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TRANSPORTATION INFRASTRUCTURE

Impacts of Utility Relocations on Highway and Bridge Projects



**Resources, Community, and
Economic Development Division**

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The Honorable John H. Chafee
Chairman
The Honorable Max S. Baucus
Ranking Minority Member
Committee on Environment and Public Works
United States Senate

The Honorable Bud Shuster
Chairman
The Honorable James L. Oberstar
Ranking Democratic Member
Committee on Transportation and Infrastructure
House of Representatives

Work on highway and bridge projects often involves relocating utility lines and facilities that are used in producing, transmitting, or distributing communications, electricity, natural gas, water, and sewage. Schedule slippages and increased costs associated with the construction of these projects may result when these lines and facilities are not relocated in a timely manner. In this regard, the Transportation Equity Act for the 21st Century (TEA-21) directed us to assess the impact that delays in relocating utilities are having on the delivery and cost of federal-aid highway and bridge projects.

As agreed with your offices, we examined the following for fiscal years 1997-98: (1) the extent to which states are experiencing such delays and the causes and impacts of the delays; (2) the number of states that are compensating construction contractors for the added costs incurred on their projects because of untimely relocations by utility companies; (3) the available technologies, such as subsurface utility engineering (SUE),¹ that are being used during project design to reduce the number or impact of utility relocation delays; and (4) the mitigation methods that states are using, such as incentives, penalties, and litigation, to encourage or compel cooperation by utility companies that are relocating utilities on federal-aid highway and bridge projects. To obtain information about these issues, we sent a questionnaire to the departments of transportation of the 50 states and the District of Columbia—for which we achieved a 100-percent

¹SUE is an engineering process that incorporates new and existing technologies to identify and map underground utilities during the early development of a highway project.

response rate. A summary of the responses is in appendix I.² We obtained additional information through interviews with officials of the headquarters and field offices of the U.S. Department of Transportation's Federal Highway Administration (FHWA), state transportation departments, construction contractors, and/or utility companies in nine states. Additional information on our scope and methodology is discussed later in this report.

Results in Brief

The extent of the delays on highway and bridge projects because of relocating utilities ranged from none in three states to all projects in one state during fiscal years 1997-98. The states that reported the delays cited a variety of reasons for them, such as short time frames for planning and designing projects, the utility companies' lack of resources to perform relocation work, and the poor timing, sequencing, and coordination of the relocation work relative to the construction work. Only 10 states thought that the delays had a great or very great impact on the costs and/or construction schedules of federal-aid highway and bridge projects. States, however, are not always aware of all the delays that occur. The information that states have largely depends on the degree to which individual construction contractors request schedule extensions and/or submit claims for increased costs on delayed projects. Rather than requesting extensions or submitting claims, some contractors told us that they accommodate the delays by shifting work crews and equipment to other segments of the project or to another ongoing project.

Forty-four states compensated contractors for utility relocation delays by extending project completion schedules, and 30 paid contractors' claims for increased costs. Some contractors told us that while some direct-cost increases resulting from delays can be recovered in their respective states, either (1) they usually do not have the time to prepare the paperwork or (2) the expected reimbursement—along with its timing—is simply not worth the effort to prepare the paperwork. Other contractors told us that certain states require contractors to assume full financial responsibility for utility relocation delays.

Forty-three states reported that they used computer-aided design and drafting systems during the project design phase of more than half of their projects. Such systems use computer graphics technologies for designing and mapping construction projects, including locating utilities. Although

²For statistical purposes, in compiling and analyzing the questionnaire responses, we included the District of Columbia as a state.

the Federal Highway Administration recommends subsurface utility engineering as a means of using new and existing technologies to accurately identify, characterize, and map underground utilities, only seven states responded that they used this engineering process on half or more of their projects. However, it is unknown whether the use of subsurface utility engineering has reduced the extent of utility relocations or delays.

Forty-one states responded that they used early planning and coordination and 33 responded that they used special contracting methods as a means to help mitigate the impact of utility relocation delays. This contrasts with the number of states that responded that they used more forceful mitigation measures to encourage or compel utility companies to complete utility relocations in a timely manner—three states responded that they used monetary incentives, seven used monetary penalties, and two used the courts.

Background

To accommodate highway and bridge construction, utilities often must relocate their lines and facilities when they lie in the path of a construction project. Utility relocations are more prevalent today than in the past because most current federal-aid roadwork involves the reconstruction or expansion of existing highways and bridges (with accompanying utility lines and facilities that already exist) rather than new construction. Federal-aid highway and bridge programs, administered at the federal level by FHWA, provide states with financial assistance for various types of projects. The projects under these programs are financed generally on an 80-percent-federal, 20-percent-state basis—although the split in percentage varies, depending upon the specific highway or bridge program. In fiscal years 1997-98, about \$21 billion a year in federal funds was obligated for highway and bridge projects. Under TEA-21, the estimated funding for fiscal year 1999 increased to about \$26.6 billion and to about \$28.3 billion for fiscal year 2000. Along with the increased funding, an increased number of projects involving the relocation of utilities is expected.

At the state level, state transportation departments generally administer federal-aid highway and bridge projects. States are responsible for planning, designing, and—with their contractors—constructing highway and bridge projects, while utilities are usually responsible for relocating their lines and facilities out of the path of the highway or bridge construction. States often inform utility companies of planned highway and bridge projects up to 5 years before construction begins. With an early

alert, utilities can begin their own conceptual designs for relocating their lines and facilities in concert with the planned projects. During predesign meetings between the project designer and the utility representatives, the utilities learn about upcoming highway and bridge projects, as well as probable construction time frames. Even under the best of circumstances, the planning and designing of highway and bridge projects often take a long time, and frequently involve delays, cancellations, changes in alignment, and other factors that can alter the involvement of utility companies. These conditions encourage highway agencies to wait until later in the design process to involve the utilities. Similarly, utility companies prefer to wait until they are certain that the project's planning and design are firm before they begin their relocation work.

