

Asset Management and Innovative Finance

Daniel L. Dornan, *Infrastructure Management Group, Inc.*

The implications for innovative finance resulting from recent developments in infrastructure asset management are explored. Of particular note are the infrastructure reporting requirements associated with the Governmental Accounting Standards Board's (GASB's) Statement No. 34, which have the potential to revolutionize the ways in which infrastructure is financed, managed, preserved, and documented in the United States. The capital biases associated with traditional federally funded highway programs are discussed. The advent of innovative financing approaches that have evolved in response to the inability of the Federal Highway Trust Fund to meet burgeoning highway infrastructure renewal and replacement needs is described. Within the context of these gradual changes in highway financing, the infrastructure reporting requirements of GASB Statement No. 34 are described. The rationale for these requirements is discussed, and the likely consequences of compliance or noncompliance by state and local governments are identified. A number of asset management and related financial consequences of these new financial reporting requirements are suggested, including several innovative strategies for funding asset management, GASB 34 response efforts, infrastructure rehabilitation, and the creation of infrastructure asset databases to support infrastructure planning, mobilization, and utilization efforts at all levels of government.

Currently, the value of trillions of dollars in public infrastructure is not reflected in the financial statements of state and local governments. As a result, these assets are considered sunk costs whose only financial significance is the drain they represent on the maintenance budgets of infrastructure agencies. Traditional highway funding arrangements have favored capital expenditures for new construction by leaving maintenance funding responsibilities to state and local governments. The availability of relatively cheaper capital funds from the federal government has inadvertently encouraged state and local governments to defer maintenance on their highway systems. This has produced higher life-cycle costs for highway infrastructure when compared with proper asset preservation.

The infrastructure reporting requirements of the Governmental Accounting Standards Board's (GASB's) Statement No. 34 have the potential to radically change the way highway infrastructure assets are financed, documented, and ultimately managed. GASB 34's infrastructure reporting requirements will enable state and local governments that preserve their infrastructure assets to avoid having to report depreciation of these assets. This will encourage infrastructure managers to focus more attention on asset maintenance and long-term preservation through appropriate asset management efforts. Bond rating agencies will begin to rely on GASB 34 reporting to assess the financial condition of government borrowers and rate their bonds. Since state

and local governments will now be held accountable for how they manage their infrastructure, they will no longer be able to simply wait for federal capital funds to replace their prematurely deteriorating infrastructure. This will influence how infrastructure funding is structured in the future relative to capital and maintenance efforts.

One possible financial consequence of GASB 34's infrastructure reporting requirements is the conversion of the Federal Highway Trust Fund program to essentially a block grant program. This will allow state and local agencies to decide how best to allocate their funding resources between capital and preservation needs.

Another financial consequence of GASB 34 is the potential to securitize selected infrastructure assets. GASB 34's asset identification and valuation requirements will enable state and local jurisdictions to securitize their infrastructure assets for the purpose of issuing long-term bonds to pay for the costs of implementing asset management systems, rehabilitating selected infrastructure assets, and complying with GASB 34. Shadow tolls provide a possible mechanism for generating the positive revenue stream to support infrastructure securitization bonds. State infrastructure banks (SIBs) could become the primary means to consolidate securitization efforts across both state and local governments and the primary conduit for dealing with public bond underwriting companies.

A third financing consequence of GASB 34's infrastructure reporting requirements is the potential to stimulate third-party funding for a National Spatial Data Infrastructure (NSDI). With state and local governments required to identify and assess the condition of their infrastructure (particularly if using the preservation approach for reporting), this information could be linked through open-architecture systems to create a national spatial database. Public agencies and firms that could benefit from this kind of information represent a potential source of funding for state and local efforts to document GASB 34 infrastructure data cost-effectively.

