	AO	Approved	Relocation is complete by Permit. NR	Complete	Tim Taylor						
	Shady Grove WSC	No	AO	Approved	Relocation is complete by Permit. NR	Complete	Tim Taylor						
								$ 310,310.55	$ 247,287.45	$ 222,558.70	$ -	$ 24,728.75	$ -
HUNT US 380 ROW CSJ: **0135-06-022**	Caddo Basin	Yes	ROW	Approved	U11423: Relocation & Reimbursement is complete.	Complete	Mike Powers	$ 853,746.47	$ 783,618.01	$ 705,256.21	$ -	$ 78,361.80	$ -
	Verizon	No	ROW	Approved	U11450: Relocation is complete. NR	Complete	Mike Powers						
	One OK Pipeline	Yes	ROW	Approved	U11523: Relocation is complete. Reimbursement has not been submitted.	Complete	Keith Hollje	$ 229,170.00	$ -	$ -	$ -	$ -	$ 229,170.00
	Cap Rock Energy	Yes	ROW	Approved	U11524: Relocation & Reimbursement is complete.	Complete	Mike Powers	$ 741,668.69	$ 741,668.69	$ 667,388.42	$ (27,771.80)	$ 46,508.47	$ -
	AT&T	No	ROW	Approved	U11526: Relocation is complete. NR	Complete	Mike Powers						
	Explorer	Yes	ROW	Approved	U11534: Relocation & Reimbursement is complete.	Complete	Keith Hollje	$ 191,805.22	$ 201,206.44	$ 181,085.80	$ -	$ 20,120.64	$ -
	Energy Transfer (Gas)	Yes	ROW	Approved	U11695: Relocation is complete. Reimbursement returned to Utility 4/29/09. No Coorespondence!	Complete	Mike Powers	$ 370,006.39	$ 420,136.25	$ -	$ -	$ -	$ 370,006.39
	GEUS	No	ROW	Approved	U11850: Relocation is complete. NR	Complete	Mike Powers						
	AT&T	No	ROW	Approved	U12358: Relocation is complete. NR	Complete	Mike Powers						
	TMPA	No	n/a	n/a	No effect (no adjustment required)	n/a	Mike Powers						
	Comcast	No	n/a	n/a	No effect (no adjustment required)	n/a	Mike Powers						
	Kinder-Morgan	No	n/a	n/a	No effect (no adjustment required)	n/a	Mike Powers						
								$ 2,386,396.77	$ 2,146,629.39	$ 1,553,730.43	$ (27,771.80)	$ 144,990.91	$ 599,176.39
HUNT US 380 ROW CSJ: **0135-07-037**	AT&T	No	ROW	Approved	U11525: Relocation is complete. NR	Complete	Mike Powers						
	Atmos Energy (Pipeline)	Yes	ROW	Approved	U12012: Relocation & Reimbursement is complete.	Complete	Mike Powers	$ 193,912.59	$ 73,187.29	$ 65,868.56	$ -	$ 7,318.73	$ -
	Atmos Energy (Distribution)	No	ROW	Approved	U12013: Relocation is complete. NR	Complete	Mike Powers						
	Caddo Basin	Yes	ROW	Approved	U12026: Relocation & Reimbursement is complete.	Complete	Mike Powers	$ 651,005.00	$ 383,518.60	$ 345,166.74	$ -	$ 38,351.86	$ -
	TMPA	Yes	ROW	Approved	U12076: Relocation is complete. Supplemental Agreement approved 8/06/09.	Complete	Mike Powers	$ 514,097.06	$ 516,702.66	$ 462,196.85	$ -	$ 51,355.21	$ 51,355.21
	GEUS	No	ROW	Approved	U12077: Relocation is complete. NR	Complete	Mike Powers						
	TXU Electric(Transmission)	No	ROW	Approved	U12079: Relocation is complete. NR	Complete	Mike Powers						
	GEUS	Yes	ROW	No	U12445: Utility Package approved 5/19/09. Utility working on relocation.	35%	Mike Powers	$ 88,073.29	$ -	$ -			$ 88,073.29
	City of Greenville (Water)	No	AO	n/a	City has already moved utility on private easement. (no agreement required)	n/a	Mike Powers						
	City of Greenville (Sewer)	No	AO	n/a	City has already moved utility on private easement. (no agreement required)	n/a	Mike Powers						
	Cap Rock Energy	No	AO	n/a	No effect (no adjustment required)	n/a	Mike Powers						
								$ 1,447,087.94	$ 973,408.55	$ 873,232.15	$ -	$ 97,025.80	$ 139,428.50
DELTA SH 24 **0136-04-032**	Delta MUD	Yes	ROW	Approved	U11736: Relocation & Reimbursement is complete.	Complete	Keith Hollje	$ 196,689.02	$ 196,689.02	$ 177,020.12	$ -	$ 19,668.90	$ -
	Embarq Communication	No	ROW	Approved	U11853: Relocation is complete. NR	Complete	Mike Powers						
	Lamar Electric Coop	Yes	ROW	Approved	U12095: Relocation & Reimbursement is complete.	Complete	Keith Hollje	$ 124,447.65	$ 124,447.65	$ 112,002.89	$ -	$ 12,444.76	$ -
	Atmos Energy (Trans)	Yes	ROW	Approved	U12215: Relocation & Reimbursement is complete.	Complete	Mike Powers	$ 193,721.26	$ 98,779.90	$ 88,901.91	$ -	$ 9,877.99	$ -
								$ 514,857.93	$ 419,916.57	$ 377,924.92	$ -	$ 41,991.65	$ -

Figure E7. Texas DOT Sample Utility Conflict Matrix.

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UTILITY CONFLICT MATRIX SAMPLE DATABASE REPORTS

The following provides reports from the Access database that recreated sample UCMs of four states (Alaska, California, Georgia, and Texas) in an effort to demonstrate that the database structure is flexible enough to accommodate a great variety of state UCMs.

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Alaska UCM

DRAFT Utility Conflict Report — Anchorage, Alaska

West Dowling Road Phase 1 — DOT&PF No. 50898

Start Station	Start Offset	End Station	End Offset	Size	Type	Length	Conflict	ADJ/REL	Cost	PE/CE Cost	Total Cost
CEA Distribution Relocation Costs											
9+00	150' RT		200' LT	3 phi	UG	350	FG	Relocation before construction	$52,500	$15,750	$68,250
16+00	100' LT	42+30	80' LT	3 phi	UG	2,630	FG	Relocation before construction	$394,500	$118,350	$512,850
16+00	100' LT	15+50	100' RT	3 phi	UG	250	FG	Relocation before construction	$37,500	$11,250	$48,750
16+00	100' LT	29+00	75' LT	1 phi	UG	1,650	FG	Relocation before construction	$165,000	$49,500	$214,500
36+40	80' LT	35+80	350' RT	3 phi	UG	430	FG	Relocation before construction	$64,500	$19,350	$83,850
36+60	80' LT	36+70	380' LT	3 phi	UG	300	FG	Relocation before construction	$45,000	$13,500	$58,500
	UG Loop to the North			3 phi	UG	1,000	FG	Relocation before construction	$150,000	$45,000	$195,000
								Subtotal:	$909,000	$272,700	$1,181,700
CEA Transmission Relocation Costs											
14+75	55' RT			138 kV	OH	1	PWY	Relocation before construction	$30,000	$9,000	$39,000
32+75	55' RT			138 kV	OH	1	EX	Relocation before construction	$50,000	$15,000	$65,000
36+38	45' RT			138 kV	OH	1	EX	Relocation before construction	$50,000	$15,000	$65,000
								Subtotal:	$130,000	$39,000	$169,000
								Total Relocation Costs:	**$1,039,000**	**$311,700**	**$1,350,700**

Figure E8. Access Database Report Based on Alaska DOT&PF Sample Utility Conflict Report.

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California UCM

I-10-EA 122401 - Utilities Conflict Status

Date of last revision: 12/4/2009

This document was prepared by: _____

Conflict No.	Utility Sheet No.	Test Hole No.	Owner	Utility Description				Test Hole/ Manhole Location	Start Station	End Station	Offset	Utility Conflict/ Work Description	Utility Conflict Investigation	Depth (ft)	Impact?	Utility Relocation	Resp. Party	Required Completion Date	Comments
1	U-2	1	PACBELL	40 mm	DU	Telephone		62 m Rt of I-405 Sta 165+55	165+55		40 m Rt and 57 m Rt of I-405	Conflict with retaining walls No. 166 and No. 168	QLA	4.55	N	P	U	1/10/2010	
2	U-2	2	PACBELL	40 mm	DU	Telephone		48 m Lt of I-405 Sta 165+55	165+55		40 m Rt and 57 m Rt of I-405	Conflict with retaining walls No. 166 and No. 168		14.40	N	P	U	1/10/2010	
3	U-3	3	SCE	25 mm	DU	Telephone		35 m Rt of I-405 Sta 165+01	165+01		43 m Rt of I-405	Conflict with retaining wall No. 166			N	P	U	1/10/2010	Located in Bristol OC
4	U-3	4	SCE	25 mm	DU	Telephone		46 m Lt of I-405 Sta 165+55	165+01		43 m Rt of I-405	Conflict with retaining wall No. 166			N	P	U		Located in Bristol OC
5	U-3	5	MWD	900 mm		Water	in 380 mL ENC	50 m Rt of I-405 Sta 165+96	164+95		44 m Rt of I-405	Conflict with retaining wall No. 166	QLA	6.70	N	P	U		
6	U-3	6	MWD	900 mm		Water	in 380 mL ENC	50 m Lt of I-405 Sta 165+96	164+95		44 m Rt of I-405	Conflict with retaining wall No. 166	QLA	6.50	N	P	U		
7	U-3	7	Caltrans	600 mm				53 m Rt of I-405 Sta 163+42	163+29	163+24	53 m Rt of I-405	Conflict with Delhi Channel Bridge	QLA	6.00	N	P	U		
8	U-3	8	Caltrans	600 mm				53 m Rt of I-405 Sta 163+29	163+29	163+42	53 m Rt of I-405	Conflict with Delhi Channel Bridge	QLA	9.00	N	P	U		
9	U-3	9	MCWD	300 mm		Water	in 119 mL, 500 mm STL Casing	32 m Rt of I-405 Sta 163+25	163+25		35 m Rt of I-405	Conflict with I-405 widening and BR1 Line	QLA	10.30	N	P	U		
10	U-3	10	MCWD	300 mm		Water	in 119 mL, 500 mm STL Casing	32 m Lt of I-405 Sta 163+25	163+25		33 m Lt of I-405	Conflict with I-405 widening and BR1 Line	QLA	8.75	N	P	U		
11	U-3	MH 11	CSDOC			Manhole		81 m Rt of I-405 Sta 162+92	162+92		35 m Rt of I-405	Conflict with I-405 widening and BR1 Line	QLB	18.40	N	P	U		
12	U-3	12	CSDOC	380 mm		Sewer		36 m Lt of I-405 Sta 162+91	162+92		32 m Lt of I-405	Conflict with I-405 widening and BR1 Line			N	P	U		
13	U-4	13	MCWD	600 mm		Water	in 94 mL, 900 mm STL Casing	67 m Rt of I-405 Sta 161+44	161+44		58 m Rt of I-405	Conflict with airport channel	QLA	4.55	Y	RB	U		600 mm waterline to be lowered, extend encasement
14	U-4	14	MCWD	600 mm		Water	in 94 mL, 900 mm STL Casing	38 m Lt of I-405 Sta 161+40	161+42		32 m Lt of I-405	Conflict with I-405 widening			N	P	U		
15	U-4	15	MCWD	300 mm		Water		70 m Rt of I-405 Sta 160+29	157+20	160+29	72 m Rt of I-405	Conflict with AOA line and retaining wall No. 268	QLA		Y	RD	U		Encroachment CR R/W and private owner, encased under roadway
16	U-4	16	MCWD	300 mm		Water		70 m Rt of I-405 Sta 159+07	157+20	160+29	72 m Rt of I-405	Conflict with AOA line and retaining wall No. 268	QLA		Y	RD	U		Encroachment CR R/W and private owner, encased under roadway
17	U-5	17	MCWD	300 mm		Water		70 m Rt of I-405 Sta 156+87	157+20	160+29	72 m Rt of I-405	Conflict with AOA line and retaining wall No. 268	QLA	4.35	N	P	U		
18	U-5	MH 18	CSDOC			Manhole		60 m Rt of I-405 Sta 156+65	156+65		28 m Rt of I-405	Conflict with I-405 widening	QLB	16.20	N	P	U		

Figure E9. Access Database Report Based on Caltrans Sample Utility Conflict Matrix.

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Georgia DOT Utility Conflict Matrix

Wednesday, November 24, 2010
1:46:08 PM

Texas Transportation Institute

GDOT Project Number: 987654321

Conflict	Station and Offset	Utility	Identified Conflict	Testhole Needed	Utility Impact with Cost ("As-designed")	Recommended Resolution	Benefit of Resolution*
C1	100+05, 21' L, 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO.		Relocate 1150 LF of BFO-DUCT ($91,000).	Relocate proposed storm drainage into street. Use DI's that drain toward roadway.	Save cost to relocate BFO-DUCT ($91,000).
C2	100+66, 21' L, 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO.		Relocate 1150 LF of BFO-DUCT ($91,000).	Relocate proposed storm drainage into street. Use DI's that drain toward roadway.	Save cost to relocate BFO-DUCT ($91,000).
C3	100+38, 24' R, 14th St Constr. BL	UNK-UNK	Proposed 18" storm and unknown utility tee.	TH 1	Relocate unknown type and function utility.	TH to identify utility and conflict.	Eliminate possible delay during construction.
C4	100+56, 25' R, 14th St Constr. BL	8"W	Proposed 18" storm and existing 8" W.	TH 2	Relocate 8" W ($7,500).	TH on 8" W, adjust depth of proposed storm drainage.	Save cost to relocate 8" W ($6,000).
C5	100+61, 25' R, 14th St Constr. BL	8"W	Proposed 18" storm and existing 8" W.	TH 3	Relocate 8" W ($7,500).	TH on 8" W, adjust depth of proposed storm drainage.	Save cost to relocate 8" W ($6,000).
C6	100+82, 28' R, 14th St Constr. BL	4"G	Proposed storm structure and existing 4" G.	TH 4	Relocate 20 LF of 4" G ($6,000).	TH on 4" G, adjust depth of proposed storm structure.	Save cost to relocate 4" G ($4,5000).
C7	101+22, 27' R, 14th St Constr. BL	4"G	Proposed 18' and existing 4" by 2" gas tee.	TH 5	Relocate 2" G and 4" G Tee ($12,500).	TH on G lines, adjust depth of proposed storm structure.	Save cost to relocate G lines ($11,000).
C8	101+01, 28' L, 14th St Constr. BL	16"G	Proposed storm structure and existing 16" G.	TH 6	Relocate 16" G ($10,000).	TH on 16" G, adjust depth of proposed storm structure.	Save cost to relocate 16" G ($8,5000).
C9	101+25, 41' L, 14th St Constr. BL	UNK-BT-DUCT	Proposed storm structure and two BT ducts.	TH 7	Relocate BT-DUCT and 2" G ($11,000).	TH on BT-DUCT and 2" G, adjust depth of proposed storm structure.	Save cost to relocate BT duct and 2" G ($10,500).
C10	101+37, 41' L, 14th St Constr. BL	6"W	Proposed 18" storm and existing 6" W.	TH 8	Relocate 6" W ($5,000).	TH on 6" W, adjust depth of proposed storm drainage.	Save cost to relocate 6" W ($3,500).
C11	101+57, 27' L, 14th St Constr. BL	16"G	Proposed 18" storm and existing 16" G.	TH 9	Relocate 16" G ($10,000).	TH on 16" G, adjust depth of proposed storm structure.	Save cost to relocate 16" G ($8,5000).
C12	101+58, 22' L, 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO.		Relocate 1150 LF of BFO-DUCT ($91,000).	Relocate proposed storm drainage into street. Use DI's that drain toward roadway.	Save cost to relocate BFO-DUCT ($91,000).
C13	101+90, 22' L, 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO.		Relocate 1150 LF of BFO-DUCT ($91,000).	Relocate proposed storm drainage into street. Use DI's that drain toward roadway.	Save cost to relocate BFO-DUCT ($91,000).
C14	102+20, 27' R, 14th St Constr. BL	4"G	Proposed storm structure and existing 4" G.		Relocate 4" G ($4,500).	Relocate 4" G.	Eliminate conflict with proposed DI.
C15	102+36, 24" L, 14th St Constr. BL	AGL-BFO	Proposed storm structure and existing BFO.		Relocate 1150 LF of BFO-DUCT ($91,000).	Relocate proposed storm drainage into street. Use DI's that drain toward roadway.	Save cost to relocate BFO-DUCT ($91,000).

