

## IMPLEMENTATION PLAN

# NCHRP PROJECT 15-69, “UTILITY CONFLICT IMPACTS DURING HIGHWAY CONSTRUCTION”

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## 1. Objective of the Implementation Plan

While considerable progress has been made to address utility issues before a project goes to letting, a substantial knowledge gap still is how to manage utility conflicts during construction. NCHRP Project 15-69, “Utility Conflict Impacts during Highway Construction,” addressed this issue by identifying causes and impacts of utility issues during construction, evaluating the use of utility impact analysis tools, developing functional requirements for a decision support tool, documenting procedures and tools for conducting utility inspections, and documenting best practices and implementation strategies.

Research deliverables are as follows:

- *NCHRP Research Report [TBD]: Strategies to Address Utility Issues during Highway Construction.*
- *Minimizing Utility Issues During Construction: A Guide.*
- PowerPoint file describing the research background, approach, findings, and conclusions.
- Draft article suitable for publication in TR News.

The research report documented the result of research completed to identify causes and impacts of utility issues during construction, evaluate the use of utility impact analysis tools, document case studies, develop functional requirements for a decision support tool, document procedures for conducting utility inspections, and document best practices and implementation strategies. Implementable products included in the research report are strategies to minimize issues during construction (both prior to letting and during construction), utility inspection procedures, and functional requirements for an intelligent decision support system (IDSS).

The guide includes the strategies to minimize utility issues during construction, packaged in a more suitable format to facilitate implementation. It includes strategies prior to letting, strategies during construction, and utility inspection procedures, covering both data equipment and software as well as data collection protocols.

### 1.1. Implementation Leadership Team

The following stakeholder groups will play a leadership role in the implementation of the research products:

- State departments of transportation (DOTs).
- American Association of State and Highway Transportation Officials (AASHTO) Committee on Right-of-Way, Utilities, and Outdoor Advertising Control.
- AASHTO Committee on Construction.
- Federal Highway Administration (FHWA).

It is anticipated the following stakeholder groups will assist with the dissemination of the research products:

- American Public Works Association (APWA) Committee on Utilities and Public Right-of-Way.
- APWA Committee on Transportation.
- American Society of Civil Engineers (ASCE)’s Utility Engineering and Surveying Institute (UESI).
- Associated General Contractors (AGC).
- American Road and Transportation Builders Association (ARTBA).

### 1.2. Assumptions/Constraints/Risks

The implementable products will have a significant impact on business practices in at least three different areas:

- Project delivery process. The impact will be fewer utility-related delays and therefore more predictable project delivery times. The impact will also be fewer utility-change orders and therefore lower costs, both for DOTs and utility owners. Fewer utility-related issues during construction will also translate into fewer utility cuts and therefore fewer utility damages and risks to the health and safety of construction workers and the public.
- Accommodation and relocation of utility facilities. The impact will be fewer unnecessary utility relocations, more accurate utility relocation plans and as-builts, and more reliable utility relocation schedules.
- Relationship with stakeholders. The impact will be an improvement in the working relationship between transportation agencies, contractors, and utility owners.

Risks that can affect the implementation of the implementable products are as follows:

- Lack of interest in changing business practices to address utility issues proactively during the preliminary design and final design phases. This risk is usually the result of assuming that utility-related risks during project delivery are not significant and therefore not worth addressing.
- Insufficient time and resources to improve utility inspection procedures. The manifestation of this risk varies depending on whether utility relocations are reimbursable or not reimbursable and whether utility relocations are included in the highway contract or handled by utility owners directly. In general, the risk increases as the belief increases (typically within the DOT) that utility relocations should be the sole responsibility of utility owners and as the belief increases (typically by utility owners) that DOTs cause utility relocations with their projects and therefore should be fully responsible for them.
- Lack of interest in improving the management of change orders. In other cases, the challenge is not a lack of interest but lack of resources to tackle how the DOT generates change orders and then organizes, groups, and aggregates the information for future analyses.

## 2. Implementation Description

Implementing the research products will require a multi-prong approach that includes giving presentations at conferences and webinars, **setting up a framework for implementation and allocating funding for training and pilot projects**, conducting training sessions on specific topics, implementing strategies on real-world projects (either pilot or full-fledged), and developing and conducting a pilot implementation of the IDSS. The type and level of implementation depend on the specific item or product.

### 2.1. Major Tasks

#### **IMPLEMENTATION PRODUCTS THAT ARE READY FOR IMPLEMENTATION AT MINIMAL COST**

The following implementation product items are effective in minimizing utility issues during project delivery and require minimal resources to implement:

- Conduct constructability reviews whenever utility facilities are involved (prior to letting).
- Include utility relocations in the assessment of the critical path for the project (prior to letting).
- Develop a utility construction plan and include it in the highway contract (prior to letting).
- Stake right-of-way and maintain markers for utility relocations.
- Develop a common repository of utility data and other project-related data.

