Integrating Utility and Environmental Processes

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Consequences of Bad Utility Information

- Disruptions during construction
- Unplanned environmental corrective actions
- Damage to utility installations
- Difficulty to locate and characterize underground utilities
- Delays and project overruns
Utility Conflict Scenarios

• Utility facility / transportation design feature
• Utility facility / transportation construction activity or phasing
• Planned utility facility / existing utility facility
• Noncompliance with utility accommodation statutes, regulations, and policies
• Noncompliance with safety or accessibility rules
Potential Solution Strategies

- Relocate, remove, or abandon utilities in conflict (relocating utilities NOT ALWAYS the best or most cost-effective solution)
- Modify transportation facility
- Protect-in-place utility installation
- Accept an exception to policy
Research Objectives

• Feasibility of better utility data in the preliminary design phase
• Feasibility of earlier assessment of design elements in the preliminary design phase
Project Development Process

<table>
<thead>
<tr>
<th>Planning and Programming</th>
<th>Preliminary Design</th>
<th>Detailed Design</th>
<th>Letting</th>
<th>Construction</th>
<th>Post Constrn.</th>
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</thead>
<tbody>
<tr>
<td>Scoping, Selection, Financing, Sched.</td>
<td>Alternative Analysis and Preliminary Plans</td>
<td>Secure federal, state, and local agreements</td>
<td>Environmental Approval</td>
<td>Environmental Re-evaluation</td>
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<td></td>
<td>Environmental Process</td>
<td>Right-of-Way Map Development</td>
<td>Property Acquisition and Relocation Assistance</td>
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<td>Property Management</td>
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<td>Preliminary Utility Conflict Analysis</td>
<td></td>
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<td>Utility Conflict Analysis, Permits, Relocation, and Reimbursement</td>
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<td>Preliminary input to planning and programming</td>
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<td>Design and PS&amp;E Assembly</td>
<td>Letting</td>
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</table>
Utility Coordination Process

Project Development Process

Planning  Preliminary Design  30%  60%  90%  Construction  Post-Construction Utility Permitting

Utility Conflict Resolution

Letting  Project Completion
Environmental Process

- Preliminary office research
- Field survey
- Public involvement
- Environmental analysis
- Environmental document preparation
  - Categorical exclusion: CE
  - Environmental assessment: EA
  - Environmental impact statement: EIS
Environmental Process

• Memoranda of understanding (MOUs) between state DOT and resource agencies

• For example, in Texas, MOUs with:
  – Texas Commission on Environ. Quality (TCEQ)
  – Texas Parks and Wildlife (TPWD)
  – Texas Historical Commission (THC)
  – General Land Office (GLO)
Recommended Strategies

1) Involve environmental and ROW/utility staff in planning and programming
2) Establish planning advisory teams and support tools
3) Coordinate environmental and ROW/utility data collection
4) Enhance and coordinate preparation of scopes of services
5) Require utility owners to verify and certify utility facility information
Recommended Strategies

6) Gather some QLB data during preliminary design phase
7) Include some drainage design elements in preliminary design phase
8) Include some design elements in preliminary design phase
9) Address utility issues in constructability review in preliminary design phase
10) Develop/update curricula for utility coordination stakeholders
1) Involve Environmental and ROW/Utility Staff in Planning and Programming

- **Purpose:** Identify “fatal flaw” issues
  - Utilities, pipelines
  - Potential contamination sites
  - Sensitive receptors

- Preliminary feedback to advance planning
- Annual meeting with utilities
- Preliminary cost estimate
- **Issue:** Allocation of resources
2) Establish Planning Advisory Teams and Support Tools

- **Purpose:** Use environmental and utility data in transportation planning and programming
- FDOT Efficient Transportation Decision Making (ETDM) process
  - Environmental Technical Advisory Teams (ETAT)
  - Environmental Screening Tool (EST)
- Expand MOUs with resource agencies
- Cooperative Utility Planning System (CUPS)
2) Establish Planning Advisory Teams and Support Tools

**TxDOT**

- Planning and Programming
- Preliminary Design
- PS&E Development

**FDOT**

- Planning Screen
- Programming Screen
- Environmental Clearance
- Project Development
- Final Design
2) Establish Planning Advisory Teams and Support Tools
3) Coordinate Environmental and ROW/Utility Data Collection