*** Please include all benefits incurred including time, costs, and safety improvements**

Key:

AC - Asbestos Concrete
BE - Buried Electric
BFO - Buried Fiber Optic
BT - Buried Telephone
G - Gas
L - Left
MES - Mitered End Section
OT - Overhead Telephone
R - Right
RCP - Reinforced Concrete Pipe
W - Water
WM - Water Main
TH - Test Hole
UNK - Unknown

Utility Owner:

AGL Atlanta Gas Light
BE Georgia Power
BT Bell South
L3 Level 3 Communications
MFN Metromedia Fiber Network
SAN Fulton County Public Works
W City of Atlanta

Page 1 of 1

Figure E10. Access Database Report Based on Georgia DOT Sample Utility Conflict Matrix.

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TxDOT District: Houston

CSJ: 050-80-1166 IH 10: from Gelhorn to Mercury Dr.

CSJ: 002-80-2081 US 90: from IH 10 to 0.29 miles west of Mercury Dr.

Texas UCM

Wednesday, November 24, 2010

1:46:25 PM

Texas Transportation Institute

Item Number	Owner	Utility	Utility Size Material	Location	Crossing	Conflict	Sheet Number	Conflict Status	Estimated Conflict Resolution Date	Agreement Assembly	Agreement Status	Agreement Submittal Date	Comments
1	Centerpoint Energy	Electrical Conduit	18" Conduit Duct	115+36, US 90	Underground	Proposed pavement, ditch.	Utility Sketch - Centerpoint Electric Sheet 1 of 1	Document received	3/1/2006	JUA A	Agreement Submittal	5/17/2010	CPEE completed design.
2	Centerpoint Energy	Transmission Tower	N/A	115+57, US 90	Underground	Proposed pavement.	Utility Sketch - Centerpoint Transmission Sheet 1 of 1	Document received		JUA B			CPEE completed design.
3	Centerpoint Energy	Transmission Lines	N/A	114+56	Overhead	Minimum clearance requirement.	Utility Sketch - Centerpoint Transmission Sheet 1 of 1	Document received		JUA A	Agreement Approval or Execution	5/17/2010	CPEE completed design.
4	Centerpoint Energy	Distribution Line	N/A	IH 10 at Oates Rd	Overhead	Minimum clearance requirement.		Utility conflict resolved	1/12/2006	JUA B			CPEE completed design.
5	Centerpoint Energy	Distribution Line	N/A	102+00, US 90 WBFR	Overhead	Minimum clearance requirement.		Utility conflict identified		JUA B			CPEE completed design.
6	Centerpoint Energy	Distribution Line	N/A	129+00, US 90	Overhead	Minimum clearance requirement, proposed bridge at Oates Rd.	Utility Sketch - Centerpoint Distribution Sheet 1 of 1	Document received		JUA B			CPEE completed design.

Figure E11. Access Database Report Based on Texas DOT Sample Utility Conflict Matrix.

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Utility Conflict Matrix

Project Owner: Texas Department of Transportation

Project No.: 1234-56-789

Project Description: Road construction project in Houston

Highway or Route: I-10 Katy Freeway

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

Reviewed By: _____ **Date:** _____

Utility Owner and/ or Contact Name	Conflict ID	Drawing or Sheet No.	Utility Type	Size and/or Material	Utility Conflict Description	Start Station	End Station	Start Offset	End Offset	Utility Investigation Level Needed	Test Hole No.	Recommended Action or Resolution	Estimated Resolution Date	Resolution Status	Cost Analysis
AT&T	1	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	21+00	22+00	45' Lt	45' Lt	QLC		Relocation before construction.	3/8/2010	Utility conflict identified	Detail
AT&T	2	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	21+80	23+00	37' Rt	37' Rt	QLC		Relocation before construction.	3/8/2010	Utility conflict identified	Detail
AT&T	3	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	27+50	30+00	48' Rt	48' Rt	QLC		Relocation before construction.	3/8/2010	Utility conflict identified	Detail
AT&T	4	U-1	Telephone	Fiber Optic	Conflict with construction of frontage road widening.	44+40	45+15	48' Rt	48' Rt	QLC		Relocation before construction.	3/8/2010	Utility conflict identified	Detail
AT&T	5	U-1	Telephone	Unknown	Conflict with construction of frontage road widening.	45+10	45+20	49' Lt	49' Lt	QLB		Design change.	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	6	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	45+80	45+90	57' Lt	49' Lt	QLB		Design change.	3/8/2010	Utility conflict identified	Detail
AT&T	7	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	25+80	25+90	65' Lt	49' Lt	QLC		Protect in-place.	3/8/2010	Utility conflict identified	Detail
AT&T	8	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	25+80	25+90	62' Rt	49' Lt	QLC		Protect in-place.	3/8/2010	Utility conflict identified	Detail
AT&T	9	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	27+40	28+00	55' Lt	55' Lt	QLC		Protect in-place.	3/8/2010	Utility conflict identified	Detail
AT&T	10	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	27+40	28+00	55' Rt	55' Lt	QLC		Protect in-place.	3/8/2010	Utility conflict identified	Detail
AT&T	11	U-1	Telephone	Copper	Conflict with retaining wall No. 18.	28+05	29+00	62' Rt	55' Lt	QLC		Exception to policy.	3/8/2010	Utility conflict identified	Detail
AT&T	12	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 18.	15+50	16+00	49' Lt	80' Rt	QLC		Design change.	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	13	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	15+90	16+00	40' Lt	80' Rt	QLC		Design change.	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	14	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	20+40	22+00	115' Rt	80' Rt	QLC		Design change.	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	15	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	22+30	23+00	80' Rt	80' Rt	QLC		Design change.	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	16	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	25+85	28+00	55' Rt	80' Rt	QLB		Design change.	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	17	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	28+05	30+00	62' Rt	80' Rt	QLB		Design change.	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	18	U-2	Telephone	Multiple Concrete Duct	Conflict with retaining wall No. 27.	33+15	35+00	65' Rt	80' Rt	QLB		Design change.	3/8/2010	Utility owner informed of utility conflict	Detail
AT&T	19	U-2	Manhole	Steel	Conflict with retaining wall No. 27.	445+55	446+00	48' Rt	48' Rt	QLA	1	Relocation before construction.	7/2/2010	Utility conflict identified	Detail
Centerpoint Energy	20	U-3	Electricity Distribution	Steel	Conflict with retaining wall No. 27.	445+55	446+00	48' Rt	48' Rt	QLA	2	Relocation before construction.	7/2/2010	Utility conflict identified	Detail

Figure E12. Access Database Report Based on Standalone Utility Conflict Matrix.

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Utility Conflict Resolution Alternatives

Cost Estimate Analysis

Texas Transportation Institute

Date: 11/24/2010

Project Owner: Texas Department of Transportation
Project No.: 1234-56-789
Project Description: Road construction project in Houston
Highway or Route: I-10 Katy Freeway

Conflict ID:	1
Utility Owner:	AT&T
Utility Type:	Telephone
Size and/or Material:	Fiber Optic
Project Phase:	60% Design

Alternative Number	Alternative Description	Alternative Advantage	Alternative Disadvantage	Responsible Party	Engineering Cost (Utility)	Direct Cost (Utility)	Engineering Cost (DOT)	Direct Cost (DOT)	Total Cost	Feasibility	Decision
0	Relocation before construction.	No design change required and no additional cost to DOT.	Cost to utility for relocation.	Utility Company	$10,375.00	$63,875.00	$0.00	$0.00	$74,250.00	Yes	Selected
1	Protect in-place.			Utility Company	$7,875.00	$32,375.00	$0.00	$0.00	$40,250.00	No	Rejected
2	Design change.			DOT	$0.00	$0.00	$95,375.00	$0.00	$95,375.00	No	Rejected
3	Exception to policy.			DOT	$0.00	$0.00	$0.00	$0.00	$0.00	No	Rejected

Figure E13. Access Database Report Based on Standalone Utility Conflict Matrix, Cost Estimate Analysis Sub Sheet.

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SAMPLE PROJECT FILES

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Test Hole Form

Utility Type		Utility Material	Offset Measured From	Identified By
E	Electrical	1 Steel	30 Edge of Pavement	20 Sleeve
G	Gas Line	2 PVC (Polyvinyl Chloride)	31 Baseline	21 Hub/Lathe
BT	Buried Telephone	3 DIP (Ductile Iron Pipe)	32 Right-of-Way	22 Nail/Disk
FOC	Fiber Optic Cable	4 VCP (Vitrified Clay Pipe)	33 Centerline	23 "X" in Concrete
W	Water	5 PE (Polyethylene Pipe)	34 Back of Curb	24 Set Iron Rod and Cap 5/8"
SAN	Sanitary Sewer	6 AC (Transite)	35 Survey Hub	25
STM	Storm Sewer	7 CI (Cast Iron)	36 "X" in Concrete	26
CATV	Cable TV	8 DBC (Direct Buried Cable)	37 Swing Ties	
FM	Force Main	9 Concrete Pipe	38 Ref. Point in Driveway	
RW	Reclaimed Water	10 Corrugated Metal Pipe	39	
SL	Street Light	11 Duct	**Surface Type**	
TS	Traffic Signal	12 Fiberglass	A Asphalt	
FL	Fuel Line	13 Unknown	C Concrete	
EXP	Exploratory	14 Corrugated Plastic	NG Natural Ground	
UNK	Unknown	15 Concrete Duct		
IRR	Irrigation			

Conflict No.	Test Hole No.	Utility Type	Utility Material	Utility Size (O.D.) in. ☑ mm. ☐	Approx. Station	Approx. Offset Distance ft. ☑ m. ☐ L	Approx. Offset Distance ft. ☑ m. ☐ R	Offset From	Manual Depth (Top) ft. ☑ m. ☐	Cross Sectional View	Utility Direction (N/W/E/S)	ID'd By	Surface Type	Pvmnt. Thick-ness in. ☑ mm. ☐
C40	19	BE	2	6"	37+00	62.0		31	3.16'			22	NG	
C42	20	BE	2	6"	37+00	57.0		31	3.33'			22	NG	
C43	21	W	6	12"	37+00	53.0		31	4.21'			22	NG	
C44	22	G	1	6"	37+00	48.0		31	3.56'			22	NG	
C18	23	BE	2	6"	37+40	60.0		31	3.19'			22	NG	
C19	24	BT	8	1"	37+90	43.0		31	4.52'			22	NG	
C23	25	W	2	6"	39+00	110		31	3.83'			22	NG	
C24	26	CATV	8	1"	35+30	105		31	4.12'			22	NG	