TRADITIONAL HIGHWAY INFRASTRUCTURE FINANCING APPROACHES

During the past 40 years, highway infrastructure financing has been built predominantly on a pay-as-you-go basis. The Federal-Aid Highway Act of 1956 set the pattern for highway financing by establishing a pay-as-you-go plan that placed receipts from a national gasoline tax into a trust fund to pay for the Interstate system. Funds were collected by charging a fixed federal tax per gallon of gasoline sold to the public. These funds were to be paid back to the states as construction of the Interstate system was completed. In subsequent

reauthorizations of the act, Highway Trust Fund monies were allocated back to the contributing states on the basis of formulas that took into consideration the relative population levels of the state and other transportation and demographic data (lane miles, vehicle miles of travel, etc.).

Federal funds were restricted to pay for most of the capital costs associated with designing and constructing the Interstate system and other highways on the national highway system. State and local gasoline taxes, motor vehicle registration fees, and driver license fees were used to match available federal funds for new construction and to pay for the costs of operating and maintaining the resulting highway infrastructure.

For the first two decades of the program, federal gas tax proceeds could only be used for new construction. Federal funds could not be used to pay for maintenance or rehabilitation. Hence, state and local highway programs that used federal funding focused most of their attention on (a) spending available Federal Highway Trust Fund money on new capital projects and (b) meeting project schedules for letting construction contracts that commit these funds.

This arrangement pleased politicians by creating numerous opportunities to demonstrate what they were doing for their constituents. The consulting engineering industry benefited by having a steady stream of capital projects to design and redesign. The road-building industry benefited by having a steady stream of capital projects to build.

CAPITAL FINANCING BIASES OF TRADITIONAL HIGHWAY FUNDING PROGRAMS

With federal highway funding focused on new construction, state and local governments were solely responsible for funding the maintenance and rehabilitation of highway infrastructure. To limit local expenditures, state and local highway agencies often deferred road and bridge maintenance and preservation efforts. Although this led to the premature deterioration of highway infrastructure assets, state and local agencies assumed that federal funds would be available to pay much of the cost of their replacement. Essentially, the local leveraging effects of federal capital funds masked the long-term costs of deferred maintenance.

With highway programs being managed on a pay-as-you-go basis, projects were scheduled so that the available funds were expended as the project advanced from planning to design to construction. If there was a problem concerning project scope or budget, the pay-as-you-go approach permitted the responsible agencies to defer the project completion date until sufficient funds became available.

As long as Federal Highway Trust Fund money remained abundant, the strategies of deferred maintenance and pay-as-you-go financing served state and local transportation agencies well. However, in the 1970s these fiscal conditions markedly changed. Petroleum shortages, runaway inflation, post-Vietnam War recession, and the emergence of environmental consciousness undermined the adequacy of the Federal Highway Trust Fund program to meet the needs of an expanding and aging national highway system. These influences boosted the costs of highway projects and lowered the revenues produced by the fixed per-gallon federal gasoline tax.

In the mid-1970s, Congress recognized the dilemma caused by the growing costs of road repair and the diminishing financial capacity of the Highway Trust Fund. The Highway Act of 1976 established the 3-R Program to maintain Interstate highways in good repair through resurfacing, restoration, and rehabilitation. Subsequent legislation added reconstruction to the list of eligible activities aimed at extending the life of the Interstate system, with a particular focus on bridge rehabilitation and replacement. In 1983, Congress significantly raised the federal gasoline tax while reducing the federal share of highway project costs in certain categories. Despite these actions, it became apparent by the late 1980s that more creative and innovative efforts would be needed to close the widening gap between highway infrastructure needs and the resources available to pay for them.

INNOVATIVE HIGHWAY INFRASTRUCTURE FINANCING METHODS AND MANAGEMENT SYSTEMS

During the 1980s, as infrastructure needs began to outpace traditional funding sources, state and local governments began to experiment with alternative ways to finance transportation infrastructure. Besides increasing user fees and taxes, the alternatives included

- Establishing special assessment taxing districts,
- Dedicating sales tax increments, and
- Entering into design-build contracts.