• **Purpose:** Improve coordination regarding utility data collection activities

• Initial Site Assessments (ISA) vs. utility investigations (QLD and QLC)
  – Surface observations
  – Review of existing records

• Start utility investigations concurrently with initial environmental site investigations

• Share investigation results
4) Enhance and Coordinate Preparation of Scopes of Services

- **Purpose**: Identify utility facilities earlier, reduce redundancy, and reduce utility conflict impact
- Professional services (utility investigations) vs. scientific services (environmental)
- Utility investigations: Design phase (QLB and QLA)
- Environmental work: Preliminary design phase
- Many consultants offer both services
- Identify scopes of services earlier
5) Require Utility Owners to Verify and Certify Utility Facility Information

- **Purpose**: Increase quality of information from utilities during preliminary design phase
- Utility owners mark up geometric schematics
- Request utility owner verification and certification
  - Completeness of known records, ground markings
- Use One Call during preliminary design phase
  - Challenge: Design/design locate, survey tickets
Verification and Certification

Documentation provided to DOT:

- Paper copies of all known record information available at the utility in relation to the project, such as as-builts (plan, profile, cross sections, and details), GIS file printouts, survey reports, and survey data
- Electronic copies of all known record information available at the utility in relation to the project, such as as-builts (plan, profile, cross sections, and details), GIS files, survey reports, and survey data
- Pictures, field coordinates, and other documents to facilitate the location of difficult-to-find features such as valve covers, manhole covers, and handhole covers
- Marked up printed drawings or maps provided by DOT or an authorized consultant
- Marked up computer aided design (CAD) file(s) provided by DOT or an authorized consultant
- Marked up 2-D portable document format (PDF) file(s) provided by DOT or an authorized consultant
- Marked up 3-D portable PDF file(s) provided by DOT or an authorized consultant
- Marked up GeoPDF file(s) provided by DOT or an authorized consultant
- Marked up or updated GIS file(s) provided by DOT or an authorized consultant
- Marked up or updated features using an online web-based viewer provided by DOT or an authorized consultant
- Other: ___________________________
Verification and Certification

Field activities:

☐ Exposed surface features such as valve covers, manhole covers, and handhole covers that were partially or completely covered or blocked in the field

☐ Provided paint markings for those features in the field to enable DOT surveyors to tie those installations to the project survey control

☐ Marked existing underground utilities on the ground along project (no request from a One-Call notification center was necessary) to enable DOT surveyors to tie those locations to the project survey control

☐ Marked existing underground utilities on the ground along project upon request from a One-Call notification center to enable DOT surveyors to tie those locations to the project survey control

☐ Other: ____________________________

Other activities:

☐ ____________________________

☐ ____________________________
6) Gather Some QLB Data During Preliminary Design Phase

- **Purpose**: Reduce uncertainty about underground utility facilities earlier
- QLB completed in design phase (if done)
- Collect QLB data earlier if:
  - Right of way stays the same, e.g., for road widening or adding lanes within available space
  - Important to know utility locations to reduce risk
- **Issue**: Costs vs. benefits
7) Include Some Drainage Design Elements in Preliminary Design Phase

- **Purpose**: Encourage earlier participation by utilities
- Many/most utility conflicts are drainage-related
- Drainage design typically completed at 60% design
- Cross drainage structures
  - Sizing, elevation depends on district’s time availability
  - Focus on preliminary calculations
- Outfalls: Cleared by environmental process
- Appropriate for cases where cross section is stable
- High-res/low altitude aerial photography can facilitate high accuracy vertical data
8) Include Some Design Elements in Preliminary Design Phase

- **Purpose:** Reduce utility conflicts earlier
- Similar principles as for drainage design
  - Horizontal and vertical alignments needed
  - Cross sections needed
- Certain design elements possible
  - “Preliminary/standardized” foundations
    - Guide signs, overhead sign bridges
    - Signal poles, high-mast illumination poles
    - Plan view with annotated “preliminary” depth
  - Access control, noise walls
8) Include Some Design Elements in Preliminary Design Phase

- Bolt Keeper Plate
- Post 10 BWG Tubing or Schedule 80 Pipe (See General Note 3)
- Slip Base
- 5/8" structural bolts (3), nuts (3), and washers (6) per ASTM A325 or A449 and galvanized per Item 445 "Galvanizing."
- Bolt length is 2 1/2".
- Washers if required by manufacturer
- Stub
- 3/4" diameter hole. Provide a 7" x 1/2" diameter rod or #4 rebar.
- Class A concrete
- Non-reinforced concrete footing (shall be used unless noted elsewhere in the plans). Foundation should take approx. 2.5 cf of concrete.