Notes: _____

Sheet 1 of 1 Prepared By: VL Date: 10/13/06 Checked By: RMP Date: 10/14/06

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UTILITY LINECODES

	EXISTING	TO BE REMOVED	PROPOSED	TYPE OF UTILITY
OVERHEAD	E	E	E	ELECTRIC
	E-T	E-T	E-T	ELECTRIC/TELECOMMUNICATIONS
	E-TV	E-TV	E-TV	ELECTRIC/CABLE TV
	E-TC	E-TC	E-TC	ELECTRIC/TRAFFIC CONTROL
	E-T-TV	E-T-TV	E-T-TV	ELECTRIC/TELECOMMUNICATIONS/CABLE TV
	E-T-TV-TC	E-T-TV-TC	E-T-TV-TC	ELECTRIC/TELECOMMUNICATIONS/CABLE TV/TRAFFIC CONTROL
	E-TV-TC	E-TV-TC	E-TV-TC	ELECTRIC/CABLE TV/TRAFFIC CONTROL
	E-T-TC	E-T-TC	E-T-TC	ELECTRIC/TELECOMMUNICATIONS/TRAFFIC CONTROL
	GW	GW	GW	GUY WIRE
	T	T	T	TELECOMMUNICATIONS
	T-TC	T-TC	T-TC	TELECOMMUNICATIONS/TRAFFIC CONTROL
	T-TV-TC	T-TV-TC	T-TV-TC	TELECOMMUNICATIONS/CABLE TV/TRAFFIC CONTROL
	T-TV	T-TV	T-TV	TELECOMUNICATIONS/CABLE TV
	TV	TV	TV	CABLE TV
	TV-TC	TV-TC	TV-TC	CABLE TV/TRAFFIC CONTROL
	TC	TC	TC	TRAFFIC CONTROL
UNDERGROUND	E	E	E	ELECTRIC (QL-D)
	E(C)	E(C)		ELECTRIC (QL-C)
	E(B)	E(B)		ELECTRIC (QL-B)
	T	T	T	TELECOMMUNICATIONS (QL-D)
	T(C)	T(C)		TELECOMMUNICATIONS (QL-C)
	T(B)	T(B)		TELECOMMUNICATIONS (QL-B)
	TV	TV	TV	CABLE TV (QL-D)
	TV(C)	TV(C)		CABLE TV (QL-C)
	TV(B)	TV(B)		CABLE TV (QL-B)
	W	W	W	WATER (QL-D)
	W(C)	W(C)		WATER (QL-C)
	W(B)	W(B)		WATER (QL-B)
	**W	**W	**W	WATER FOR LABELED PIPE SIZES (QL-D)
	**W(C)	**W(C)		WATER FOR LABELED PIPE SIZES (QL-C)
	**W(B)	**W(B)		WATER FOR LABELED PIPE SIZES (QL-B)
	NW	NW	NW	NON-POTABLE WATER (QL-D)
	NW(C)	NW(C)		NON-POTABLE WATER (QL-C)
	NW(B)	NW(B)		NON-POTABLE WATER (QL-B)
	**NW	**NW	**NW	NON-POTABLE WATER FOR LABELED PIPE SIZES (QL-D)
	**NW(C)	**NW(C)		NON-POTABLE WATER FOR LABELED PIPE SIZES (QL-C)
	**NW(B)	**NW(B)		NON-POTABLE WATER FOR LABELED PIPE SIZES (QL-B)
	STM	STM	STM	STEAM (QL-D)
	STM(C)	STM(C)		STEAM (QL-C)
	STM(B)	STM(B)		STEAM (QL-B)
	**STM	**STM	**STM	STEAM FOR LABELED PIPE SIZES (QL-D)
	**STM(C)	**STM(C)		STEAM FOR LABELED PIPE SIZES (QL-C)
	**STM(B)	**STM(B)		STEAM FOR LABELED PIPE SIZES (QL-B)
	SS	SS	SS	SANITARY SEWER WITH FLOW DIRECTION (QL-D)
	SS(C)	SS(C)		SANITARY SEWER WITH FLOW DIRECTION (QL-C)
	SS(B)	SS(B)		SANITARY SEWER WITH FLOW DIRECTION (QL-B)
	Σ**SS	Σ**SS	Σ**SS	SANITARY SEWER WITH FLOW DIRECTION FOR LABELED PIPE SIZES (QL-D)
	Σ**SS(C)	Σ**SS(C)		SANITARY SEWER WITH FLOW DIRECTION FOR LABELED PIPE SIZES (QL-C)
	Σ**SS(B)	Σ**SS(B)		SANITARY SEWER WITH FLOW DIRECTION FOR LABELED PIPE SIZES (QL-B)
	SFM	SFM	SFM	SANITARY SEWER FORCE MAIN WITH FLOW DIRECTION (QL-D)
	SFM(C)	SFM(C)		SANITARY SEWER FORCE MAIN WITH FLOW DIRECTION (QL-C)
	SFM(B)	SFM(B)		SANITARY SEWER FORCE MAIN WITH FLOW DIRECTION (QL-B)
	G	G	G	GAS (QL-D)
	G(C)	G(C)		GAS (QL-C)
	G(B)	G(B)		GAS (QL-B)
	**G	**G	**G	GAS FOR LABELED PIPE SIZES (QL-D)
	**G(C)	**G(C)		GAS FOR LABELED PIPE SIZES (QL-C)
	**G(B)	**G(B)		GAS FOR LABELED PIPE SIZES (QL-B)
	P	P	P	PETROLEUM (QL-D)
	P(C)	P(C)		PETROLEUM (QL-C)
	P(B)	P(B)		PETROLEUM (QL-B)
	**P	**P	**P	PETROLEUM FOR LABELED PIPE SIZES (QL-D)
	**P(C)	**P(C)		PETROLEUM FOR LABELED PIPE SIZES (QL-C)
	**P(B)	**P(B)		PETROLEUM FOR LABELED PIPE SIZES (QL-B)
	TC	FOR PROPOSED/TEMPORARY TRAFFIC CONTROL INFORMATION REFER TO TRAFFIC SIGNAL PLANS		TRAFFIC CONTROL (QL-D)
	TC(C)			TRAFFIC CONTROL (QL-C)
	TC(B)			TRAFFIC CONTROL (QL-B)
	UNK(B)	UNK(B)		UNKNOWN UTILITY FOUND IN SUE INVESTIGATION (QL-B)

UTILITY SYMBOLS

EXISTING	PROPOSED	TEMPORARY	
			UTILITY POLE/GUY POLE
			LIGHT POLE
			GUY ANCHOR
M	M	M	MARKER
X	X	X	SPLICE BOX
			CABINET
			VENT
E	E	E	ELECTRIC MANHOLE
H	H	H	HAND HOLE
E	E	E	TRANSFORMER
E	E	E	ELECTRIC METER
E	E	E	ELECTRIC BOX
T	T	T	TELECOMMUNICATIONS MANHOLE
T	T	T	TELECOMMUNICATIONS PEDESTAL
SLC	SLC	SLC	SUBCRIBER LOOP CARRIER (aka "SLICK")
			PHONE BOOTH
			CABLE TV PEDESTAL
TV	TV	TV	CABLE TV MANHOLE
W	W	W	WATER VALVE
W	W	W	WATER METER
W	W	W	WATER MANHOLE
			FIRE HYDRANT ASSEMBLY (INCLUDES ASSOCIATED VALVE)
BFP	BFP	BFP	BACKFLOW PREVENTER
PIV	PIV	PIV	PRESSURE INDICATOR VALVE
ARV	ARV	ARV	AIR RELEASE VALVE
W	W	W	WELL
W	W	W	WATER VAULT
W	W	W	WATER VALVE MARKER
			STAND PIPE

EXISTING	PROPOSED	TEMPORARY	
			CLEANOUT
SS	SS	SS	SANITARY SEWER MANHOLE
ARV	ARV	ARV	AIR RELEASE VALVE
GT	GT	GT	GREASE TRAP
S	S	S	SANITARY SEWER FORCE MAIN VALVE
G	G	G	GAS VALVE
G	G	G	GAS METER
G	G	G	GAS MANHOLE
GPR	GPR	GPR	GAS PRESSURE REGULATOR
G	G	G	GAS VAULT
GTS	GTS	GTS	GAS TEST STATION
P	P	P	PETROLEUM VALVE
TC	FOR PROPOSED/TEMPORARY TRAFFIC CONTROL INFORMATION REFER TO TRAFFIC SIGNAL PLANS		TRAFFIC CONTROL MANHOLE/ ELECTRIC COMMUNICATIONS BOX
			TRAFFIC CONTROL PEDESTRIAN SIGNAL/BUTTON POST

MISCELLANEOUS

LOS	LIMITS OF OVERHEAD AND SUBSURFACE UTILITY INVESTIGATION
TH	TEST HOLE (QL-A ONLY)
EOI	END OF INFORMATION
	QUALITY LEVEL (QL) DELINEATION
123	POLE ID
A01	SANITARY SEWER MANHOLE (SSMH) ID
C123	CONFLICT LOCATION (UTILITY IMPACT ANALYSIS (UIA) ONLY)

QUALITY LEVELS AND DEFINITIONS

QL-D DEPICTED ACCORDING TO UTILITY RECORD INFORMATION AND IN-FIELD VISUAL INSPECTION. NO ELECTRONIC DESIGNATING INFORMATION WAS OBTAINED.

QL-C EXISTING UTILITY STRUCTURES HAVE BEEN FIELD LOCATED AND SURVEYED TO ASSIST IN DEPICTING THE UTILITIES SHOWN ON RECORDS. NO ELECTRONIC DESIGNATING INFORMATION WAS OBTAINED.

QL-B INFORMATION WAS OBTAINED THROUGH THE APPLICATION OF APPROPRIATE SURFACE GEOPHYSICAL METHODS TO DETERMINE THE EXISTENCE AND APPROPRIATE HORIZONTAL POSITION OF THE SUBSURFACE UTILITIES. QL-B DATA SHOULD BE REPRODUCIBLE BY SURFACE GEOPHYSICS AT ANY POINT OF THEIR DEPICTION. THIS INFORMATION IS SURVEYED TO APPLICABLE TOLERANCES DEFINED BY THE PROJECT AND REDUCED ONTO PLAN DOCUMENTS.

QL-A OBTAIN PRECISE HORIZONTAL AND VERTICAL POSITION OF THE UTILITY LINE BY EXCAVATING A TEST HOLE. THE TEST HOLE SHALL BE DONE USING VACUUM EXCAVATION OR COMPARABLE NONDESTRUCTIVE EQUIPMENT IN A MANNER AS TO CAUSE NO DAMAGE TO THE UTILITY LINE. AFTER EXCAVATING A TEST HOLE, A FIELD SURVEY SHALL BE PERFORMED TO DETERMINE THE EXACT LOCATION AND POSITION OF THE UTILITY LINE.

TELEPHONE PAIR SIZE TABLE

TELEPHONE PAIR SIZE	TELEPHONE CABLE DIAMETER
5 - 100	0.50 TO 2.00 IN
101 - 2400	UP TO 3.50 IN

NOT TO SCALE

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: UTILITIES

UTILITY PLANS
LEGEND

SR 120/ROSWELL RD. WIDENING

F5

DRAWING No. 24-0B

3/1/2007 GPLN

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UTILITY POLE DATA SHEET

Description: SR120 (ROSWELL RD.)
TBE Job #: GA095-005-05

Pole #	Pole ID	Pole Owner	Electric	Telecom	Cable TV	Traffic	Other	Northing	Easting	Height	Dia.	Material	Misc.
1		COMT	0	0	0	1	0	1440619.299	2196108.477	28.34	8"	METAL	TRAFFIC SIGN
1A		COMT	0	0	0	1	0	1440541.586	2196196.505	52.38	8"	METAL	TRAFFIC SIGN
2		COMT	0	0	0	0	0	1440630.171	2196115.085	43.43	12"	METAL	LIGHT
3		CEMC	1	1	0	1	0	1440549.258	2196251.533	43.43	12"	WOOD	
4		GP	1	0	1	0	0	1440761.236	2196145.671	43.65	12"	WOOD	
4A		GP	1	0	1	0	0	1440772.462	2196123.745	49.95	12"	WOOD	
4B		PRIVATE	0	0	0	0	0	1440768.565	2196124.796	12.10	6"	WOOD	ABANDONED
5		COMT	1	0	0	1	0	1440569.437	2196255.795	43.57	12"	WOOD	
6		GP	1	0	1	0	0	1440914.264	2196272.924	54.80	12"	WOOD	
6A		COMT	1	0	0	1	0	1440695.733	2196390.965	57.13	12"	WOOD	LIGHT
7		COMT	0	0	0	1	0	1440726.978	2196379.319	24.45	12"	WOOD	
7A		COMT	0	0	0	1	0	1440974.807	2196439.520	30.63	12"	WOOD	
7B		COMT	1	0	0	1	0	1440824.977	2196299.807	33.20	12"	WOOD	
7C		COMT	0	0	0	1	0	1440802.429	2196223.907	30.06	12"	WOOD	
7D		COMT	0	0	0	1	0	1440626.918	2196311.771	29.30	12"	WOOD	
7E		PRIVATE	0	0	0	0	0	1440620.292	2196326.497	36.17	12"	WOOD	ABANDONED
8		COMT	1	0	0	1	0	1440824.535	2196531.179	66.11	12"	WOOD	
8A		COMT	0	0	0	1	0	1440779.995	2196637.567	30.63	12"	WOOD	NOT SHOWN
8B		COMT	0	0	0	1	0	1440747.224	2196573.803	25.92	12"	WOOD	NOT SHOWN
9		COMT	0	0	0	1	0	1440938.793	2196577.454	33.44	12"	WOOD	
9A		GP	1	0	1	0	1	1441047.394	2196381.276	58.58	12"	WOOD	
10		GP	1	1	1	1	1	1441190.074	2196629.446	55.46	12"	WOOD	
10A		COMT	0	0	0	1	0	1441079.141	2196506.343	40.26	12"	WOOD	
11		COMT	0	0	0	0	1	1441065.962	2196722.612	41.57	12"	WOOD	GUY POLE
12		CEMC	1	0	0	0	0	1441099.254	2196793.720	37.42	12"	WOOD	
13		COMT	1	0	0	1	0	1441186.051	2196809.117	29.91	12"	METAL	SIGN W/LIGHT
14		COMT	0	0	0	1	0	1441275.032	2196719.128	27.6	12"	METAL	TRAFFIC SIGN
15		PRIVATE	1	0	0	0	0	1441319.432	2196723.267	37.85	12"	WOOD	LIGHT
16		COMP	1	1	0	0	0	1441214.808	2196909.161	47.4	12"	WOOD	
16A		PRIVATE	0	0	0	0	0	1441218.015	2196906.789	23.01	12"	WOOD	ABANDONED
17		GP	1	1	1	1	0	1441365.019	2196808.094	37.10	12"	WOOD	
18		COMP	1	1	0	0	0	1441291.635	2196988.610	37.79	12"	WOOD	
18A		CEMC	1	1	0	0	0	1441438.183	2197086.669	39.51	12"	WOOD	
18B		PRIVATE	1	0	0	0	0	1441443.446	2197105.165	28.96	12"	WOOD	
19		PRIVATE	1	0	0	0	0	1441418.973	2196833.443	38.37	12"	WOOD	LIGHT
20		PRIVATE	1	0	0	0	0	1441532.602	2196928.269	50.56	12"	WOOD	LIGHT
21		GP	1	1	1	1	0	1441511.711	2196957.307	41.26	12"	WOOD	
22		CEMC	1	1	0	0	0	1441478.622	2197117.185	43.23	12"	WOOD	
23		CEMC	1	1	0	0	1	1441591.907	2197203.634	41.92	12"	WOOD	
24		COMT	0	0	0	0	1	1441694.117	2197139.018	30.16	12"	WOOD	TRAFFIC SIGN
25		COMT	0	0	0	0	1	1441630.827	2197210.701	30.61	12"	WOOD	TRAFFIC SIGN
26			POLE	#	NOT	USED							
27		GP	1	1	1	1	0	1441707.808	2197134.047	42.92	12"	WOOD	
28		CEMC	1	0	0	0	0	1441710.939	2197295.056	38.48	12"	WOOD	
28A		COMT	0	0	0	1	0	1441748.646	2197331.619	27.71	12"	WOOD	TRAFFIC POLE
29		GP	1	1	1	0	0	1441901.972	2197311.859	29.58	12"	WOOD	
29A		COMT	0	0	0	1	0	1441876.030	2197296.963	27.82	12"	METAL	TRAFFIC POLE
29B		GP	1	1	0	0	0	1441887.864	2197275.864	51.75	12"	WOOD	
29C		GP	1	1	0	0	0	1442020.246	2197123.784	43.36	12"	WOOD	
29D		COMT	0	0	0	1	0	1441820.581	2197249.795	27.99	12"	METAL	TRAFFIC POLE
30		GP	1	1	1	0	1	1441904.002	2197314.000	56.87	12"	WOOD	
31		BST	0	1	0	0	0	1441801.851	2197376.529	31.25	12"	WOOD	LIGHT
31A		CEMC	1	0	1	0	0	1441814.520	2197378.793	42.98	12"	WOOD	
31B		CCDOT	0	0	0	1	0	1441806.670	2197377.795	27.73	12"	METAL	TRAFFIC POLE
32		CEMC	1	0	0	0	0	1441961.313	2197501.664	36.63	12"	WOOD	
33	60532	GP	1	0	1	1	0	1442042.538	2197438.823	58.26	12"	WOOD	
34		GP	1	0	1	0	0	1442133.789	2197520.321	48.18	12"	WOOD	
35		GP	1	0	0	0	0	1442152.106	2197520.473	38.97	12"	WOOD	
36		GP	1	0	0	0	0	1442154.025	2197500.233	34.11	12"	WOOD	
37		CEMC	1	0	0	0	0	1442115.721	2197621.902	37.79	12"	WOOD	
38		GP	1	0	1	0	0	1442200.900	2197581.107	41.87	12"	METAL	
39		GP	1	0	0	0	0	1442271.354	2197611.565		12"	METAL	TRANS. TOWER
40		GP	1	1	1	0	0	1442330.548	2197665.980	42.07	12"	WOOD	
41	C0512	GP	1	0	0	0	0	1442379.578	2197810.932	47.08	12"	WOOD	