Construction contractors and utilities need to schedule their respective work so that their activities are properly sequenced. Before utility companies can relocate their lines and facilities, they must have the right-of-way to the locations where the utilities are to be moved, and those sites need to be cleared and graded.³

To varying degrees among states and individual projects, the site preparation work is performed by the construction contractor, the utility company, or a separate contractor. Once the site is cleared, the utilities can install their conduits, ducts, or poles and connect their lines and facilities at the new location. However, if a utility does not have the needed right-of-way or the site is not cleared or graded, a utility company's relocation work would likely be delayed. If for these, or any other reasons, a utility does not relocate its lines or facilities as scheduled, the construction contractor's schedule can be delayed.

Extent, Causes, and Impacts of Delays Resulting From Utility Relocations

During fiscal years 1997-98, about half of all federal-aid highway and bridge projects involved the relocation of utilities.⁴ States' responses to our questionnaire varied widely—from no delays resulting from utility relocations in three states to delays on all projects involving the relocation of utilities in one state. However, the full extent of the delays on federal-aid highway and bridge projects caused by relocating utilities is not known because states are not always aware of the delays. The states provided us with a number of reasons for the delays, such as the following: short time frames for states to plan and design projects, which affect all

³Right-of-way is a general term denoting real property, or an interest therein, usually in a strip, acquired for or devoted to transportation purposes.

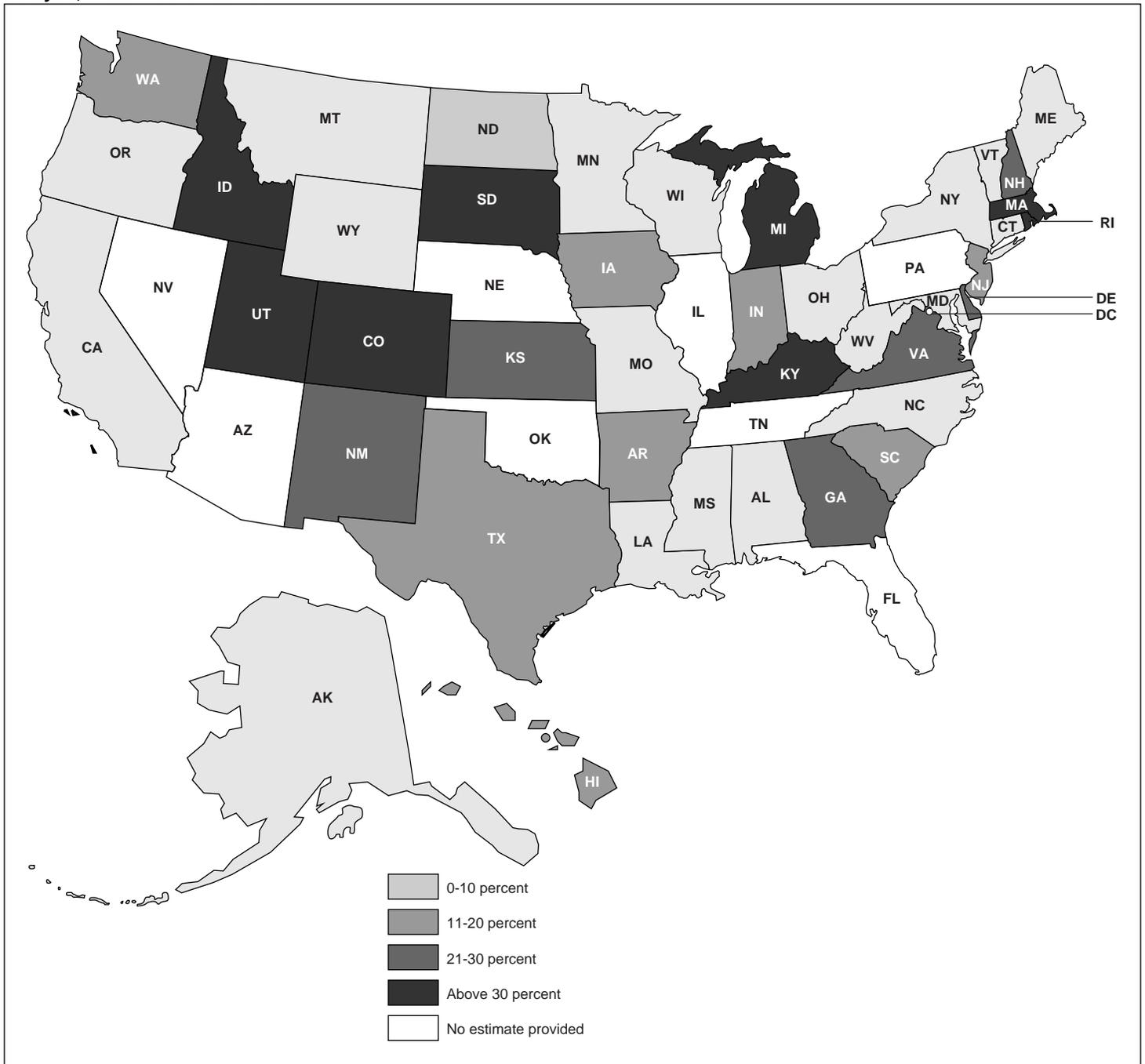
⁴Based on the numbers of advertised projects in the states' responses to GAO's questionnaire.

subsequent aspects of a project, including utility relocations; utility companies' limited resources to perform an expanding amount of relocation work; and the poor timing, sequencing, and coordination of the utility relocation and construction work. States generally did not perceive that the delays have had a great impact on the costs and construction schedules of federal-aid highway and bridge projects.

States Indicated That Projects Were Delayed, but the Full Extent Is Not Known

Forty-two states responded to our questionnaire on the percentage of delays caused by the relocation of utilities on federal-aid highway and bridge projects in their respective state for fiscal years 1997-98. The extent of these delays ranged widely among the states—from none reported by Montana, North Dakota, and Vermont to about 95 percent of the completed projects involving utility relocations in Idaho and to 100 percent of such projects in Rhode Island. We found that 20 states reported delays for 0-10 percent of their projects, 8 for 11-20 percent, 6 for 21-30 percent, and 8 for above 30 percent. Nine states did not provide an estimate. Figure 1 shows the extent of the delays reported for each state.