Dimensions:
- 36" height
- 42" width
- 12" dia
- 12" min, 24" max
8) Include Some Design Elements in Preliminary Design Phase

FOUNDATION DESIGN TABLE

<table>
<thead>
<tr>
<th>FOUNDATION</th>
<th>DESIGNATION</th>
<th>COLUMN 1</th>
<th>COLUMN 2</th>
<th>COLUMN 3</th>
<th>COLUMN 4</th>
<th>COLUMN 5</th>
<th>COLUMN 6</th>
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FOUNDATION SUMMARY TABLE

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</tbody>
</table>

NOTES:

- Design according to FHWA AASHTO Standards.
- Note: 8-A: Design for Structural Support for 24' 0" support with single 14' 6" mast arm.
- 8-B: Design for Structural Support for 24' 0" support with two 14' 6" mast arms.
- 8-C: Design for Structural Support for 24' 0" support with three 14' 6" mast arms.

TYPICAL POLE ASSEMBLY

<table>
<thead>
<tr>
<th>TYPE</th>
<th>TYPICAL POLE ASSEMBLY</th>
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<tbody>
<tr>
<td>1</td>
<td>TYPICAL STRAIN POLE ASSEMBLY</td>
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<tr>
<td>2</td>
<td>TYPICAL MAST ARM ASSEMBLY</td>
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TYPICAL FOUNDATION DETAILS

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<tr>
<th>TYPE</th>
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<tr>
<td>1</td>
<td>Foundation Design</td>
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<td>2</td>
<td>Foundation Summary</td>
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</table>

GENERAL NOTES:

- Design according to FHWA AASHTO Standards.
- Note: 8-A: Design for Structural Support for 24' 0" support with single 14' 6" mast arm.
- 8-B: Design for Structural Support for 24' 0" support with two 14' 6" mast arms.
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TRAFFIC SIGNAL POLE FOUNDATION

TS-FD-99
8) Include Some Design Elements in Preliminary Design Phase

FOUNDATION DESIGN TABLE

<table>
<thead>
<tr>
<th>FDN TYPE</th>
<th>DRILLED SHAFT DIA</th>
<th>REINFORCING STEEL</th>
<th>DRILLED SHAFT LENGTH-FT</th>
<th>ANCHOR BOLT DESIGN</th>
<th>FOUNDATION DESIGN LOAD</th>
<th>TYPICAL APPLICATION</th>
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<tr>
<td></td>
<td>VERT BARS</td>
<td>SPIRAL &amp; PITCH</td>
<td>PENTOMETER BLOWS/FT</td>
<td>ANCHOR BOLT DIA</td>
<td>BOLT CIRC TYPE</td>
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<td>12-#9 #3 at 6&quot;</td>
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</table>

FOUNDATION SELECTION TABLE FOR STANDARD MAST ARM PLUS ILSN SUPPORT ASSEMBLIES (+)

<table>
<thead>
<tr>
<th>MAX SINGLE ARM LENGTH</th>
<th>FDN 30-A</th>
<th>FDN 36-A</th>
<th>FDN 36-B</th>
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<td>32' x 28'</td>
<td>36'</td>
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<td>MAXIMUM DOUBLE ARM LENGTH COMBINATIONS</td>
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<tr>
<td>32' x 24'</td>
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</table>

Use average k value over the top third of the embedded shaft. Ignore the top 1' of soil.
9) Address Utility Issues in Constructability Review in Preliminary Design Phase

• **Purpose:** Include utilities in constructability review

• NCHRP 391 did not mention utility issues in constructability review

• Examples of utility issues
  – Impact of utilities on construction phasing
  – Trench section and protection
  – Temporary pole bracing
  – Utility conflicts
10) Develop/Update Curricula for Utility Coordination Stakeholders

- **Purpose**: Improve quality of utility processes
- GDOT: Utility conflict management
- Mn/DOT: Two-day course on new process
- NHI Course “Highway/Utility Issues”
- Recommendations from international scan
- SHRP 2 R15-B “Utility Conflicts and Solutions”
Questions?

• For additional information:
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  – Phone: 210-979-9411