Starting with the passage of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and continuing with the passage of the National Highway System Designation Act of 1995, the Transportation Infrastructure Finance and Innovation Act of 1998, and the Transportation Equity Act for the 21st Century of 1998 (TEA-21), Congress has expanded the options available to state and local governments to finance highway infrastructure projects. Options include

- Reaffirming the viability of toll-based financing of highway infrastructure;
- Capitalizing SIBs in a number of states to augment traditional funding programs by providing a range of loans and credit enhancement products and providing a pooling mechanism for private and public funding involving all levels of government;
- Establishing a federal credit program that includes secured loans, loan guarantees, and lines of credit for projects of national significance;
- Encouraging public-private partnerships;
- Enabling state and local governments to bond against future federal funding allocations through grant anticipation notes and longer-term bonds (GARVEE bonds); and
- Expanding design-build contract concepts to design-build-operate-maintain-finance.

Other innovative financing approaches that have recently evolved include

- Long-term maintenance warranties (New Mexico);
- Privatization of asset management (E-470 in Colorado), maintenance and operations (Virginia Interstate highways), and ownership (Highway 407 in Ontario); and
- Installation of high-occupancy toll lanes that charge tolls for access to restricted-access lanes (California).

As the responsibility for transportation program funding increasingly passes to state and local governments, so too must the authority to decide how these funds are to be used and managed. Whereas traditional highway funding arrangements ceded to FHWA the authority to dictate the terms and conditions for administering these funds, the increasing involvement of state, local, and private-sector entities in financing highway infrastructure will lead to a gradual transfer of administrative authority to these entities. As a result, state and local agencies will begin to assess the life-cycle implications of capital programming and asset management decisions. This will have major effects on the way highway infrastructure is planned, financed, managed, and maintained.

Among the consequences of ISTEA and TEA-21 legislation are the growing adoption and use of pavement and bridge management systems by many state transportation agencies designated to administer the Federal Highway Trust Funds. These management systems improve the cost-effectiveness of infrastructure programs by tracking and programming preservation efforts over the life of the assets. FHWA continues to support these asset management systems through training and technical assistance.

IMPLICATIONS OF GASB 34 FOR INFRASTRUCTURE FINANCE AND ASSET MANAGEMENT

How state and local governments finance and administer highway infrastructure will also be affected by the recent pronouncements of GASB. GASB is a private, nonprofit organization whose standards define Generally Accepted Accounting Principles for all state and local governments in the United States. In June 1999, GASB unanimously approved *Statement No. 34: Basic Financial Statements—and Management's Discussion and Analysis—for State and Local Governments* (1). Among other features, GASB 34 requires that state and local governments report on the value of their long-lived infrastructure assets, including roads and bridges. These requirements apply to all 84,000 state and local governments in the United States, of which it is estimated that about 28,000 own infrastructure assets.

Rationale for Infrastructure Reporting

Infrastructure assets contribute significantly to the viability of the nation's economy and the competitiveness of individual states and localities. With several trillion dollars invested in the nation's infrastructure, public agencies are faced with the choice of preserving these key assets at reasonable cost or deferring maintenance and having to replace them prematurely at much higher cost.

GASB's decision to require state and local governments to publicly account for the value and condition of infrastructure assets reflects the importance of these assets to the financial and economic viability of these jurisdictions. It also recognizes what maintenance engineers have long known—that it is more cost-effective over the long term to perform preventive maintenance on infrastructure than to defer maintenance and incur premature replacement.

Figure 1 shows how pavement condition changes over time when maintenance is deferred. While new pavements generally remain in good to excellent condition for several years with little or no upkeep, the rate of deterioration rapidly increases after 7 to 10 years. At approximately 20 years, the entire road must be replaced at high cost.