Figure 1: States' Responses Regarding Percentages of Federal-Aid Projects Involving Utility Relocations That Were Delayed, Fiscal Years 1997-98



Source: GAO's analysis of states' responses to GAO's questionnaire.

Although 20 states reported that about 10 percent or less of the federal-aid highway and bridge projects involving the relocations of utilities encountered delays because of these relocations, this does not necessarily indicate the full extent of the delays. For example, although Connecticut reported that only about 3 percent of its projects involving utility relocations had delays caused by the need to relocate utilities, a state transportation official told us that Connecticut does not keep track of all the delays caused by utility relocations. This official stated that the 3-percent figure, which the state reported, represents the state's federal-aid highway and bridge projects involving documented delays in relocating utilities. Therefore, if delays were not documented, they were not included in the state's response. A contractor association official in Connecticut told us that the state has no good indicators of the frequency and magnitude of delays caused by utility relocations. One contractor pointed out that because Connecticut does not reimburse contractors for the cost increases resulting from delays in relocating utilities, the costs of such delays are often anticipated and incorporated somewhere in a given contractor's bid. As such, the costs of these delays go unreported.

States Gave Various Reasons for Delays

The reasons that states gave for delays caused by utility relocations were related but varied. Table 1 shows the reasons most frequently indicated for such delays and lists them according to the number of states that considered them to be a moderate or major reason for delays.

Table 1: States' Responses Identifying Reasons for Delays in Relocating Utilities

Reason	Number of states
Utility lacked resources	34
Short time frame for state to plan and design project	33
Utilities gave low priority to relocations	28
Increased workload on utility relocation crews because highway/bridge construction had increased	28
Delays in starting utility relocation work: some utilities would not start until construction contract was advertised or let	28
Phasing of construction and utility relocation work out of sequence	26
Inaccurate locating and marking of existing utility facilities	23
Delays in obtaining rights-of-way for utilities	23
Shortages of labor and equipment for utility contractor	19
Project design changes required changes to utility relocation designs	19
Utilities were slow in responding to contractors' requests to locate and mark underground utilities	16
Inadequate coordination or sequencing among utilities using common poles/ducts	13

Source: States' responses to GAO's questionnaire.

As the table shows, one of the most prevalent reasons cited by the states was the short time frame for them to plan and design projects, which can affect all subsequent aspects of the project, including utility relocations. With recent increases in the federal funding of highway and bridge projects, states are planning and designing an increasing number of projects in a shorter amount of time. For example, Colorado told us that

its highway construction program had nearly doubled since 1995 and that, in its rush to get projects under contract, time had become a shrinking resource—particularly the time available for planning and designing projects and the time available for designing and relocating utility lines and facilities.

Shorter time frames for planning and designing construction projects also reduce the amount of time available to acquire needed utility rights-of-way. When utility facilities are located on a state's rights-of-way and those existing rights-of-way are not sufficient to accommodate a planned utility relocation, additional rights-of-way need to be acquired. Utilities are generally responsible for acquiring additional rights-of-way that may be needed for a given project. In some instances, the utilities may already have the necessary rights-of-way prior to the construction of the highway and/or bridge project (known as "prior rights"). If the utility has prior rights, the state usually pays for any additional rights-of-way that may be needed, as well as for the relocation itself. Because utilities cannot relocate their facilities unless they have the right-of-way for the new location, delays in obtaining rights-of-way can, in turn, slow the timing of relocation work.

Utility relocations for large highway and bridge construction projects can be very complicated. In addition to the state transportation department and its construction contractors, multiple utilities also may be involved. To reduce scheduling problems, the contractors would prefer that, to the extent possible, all utility relocation work be finished before the highway or bridge construction begins. Preconstruction conferences involving all the parties to the project provide an opportunity for the state agency and the utility companies to communicate any final changes in project schedules, jointly review and approve final sets of plans, and identify key points of contact for the project. The conferences also provide an opportunity for the contractors and utilities to agree upon work schedules that will minimize possible conflicts during construction.

Several contractor officials told us that the work schedules that the utilities provide at preconstruction conferences are often not specific or reliable. Contractor officials also stated that utilities are often unresponsive to contractors' requests for needed actions. Contractor and state highway officials pointed out, however, that utilities are not solely to blame for all delays associated with relocating utilities. In this regard, utility company officials told us that (1) contractors often make changes to construction work schedules, (2) they have limited resources to respond

to contractors' requests, and (3) their first obligation is in servicing their existing and new customers. Furthermore, even when reimbursed by a state, utility companies do not profit from relocation work and generally do not recover all of their indirect costs.

Impacts of Delays Vary

As with the extent of delays, quantifiable information on the full impact of delays caused by relocating utilities on the cost and delivery of federal-aid highway and bridge projects does not exist. Delays in relocating utilities can cause construction work to be rescheduled or delayed, or result in contractor claims or litigation. In addition, less tangible impacts result. For example, safety concerns, such as leaving excavations open while conflicts are resolved, increase the risk to state agencies, contractors, utility companies, and the traveling public. Furthermore, public travel on highways under construction is more time-consuming and less convenient.

Five states responded that delays caused by relocating utilities had a great or very great impact on the construction schedules of federal-aid highway and bridge projects. Five states responded that these delays greatly or very greatly increased the construction costs to the state, two states responded that they greatly increased the costs to construction contractors, and two states responded that they greatly or very greatly increased the costs to other utility companies. In addition one state, New Mexico, reported that delays greatly affected utility coordination efforts on other projects. The states responding that the delays had a great impact on the projects' schedule and/or costs for fiscal years 1997-98 are shown in figure 2.

Figure 2: States Reporting Great or Very Great Impacts From Delays Caused by Relocating Utilities, Fiscal Years 1997-98



Source: States' responses to GAO's questionnaire.