- Schedule utility pre-construction meetings or include utility owners in highway preconstruction meetings.
- Schedule recurrent utility coordination meetings during construction.
- Use plastic pipe to mark underground lines.
- Use utility layout to show abandoned utility facilities.

Implementation tasks include giving presentations at conferences and webinars (Suggestion: Use the PowerPoint file describing the research background, approach, findings, and conclusions) and implementing the strategies on real-world projects.

#### **IMPLEMENTATION PRODUCTS THAT ARE READY FOR IMPLEMENTATION AND REQUIRE SOME INVESTMENT**

The following implementation product items are also effective in minimizing utility issues during project delivery but require investment if the DOT does not already have programs in place:

- Conduct utility investigations systematically (prior to letting).
- Apply a utility conflict management (UCM) approach to identify and resolve utility conflicts (prior to letting).
- Use right-of-way clearing contracts for utility relocations (prior to letting).
- Conduct utility relocation inspections systematically.
- Improve the quality of change order descriptions.

Implementation tasks include giving presentations at conferences and webinars (Suggestion: Use the PowerPoint file describing the research background, approach, findings, and conclusions), setting up a framework for implementation and allocating funding for training and pilot projects, conducting training courses, and implementing the strategies on real-world projects.

The framework for implementation (including changes to DOT guidelines and manuals) and associated funding depends on the specific product, as described in *Minimizing Utility Issues During Construction: A Guide*:

- Utility investigations should follow industry standards, more specifically ASCE 38-22 and ASCE 75-22, as opposed to traditional approaches that only use records from utility owners and some test holes.
- The UCM approach involves the systematic identification and resolution of utility conflicts throughout project delivery.
- Right-of-way clearing contracts outside the highway contract are useful for preparing and clearing the right-of-way in preparation for utility relocations but probably require a separate funding source.
- Utility inspection procedures require (a) changes to traditional business practices that have neglected the verification of the installation of utility facilities within the right-of-way and (b) investment in low-cost data collection equipment and software to facilitate the inspections.
- Improving the quality of change order descriptions requires training and changes to the way DOTs document the justification and description of change orders.

To maximize effectiveness, the training courses should become a standard practice at a DOT. A one-day training course per topic (i.e., utility investigations, UCM, right-of-way clearing contracts, utility inspections, change order descriptions) is sufficient in most cases, but covering specific items might require an extra day. Any stakeholder who deals with utility topics during the project delivery process should take the courses. Stakeholders include, but are not limited to project managers, designers, utility coordinators, right-of-way

coordinators, environmental coordinators, hydraulic engineers, construction managers, utility permit coordinators, utility owners, highway contractors, and utility contractors.

**IMPLEMENTATION PRODUCT THAT REQUIRES INVESTMENT FOR DEVELOPMENT**

NCHRP 15-69 produced a set of functional requirements for an intelligent decision support system. The purpose of the IDSS is to facilitate the extraction of UR change orders and claims from an existing database and has components that enable the classification of records, various analyses, and preparation of reports. **Processing and analyzing change order data in the IDSS would involve a combination of automated record classification (including the use of artificial intelligence [AI] models) and manual review and editing.**

The IDSS could be owned by the DOT or hosted on a commercial platform. A potential implementation strategy is to develop and market the IDSS as part of the AASHTOWare Project Construction & Materials web-based software platform. This strategy would enable individual DOTs to license the IDSS instead of having to invest a considerable sum in its development, testing, and implementation.

**2.2. Target Audience**

Target audience	Benefits
<b>DOTs</b>	<ul style="list-style-type: none"> <li>• Fewer utility-related delays and therefore more predictable project delivery times; fewer utility-change orders and therefore lower costs.</li> <li>• Fewer utility cuts and therefore fewer utility damages and risks to the health and safety of construction workers and the public.</li> <li>• Fewer unnecessary utility relocations, more accurate utility relocation plans and as-builts, and more reliable utility relocation schedules.</li> <li>• More effective working relationship with contractors and utility stakeholders.</li> </ul>
<b>FHWA</b>	<ul style="list-style-type: none"> <li>• More predictable delivery schedules and costs on federal-aid highway projects.</li> <li>• More effective relationship with state DOTs.</li> </ul>
<b>Consultants</b>	<ul style="list-style-type: none"> <li>• More clarity about project scopes and deliverables.</li> <li>• More certainty about utility facility locations and associated impacts on project delivery schedules and costs.</li> </ul>
<b>Contractors</b>	<ul style="list-style-type: none"> <li>• Fewer utility-related delays and therefore more predictable project delivery times; fewer utility-change orders and therefore lower costs.</li> <li>• Fewer utility cuts and therefore fewer utility damages and risks to the health and safety of construction workers and the public.</li> </ul>
<b>Utility Owners</b>	<ul style="list-style-type: none"> <li>• Fewer utility cuts and therefore fewer utility damages and risks to the health and safety of construction workers and the public.</li> <li>• Fewer unnecessary utility relocations, more accurate utility relocation plans and as-builts, and more reliable utility relocation schedules.</li> <li>• More effective working relationship with DOTs.</li> </ul>

**2.3. Additional Support**

The level of support that is necessary depends on the specific item or product.