Figure 2 demonstrates how periodic preventive maintenance efforts (such as crack sealing, drainage cleaning, and the application of thin overlays) can significantly extend the longevity of pavements, to up to 60 years. By reducing the frequency of asset replacement, research has shown that preventive maintenance efforts can reduce the life-cycle costs in infrastructure by 75 to 90 percent (2, 3). This is demonstrated in

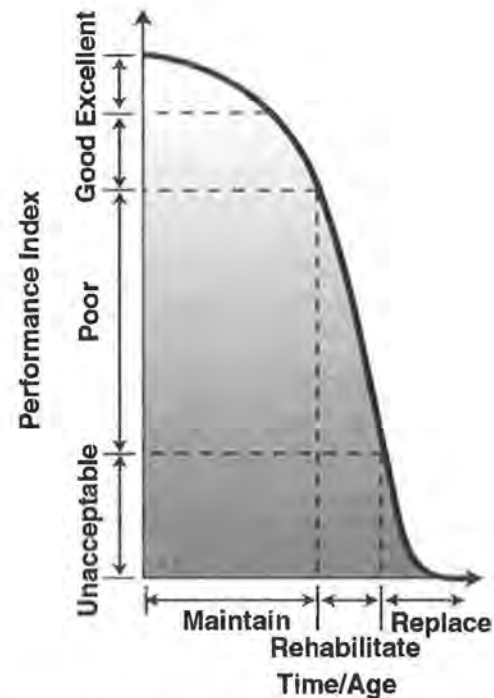


FIGURE 1 Deferred maintenance pavement performance curve.

Figure 3, which shows the high costs of more frequent asset replacement resulting from deferred maintenance strategies.

GASB 34's infrastructure reporting requirements are intended to improve fiscal accountability for public investments in infrastructure. For infrastructure financed by general obligation bonds or revenue bonds, the investment community will have better data to understand governments' ability to service debt and properly care for infrastructure assets once they are built. For infrastructure paid by various user fees and taxes, the general public and those paying the user fees and taxes will have greater assurance that what they are paying for will provide lasting service. As Tom Peters noted in his book *Thriving on Chaos*, "What gets measured gets done."

GASB 34 Infrastructure Reporting Requirements

The following are the key aspects of GASB 34's infrastructure reporting requirements:

- Infrastructure assets must be identified and valued so they can be reported in the annual balance sheets of all state and local governments.
- Valuation of infrastructure assets can be on the basis of either historical costs or discounted replacement costs.