Although, as indicated by figure 2, most states did not report that delays caused by relocating utilities had a great impact on the construction schedules and costs of federal-aid highway and bridge projects, officials of one national contractor association and several contractor companies told us that states are not fully aware of the increased costs borne by contractors because of these delays. This is because many states do not reimburse their contractors for the costs resulting from delays caused by relocating utilities and, therefore, the documentation supporting the full impacts of delays is not sent to the states. Even in one state that provides reimbursements, Rhode Island, four contractors that we met with told us that, rather than take the time to gather the documentation and submit a claim to the state, they find it easier to either absorb the increased costs or simply factor an estimate of such costs into their contract bids.

State and contractor officials told us that contractors can lessen the impact of some relocation delays by shifting their work crews to other segments of the delayed project, or to entirely different projects until the delayed work can be resumed. To illustrate, Idaho reported that about 95 percent of its projects had been affected by delays in relocating utilities. Such delays caused the respective contractors to shift work crews and adjust their schedules; thus, only about 6 percent of Idaho's projects actually resulted in contractual change orders or claims.

States' Compensation of Contractors

States can compensate contractors for delays caused by relocating utilities by extending project completion schedules and/or paying contractors' claims for increased costs. Claims due to delays in relocating utilities may be included in the federal share of project costs provided to states.⁵ However, it must first be determined that (1) the utilities were relocated prior to advertising for bids, or necessary coordination was arranged with the utility company to avoid delaying the contractor, (2) approved state procedures were followed, (3) construction work was delayed by the utility company through no fault of the construction contractor, and (4) the state exercised reasonable efforts to control the situation. Some contractors in states that reimburse contractors for direct cost increases resulting from delays told us that they usually do not have the time to prepare the paperwork or that the expected reimbursement—along with its timing—is simply not worth the effort to prepare the paperwork. Other contractors told us that certain states require contractors to assume full financial responsibility for delays caused by relocating utilities.

⁵See Program Guide, *Utility Adjustments and Accommodation on Federal-Aid Highway Projects*, fourth edition, Federal Highway Administration, U.S. Department of Transportation (Mar. 1998).

Twenty-nine states responded that they provided both project time extensions and reimbursements to contractors for cost increases resulting from delays in relocating utilities in fiscal years 1997-98, 15 states provided only time extensions, 1 provided only cost reimbursement, 5 provided neither, and 1 responded that it did not know if it gave time extensions but it did not provide cost reimbursements. The states responding that they provided project time extensions and/or reimbursed contractors for cost increases in fiscal years 1997-98 are shown in figure 3.

Figure 3: States' Responses Concerning Compensation of Contractors for Delays Caused by Relocating Utilities, Fiscal Years 1997-98



Source: States' responses to GAO's questionnaire.

Thirty-three of the 44 states shown in figure 3 reported that in fiscal years 1997-98, they granted time extensions for delays caused by relocating utilities that ranged from 1 to 912 days. Eleven of the 30 states that compensated contractors for costs incurred as a result of these delays also identified the dollar amounts compensated in fiscal years 1997-98. These amounts ranged from \$7,855 to \$8 million per state and totaled \$15.4 million for the 11 states.

States' Use of Available Technologies

The states identified technologies used in locating and identifying utilities during the design process to facilitate utility relocations.

- Computer-aided design and drafting (CADD) systems use computer graphics technologies to design and map construction projects and presents an expedient way to consolidate many different design aspects, such as rights-of-way maps, into a common database, or base map. Forty-three, or about 84 percent, of the respondents to our questionnaire said that they had used CADD on more than half of their projects.
- Vacuum extraction, which removes dirt and debris from test holes with a vacuum, is one of the more accurate methods for the nondestructive location of underground utilities. Seven states used it on more than half of their projects.
- Geographic information/global positioning systems are used for mapping purposes. Geographic information systems use software and hardware to develop an information database using coordinates of various land features and mapping techniques. Global positioning systems represent a newer method of providing ground control points for mapping purposes by monitoring satellite signals; on-ground receivers pick up the satellite information, which is then transferred to an attached computer. Fifteen states reported they had used these systems on more than half of their projects.
- Subsurface utility engineering is used to incorporate new and existing technologies to identify and map underground utilities during the early development of a highway project. This engineering process might include using vacuum extraction to help locate utilities and CADD or geographic information systems for information management and mapping activities critical to the design process. Having such information early in the design process offers project designers the ability to redesign the project or avoid existing utilities. Seven states reported that they had used SUE on more than half of their projects.

The states that reported that they had used these various technologies on more than half of their projects in the design phase during fiscal years 1997-98 are shown in figure 4.

Figure 4: States' Responses Regarding Use of Selected Technologies on More Than Half of Their Projects, Fiscal Years 1997-98



Source: States' responses to GAO's questionnaire.

Because we were specifically asked to examine SUE, we took a closer look at its use among the states. FHWA has recommended the use of SUE to accurately identify, characterize, and map underground utilities during the design phase of a highway or bridge project. In April 1997, FHWA reported several case studies to illustrate the cost savings or cost avoidances that can result from using SUE.⁶ For example, Virginia made design adjustments to a major highway project and eliminated 61 of 75 potential utility conflicts with construction. By making the design changes, Virginia reported that utility relocation work estimated to cost \$731,425 was avoided. With the cost of the project's SUE activities totaling \$93,553, a net savings of \$637,872 was reported. In another case, using SUE technology enabled Maryland to redesign a project and thus reduce the length of gas, water, and sewage lines needing relocation from 5,000 to about 400 feet for each utility. SUE activities cost the project about \$56,000, but Maryland reported that the state and the utilities avoided over \$1.3 million in relocation costs that they otherwise would have incurred. Still another example was a project in North Carolina, where vacuum extraction technology was used in conjunction with SUE to precisely identify the location of a water line running alongside 18 miles of roadway. According to North Carolina, the process, costing about \$10,000, resulted in identifying approximately 4 miles of the water line that could remain in place, thus helping the state and the utility company avoid about \$500,000 in relocation costs.