UTILITY POLE DATA SHEET

Description: SR120 (ROSWELL RD.)
TBE Job #: GA095-005-05

Pole #	Pole ID	Pole Owner	Electric	Telecom	Cable TV	Traffic	Other	Northing	Easting	Height	Dia.	Material	Misc.
42		GP	1	1	1	0	0	1442562.352	2197814.124	46.79	12"	WOOD	
43	C0522	GP	1	0	0	0	0	1442521.107	2197901.599	33.18	12"	WOOD	
44		GP	1	1	1	0	0	1442628.379	2197854.364	81.97	12"	WOOD	
45		GP	1	0	0	0	0	1442615.404	2197979.819	48.95	12"	WOOD	
46		GP	1	0	0	0	0	1442687.421	2198024.769	42.39	12"	WOOD	
46A		PRIVATE	0	0	0	0	0	1442750.512	2198088.317	19.22	12"	WOOD	LIGHT
47		GP	1	1	1	0	0	1442908.084	2198022.602	84.11	12"	WOOD	
47A		PRIVATE	0	0	0	0	0	1443011.485	2198069.300	26.88	12"	METAL	LIGHT
47B		PRIVATE	0	0	0	0	0	1442951.615	2198030.496	25.29	12"	METAL	LIGHT
48		GP	1	0	1	0	0	1442885.000	2198149.510	41.98	12"	WOOD	
49	37	GP	1	1	1	0	0	1443131.659	2198172.706	82.00	12"	WOOD	
50		GP	1	0	1	0	0	1443092.582	2198280.691	43.28	12"	WOOD	
51		PRIVATE	0	0	0	0	0	1443150.434	2198186.636	28.95	12"	METAL	ABANDONED
52	SC335	GP	1	1	1	0	0	1443386.921	2198333.009	79.66	12"	WOOD	
53		GP	1	0	1	0	0	1443317.706	2198425.100	43.87	12"	WOOD	
53A		PRIVATE	0	0	0	0	0	1443273.330	2198399.956	24.06	12"	METAL	LIGHT
53B		PRIVATE	0	0	0	0	0	1443164.033	2198330.551	22.95	12"	METAL	LIGHT
54		GP	1	0	0	0	0	1443473.516	2198522.980	40.96	12"	WOOD	
55	27751	GP	1	1	1	0	0	1443581.514	2198455.023	81.40	12"	WOOD	
56		PRIVATE	1	0	0	0	0	1443765.607	2198578.163	28.80	12"	WOOD	LIGHT
56A		PRIVATE	0	0	0	0	0	1443732.528	2198539.853	30.52	12"	METAL	LIGHT
57		GP	1	0	0	1	0	1443657.655	2198638.373	39.17	12"	WOOD	
57A		PRIVATE	0	0	0	0	0	1443718.062	2198679.523	20.37	12"	METAL	LIGHT
57B		PRIVATE	0	0	0	0	0	1443634.291	2198627.041	20.43	12"	METAL	LIGHT
58	27751	GP	1	0	0	0	0	1443845.436	2198618.717	87.30	12"	METAL	TRANS. POLE
59		GP	1	1	1	0	1	1443851.966	2198624.331	49.19	12"	WOOD	
59A		PRIVATE	0	0	0	0	0	1443860.694	2198622.232	29.21	12"	METAL	LIGHT
60		GP	1	0	0	0	0	1443906.976	2198668.181	37.23	12"	WOOD	
61		GP	1	0	0	1	0	1443859.780	2198765.038	42.83	12"	WOOD	
61A		PRIVATE	0	0	0	0	0	1443854.842	2198785.642	22.92	12"	METAL	LIGHT
62		PRIVATE	0	0	0	0	0	1443977.296	2198704.467	26.65	12"	METAL	LIGHT
62A		PRIVATE	0	0	0	0	0	1444066.054	2198735.926	24.19	12"	METAL	LIGHT
62B		PRIVATE	0	0	0	0	0	1443939.619	2198667.624	25.58	12"	METAL	LIGHT
63		GP	0	1	0	0	0	1444019.164	2198740.530	32.07	12"	WOOD	
64		GP	1	0	1	0	0	1444036.704	2198755.594	89.63	12"	METAL	TRANSMISSION
65		CCDOT	0	0	0	1	0	1444057.304	2198756.927	32.13	12"	METAL	TRAFFIC
66		CCDOT	0	0	0	0	0	1444063.047	2198760.641	11.99	12"	METAL	PEDESTRIAN
67		CCDOT	0	0	0	0	0	1444066.672	2198756.676	49.93	12"	METAL	SURVEILLANCE
68		GP	0	0	0	0	0	1444070.649	2198756.709	26.61	12"	WOOD	ABANDONED
69		GP	1	1	0	0	0	1444070.505	2198755.110	29.84	12"	WOOD	
70		PRIVATE	0	0	0	0	0	1444156.926	2198721.834	40.24	12"	METAL	LIGHT
71		GP	1	1	1	1	0	1444016.282	2198862.357	38.83	12"	WOOD	
72		PRIVATE	0	0	0	0	0	1444194.732	2198754.571	21.60	12"	METAL	LIGHT
73		PRIVATE	0	0	0	0	0	1444186.098	2198836.224	21.79	12"	METAL	LIGHT
74		GP	1	1	1	0	0	1444162.059	2198817.940	33.57	12"	WOOD	
75		CCDOT	0	0	0	0	0	1444163.412	2198820.644	11.88	12"	METAL	PEDESTRIAN
76		CCDOT	0	0	0	1	0	1444172.601	2198828.626	32.18	12"	METAL	TRAFFIC
77		CCDOT	0	0	0	0	0	1444090.365	2198911.601	11.90	12"	METAL	PEDESTRIAN
78		CCDOT	0	0	0	1	0	1444103.858	2198928.678	32.28	12"	METAL	TRAFFIC
78A		GP	1	1	1	0	0	1444027.819	2199052.638	78.55	12"	WOOD	
79		PRIVATE	0	0	0	0	0	1444198.764	2198852.413	32.52	12"	WOOD	ABANDONED
79A		PRIVATE	0	0	0	0	0	1444291.110	2198895.631	21.80	12"	METAL	LIGHT
80		GP	1	0	1	0	0	1444226.421	2198991.994	41.74	12"	WOOD	
81		CCDOT	0	0	0	0	1	1444292.153	2198912.663	28.23	12"	METAL	TRAFFIC
82		GP	1	0	1	1	0	1444322.764	2198925.319	93.62	12"	WOOD	
83		GP	1	0	1	1	0	1444527.640	2199053.912	93.73	12"	METAL	TRANSMISSION
84		GP	1	1	1	0	0	1444513.678	2199168.985	41.47	12"	WOOD	
84A		GP	1	0	1	0	0	1444389.954	2199092.983	42.81	12"	WOOD	
85		GP	0	1	0	0	0	1444532.054	2199066.397	29.66	12"	WOOD	
86		GP	1	1	1	0	0	1444678.011	2199278.133	44.35	12"	WOOD	
87		GP	1	0	1	1	0	1444709.557	2199166.888	42.17	12"	WOOD	
88		PRIVATE	0	0	0	0	0	1444778.781	2199211.039	27.74	12"	METAL	LIGHT
89		PRIVATE	0	0	0	0	0	1444829.703	2199230.022	32.21			LIGHT
90		GP	1	1	1	1	0	1444801.234	2199343.490	41.80	12"	WOOD	TRANSMISSION
91		GP	1	0	0	0	0	1444797.365	2199356.516	97.47	36"	METAL	
92		GP	1	1	1	1	1	1444849.922	2199253.332	51.30	12"	WOOD	
92A		CCDOT	0	0	0	0	0	1444883.842	2199280.173	9.85	4"	METAL	PEDESTRIAN

NOT TO SCALE

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: UTILITIES
UTILITY PLANS
UTILITY POLE DATA
SR 120/ROSWELL RD. WIDENING
DRAWING No. 24-0C

3/1/2007 GPLN

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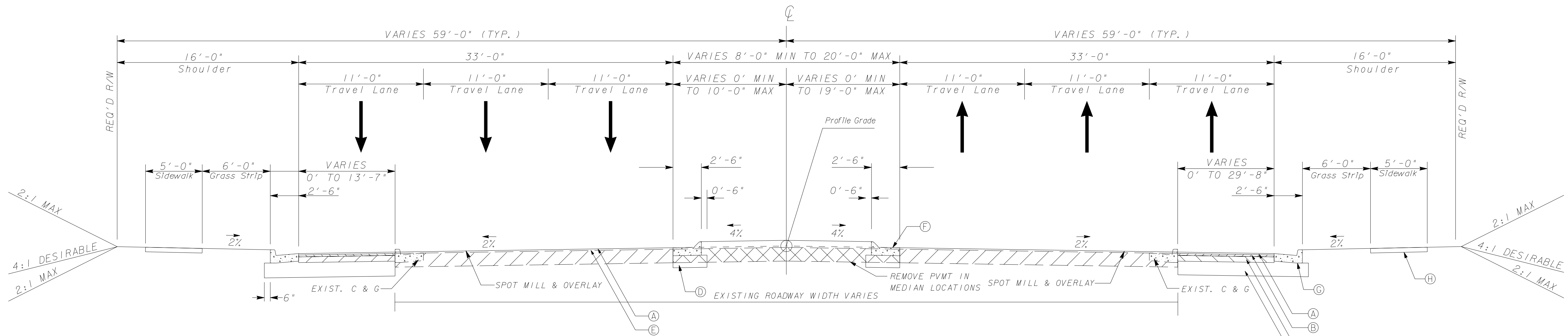
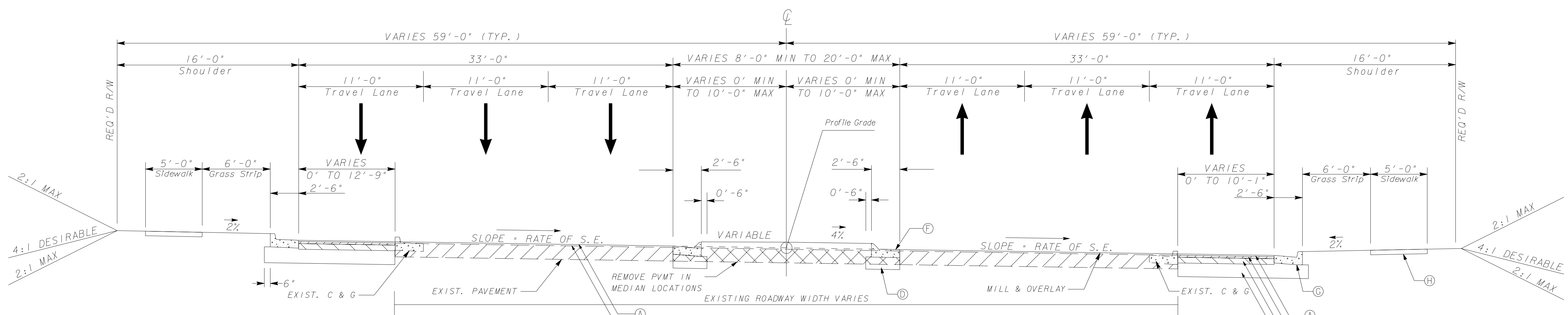


TANGENT SECTION
SR 120 / ROSWELL ROAD

STA. 14+95.93 TO 24+67.00
STA. 35+89.00 TO 62+90.00
STA. 86+88.96 TO 90+50.00

SLOPE CONTROLS		
SLOPE	CUT	FILL
4:1	0-10'	0-10'
3:1	--	--
2:1	OVER 10'	OVER 10'

PAVEMENT MATERIAL SCHEDULE
(A) RECYCLED ASPH. CONC. 12.5 mm SMA, GP 2 ONLY, 165 LBS./SY, DESIGN MIX LEVEL D
(B) RECYCLED ASPH. CONC. 19 mm SUPERPAVE, GP 1OR GP2, 330 LBS./SY, DESIGN MIX LEVEL D
(C) RECYCLED ASPH. CONC. 25 mm SUPERPAVE, GP1OR GP2, 880 LBS./SY, DESIGN MIX LEVEL C
(D) GRADED AGGREGATE BASE COURSE, 12"
(E) ASPHALTIC CONCRETE LEVELING, AS REQUIRED
(F) CONCRETE CURB & GUTTER, 8" X 30", TYPE 7, GA STD. 9032 B
(G) CONCRETE CURB & GUTTER, 8" X 30", TYPE 2, GA STD. 9032 B
(H) 5' CONCRETE SIDEWALK, 4 INCH THICK



SUPER ELEVATED SECTION
SR 120 / ROSWELL ROAD

STA. 24+67.00 TO 35+89.00
STA. 62+90.00 TO 66+29.91

NOTE: SEE DRAWING NO. 5-07 FOR STD. DETAILS

SCALE IN FEET: 0 5 10 20

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: URBAN DESIGN
TYPICAL SECTIONS
SR 120/ROSWELL RD. WIDENING

F9

DRAWING No. 5-01

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PARKING
TAX PARCEL # 16-1100-2
L. NORRIS JONES.
DB/PG 10034/397
NATIONAL AUTO SALES
35+00
TAX PARCEL # 16-1061-1
THE FRANCES G. LASSITER
FAMILY LLLP
DB/PG 13504/3256
STA. 39+32.65 ROSWELL RD./SR120
STA. 10+00.00 PRIVATE DRIVE A
Δ = 90°09'47"
LIMIT OF CONSTRUCTION
STA. 13.00
PRIVATE DRIVE "A"
TAX PARCEL # 16-0625-1
L & B VILLAGE AT EAST COBB LLC
DB/PG 13319/2379
40+00
(CEMC) HIGH VOLTAGE 3 PHASE
HIGH VOLTAGE LINES
6" STEEL (GAS)
UNK SIZE/TYPE
3 PHASE PRIMARY
6" STEEL
(TELEPORT) FOC
DUCT UNK SIZE/TYPE
ROSWELL ROAD/SR 120
(COMM) 8" CIP
MH 01
TOP: 1043.92
MANHOLE ON TOP OF VAULT INACCESSIBLE
NO RECORDS AVAILABLE
MH 02
TOP: 1042.87
MANHOLE INACCESSIBLE
NO RECORDS AVAILABLE
30" UNK TYPE (COMM)
18" CIP
8" CIP
COMM VAULT
2 VALVES / METER
4" PLASTIC
6" PLASTIC
STA. 38+70.00
END "W" BEAM GR
TP ANCHOR
SEWER MH
OBSCURE AREA
COULD NOT FIND IN FIELD
(SEWER MH PER MAPPING FILES)
LAND LOT 106
TAX PARCEL # 16-1061-1
THE FRANCES G. LASSITER
FAMILY LLLP
DB/PG 13504/3256
STA. 39+36.24 ROSWELL RD. /SR120
STA. 13+08.09 PRIVATE DRIVE B
Δ = 89°46'06"
VAULT 4' X 4' X 14'
VAULT 4' X 4' X 14'
VAULT 4' X 4' X 14'
3 METERS
3 PHASE PRIMARY
PRIVATE DR. "B"
LIMIT OF CONSTRUCTION
STA. 15+50.00
PRIVATE DRIVE "B"
CITY TAX PARCEL # 16-1133-1
SOPE CREEK LLC
PHASE III
DB/PG 13240/2500
MATCH LINE STA. 34+40
MATCH LINE STA. 40+20
S.R. 120
N 32° 8'10" E
N 57°27'56.9" W
10+00

