

United States General Accounting Office Washington, DC 20548

November 3, 2003

The Honorable Peter G. Fitzgerald Chairman The Honorable Daniel K. Akaka Ranking Member Subcommittee on Financial Management, the Budget, and International Security Committee on Governmental Affairs United States Senate

Subject: Comparison of States' Highway Construction Costs

In your recent letter to us concerning the impending reauthorization of the Transportation Equity Act for the 21st Century, you stated that the return on federal investment could be increased through effective cost competition for states' highway construction contracts. In this context, you asked that we report on how states compare in terms of the cost of highway construction. As agreed with your offices, we are reporting to you on whether Federal Highway Administration (FHWA) data can help transportation stakeholders understand how states' costs to build, reconstruct, and maintain federally financed highways, roads, and bridges (termed "constructing highways" for this report) compare. During our review, we became aware of significant issues regarding the quality of the data that FHWA collects and reports, a topic also discussed in this report. On September 11, 2003, we briefed the Chairman on the results of our work, and on September 22 we provided the Ranking Member's office with the briefing slides we prepared. This report summarizes the briefing. The slides that formed the basis for the briefing are enclosed.

Background

States, with support from localities, are primarily responsible for building and maintaining the nation's highways, roads, and bridges, with significant financial support from the federal government. From 1998 through 2001 (the latest years for which data are available), all levels of government spent more than \$80 billion each year for capital construction and maintenance of their highways, roads, and bridges. Of this amount, the federal government supplied about \$30 billion annually.

Highway project costs can differ for a number of reasons.¹ For example, highways are more expensive to build in mountainous areas than in flat areas. Projects in urban areas are more expensive than those in rural areas. Projects with bridges cost more than similar projects that do not require bridges. Compared with smaller projects, large projects may result in lower unit costs because of economies of scale. More complicated projects, such as those with a large number of interchanges or complicated engineering problems, can cost more than less complicated projects. Other factors that may affect cost are the degree of competition for contracts and different state design standards.

For each contract exceeding \$500,000, FHWA requires that each state, the District of Columbia, and Puerto Rico (collectively called "states") provide the agency with data (called bid price data) on the quantity of materials used and the installed price of the materials (representing materials, labor, overhead, and profit) from contracts to construct and maintain roads on the National Highway System.² States are required to provide FHWA with this data for seven materials (common and unclassified roadway excavation, structural reinforcement and structural steels, bituminous and Portland cement concrete surfaces, and structural concrete), as well as provide the total contract costs for road and bridge aspects of the contract, and the location of the project. According to FHWA, the bid price data are limited to seven materials because the materials are common to all states; therefore, they act as good indicators for changes in principal work items. FHWA makes summaries of its bid price data, including a national composite index of all materials on which data are collected, available to the public in its quarterly *Price Trends for Federal-Aid Highway Construction* and in its annual *Highway Statistics*.³

According to FHWA officials, the bid price data are the only data they collect from states involving price and quantity, both of which are needed to compare state highway construction costs. FHWA collects bid price data so that it can use the national composite index to help (1) monitor changes in the purchasing power of the federal-aid highway construction dollar, and (2) develop, as one factor, projections of future highway funding needs.

¹Most federal funds that states receive to fund their highway projects are apportioned to the states based on formulas and procedures prescribed by law. With few exceptions, state decisions to undertake higher- or lower-cost projects do not affect the level of funding they receive. However, to the extent that states can avoid excessive costs on ongoing projects, they will be able to undertake additional projects.

²The National Highway System consists of completed interstate highways, urban and rural principal arterials, other strategic highways, and intermodal connectors. The system comprises about 161,000 miles of highway. Although the system represents about 4 percent of total highway miles, it carries about 43 percent of the traffic (as measured by vehicle miles traveled).

³In these publications, FHWA combines the two excavation items and reports on six materials.

Summary

FHWA's database allows for comparisons of an individual state's costs over time but does not allow for comparisons between states. In addition, FHWA has concerns, which have not been formally disclosed to users, about the quality of the data.