We examined whether the states using SUE on more than half of their projects performed better than the rest of the states in terms of having fewer projects involving utility relocations, having less costly projects, or having fewer delays caused by utility relocations. Five of the seven states that indicated they used SUE on more than half of their projects also included information on the numbers and costs of advertised projects, and the delays of completed projects, which we used to compare with similar information provided by many of the 32 states that reported that they were not using SUE to any great extent. The results of our comparisons were inconclusive. For the small number of states using SUE, we got mixed results with respect to whether the use of SUE directly affected the number of utility relocations, their costs, and any associated delays. These results

⁶Subsurface Utility Engineering, Federal-Aid and Design Division, Office of Engineering, Federal Highway Administration (Apr. 1997).

indicated that other factors may be affecting the extent of utility relocations and the extent of the delays caused by utility relocations.⁷

Under a July 1997 contract with FHWA, Purdue University is currently conducting a 2 1/2-year study to determine the effectiveness of SUE on reducing costs and delays on highway projects. This study is examining the use of SUE in North Carolina, Ohio, Oregon, Texas, Virginia, Wyoming, and Puerto Rico. A final report is due in late 1999.

Mitigation Methods Used

Incentives, penalties, and/or the courts were infrequently used to encourage or compel utility companies to relocate utilities for federal-aid highway and bridge projects in a timely manner. Forty-one states used early planning and coordination, and 33 states used special contracting methods to help mitigate or ameliorate the impact of relocating utilities. Table 2 shows the number of states that reported that they used these mitigation methods or measures in fiscal years 1997-98.

Table 2: States' Responses Regarding Mitigation Methods Used by States, Fiscal Years 1997-98

Mitigation method	Number of states
Monetary incentives	3
Monetary penalties	7
Courts	2
Early planning and coordination	41
Special contracting methods	33

Source: States' responses to GAO's questionnaire.

Use of Incentives

Although three states provided monetary incentives to encourage utility companies to complete utility relocations on federal-aid highway and bridge projects, none of these incentives were contingent on the timely completion of the relocation work. For example, Delaware noted that it paid one of its construction contractors to perform the utility trench excavation for one utility relocation project. The second state, Missouri, stated that it pays utility companies for the state's share of relocation costs

⁷States' identified the extent to which they used SUE on the basis of the projects in the design phase during fiscal years 1997-98. Our comparisons would be affected if the states significantly altered their use of SUE for projects advertised or completed during fiscal years 1997-98.

before the utilities begin work, subject to a final audit. Lastly, Massachusetts pointed out that it reimburses utilities for 100 percent of the costs of relocating utilities on bridge replacement projects. Under the provisions of this program, Massachusetts makes the reimbursements contingent on the utilities' completing the relocation work on time. For each day that the utility falls behind schedule, the state reduces the amount being reimbursed. If relocating the utilities causes a contractor to incur a delay that results in a claim, the cost of the claim would also be deducted from the moneys due the utility. Although these provisions to reduce payments for delays incurred are written into project agreements, a Massachusetts highway official told us that these provisions have never been used.

Use of Penalties

Seven states responded that they had assessed monetary penalties against utilities that failed to complete utility relocations on federal-aid highway and bridge projects in a timely manner. These states either charged the utilities for the costs that the states incurred or for contractor claims paid as a result of delays in relocating utilities. These penalties were not directly tied to missed agreed-upon utility relocation dates but were assessed on a case-by-case basis. In 1998, the state of Rhode Island, which pays for all of the costs of relocating utilities on federal-aid highway and bridge projects, considered legislation that would have required utilities to relocate their facilities within 30 days of receiving notice. If utilities were not relocated within that time, Rhode Island's department of transportation would have been permitted to contract for the relocation with a private company, and the utility company would have had to pay for the cost of the contract. The utilities successfully argued that having them pay for the relocations would increase the cost to their utilities' customers, and the proposed legislation was not enacted.

Use of Courts

The courts are seldom used to discipline utility companies for untimely utility relocations. Only two states reported using the courts over the past 2 years. Kentucky responded that it had used the courts very infrequently, and Texas responded that it had used the courts on only one occasion. Officials from Maryland, which has not used the courts, questioned whether the state could be successful in court because it would be difficult to show that the utility was at fault. The officials said that the state would need to demonstrate that (1) it or the construction contractor had notified the utility company in a timely manner of the work to be done and (2) the utility had not been kept from doing its relocation work. An

official from Maine pointed out that his state works closely with utility companies to resolve problems and conflicts. He expressed concern that litigation would jeopardize the positive working relationship that exists between the Maine department of transportation and the utilities. Officials in several of the states we visited echoed this comment.

Early Planning and Coordination

Forty-one states responded that they used early planning and coordination methods to help avoid or reduce delays in relocating utilities and their impacts on highway and bridge projects. For example, various states were

- providing much earlier—in some instances 5-year—notices of upcoming projects;
- inviting utility companies to meetings early in the design phase of a project;
- holding monthly, quarterly, or other periodic planning/coordination meetings;
- providing advanced rights-of-way and utility relocation funding before the highway and/or bridge construction work was funded; and
- improving coordination efforts and working relationships.

Illustrative of some of the actions being taken by states to deal with utility relocation concerns, the Texas department of transportation recently developed and adopted what it calls its Utility Cooperative Management Process. This process was put together as a means of discovering and incorporating utilities' concerns into the planning, design, acquisition, and construction phases of project development. Texas recognized, as have many other states, that early coordination provides for more efficient highway design, economical utility relocation, and reduced construction costs. Texas's goal is to (1) accommodate utilities during the planning and design phase and (2) when utility adjustments are necessary, implement an adjustment plan that is compatible with the state's established contract award scheduling and construction sequencing.

Use of Special Contracting Methods

States are using special contracting methods to help mitigate relocation delays. One way of reducing conflicts between construction work and relocation work is to include the relocation work in the construction contracts; thus, giving the construction contractor more control over all the work. Fifteen states—Alabama, Alaska, Colorado, Delaware, Georgia, Kentucky, Louisiana, Maine, Maryland, Missouri, Montana, New Hampshire, North Carolina, Ohio, and South Carolina—have included

utility relocation work, such as that for water and sewer lines, directly in construction contracts for certain projects.