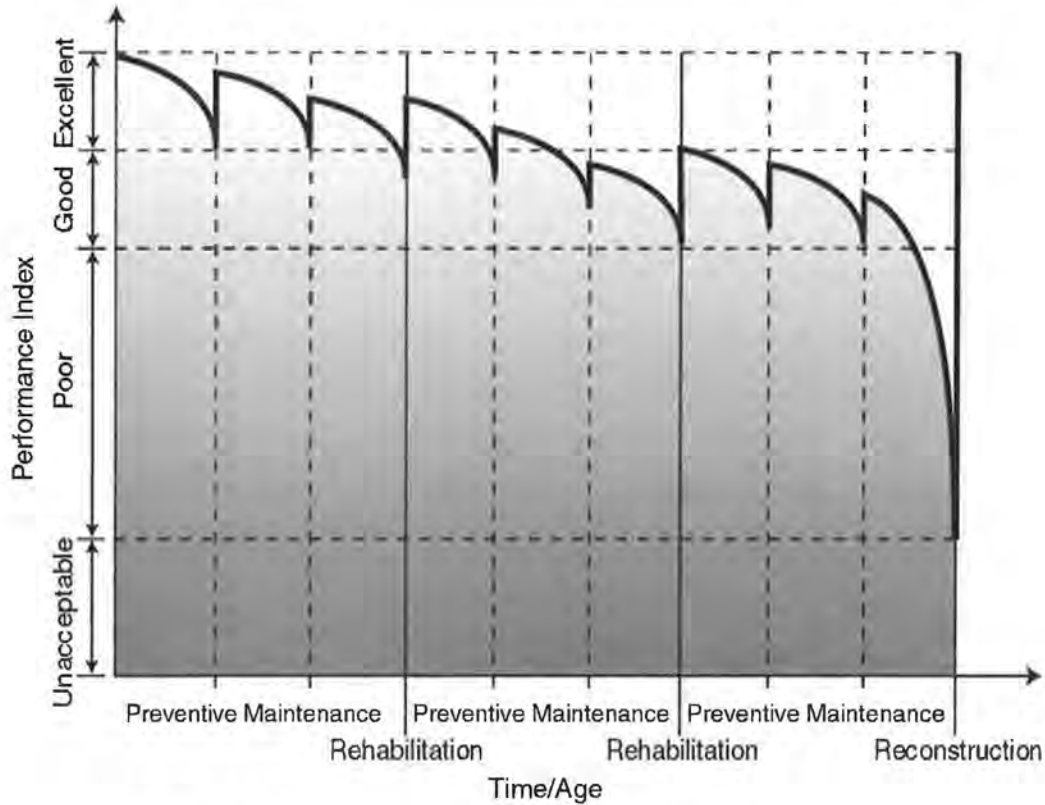


FIGURE 2 Preventive maintenance pavement performance curve.

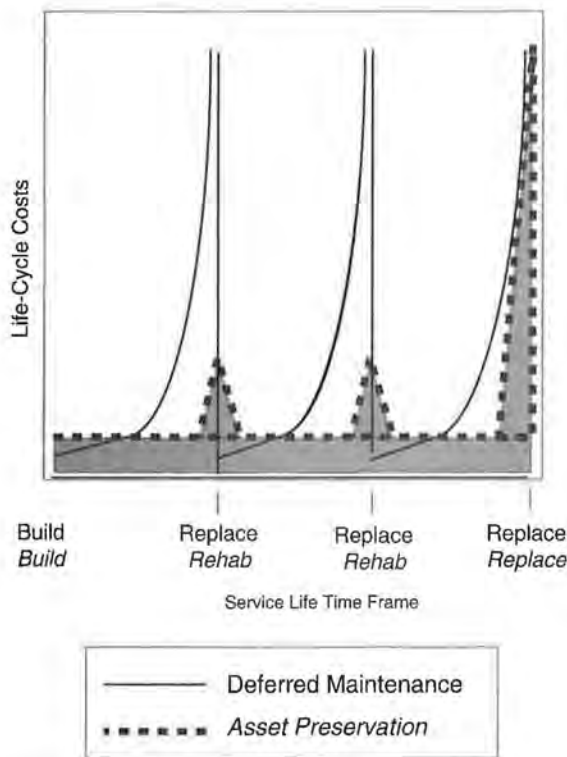


FIGURE 3 Life-cycle cost curves—deferred maintenance versus asset preservation.

- Infrastructure depreciation must be reported each year—alternatively, a modified approach that reports on the costs and results of preservation efforts can be used under certain conditions.
- The modified approach to infrastructure preservation reporting requires the reporting jurisdiction to institute an asset management system that
 - Maintains an up-to-date inventory of eligible infrastructure assets (1, Para. 23a);
 - Performs condition assessments of eligible infrastructure assets at least every 3 years, using a replicable basis of measurement and measurement scale (1, Para. 23b);
 - Summarizes the results, noting any factors that may influence trends in the information (1, Paras. 23b, 24a, 133a, and 133c);
 - Annually estimates the amount needed to maintain and preserve the eligible infrastructure assets at or above the established condition level (1, Paras. 23c and 133b);
 - Ensures that the results of the three most recent condition assessments meet or exceed the established condition level (1, Paras. 23, 24b, and 132a); and
 - Compares the estimated amount required to maintain and preserve eligible infrastructure assets at

or above the established condition level with the amounts actually expended for each of the past five reporting periods (1, Para. 132b).

- Annual financial reports must include sufficient documentation to justify the use of the modified approach, prove that infrastructure assets are being preserved, and describe the asset management methodologies and standards used.