Comparing States' Construction Costs

FHWA's database containing its bid price data allows for comparisons of an individual state's costs over time but does not allow for comparisons between states.⁴ Costs are tracked by state, according to an index value that is assigned quarterly. Each state received an index value of 100 for the base year (1987). If one state's costs in the base year were twice those of another state, both would have an index value of 100 for that year, and the difference in those costs would not be shown, thus preventing a comparison.

In addition, FHWA officials told us that the bid price data do not contain details to determine why costs appear to differ either between states or within a state. They told us that the installed cost of materials could vary significantly, for example, because the quality of the materials or the installation specification (e.g., smoothness of the surface) could be very different. FHWA's bid price data do not contain this information.

FHWA is considering whether to discontinue collecting bid price data because of the (1) apparent limited use of the data, and (2) level of effort to collect data that apparently is not extensively used. In commenting on a draft of this report, FHWA noted that it hired a consultant to evaluate the usefulness of the data to stakeholders and to explore potential alternative approaches to gathering information that could be used within FHWA. FHWA also commented that it recently partnered with the American Association of State Highway Transportation Officials to survey all state departments of transportation on the extent of use of the published price trend data and alternative ways that FHWA could gather these data (such as using data that are being collected by states for their internal use).

We contacted 12 states, the Bureau of Transportation Statistics, and several industry associations about the usefulness of the bid price data. Generally, they told us they do not use the data. For example, a few states told us that they maintain more complete data, and FHWA's data are not compatible with their own. FHWA estimated that it takes states, in total, about 975 hours annually to report the bid price

⁴In 2002, the Washington State Department of Transportation surveyed states on the costs to build a 1.02-mile interchange whose design the department believed was universal to all states. Reported costs ranged from \$4 million to \$26.7 million, based on 25 states reporting. See the enclosure to this report.

data (based on reporting by 37 states), or an average of about 6.5 hours per state per quarterly report.

Quality of FHWA's Bid Price Data

FHWA's quality control procedures on its bid price data are limited. It receives the bid price data either electronically or on paper from the states, and FHWA officials then input the data into their database. FHWA officials told us that they intermittently review submitted data for obvious errors and completeness and follow up with states for correction. However, they said they do not follow standard error-checking procedures, such as those contained in departmental guidelines, for reviewing state submitted reports.⁵ They also told us that they have no procedures for verifying the keypunching of data made by their data entry staff. An FHWA official told us that FHWA is reluctant to invest time and money into improving the quality of its data until it decides whether it will continue to collect the data. While we agree that any substantial investments in time and money may not be warranted if FHWA ultimately decides to discontinue collecting bid price data, following standard error-checking routines would increase FHWA's knowledge about the quality of its data users.

FHWA recognizes that it has problems with the quality of its bid price data. According to FHWA officials, underreporting and, to a lesser degree, inconsistent reporting are the biggest problems affecting data quality. Regarding underreporting, we examined data in the database for 3 years, 2000 through 2002. We found that the database did not contain data for seven states for 1, 2, or all 3 years.⁶ In addition, we found instances in which states that received relatively more highway funds from FHWA reported far fewer contracts (and contract amounts) than states that received significantly fewer funds from FHWA, suggesting that states that received more funds may be underreporting.

We also found data inconsistencies. For example, about 19 percent of the data for 2000 through 2002 were for a year other than the one being reported on. Most often these incorrect data were for the previous year. FHWA officials told us that, for the most part, states submitted these data late.⁷ Instead of omitting the data, FHWA officials told us they included the previous year's data to add robustness to the data reported for the reporting year and because the information for the prior years had already been disseminated. Among other problems, we found a \$7 million contract erroneously included in the database as a \$7 billion contract, thus potentially skewing some information (but not the unit costs for the six materials reported) for that state.

⁵Guidelines for processing statistical data are available in *The Department of Transportation's Information Dissemination of Quality Guidelines* and the Bureau of Transportation Statistics' *Guide to Good Statistical Practices in the Transportation Field.*

⁶The one state that did not report data for all 3 years told us that it was too much trouble. Three other states we contacted told us that they made data available to FHWA's field office, which compiled it for reporting purposes. We did not attempt to verify whether the states reported the data or how FHWA processed submitted data.