PROPERTY AND EXISTING R/W LINE	BEGIN LIMIT OF ACCESS.....BLA
REQUIRED R/W LINE	END LIMIT OF ACCESS.....ELA
CONSTRUCTION LIMITS —C— —F—	LIMIT OF ACCESS
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES	R/W AND LIMIT OF ACCESS
EASEMENT FOR CONSTR OF SLOPES	EXISTING R/W LINE
EASEMENT FOR CONSTR OF DRIVES	

SCALE IN FEET
0 20 40 80

REVISION DATES		

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: UTILITIES
UTILITY PLANS
SR 120/ROSWELL RD. WIDENING
STA. 34+40 - STA. 40+20
F11
DRAWING No. 24-05

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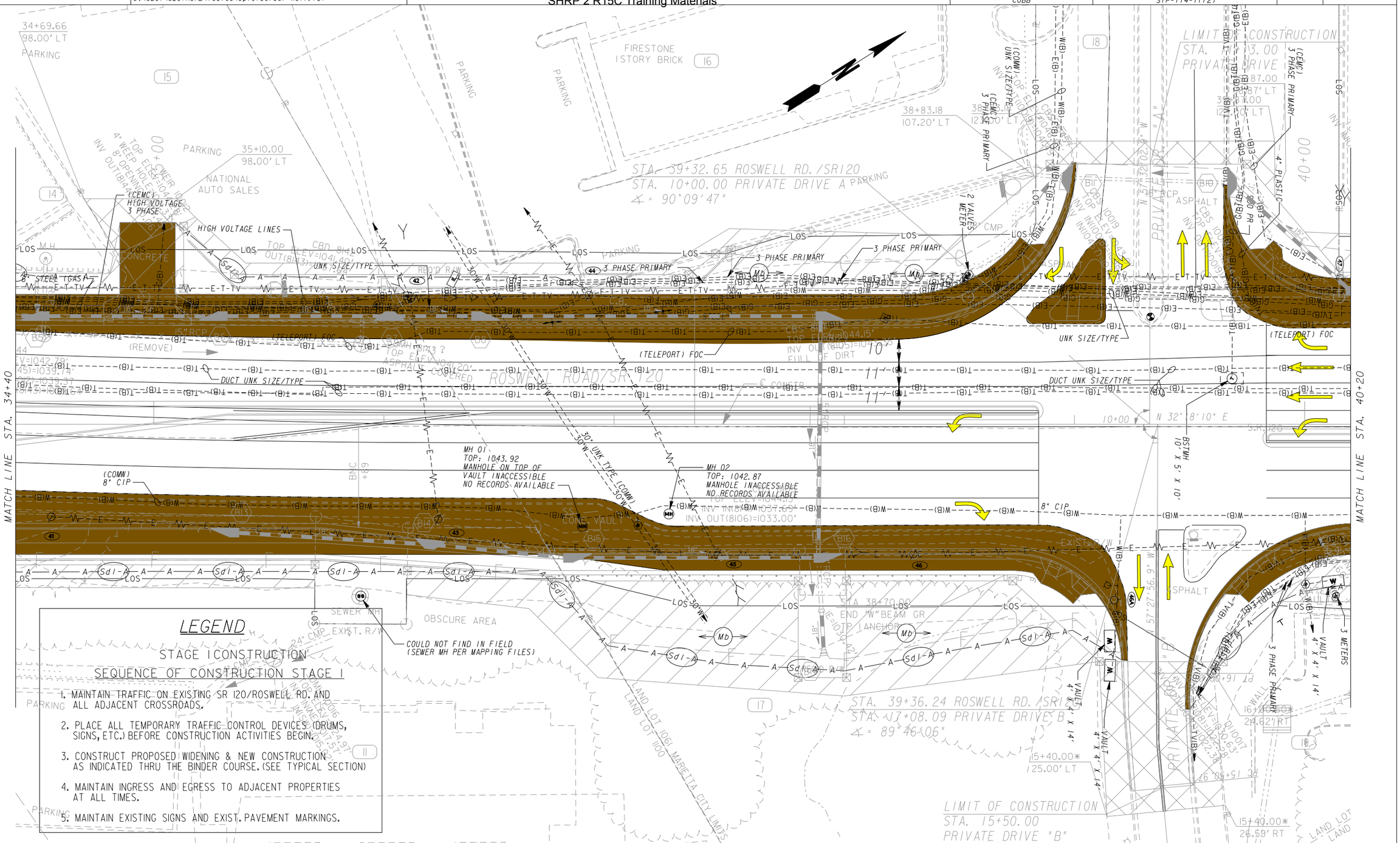
7/19/2010 9:00:12 AM USER: jblrnkammer	Plot file C:\GDOT\GDOTROAD\tables\Gplotborder-half.tbl	G:\SUE\SUE Training\AUPI Sample Plans\72130stage1.dgn(ON-13, 45-49, 60-62))	COUNTY COBB	PROJECT NUMBER STP-114-1(72)	SHEET NO.	TOTAL SHEETS



LEGEND

STAGE I CONSTRUCTION

SEQUENCE OF CONSTRUCTION STAGE I

1. MAINTAIN TRAFFIC ON EXISTING SR 120/ROSWELL RD. AND ALL ADJACENT CROSSROADS.
2. PLACE ALL TEMPORARY TRAFFIC CONTROL DEVICES (DRUMS, SIGNS, ETC.) BEFORE CONSTRUCTION ACTIVITIES BEGIN.
3. CONSTRUCT PROPOSED WIDENING & NEW CONSTRUCTION AS INDICATED THRU THE BINDER COURSE. (SEE TYPICAL SECTION)
4. MAINTAIN INGRESS AND EGRESS TO ADJACENT PROPERTIES AT ALL TIMES.
5. MAINTAIN EXISTING SIGNS AND EXIST. PAVEMENT MARKINGS.

PROPERTY AND EXISTING R/W LINE	BEGIN LIMIT OF ACCESS.....BLA
REQUIRED R/W LINE	END LIMIT OF ACCESS.....ELA
CONSTRUCTION LIMITS —C— F—	LIMIT OF ACCESS
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES	R/W AND LIMIT OF ACCESS
EASEMENT FOR CONSTR OF SLOPES	EXISTING R/W LINE
EASEMENT FOR CONSTR OF DRIVES	

SCALE IN FEET
0 20 40 80

REVISION DATES		

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: URBAN DESIGN

MAINLINE PLAN
STAGE I CONSTRUCTION
SR 120/ROSWELL RD. WIDENING
STA. 34+40 - STA. 40+20

F13

DRAWING No. 13-05

GPLN

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7/19/2010 9:05:18 AM USER:jblrnkammer	Plot file C:\GDOT\GDOTROAD\tables\Gplotborder-half.tbl	G:\SUE\SUE Training\AUPI Sample Plans\72130stage2.dgn(ON=13,45-49,60-62))	COUNTY COBB	PROJECT NUMBER STP-114-1(72)	SHEET NO.	TOTAL SHEETS

SHRP 2 R15C Training Materials

34+69.66
98.00' LT
PARKING

15

FIRESTONE
1STORY BRICK

16

5" SKIP WHITE
(10' SEG., 30' GAP)

STA. 39+32.65 ROSWELL RD./SR120
STA. 10+00.00 PRIVATE DRIVE A
Δ = 90°09'47"

38+83.18
107.20' LT

LIMIT OF CONSTRUCTION
STA. 13.00
PRIVATE DRIVE

18

40+00

35+10.00
98.00' LT

5" DSYL

NATIONAL
AUTO SALES

14

(CEMC)
HIGH VOLTAGE
3 PHASE

HIGH VOLTAGE LINES

M.H.
CONCRETE

TOP ELEV=1041.42'
OUT(8143)=1031.92'
UNK SIZE/TYPE

6" STEEL (GAS)

42

44

3 PHASE PRIMARY

3 PHASE PRIMARY

3 PHASE PRIMARY

2 VALVES
METER

CMP

ASPHALT

(TELEPORT) FOC

(TELEPORT) FOC

15" RCP
(REMOVE)

B5

B6

B7

B8

TOP ELEV=1044.20'
INV. OUT(8105)=1043.35'
FULL OF DIRT

DUCT UNK SIZE/TYPE

DUCT UNK SIZE/TYPE

ROSWELL ROAD/SR120

℄ CONSTR.

10+00

N 32° 8'10" E

S.R. 120

MATCH LINE STA. 34+40

MATCH LINE STA. 40+20

(COMM)
8" CIP

B13

B14

B15

B16

41

43

45

46

MH 01
TOP: 1043.92
MANHOLE ON TOP OF
VAULT INACCESSIBLE
NO RECORDS AVAILABLE

MH 02
TOP: 1042.87
MANHOLE INACCESSIBLE
NO RECORDS AVAILABLE

INV IN(8106)=1037.69'
INV OUT(8106)=1033.00'

8" CIP

30" UNK TYPE (COMM)

BNC
+69

SEWER MH

OBSCURE AREA

5" SSWL

COULD NOT FIND IN FIELD
(SEWER MH PER MAPPING FILES)

24" SSWL

STA. 38+70.00
END "W" BEAM GR
TP ANCHOR

EXIST R/W

ASPHALT

N 57°27'56.9" W

3 METERS

VAULT
4' X 4' X 14'

VAULT
4' X 4' X 14'

3 PHASE PRIMARY

8" SSWL

STA. 39+36.24 ROSWELL RD./SR120
STA. 17+08.09 PRIVATE DRIVE B
Δ = 89°46'06"

15+40.00*
125.00' LT

LIMIT OF CONSTRUCTION
STA. 15+50.00
PRIVATE DRIVE "B"

15+40.00*
26.59' RT

16+00.00*
24.62' RT

LAND LOT 1061 MARIETTA CITY LIMITS

LAND LOT 1100

LAND LOT
LAND

LEGEND

STAGE 2 CONSTRUCTION

SEQUENCE OF CONSTRUCTION STAGE 2

1. MAINTAIN TRAFFIC ON EXISTING SR 120/ROSWELL RD. AND ALL ADJACENT CROSSROADS.
2. PLACE ALL TEMPORARY TRAFFIC CONTROL DEVICES (DRUMS, SIGNS, ETC.) BEFORE CONSTRUCTION ACTIVITIES BEGIN.
3. CONSTRUCT PROPOSED WIDENING & NEW CONSTRUCTION AS INDICATED THRU THE BINDER COURSE. (SEE TYPICAL SECTION)
4. MAINTAIN INGRESS AND EGRESS TO ADJACENT PROPERTIES AT ALL TIMES.
5. MAINTAIN EXISTING SIGNS AND EXIST. PAVEMENT MARKINGS.

PROPERTY AND EXISTING R/W LINE	
REQUIRED R/W LINE	
CONSTRUCTION LIMITS	C F
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES	
EASEMENT FOR CONSTR OF SLOPES	
EASEMENT FOR CONSTR OF DRIVES	

BEGIN LIMIT OF ACCESS	BLA
END LIMIT OF ACCESS	ELA
LIMIT OF ACCESS	
R/W AND LIMIT OF ACCESS	
EXISTING R/W LINE	

SCALE IN FEET
0 20 40 80

REVISION DATES		

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: URBAN DESIGN

MAINLINE PLAN
STAGE 2 CONSTRUCTION
SR 120/ROSWELL RD. WIDENING
STA. 34+40 - STA. 40+20

F15

DRAWING No. 13-05

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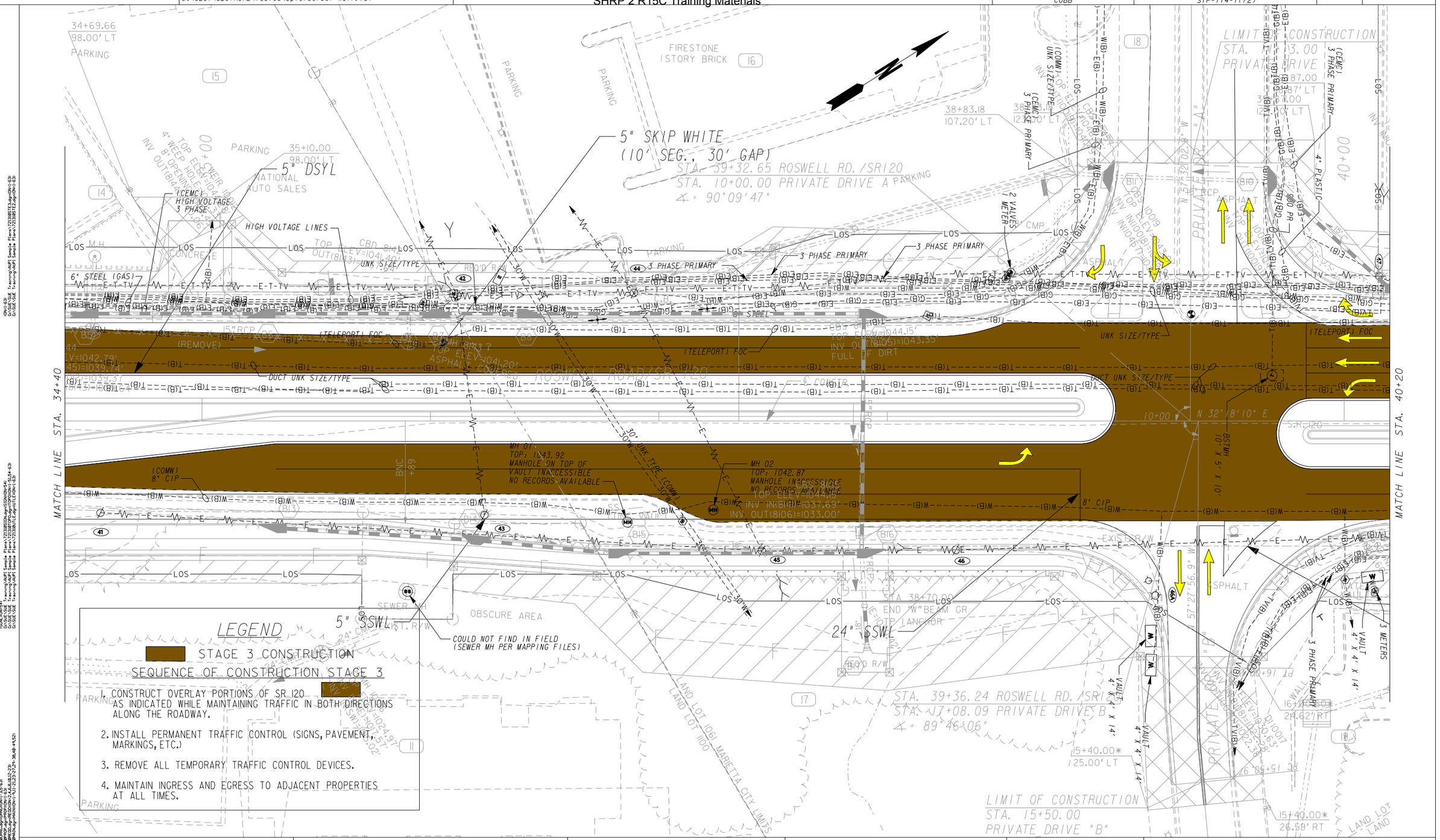
7/19/2010 9:07:15 AM USER:jblrnkammer	Plot file C:\GDOT\GDOTROAD\tables\Gplotborder-half.tbl	G:\SUE\SUE Training\AUPI Sample Plans\72130stage3.dgn(ON-13, 45-49, 60-62))	COUNTY COBB	PROJECT NUMBER STP-114-1(72)	SHEET NO.	TOTAL SHEETS