## **IMPLEMENTATION PRODUCTS THAT ARE READY FOR IMPLEMENTATION AT MINIMAL COST**

Support needed: Presentations at conferences and webinars, using the PowerPoint file describing the research background, approach, findings, and conclusions. Personnel include presenters and participants (including, but not limited to project managers, designers, utility coordinators, right-of-way coordinators, environmental coordinators, hydraulic engineers, construction managers, utility permit coordinators, utility owners, highway contractors, and utility contractors).

## **IMPLEMENTATION PRODUCTS THAT ARE READY FOR IMPLEMENTATION AND REQUIRE SOME INVESTMENT**

Support needed:

- Presentations at conferences and webinars, using the PowerPoint file describing the research background, approach, findings, and conclusions. Personnel include presenters and participants (including, but not limited to project managers, designers, utility coordinators, right-of-way coordinators, environmental coordinators, hydraulic engineers, construction managers, utility permit coordinators, utility owners, highway contractors, and utility contractors).
- Setting up a framework for implementation (including changes to DOT guidelines and manuals) and associated funding, which depends on the specific product, as described in *Minimizing Utility Issues During Construction: A Guide*. Personnel include those at DOT divisions and sections that develop and implement utility relocation and accommodation policies as well as district personnel who execute those policies.
- Utility inspection procedures. Investment is required in low-cost data collection equipment and software to facilitate utility inspections.
- Training courses. A one-day training course per topic (i.e., utility investigations, UCM, right-of-way clearing contracts, utility inspections, change order descriptions) is sufficient in most cases, but covering specific items might require an extra day. Personnel include presenters and participants (including, but not limited to project managers, designers, utility coordinators, right-of-way coordinators, environmental coordinators, hydraulic engineers, construction managers, utility permit coordinators, utility owners, highway contractors, and utility contractors).

## **IMPLEMENTATION PRODUCT THAT REQUIRES INVESTMENT FOR DEVELOPMENT**

Support needed: Funding to develop, test, and implement the IDSS. The IDSS could be owned by the DOT or hosted on a commercial platform. A potential implementation strategy is to develop and market the IDSS as part of the AASHTOWare Project Construction & Materials web-based software platform. This strategy would enable individual DOTs to license the IDSS instead of having to invest a considerable sum in its development, testing, and implementation.

### **2.4.Evaluation and Monitoring**

Criteria to measure the progress of the implementation include, but are not limited to the following:

- Project delivery process: Evidence of fewer utility-related time extensions, change orders, and claims during construction.
- Utility inspection process: Evidence of fewer discrepancies between utility relocation plan locations and utility as-built documentation.

- Decision support system: Number of transportation agencies that install and use the IDSS. Number of reports by DOTs documenting causes of change orders.
- Training courses: Number of courses offered per topic (i.e., utility investigations, UCM, right-of-way clearing contracts, utility inspections, change order descriptions) and number of participants.

### 3. Final Deliverables

Final implementation deliverables depend on the specific item or product.

#### **IMPLEMENTATION PRODUCTS THAT ARE READY FOR IMPLEMENTATION AT MINIMAL COST**

Final implementation deliverable: Report by DOTs summarizing the implementation of the various strategies, along with statistics showing evidence of (a) fewer utility-related time extensions, change orders, and claims during construction; and (b) fewer discrepancies between utility relocation plan locations and utility as-built documentation.

#### **IMPLEMENTATION PRODUCTS THAT ARE READY FOR IMPLEMENTATION AND REQUIRE SOME INVESTMENT**

Final implementation deliverable: Report by DOTs summarizing the implementation of the various strategies, along with statistics showing evidence of (a) fewer utility-related time extensions, change orders, and claims during construction; and (b) fewer discrepancies between utility relocation plan locations and utility as-built documentation. The report would also include a summary of levels of investment and a summary of the number of training courses offered and level of participation.

#### **IMPLEMENTATION PRODUCT THAT REQUIRES INVESTMENT FOR DEVELOPMENT**

Final implementation deliverable: Report by DOTs summarizing the results of developing, testing, and implementing the IDSS.