⁷We did not attempt to determine when these data were submitted.

With the exception of the erroneous \$7 billion contract amount, we did not attempt to trace the data back to the states. Therefore, we cannot say whether the state incorrectly reported the data for the problems we found or whether the data were entered incorrectly at FHWA.⁸

FHWA has not formally disclosed its concerns with the quality of the bid price data when it reported these data in its *Price Trends for Federal-Aid Highway Construction* or *Highway Statistics*. An FHWA official told us that he believes that most state departments of transportation and other users are aware of the bid price data flaws because this information has been provided informally to many stakeholders over the years and state departments of transportation use the published summaries primarily to cross-check other state highway construction cost data. After we raised this concern, an FHWA official said that FHWA is considering how to advise states and other users about the quality of the data that it is reporting.

Conclusions

As we were examining the use of FHWA's bid price data to determine whether it could be used to compare states' highway construction costs, FHWA officials alerted us to their concerns about the quality and usefulness of its bid price data. We agree with FHWA that it is wasteful to collect and disseminate data that is not used. However, there may be other state construction data that FHWA could collect that would be useful to stakeholders. Until FHWA decides whether it will discontinue, supplement, or supplant bid price data collection, the quality of the bid price data that FHWA reports to the public could be improved through use of more systematic quality control procedures, such as through standard error-checking routines and keypunching verification required by departmental guidelines.

Recommendations for Executive Action

In order to determine whether continued federal and state efforts to provide and analyze state construction cost data are warranted, we recommend that the Secretary of Transportation direct the Federal Highway Administrator to determine whether the bid price data collected by FHWA is useful to transportation stakeholders and, if not, to discontinue collecting the data. Further, we recommend that the Secretary direct the Federal Highway Administrator to determine whether it would be useful and feasible to collect and disseminate other state construction cost data that could supplement or supplant FHWA's bid price data.

While FHWA continues to collect and disseminate bid price data, we recommend that the Secretary direct the Federal Highway Administrator follow departmental guidelines for systematic quality control procedures, such as standard error-checking routines and keypunching verification, to improve the accuracy of the data reported.

⁸In commenting on a draft of this report, FHWA told us that the state reported the \$7 million contract amount as \$7 billion. The state did not respond to our requests for information.

Finally, until the quality of the bid price data is improved, we recommend that the Secretary of Transportation direct the Federal Highway Administrator to disclose its limitations in any published distribution of the data.

Agency Comments and Our Evaluation

We obtained oral comments on a draft of this report from the Department of Transportation. The department did not provide an overall opinion about our draft report or directly comment on our proposed recommendations. The department commented that in situations where data is provided by nondepartmental sources such as states, the department's options for ensuring the accuracy of the original source data are limited. In these situations, departmental guidelines emphasize disseminating information to users about data quality, the department's processing methods, and analysis methods. Exploring ways to ensure the accuracy of data submitted by others, such as states, was beyond the scope of our effort. Therefore, we cannot comment on whether the department's options are limited or whether cost-effective means and incentives exist to better ensure data accuracy and completeness. However, the department's comment that its guidelines emphasize communicating to users about data quality suggests that it agrees with the proposed recommendation in our draft report (and included in this final report) that it disclose the limitations of its bid price data in any published distribution of the data.

The department also suggested that the report recognize FHWA's recent efforts to determine if collecting bid price data should continue. We added this information to this final report. The department also provided a number of technical and clarifying comments, which we incorporated where appropriate.

Scope and Methodology

To identify whether FHWA collects information on states' highway construction costs that could help it and other stakeholders in overseeing federal-aid highway programs, we contacted officials in FHWA and the Bureau of Transportation Statistics in the Department of Transportation. They identified FHWA's bid price data as the only data set that included both quantity and cost information.⁹ To understand the nature of the bid price data and their uses, we interviewed officials in FHWA's Office of Program Administration; reviewed data collection forms and instructions; reviewed FHWA documentation on how bid price data are compiled into reports; and reviewed the primary public summary of the data in *Price Trends for Federal-Aid Highway Construction*.