SHRP 2 R15C Training Materials



LEGEND

STAGE 3 CONSTRUCTION

SEQUENCE OF CONSTRUCTION, STAGE 3

1. CONSTRUCT OVERLAY PORTIONS OF SR 120 AS INDICATED WHILE MAINTAINING TRAFFIC IN BOTH DIRECTIONS ALONG THE ROADWAY.
2. INSTALL PERMANENT TRAFFIC CONTROL (SIGNS, PAVEMENT, MARKINGS, ETC.)
3. REMOVE ALL TEMPORARY TRAFFIC CONTROL DEVICES.
4. MAINTAIN INGRESS AND EGRESS TO ADJACENT PROPERTIES AT ALL TIMES.

PROPERTY AND EXISTING R/W LINE	
REQUIRED R/W LINE	
CONSTRUCTION LIMITS	—C— F —
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES	
EASEMENT FOR CONSTR OF SLOPES	
EASEMENT FOR CONSTR OF DRIVES	

BEGIN LIMIT OF ACCESS	BLA
END LIMIT OF ACCESS	ELA
LIMIT OF ACCESS	
R/W AND LIMIT OF ACCESS	
EXISTING R/W LINE	

SCALE IN FEET
0 20 40 80

REVISION DATES		

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: URBAN DESIGN

MAINLINE PLAN
STAGE 3 CONSTRUCTION

SR 120/ROSWELL RD. WIDENING
STA. 34+40 - STA. 40+20

F17

DRAWING No. 13-05

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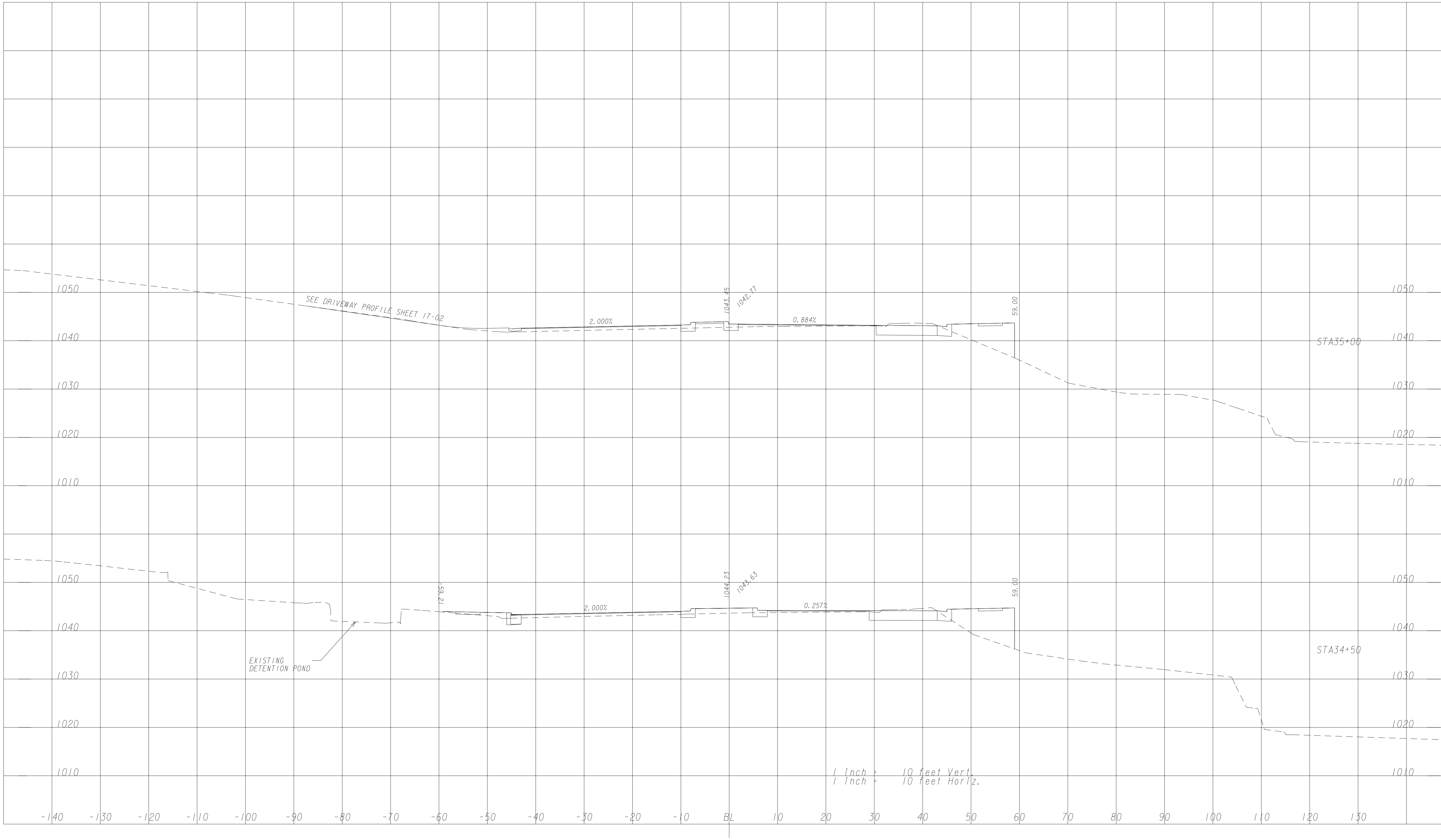
SHRP 2 R15C Training Materials

COUNTY	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
COBB	STP-114-1(72)		



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V. 0 10 20 30
(SCALE IN FEET)

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION

OFFICE: URBAN DESIGN

EARTHWORK CROSS SECTIONS

SR 120/ROSWELL RD. WIDENING

F19

DRAWING No. 23-12

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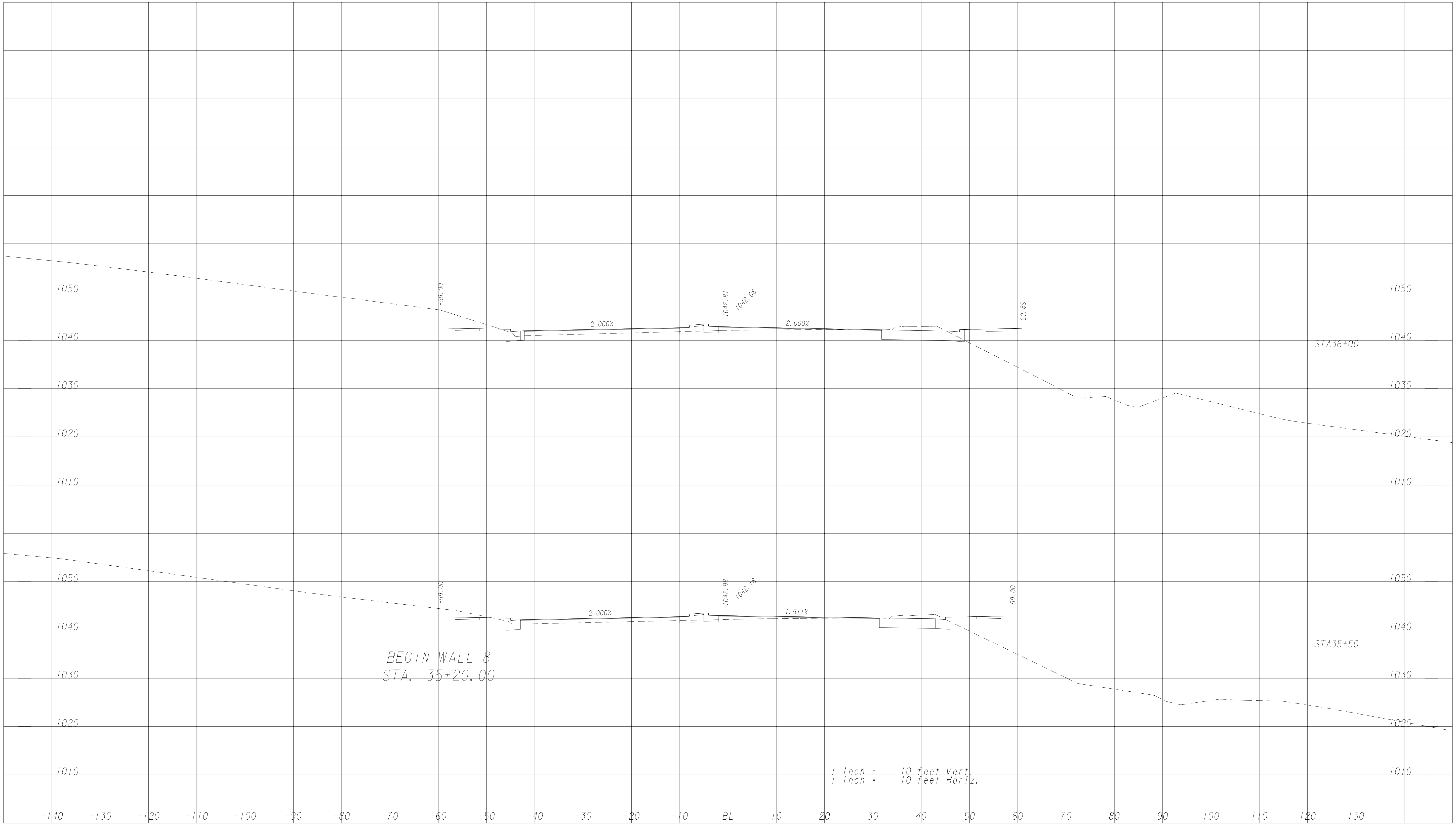
SHRP 2 R15C Training Materials

COUNTY	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
COBB	STP-114-1(72)		



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H. 0 10 20 30
V. 0 10 20 30
(SCALE IN FEET)

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION

OFFICE: URBAN DESIGN

EARTHWORK CROSS SECTIONS

SR 120/ROSWELL RD. WIDENING

F21

DRAWING No. 23-13

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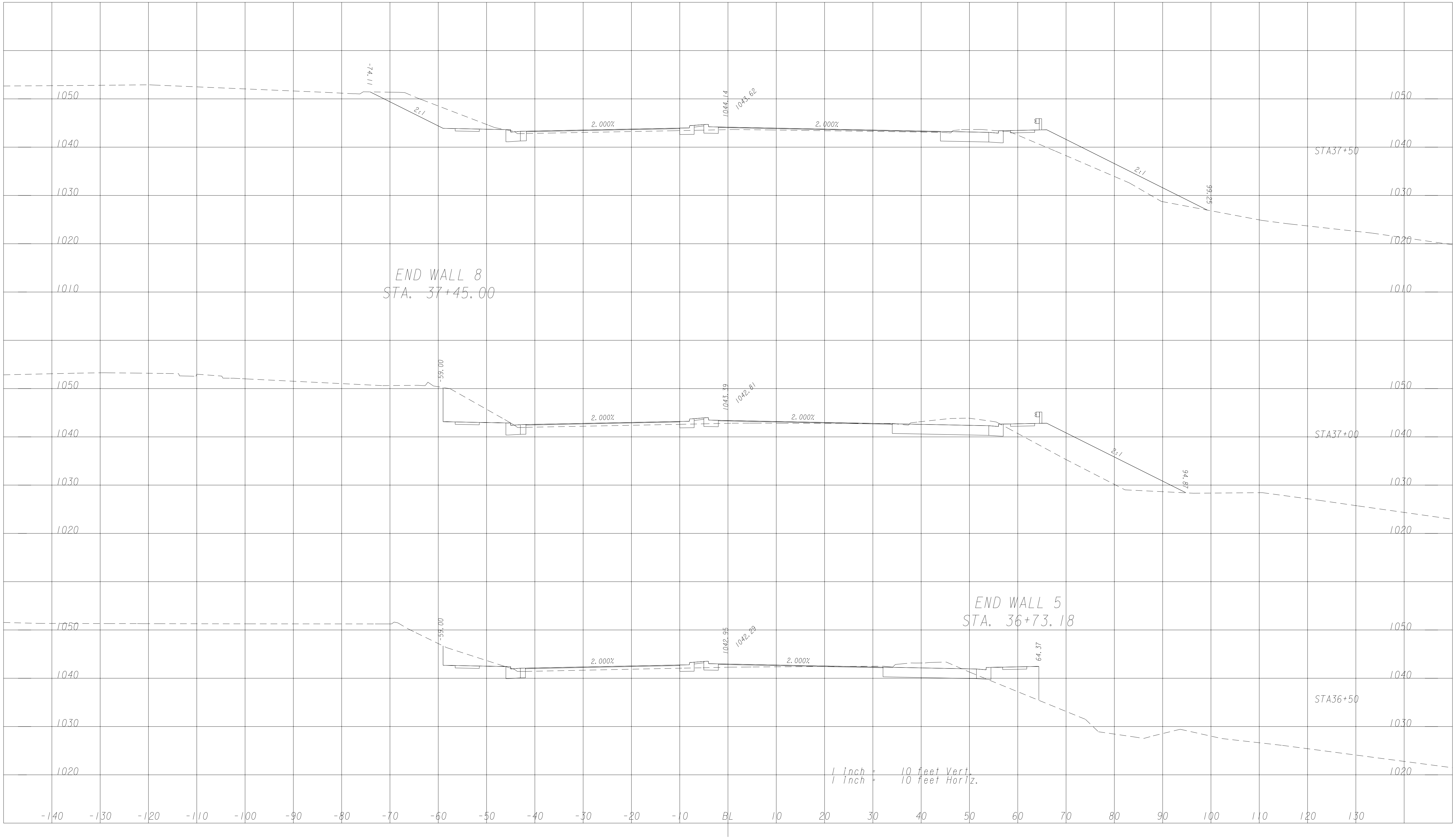