- Selection of asset management methodologies, standards, performance criteria, and systems is left to the discretion of the responding jurisdiction. However, each jurisdiction is expected to be consistent in how it responds from year to year.

Asset Management System Components

FHWA and AASHTO define asset management as “a systematic process of maintaining, upgrading, and operating physical assets cost-effectively” (4, p. 3). The following are the key components of an asset management system for supporting GASB 34 reporting (5, pp. 7–9):

- Asset inventory—linked to a geographic information system
- Asset valuation processes
- Performance measures and standards
- Quantitative condition assessment processes
- Performance-prediction capabilities
- Usage information
- Asset management planning systems

- Pavement management system
- Bridge management system
- Maintenance management system
- Asset renewal/replacement analysis methods
 - Life-cycle costing
 - Cost-effectiveness analysis
 - Equivalent annual cost
 - Longevity cost index
- Asset disposal policies and procedures

Figure 4 shows how a comprehensive asset management system integrates across the life-cycle phases of highway infrastructure assets. As demonstrated in the figure, asset management is more than just a maintenance approach. If properly implemented, it should influence all aspects of infrastructure development, maintenance, and disposal. Individual infrastructure agencies may already have in place a number of the components of an asset management system. In such cases, the agencies will be able to build on their existing capabilities and focus their efforts on developing the missing components. This will reduce the overall compliance effort while making it more relevant to the management needs of the responding jurisdiction.

Effective Dates for GASB 34 Infrastructure Reporting

The effective dates for responding to GASB 34 depend on the time frame in which the assets are built or improved and the size of the government.

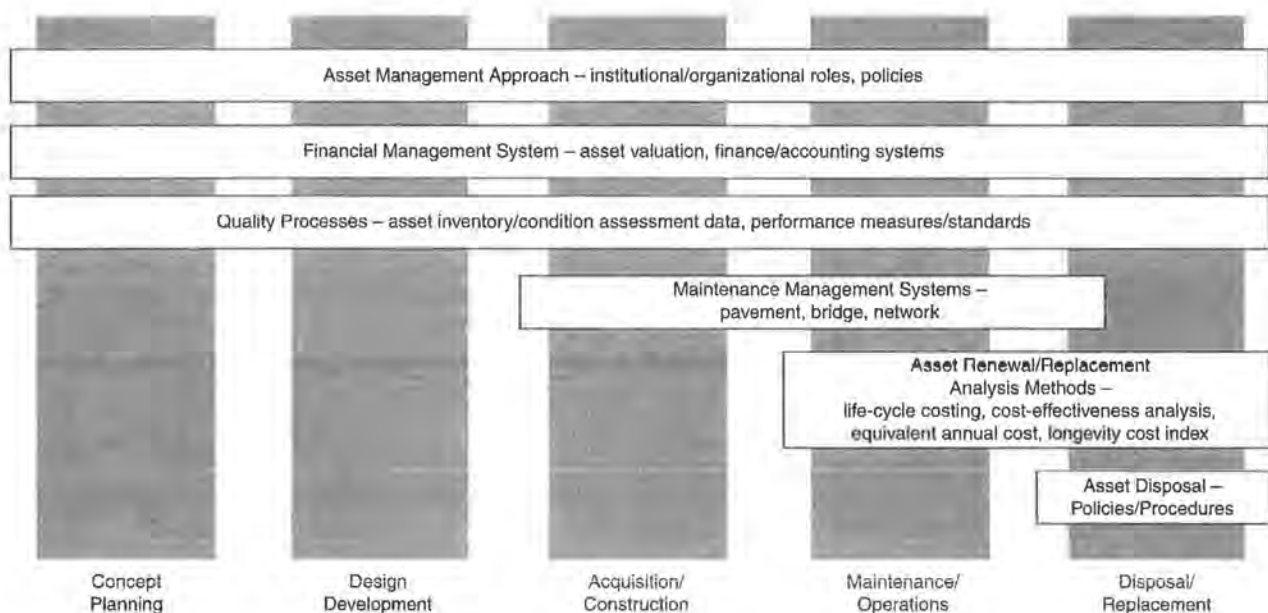


FIGURE 4 Integration of asset management system components with life-cycle phases.