As part of our work to determine how FHWA's bid price data help it and other stakeholders understand how states' costs to build federally financed highways compare, we (1) examined how FHWA ensures the quality of its bid price data, (2) tested the quality and reliability of the data, and (3) asked selected stakeholders

⁹FHWA also requires that contractors provide it with certain labor cost information. However, an FHWA official believes that few contractors submit this information.

about their perceptions of the data's usefulness. Regarding how FHWA ensures the quality of its bid price data, we discussed with FHWA officials in its Office of Program Administration how the data are submitted to FHWA and how the data are entered and maintained in the database. We also discussed quality control procedures, such as ensuring accuracy and completeness of data submissions and ensuring accuracy of data entered into the database. We also contacted four states for which FHWA's database did not contain any contract information for 2000, 2001, or 2002, to ask if they had submitted data. These states were the District of Columbia, Kentucky, Minnesota, and New Hampshire. Finally, we reviewed departmental guidelines for processing statistical data: *The Department of Transportation's Information Dissemination of Quality Guidelines* and *Guide to Good Statistical Practices in the Transportation Field*.

Regarding testing the quality and reliability of FHWA's bid price data, we obtained electronic files from FHWA for 2000, 2001, and 2002. Our tests focused primarily on checking

- contract award dates, to make sure they fell within the year in which they were being reported (e.g., that all contracts in the 2000 database had a start date within 2000);
- contract award amounts for apparent extreme (high or low) amounts; and
- the number of contracts reported by each state in each year, to see if they were relatively consistent from year to year and to see if some states had not reported any contracts for at least 1 year.

We then discussed the results of our tests with FHWA officials. When we found examples of incomplete data or inaccurate data, we did not attempt to determine whether states submitted incorrect data or whether FHWA incorrectly entered the data into its database.

Regarding understanding the usefulness of FHWA bid price data to transportation stakeholders, we contacted private associations, state highway officials, and federal agencies. We discussed the practical applications, if any, of the FHWA bid price data. The private associations we contacted were the Association for the Advancement of Cost Engineering International, American Road and Transportation Builders Association, and American Association of State Highway Transportation Officials. We contacted the state departments of transportation in California, the District of Columbia, Hawaii, Illinois, Kentucky, Louisiana, Minnesota, Nevada, New Hampshire, North Dakota, Ohio, and Wyoming. We selected these states because (1) they represented states with either a large, medium, or small number of contracts in the database, or (2) we were contacting them anyway about whether they had submitted bid price data from 2000 through 2002. The federal agencies were the Bureau of Transportation Statistics and the Congressional Research Service. Finally, we reviewed recent reports by the Department of Transportation's Office of Inspector General and by us on FHWA cost oversight issues.¹⁰ We conducted our work from July through October 2003 in accordance with generally accepted government auditing standards.

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As arranged with your offices, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days after the date of this letter. At that time, we will send copies of this report to congressional committees with responsibilities for highway issues; the Secretary of Transportation; the Federal Highway Administrator; and the Director, Office of Management and Budget. We will also make copies available to others upon request. This report will be available at no charge on GAO's Web site at http://www.gao.gov.

If you or your staff have any questions about this report, please contact either James Ratzenberger at <u>ratzenbergerj@gao.gov</u> or me at <u>guerrerop@gao.gov</u>. Alternatively, we may be reached at (202) 512-2834. Key contributors to this report were Jay Cherlow, Hiroshi Ishikawa, Jennifer Popovic, Robert Parker, and James Ratzenberger.

Peter Guerrero Director, Physical Infrastructure Issues

Enclosure

¹⁰See, for example, our recent reports: *Transportation Programs: Opportunities for Oversight and Improved Use of Taxpayer Funds*, GAO-03-1040T (Washington, D.C.: July 22, 2003); *Federal-Aid Highways: Cost and Oversight of Major Highway and Bridge Projects—Issues and Options*, GAO-03-764T (Washington, D.C.: May 8, 2003); and *Transportation Infrastructure: Cost and Oversight Issues on Major Highway and Bridge Projects*, GAO-02-702T (Washington, D.C.: May 1, 2002).





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