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V. 0 10 20 30
(SCALE IN FEET)

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION

OFFICE: URBAN DESIGN

EARTHWORK CROSS SECTIONS

SR 120/ROSWELL RD. WIDENING

F23

DRAWING No. 23-14

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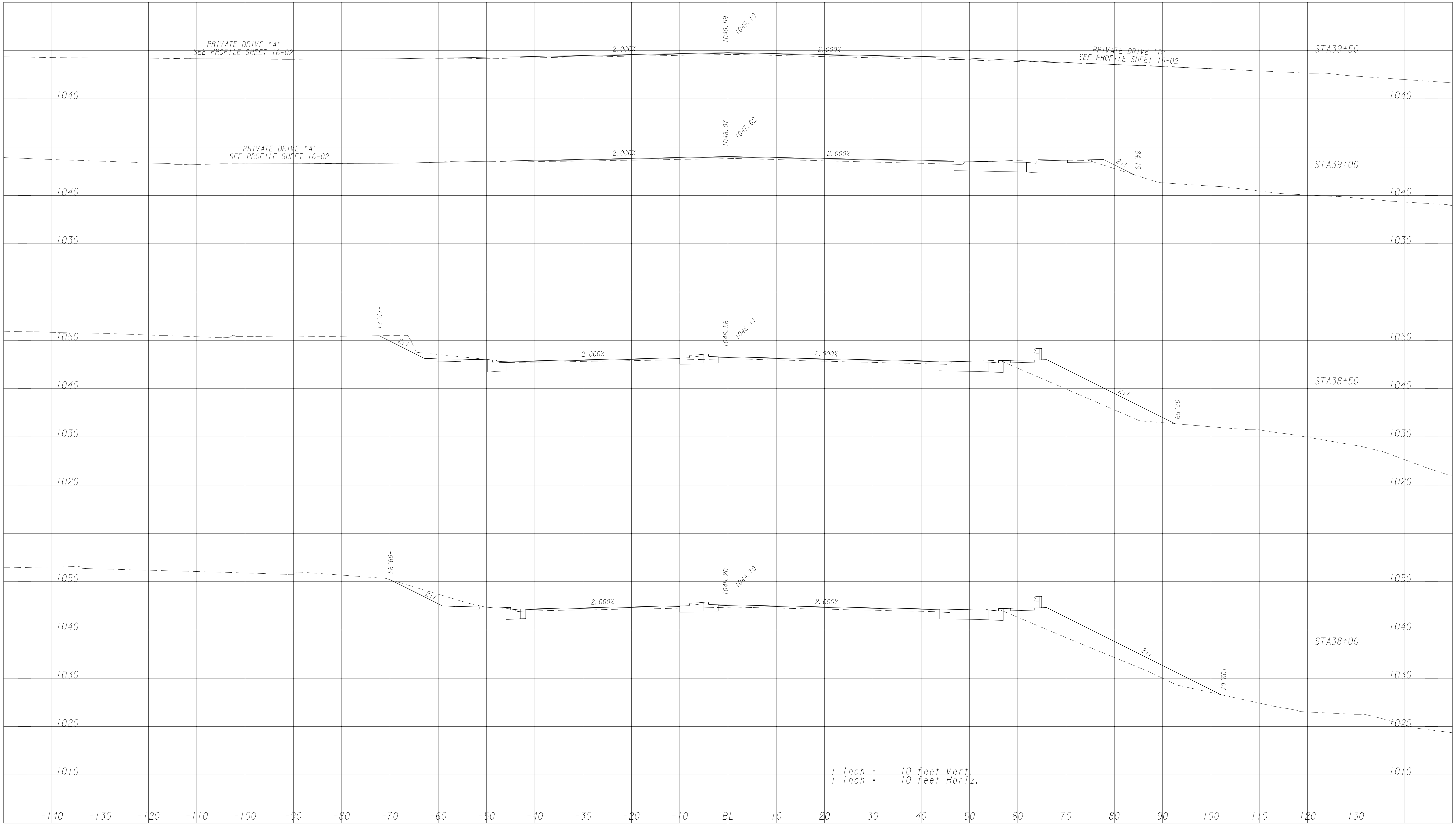

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H. 0 10 20 30
V. 0 10 20 30
(SCALE IN FEET)

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION

OFFICE: URBAN DESIGN

EARTHWORK CROSS SECTIONS

SR 120/ROSWELL RD. WIDENING

F25

DRAWING No.
23-15

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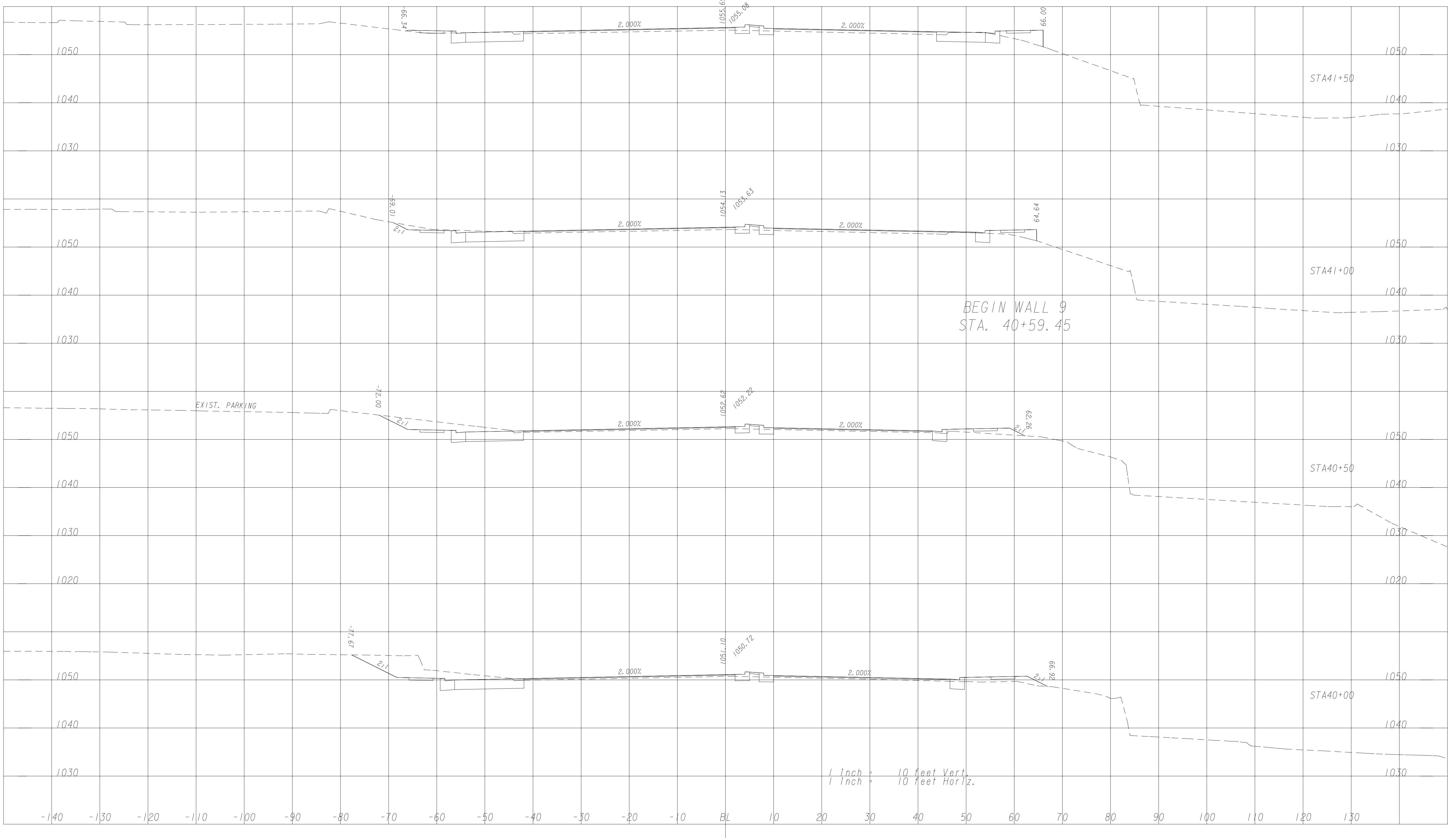
COUNTY	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
COBB	STP-114-1(72)		



H. 0 10 20 30
V. 0 10 20 30
(SCALE IN FEET)

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: URBAN DESIGN
EARTHWORK CROSS SECTIONS
SR 120/ROSWELL RD. WIDENING
F27
DRAWING No. 23-16

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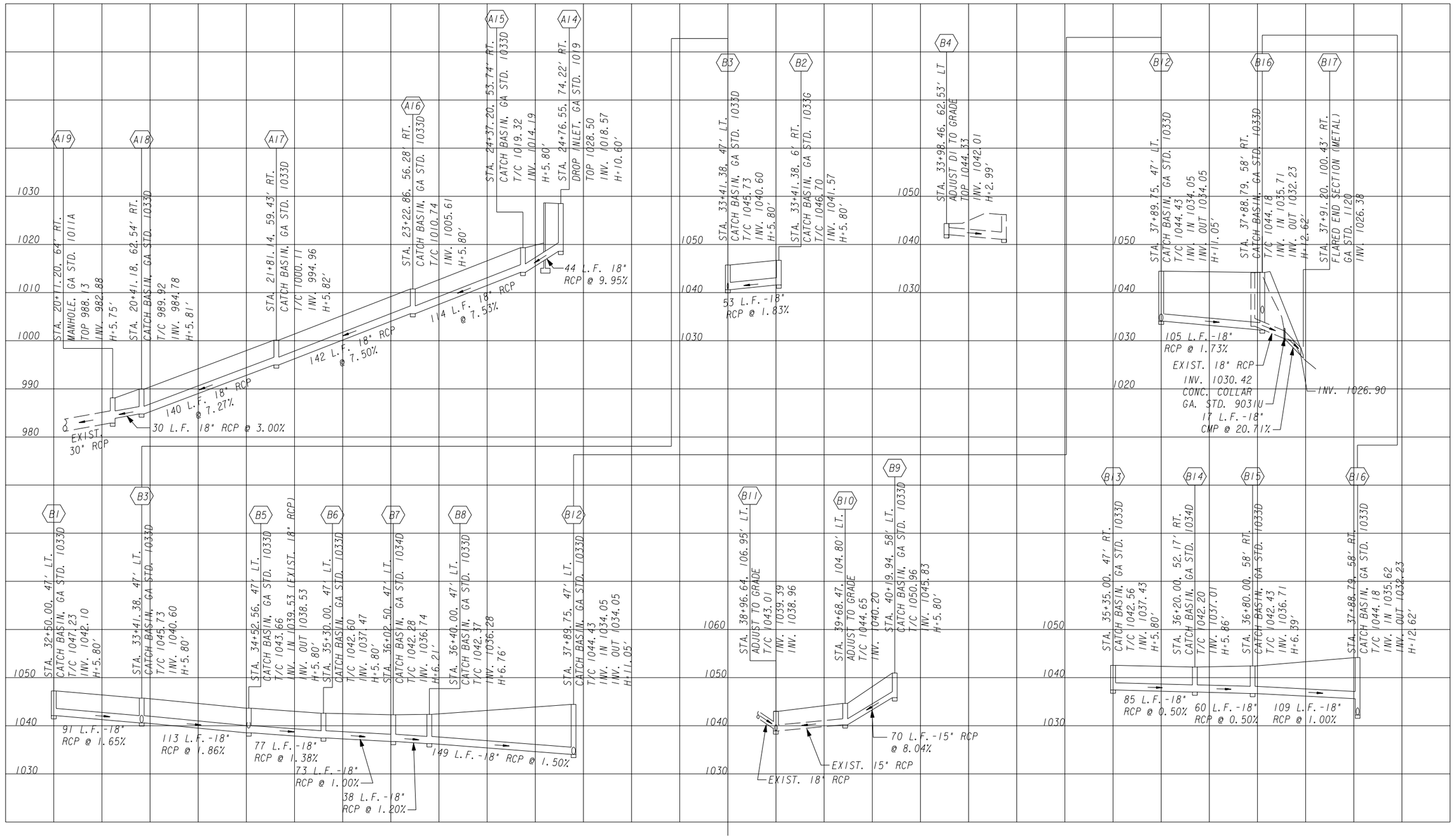

REVISION DATES		

H. 0 50 100 150
V. 0 10 20 30
(SCALE IN FEET)

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: URBAN DESIGN

DRAINAGE PROFILES

SR 120/ROSWELL ROAD WIDENING F29

DRAWING No. 22-02

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Utility Conflict Matrix

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

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

Note: refer to subsheet for utility conflict cost analysis.

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

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Utility Conflict Resolution Alternatives

Cost Estimate Analysis

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

Utility Conflict: _____
Utility Owner: _____
Utility Type: _____
Size and/or Material: _____
Project Phase: _____

Cost Estimate Analysis Developed/Revised By _____
Date _____
Reviewed By _____
Date _____

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

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SELECTED DATABASE LOOKUP TABLES

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LOOKUP TABLES USED IN LESSON 4

Table 1. Company
Table 2. Estimate Type
Table 3. Horizontal Spatial Reference
Table 4. Highway Functional Class
Table 5. State
Table 6. Utility Conflict Event Type
Table 7. Utility Conflict Investigation Need Type
Table 8. Utility Conflict Type
Table 9. Utility Conflict Subtype
Table 10. Utility Conflict Resolution Alternative Decision
Table 11. Utility Conflict Resolution Alternative Responsibility
Table 12. Utility Facility Material
Table 13. Utility Facility Operation Type
Table 14. Utility Facility Type
Table 15. Utility Facility Subtype
Table 16. Vertical Spatial Reference

Table 1. Company.

CMPNY		
COMPANY ID:	**COMPANY NAME:**	**COMPANY ACRONYM TEXT:**
0	Chugach Electric Association, Inc.	CEA
1	Pacific Bell	PACBELL
2	Southern California Edison	SCE
3	Metropolitan Water District of Southern California	MWD
4	California Department of Transportation	Caltrans
5	Marina Coast Water District	MCWD
6	County Sanitation Districts of Orange County	CSDOC
7	AT&T	ATT
8	Centerpoint Energy	CPE
9	Southwestern Bell	SBC
10	Atlanta Gas Light	AGL
11	Unknown	UNK

Table 2. Estimate Type.