Another contracting method used by nine states—Louisiana, Maine, Maryland, Mississippi, Missouri, North Carolina, Ohio, Oregon, and Rhode Island—is to separately contract the site clearing and preparation work and allow utility companies the time to relocate their lines and facilities before the state advertises the highway construction project. A state transportation official told us, however, that such a phased approach can generally extend the length of each job. Some representatives of utility companies told us that they are reluctant to relocate utilities too soon (e.g., before a construction project starts) because of the possibility of subsequent project redesigns and the need for them to come back and redo what they have already done.

Partnering is still another mitigation method mentioned by 11 states—Alaska, Connecticut, Delaware, Indiana, Kansas, Kentucky, Maine, Massachusetts, Michigan, Nebraska, and Texas. This method, which is advocated by at least one national contractor association, seeks to remove the adversarial relationships that sometimes exist between states, contractors, and utility companies and replace them with business relationships that are based on common goals and a desire to work productively together.⁸ According to the contractor association, partnering does not change nor release any of the contractual requirements but helps all parties recognize that a basic tenet of contract law is to act in good faith. A Massachusetts highway official explained that partnering has been used on large projects. State, contractor, and utility company officials involved in the project meet weekly or biweekly to discuss all issues and resolve problems. This official said that partnering helps improve communications and reduce delays but that it does not resolve all delay problems. He explained that when conflicting demands for a utility company's resources arise, relocating utilities may receive a lower priority by the utility company because it entails expending resources as opposed to doing something that generates income.

Contracts associated with very large federal-aid highway and bridge projects sometimes contain unique features involving utility relocations because of the magnitude of the relocation work. For example, the ongoing Interstate-15 Project in Salt Lake City, Utah, is a multi-billion-dollar, 17-mile project that involves the relocation of the lines and facilities of about 45 utility companies and must be completed in time

⁸See *Partnering: A Concept for Success*, The Associated General Contractors of America (Oct. 1991).

for the 2002 Winter Olympic Games. As a means of facilitating the relocation of utilities on this time-critical project, agreements were reached whereby the relocation work of all but one of the utilities is being done by the construction contractor. The electric utility company is the only holdout, preferring to remain in charge of its relocation work. Performing the utility relocation work gives the contractor more control over this work, thus reducing the coordinating and work-sequencing problems that might otherwise arise.

Another example of a very large highway and bridge project is the \$10.8 billion Central Artery/Tunnel Project in Boston, Massachusetts. This project involves hundreds of miles of gas, electric, sewer, telephone, and other utility lines and facilities that needed to be moved out of the path of the new highway. At the time of our visit to the project in September 1998, the utility work was more than 80-percent complete. Project officials attributed the success they had in relocating the utilities to their ability to (1) obtain utility companies' involvement from the start and throughout the design process; (2) require construction contractors to build the ducts and conduits and the utilities to perform the hookups, such as cutting and splicing cables; (3) enhance project coordination by having each utility provide an employee liaison; and (4) use SUE early in the design process. Project officials estimated that the costs of relocating utilities for the Central Artery/Tunnel Project will total about \$1 billion, including about \$150 million that represents reimbursements to the various utilities for their relocation costs.

Observations

The relocation of utility lines and facilities is an integral part of many highway and bridge construction projects. Project construction is often delayed when utilities are not relocated in a timely manner for the construction work to proceed. There is no one solution to this problem. Each highway or bridge project is different, with its own set of circumstances, and must be dealt with accordingly by those involved in the project. The highway and bridge projects that have proceeded most smoothly are those that involved a lot of coordination, cooperation, and communication between the various project participants early in the project's design and throughout the project. However, delays in relocating utilities may become even more pronounced in the future. Increased funding provided under TEA-21 for highway and bridge construction currently and in the years ahead is expected to result in increased (1) numbers of ongoing highway and bridge construction projects and (2) demands on the resources of state transportation departments,

construction contractors, and utility companies. Because the resources available for utility relocation work are already stretched thin, utility relocation delays will continue to demand attention by all project participants.

Agency Comments

We provided the Department of Transportation with a draft of this report for review and comment. The Department generally agreed that the facts have been accurately and fairly presented in the report.

Scope and Methodology

To assess the impact that delays in relocating utilities are having on the delivery and cost of federal-aid highway and bridge projects, we conducted various literature searches. We met with officials from FHWA headquarters, the American Society of Civil Engineers, and several subsurface utility engineering companies. We visited nine states and met with officials from FHWA, state departments of transportation, and construction and utility companies. We visited Delaware, Maryland, North Carolina, and Virginia because of their proximity to Washington, D.C. We visited Connecticut because construction contractors in the state brought the issue of utility relocations to Congress's attention. Massachusetts and Utah were selected because of the large highway project going on in each state—the Central Artery/Tunnel Project in Massachusetts and the I-15 Project in Utah. Both are large-dollar projects involving extensive utility relocations. Rhode Island was selected because its state legislature recently considered a bill that would impose a penalty on utility companies that failed to relocate their utilities within 30 days. Texas was selected because several officials we met with mentioned its utility relocation activities.

We also met with representatives of the Connecticut Road Builders Association, Construction Industries of Massachusetts, Construction Industries of Rhode Island, the Associated General Contractors of America, and Bell Communications Research. We contacted, by telephone, officials from the Baltimore City Public Works, Maryland Public Service Commission, Electric Power Research Institute, and American Road and Transportation Builders Association. We attended a forum on utility relocation delays hosted in July 1998 by the Construction Automation & Robotics Laboratory, North Carolina State University; a national utility relocation conference held in Louisville, Kentucky, in October 1998; and a Utility/Contractor Forum hosted in October 1998 by the Connecticut department of transportation.