Infrastructure assets acquired, renovated, restored, or improved after the effective date of implementation of GASB 34 must be reported on a prospective basis. For infrastructure that is newly built or improved, the effective dates for GASB 34 compliance are as follows:

- For governments whose total annual revenues are \$100 million or more, Fiscal Year 2002;
- For governments whose total annual revenues are from \$10 million to \$100 million, Fiscal Year 2003; and
- For governments whose total annual revenues are less than \$10 million, Fiscal Year 2004.

Infrastructure assets acquired, renovated, restored, or improved in fiscal years ending after June 30, 1980, but before the effective date of implementation of GASB 34 must be reported on a retroactive basis. For infrastructure that is newly built or improved, the effective dates for GASB 34 compliance are as follows:

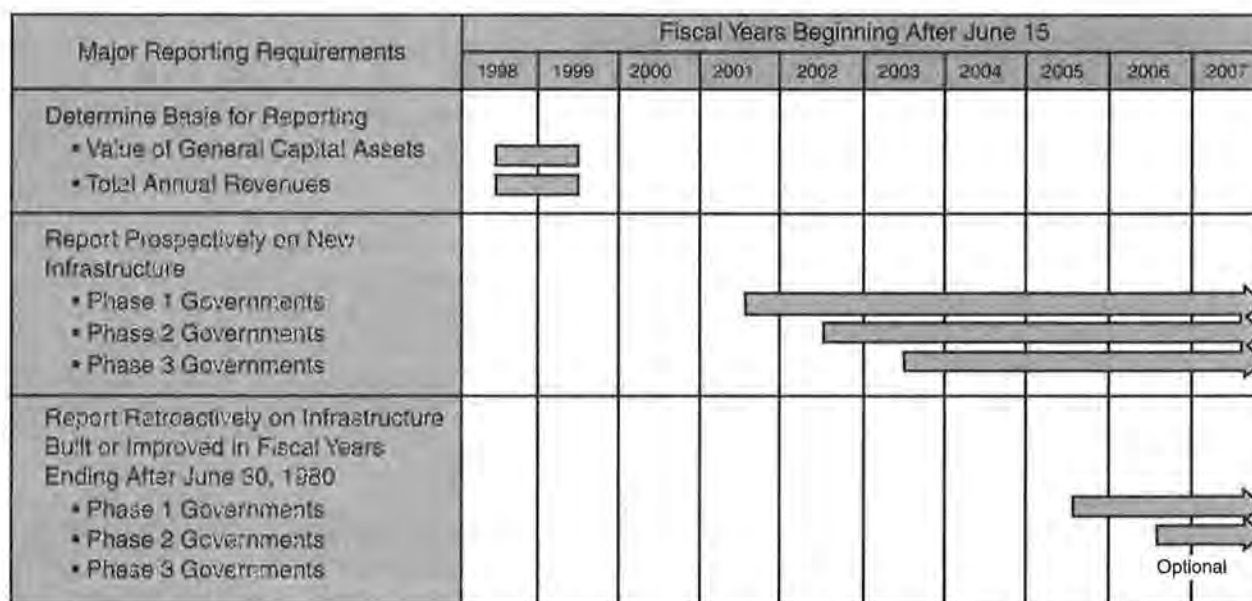
- For governments whose total annual revenues are \$100 million or more, Fiscal Year 2006;
- For governments whose total annual revenues are from \$10 million to \$100 million, Fiscal Year 2007; and
- For governments with total annual revenues less than \$10 million, retroactive reporting on infrastructure assets is encouraged but not required.