ESTMT_TYPE		
ESTIMATE TYPE ID:	**ESTIMATE TYPE NAME:**	**ESTIMATE TYPE DESCRIPTION:**
0	Alternate Procedure Estimate	An Alternate Procedure Estimate is the approximate amount a utility adjustment will cost that a utility company provides to a DOT and which is then subsequently submitted to FHWA for review. The Alternate Procedure Estimate is typically a rough approximation of the actual cost that is submitted during the preliminary design phase of a highway project.
1	Direct Cost to Utility Estimate	A Direct Cost to Utility Estimate is the approximate amount that a utility adjustment will cost that a utility company provides to a DOT, not including the cost for engineering and design. Typical cost items of a Direct Cost to Utility Estimate are construction labor, materials, and transportation costs.
2	Engineering Cost to Utility Estimate	An Engineering Cost to Utility Estimate is the approximate amount that the engineering and design portion of a utility adjustment will cost that a utility company provides to a DOT, not including direct adjustment costs such as construction labor and materials.
3	Total Cost Estimate	A Total Cost Estimate is the approximate amount that a utility adjustment will cost that a utility company provides to a DOT, including engineering costs and direct construction costs.
4	Direct Cost to DOT Estimate	A Direct Cost to DOT Estimate is the approximate amount that a modification to the highway design will cost the DOT, except cost for redesign and reengineering.
5	Engineering Cost to DOT Estimate	An Engineering Cost to DOT Estimate is the approximate amount that a modification to the highway will cost the DOT to reengineer or redesign the project.

Table 3. Horizontal Spatial Reference.

HRZNTL_SPATIAL_REF		
HORIZONTAL SPATIAL REFERENCE ID:	**HORIZONTAL SPATIAL REFERENCE NAME:**	**HORIZONTAL SPATIAL REFERENCE DESCRIPTION:**
0	NAD_1983_UTM_Zone_12N	North American Datum 1983 Universal Transverse Mercator Zone 12 N (meters).
1	NAVD_1988	North American Vertical Datum 1988 (meters).
2	GCS_WGS_1984	Geographic Coordinate System World Geodetic System 1984 (degrees).
3	GCS_North_American_1983	Geographic Coordinate System North American Datum 1983 (degrees).
4	Geodetic (lat/long)	Geographic Coordinate System of latitude and longitude.

Table 4. Highway Functional Class.

HWY_FUNCL_CLASS		
HIGHWAY FUNCTIONAL CLASS ID:	**HIGHWAY FUNCTIONAL CLASS CODE:**	**HIGHWAY FUNCTIONAL CLASS NAME:**
0	I	Interstate
1	UF	Other Urban Freeway or Expressway
2	RA	Rural Principal Aterial
3	FM	Farm to Market Road
4	US	United States Highway

Table 5. State.

STATE			
STATE ID:	**STATE NAME:**	**STATE DOT NAME:**	**STATE DOT ACRONYM TEXT:**
1	Alabama	Alabama Department of Transportation	ALDOT
2	Alaska	Alaska Department of Transportation and Public Facilities	Alaska DOT&PF
3	American Samoa		
4	Arizona	Arizona Department of Transportation	ADOT
5	Arkansas	Arkansas State Highway and Transportation Department	AHTD
6	California	California Department of Transportation	Caltrans
7	Colorado	Colorado Department of Transportation	CDOT
8	Connecticut	Connecticut Department of Transportation	CONNDOT
9	Delaware	Delaware Department of Transportation	DELDOT
10	District of Columbia	District Department of Transportation	DDOT
11	Federated States of Micronesia		
12	Florida	Florida Department of Transportation	FDOT
13	Georgia	Georgia Department of Transportation	GDOT
14	Guam		
15	Hawaii	Hawaii Department of Transportation	HDOT
16	Idaho	Idaho Transportation Department	ITD
17	Illinois	Illinois Department of Transportation	IDOT
18	Indiana	Indiana Department of Transportation	INDOT
19	Iowa	Iowa Department of Transportation	Iowa DOT
20	Kansas	Kansas Department of Transportation	KDOT
21	Kentucky	Kentucky Transportation Cabinet	KTC
22	Louisiana	Louisiana Department of Transportation and Development	DOTD
23	Maine	Maine Department of Transportation	MaineDOT
24	Marshall Islands		
25	Maryland	Maryland Department of Transportation	MDOT
26	Massachusetts	Massachusetts Department of Transportation	MassDOT
27	Michigan	Michigan Department of Transportation	MDOT
28	Minnesota	Minnesota Department of Transportation	Mn/DOT
29	Mississippi	Mississippi Department of Transportation	MDOT
30	Missouri	Missouri Department of Transportation	MoDOT
31	Montana	Montana Department of Transportation	MDT
32	Nebraska	Nebraska Department of Roads	NDOR

Table 5. State (Continued).

STATE			
STATE ID:	**STATE NAME:**	**STATE DOT NAME:**	**STATE DOT ACRONYM TEXT:**
33	Nevada	Nevada Department of Transportation	NDOT
34	New Hampshire	New Hampshire Department of Transportation	NHDOT
35	New Jersey	New Jersey Department of Transportation	NJDOT
36	New Mexico	New Mexico Department of Transportation	NMDOT
37	New York	New York State Department of Transportation	NYSDOT
38	North Carolina	North Carolina Department of Transportation	NCDOT
39	North Dakota	North Dakota Department of Transportation	NDDOT
40	Northern Mariana Islands		
41	Ohio	Ohio Department of Transportation	ODOT
42	Oklahoma	Oklahoma Department of Transportation	ODOT
43	Oregon	Oregon Department of Transportation	ODOT
44	Palau		
45	Pennsylvania	Pennsylvania Department of Transportation	PennDOT
46	Puerto Rico		
47	Rhode Island	Rhode Island Department of Transportation	RIDOT
48	South Carolina	South Carolina Department of Transportation	SCDOT
49	South Dakota	South Dakota Department of Transportation	SDDOT
50	Tennessee	Tennessee Department of Transportation	TDOT
51	Texas	Texas Department of Transportation	TxDOT
52	Utah	Utah Department of Transportation	UDOT
53	Vermont	Vermont Agency of Transportation	VTrans
54	Virgin Islands		
55	Virginia	Virginia Department of Transportation	VDOT
56	Washington	Washington State Department of Transportation	WSDOT
57	West Virginia	West Virginia Department of Transportation	WVDOT
58	Wisconsin	Wisconsin Department of Transportation	WisDOT
59	Wyoming	Wyoming Department of Transportation	WYDOT

Table 6. Utility Conflict Event Type.

UTIL_CNFLT_EVNT_TYPE	
UTILITY CONFLICT EVENT TYPE ID:	**UTILITY CONFLICT EVENT TYPE NAME:**
0	Utility conflict identified
1	Comment created
2	Utility owner informed of utility conflict
3	Utility conflict resolved
4	Utility owner acknowledges receipt of document
5	Document requested
6	Document sent
7	Document received
8	Document reviewed
9	Document certified
10	Document approved
11	Document uploaded
12	Document review, comment, and approval
13	Utility coordination meeting
14	ROW cleared for adjustment
15	Required adjustment completion
16	Estimated adjustment completion
17	Scheduled adjustment completion
18	Notice to proceed to utility owner
19	Adjustment construction start
20	Adjustment construction end
21	Permit application
22	Permit approved
23	Exception requested
24	Exception approved
25	Plans sufficient sent to utility owner
26	30-day notice submitted
27	90-day notice submitted
28	Utility conflict resolution strategy selected
29	Utility relocation under construction
30	Utility conflict archived

Table 7. Utility Conflict Investigation Need Type.

UTIL_CNFLT_INVESTIGATION_NEED_TYPE		
UC INVESTIGATION NEED TYPE ID:	**UC INVESTIGATION NEED TYPE NAME:**	**UC INVESTIGATION NEED TYPE DESCRIPTION:**
0	QLD	Utility Investigation QLD
1	QLC	Utility Investigation QLC
2	QLB	Utility Investigation QLB
3	QLA	Utility Investigation QLA
4	Unknown	Unknown

Table 8. Utility Conflict Type.

UTIL_CNFLT_TYPE		
UTILITY CONFLICT TYPE ID:	**UTILITY CONFLICT TYPE NAME:**	**UTILITY CONFLICT TYPE DESCRIPTION:**
0	Conflict with roadway project features.	A conflict of a utility facility with a feature of the roadway project. For example, this can be roadway drainage feature that is planned to be installed in the location of an underground sewer line.
1	Conflict with another utility feature.	A conflict of a utility facility with another utility facility feature. For example, this can be a conflict between two existing facilities that are found to be in violation of a safety standard. This can also be a proposed facility that is designed to be installed in a location that is either occupied by an existing utility facility or that would violate a safety distance requirement of an existing utility facility.
2	Conflict with utility regulations or standards.	A conflict of a utility facility with a utility standard, utility installation regulation, or utility accommodation rule. For example, buried utility facilities must be installed with a minimum depth of cover above the facility. If a utility is buried at a shallower depth, it is a conflict with the depth of cover regulation.
3	Conflict with safety regulations.	A conflict of a utility facility with an established safety regulation. For example, a utility pole may be located within the clear zone of a roadway. If the pole is unprotected, it may violate clear zone safety regulations.
4	Conflict with transportation construction or phasing.	A conflict of a utility facility with temporary activities during construction or construction phasing. For example, a utility facility may interfere with the space requirements to construct a roadway. This type of conflict may only exist temporarily for the duration of a construction phase, and may not exist as a conflict of the utility facility with the constructed roadway.

Table 9. Utility Conflict Subtype.

UTIL_CNFLT_SUBTYPE		
UTILITY CONFLICT SUBTYPE ID:	**UTILITY CONFLICT SUBTYPE NAME:**	**UTILITY CONFLICT SUBTYPE DESCRIPTION:**
0	FG	Finish grade
1	PWY	Pathway
2	EX	Excavation

Table 10. Utility Conflict Resolution Alternative Decision.

UTIL_CNFLT_RESOLN_ALTERNAT_DCSN	
UTILITY CONFLICT RESOLUTION ALTERNATIVE DECISION ID:	**UTILITY CONFLICT RESOLUTION ALTERNATIVE DECISION NAME:**
0	Under review
1	Selected
2	Rejected

Table 11. Utility Conflict Resolution Alternative Responsibility.

UTIL_CNFLT_RESOLN_ALTERNAT_RSPNBL		
UCR ALTERNATIVE RESPONSIBILITY ID:	**UCR ALTERNATIVE RESPONSIBILITY CODE:**	**UCR ALTERNATIVE RESPONSIBILITY NAME:**
0	U	Utility Company
1	D	DOT
2	U/D	Utility Company and DOT
3	N/A	Not Available
4	C	Contractor

Table 12. Utility Facility Material.

UTIL_FCLTY_MTRL		
UTILITY FACILITY MATERIAL ID:	**UTILITY FACILITY MATERIAL NAME:**	**UTILITY FACILITY MATERIAL ACRONYM TEXT:**
0	Welded Steel Pipe	WSP
1	Reinforced Concrete Pipe	RCP
2	Asbestos Cement Pipe	ACP
3	Concrete Cylinder Pipe	CCP
4	Vitrified Clay Pipe	VCP
5	Unknown	U
6	Multiple Concrete Duct	MCD
7	Fiber Optic	FO
8	Copper	CO
9	Steel	ST

Table 13. Utility Facility Operation Type.

UTIL_FCLTY_OPERATION_TYPE	
UTILITY FACILITY OPERATION TYPE ID:	**UTILITY FACILITY OPERATION TYPE NAME:**
0	Public Utility
1	Private Utility

Table 14. Utility Facility Type.

UTIL_FCLTY_TYPE			
UTILITY FACILITY TYPE ID:	**UTILITY FACILITY TYPE NAME:**	**UTILITY FACILITY SUBTYPE ID:**	**UTILITY FACILITY TYPE ACRONYM TEXT:**
0	Electricity Distribution	0	
1	Electricity Distribution	1	
2	Electricity Transmission	2	
3	Telephone	3	
4	Water	4	W
5	Sewer	4	
6	Manhole	4	
7	Unknown	4	UNK
8	Electricity Distribution		
9	Communication	4	
10	Gas	4	G
11	Buried Fiber Optic	4	BFO
12	Buried Telephone Duct Bank		BT-DUCT
13	Electrical Conduit	4	
14	Transmission Tower	4	
15	Transmission Lines	4	
16	Distribution Line	4	

Table 15. Utility Facility Subtype.

UTIL_FCLTY_SUBTYPE		
UTILITY FACILITY SUBTYPE ID:	**UTILITY FACILITY SUBTYPE NAME:**	**UTILITY FACILITY SUBTYPE DESCRIPTION:**
0	3 phi	
1	1 phi	
2	138 kV	
3	DU	
4		No subtype

Table 16. Vertical Spatial Reference.

VERT_SPATIAL_REF		
VERTICAL SPATIAL REFERENCE ID:	**VERTICAL SPATIAL REFERENCE NAME:**	**VERTICAL SPATIAL REFERENCE DESCRIPTION:**
0	NAD_1983_UTM_Zone_12N	North American Datum 1983 Universal Transverse Mercator Zone 12 N (meters).
1	NAVD_1988	North American Vertical Datum 1988 (meters).
2	GCS_WGS_1984	Geographic Coordinate System World Geodetic System 1984 (degrees).
3	GCS_North_American_1983	Geographic Coordinate System North American Datum 1983 (degrees).
4	Geodetic (lat/long)	Geographic Coordinate System of latitude and longitude.

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COURSE FORMS

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REVIEW FORM

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Instructor: _____

Location: _____ **Date**: _____

Lesson 1: Introductions and Seminar Overview				
	Excellent	**Good**	**Acceptable**	**Needs Improvement**
Presentation Materials	○	○	○	○
Handout Materials	○	○	○	○
Time Allocation	○	○	○	○
Comment				

Lesson 2: Utility Conflict Concepts and SHRP 2 R15(B) Research Findings				
	Excellent	**Good**	**Acceptable**	**Needs Improvement**
Presentation Materials	○	○	○	○
Handout Materials	○	○	○	○
Time Allocation	○	○	○	○
Comment				

Lesson 3: Utility Conflict Identification and Management				
	Excellent	**Good**	**Acceptable**	**Needs Improvement**
Presentation Materials	○	○	○	○
Handout Materials	○	○	○	○
Time Allocation	○	○	○	○
Comment				

Lesson 4: Hands-On Utility Conflict Management Exercise				
	Excellent	**Good**	**Acceptable**	**Needs Improvement**
Presentation Materials	○	○	○	○
Handout Materials	○	○	○	○
Time Allocation	○	○	○	○
Comment				

Lesson 5: Use of Database Approach to Manage Utility Conflicts				
	Excellent	**Good**	**Acceptable**	**Needs Improvement**
Presentation Materials	○	○	○	○
Handout Materials	○	○	○	○
Time Allocation	○	○	○	○
Comment				

Lesson 6: Wrap-Up				
	Excellent	**Good**	**Acceptable**	**Needs Improvement**
Presentation Materials	○	○	○	○
Handout Materials	○	○	○	○
Time Allocation	○	○	○	○
Comment				

Additional Comments

SIGN-IN SHEET

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Instructor: _____

Location: _____ **Date**: _____

Name	Affiliation	Phone	Email Address

Name	Affiliation	Phone	Email Address