Finally, on the basis of information we obtained through the above efforts, we prepared a questionnaire and mailed it to the highway departments of each of the 50 states and the District of Columbia. We received responses from all 50 states and the District of Columbia, which we summarized and analyzed. The responses provided us with general information regarding the extent, causes, and impacts of delays caused by relocating utilities in each of the states and some information on how each state is responding to the problem.

We performed our work from July 1998 through May 1999 in accordance with generally accepted government auditing standards.

We are sending copies of this report to the Honorable Rodney E. Slater, Secretary of Transportation; Kenneth R. Wykle, Administrator, Federal Highway Administration; the Honorable Jacob J. Lew, Director, Office of Management and Budget; state departments of transportation; interested congressional committees; and other interested parties. We will send copies to other interested parties upon request. Major contributors to this report are listed in appendix II.



Phyllis F. Scheinberg
Associate Director, Transportation Issues

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Abbreviations

CADD	computer-aided design and drafting (system)
FHWA	Federal Highway Administration
GAO	General Accounting Office
SUE	subsurface utility engineering
TEA-21	Transportation Equity Act for the 21 st Century

Summary of States' Responses to GAO's Questionnaire

**U.S. General Accounting Office
Survey of State Highway Offices Regarding Utility Relocation Delays
on Federal-Aid Highway and Bridge Projects**

Introduction

The Transportation Equity Act for the 21st Century (TEA-21) mandated the U.S. General Accounting Office to conduct a study of the effect of utility relocation delays on the delivery and cost of federal-aid highway and bridge projects. As part of the study, we are mailing this questionnaire to each of the highway departments in the 50 states and the District of Columbia.

Specifically, the questionnaire asks for information about each state's federal-aid highway program, the extent that utility relocation delays occur in this program, the reasons for the delays, the effects of the delays, the use of available technologies and other methods to mitigate delays, and whether states are compensating contractors for costs resulting from delays. Your responses are important to our gaining a nation-wide perspective of these issues.

If you should lose or misplace the envelope, please return the completed questionnaire by mail or fax to:

Attn: Ralph Lamoreaux
U.S. General Accounting Office
441 G St. N.W., Room 2T23
Washington, DC 20548

FAX: (202)512-3766

If you have any questions, please call Ralph Lamoreaux at (202)512-8113 or Sumi Arima at (202)512-5776.

Thank you for your help!

INSTRUCTIONS

We are requesting that you and/or members of your staff familiar with the design and construction of federal-aid highway and bridge projects involving utility relocations, provide your state's position and experience on these issues in completing this questionnaire. In considering your responses, please respond in terms of the last two federal fiscal years (October 1, 1996 to September 30, 1998).

Please return your completed questionnaire in the enclosed business reply envelope within 10 business days of receipt. We plan a follow-up effort in order to get as many responses as possible; thus, your timely response will help us reduce the time and cost involved in such an effort.

We recognize that there are great demands on your time; however, your cooperation is critical to our efforts to provide complete and accurate information to the Congress.

**Appendix I
Summary of States' Responses to GAO's
Questionnaire**

STATE'S FEDERAL-AID HIGHWAY/BRIDGE PROGRAM

1. For each of the last two federal fiscal years (FFY), please provide the following information for the federal-aid highway and bridge projects in your state. (Enter Number; if none, enter '0')

	FFY 1997		FFY 1998	
	Number of Advertised Projects	Total Cost of Projects	Number of Advertised Projects	Total Cost of Projects
a. Number of federal-aid highway and bridge projects	(N ¹ =49) mean: 188.5 median: 109 range: 14 to 838 sum: 9,236	(N=49) mean: \$317.4 million median: \$224.5 million range: \$46.9 million to \$1.3 billion sum: \$15.6 billion	(N=50) mean: 184.5 median: 122 range: 19 to 846 sum: 9,224	(N=50) mean: \$332.8 million median: \$257.1 million range: \$43.6 million to \$1.4 billion sum: \$16.6 billion
b. Number of advertised federal-aid highway and bridge projects that involved utility relocations	(N=38) mean: 71.3 median: 57 range: 5 to 256 sum: 2,708	(N=33) mean: \$133.6 million median: \$94.2 million range: \$426,000 to \$483 million sum: \$4.4 billion	(N=39) mean: 68.1 median: 42 range: 7 to 264 sum: 2,656	(N=34) mean: \$148.3 million median: \$73.8 million range: \$815,000 to \$484 million sum: \$5.0 billion

2. Consider the federal-aid highway/bridge projects that involved utility relocations that were completed in the last two years. About what percent, if any, of these projects encountered utility relocation delays? (Enter Percent; if none, enter '0')

(N=42)
median: 13.5%
range: 0% to 100%

Distribution:
0 - 10% N=20
11-20% N= 8
21-30% N= 6
above 30% N= 8

3. During the last two years, to what extent did your state pay for utility relocations on federal-aid highway and bridge projects? (Check all that apply)

- a. [3] State paid for all utility relocations for all types of projects/relocations
- b. [21] State paid, in total, for some--certain types of--projects/utility relocations (please specify type)

- c. [39] State and utility companies both paid for utility relocations-- rates vary by project based on prior rights/easements
- d. [6] State and utility companies both paid specified/mandated percentage for utility relocations:
(N=4)
State paid 30 to 90%
Utility companies paid 10 to 70%
- e. [5] State did not pay for any utility relocations
- f. [5] Other (Specify)

¹ 'N' is number of states that responded to item.

**Appendix I
Summary of States' Responses to GAO's
Questionnaire**

4. In your experience during the last two years, please indicate which of the following were reasons that utility relocations delays occurred in your state? (Check one for each reason)

REASONS		Not a Reason	Minor reason	Moderate reason	Major reason
a.	Inaccurate locating and marking of existing utility facilities (N=50)	3	24	17	6
b.	Phasing of construction and utility relocation work out of sequence (N=50)	2	22	22	4
c.	Utility company not informed of a need to relocate utilities in advance of the construction project (N=50)	29	16	4	1
d.	Inadequate coordination or sequencing among utilities using common poles/ducts (N=50)	8	29	9	4
e.	Delays in obtaining right-of-ways for the utilities (N=50)	13	14	14	9
f.	Project design changes required changes to utility relocation designs (N=50)	4	27	13	6
g.	Utilities lacked resources (e.g., personnel, materials, and equipment) for timely relocations (N=49)	1	14	17	17
h.	State lacked funding and other resources (N=50)	39	9	2	0
i.	Short time frames to plan and design projects (N=49)	5	11	26	7
j.	Shortages of labor and equipment for utility contractor (N=50)	12	19	14	5
k.	Inclement weather (N=49)	13	29	7	0
l.	Utilities gave low priority to relocations (N=50)	8	14	15	13
m.	Increased workload on utility relocation crews because highway/bridge construction has increased (N=50)	4	18	18	10
n.	Delays in state authorization of utility relocation work (N=50)	28	18	4	0

**Appendix I
Summary of States' Responses to GAO's
Questionnaire**

(QUESTION 4 CONTINUED)

REASONS		Not a reason	Minor reason	Moderate reason	Major reason
o.	Delays in starting utility relocation work; some utilities would not start until construction contract was advertised/let (N=50)	7	15	15	13
p.	Utilities were slow in responding to contractor requests to locate and mark underground utilities (N=50)	11	23	13	3
q.	Other (Please specify) _____ (N=14)	1	1	6	6

5. In your experience, what effect, if any, have utility relocation delays had on the following factors related to the delivery or costs of federal-aid highway and bridge projects in your state? *(Check one for each)*

FACTORS		Increased a little or not at all	Increased somewhat	Increased moderately	Increased greatly	Increased very greatly	Don't know
a.	Length of project construction schedule (N=50)	8	22	13	3	2	2
b.	Construction costs to the state (N=50)	11	21	12	5	0	1
c.	Costs to construction contractors (N=50)	13	14	12	2	0	9
d.	Costs to other utility companies (N=50)	12	15	3	1	1	18
e.	Other (Please specify) _____ (N=5)	1	1	3	1	0	0

**Appendix I
Summary of States' Responses to GAO's
Questionnaire**

USE OF AVAILABLE TECHNOLOGIES

6. During the project design phase of projects over the last two years, on which portion of the federal-aid highway and bridge projects were the following available technologies used? (*Check one for each available technology.*)

AVAILABLE TECHNOLOGIES	None or almost none of the projects	Less than half the projects	About half the projects	More than half the projects	All or almost all the projects
a. Vacuum extraction (N=50)	33	7	3	2	5
b. Geographic information systems (GIS)/ global positioning systems (GPS) (N=50)	27	5	3	7	8
c. Ground penetrating radar (N=51)	44	7	0	0	0
d. Computer-aided design and drafting (CADD) system (N=49)	1	2	3	5	38
e. Subsurface utility engineering process (N=50)	32	10	1	4	3
f. Other (<i>Please specify</i>) (N=6)	0	0	5	0	1

METHODS TO REDUCE THE NUMBER OR IMPACT OF UTILITY RELOCATION DELAYS

7. In the last two years, has your state provided any monetary incentives to utility companies to encourage them to complete utility relocations on federal-aid highway and bridge projects in a timely manner?

a. [3] Yes --> Please describe each incentive and how often it was used.

b. [48] No

8. In the last two years, has your state assessed any monetary penalties to utility companies that failed to complete utility relocations on federal-aid highway and bridge projects in a timely manner? (*Check one.*)

a. [7] Yes--> Please describe the penalties.

b. [43] No

**Appendix I
Summary of States' Responses to GAO's
Questionnaire**

9. In the last two years, has your state used the courts to encourage or compel cooperation by utility companies on federal-aid highway and bridge projects? (*Check one*)

a. [2] Yes--> Under what circumstances and how often were the courts used?

b. [49] No

10. In the last two years, has your state used any special advance planning or coordination methods to help avoid or reduce the impact of utility relocation delays on federal-aid highway and bridge projects? (*Check one*)

a. [41] Yes--> Please describe the methods used and indicate how often they were used.

b. [9] No

11. In the last two years, has your state used any special contracting methods to help avoid or reduce the impact of utility relocation delays? (*Check one*)

a. [33] Yes--> Please describe the methods used and indicate how often they were used.

b. [18] No

12. In the last two years, has your state used any other methods to help avoid or reduce the effect of utility relocation delays? (*Check one*)

a. [27] Yes--> Please describe the other methods used and indicate how often they were used.

b. [22] No

CONTRACTOR COMPENSATION FOR DELAYS

13. In the last two years, has your state granted time extensions to construction contractors for delays resulting from utility relocation delays. (*Check one*)

a. [44] Yes --> On what portion of the projects that involved utility relocations were time extensions granted?

(N=38)
median: 10%
range: 1% to 75%

Across these projects, what was the range of the time extensions granted?

(N=33)
1 day to 912 days

b. [6] No

**Appendix I
Summary of States' Responses to GAO's
Questionnaire**

14. In the last two years, has your state compensated construction contractors for costs incurred as a result of utility relocation delays? (*Check one*)

a. [30] Yes --> On about what percent of the projects that involved utility relocations were contractors compensated?

(N=22)
median: 10%
range: 1% to 41%

What was the amount of the compensation for these projects?

(N=11)
mean: \$1,403,830
median: \$184,000
range: \$7,855 to \$8,000,000
sum: \$15,442,132

b. [20] No

Please provide the following information concerning the primary person responsible for completing this questionnaire, so that we may call to clarify information, if necessary.

Name: _____

Title: _____

Agency: _____

Phone No. (____) _____

Again, thanks for your help!

COMMENTS

15. Please provide any additional comments or concerns that you may have about utility relocations on federal-aid highway and bridge projects.

18 states provided comments

Major Contributors to This Report

Resources,
Community, and
Economic
Development
Division, Washington,
D.C.

Sumikatsu J. Arima
Paul D. Lacey
Ralph W. Lamoreaux
Luann M. Moy
Earl P. Williams, Jr.

Office of the General
Counsel, Washington,
D.C.

Helen T. Desaulniers

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