Figure 5 illustrates the major milestones associated with the infrastructure reporting requirements of GASB 34, for governments of different sizes and infrastructure built before and after the effective date of the statement.

INNOVATIVE FINANCING OPPORTUNITIES RESULTING FROM GASB 34'S INFRASTRUCTURE REPORTING REQUIREMENTS

GASB 34 has the potential to radically change the way infrastructure assets are financed, documented, and ultimately managed. Bond rating agencies will begin to rely on GASB 34 reporting to assess the financial condition of government borrowers and rate their bonds. Since state and local governments will now be held accountable for how they manage their infrastructure, they will no longer be able simply to wait for federal capital funds to replace their deteriorating infrastructure. This will influence how highway infrastructure funding is structured in the future relative to capital and maintenance efforts.

The following sections discuss a number of strategies for using GASB 34 to leverage available funding sources, expand the availability of financial resources, improve the efficiency and effectiveness of funding programs, and establish a national database for highway infrastructure.



Note: Phase 1 Governments have total annual revenues of \$100 million or more in fiscal year 1999.
 Phase 2 Governments have total annual revenues of \$10 million up to \$100 million in fiscal year 1999.
 Phase 3 Governments have total annual revenues of less than \$10 million in fiscal year 1999.

FIGURE 5 GASB 34 infrastructure reporting schedule.

Block Grant Highway Program Funding

As state and local governments become more accountable for the condition and preservation of their highway infrastructure, they will likely demand greater authority to allocate available highway program funds between capital expenditures (for new construction, improvement, and major rehabilitation) and operating expenditures (for maintenance, repair, and preservation). Once the financial status and cost of debt for a governmental jurisdiction can be affected by the condition of its highway infrastructure, greater emphasis will be placed on preserving these assets. The infrastructure reporting requirements of GASB 34 will encourage highway agencies to develop infrastructure asset management programs based on the long-term life-cycle costs and effects of various preservation and replacement strategies. Once the long-term advantages of infrastructure preservation strategies are understood, greater emphasis will be placed on assessing the trade-offs between capital replacement and preservation.

The shift in program emphasis will promote the relaxation or elimination of funding eligibility distinctions between capital and operating expenditures. This might take the form of restructuring of future surface transportation funding legislation to replace the current array of capital funding programs and project earmarks with block grants. Block grants would provide greater discretion to state and local governments to decide how best to apply scarce Highway Trust Fund money, as indicated below.

Federal Funding Formulas and Project Set-Asides

Federal determination of funding use
 Focus on capital program
 Rigid allocation of funds
 Limited provisions for asset management
 Treat infrastructure assets as sunk costs
 Federal role predominates

Block Grants to State and Local Governments

State/local determination of funding use
 Tailor funds to functional needs
 Flexible allocation of funds
 Accommodates asset management requirements
 Treat infrastructure as a valued resource to be preserved
 Partnership among federal, state, local, and private sectors

Having fostered the institutional infrastructure to plan, program, develop, operate, and maintain transportation facilities and services during the last 50 years (through the establishment of state transportation departments, metropolitan planning organizations, and councils of governments), the federal government

should continue the devolution process begun in the 1980s by empowering these institutions to make the most appropriate decisions concerning how surface transportation funding is applied for the maximum benefit of local residents and businesses.

Alternatively, broader interpretations could be made concerning how federal-aid funds can be used to permit asset preservation efforts to become eligible for such funding. For example, the New Mexico State Highway and Transportation Department recently issued GARVEE bonds to prepay the up-front warranty payment to Koch Industries for a major highway reconstruction and widening project along 192 km (119 mi) of State Road 44. The warranty covers efforts to maintain pavement quality over a 20-year period and certain structures over a 10-year period. In this case, FHWA approved the use of federal-aid funds to service the debt associated with these bonds. Since the bond-funded warranty covers asset maintenance and preservation, it appears that asset preservation spending is already eligible for federal-aid funds, even if it is considered current expense for reporting purposes.

Another possible consequence of GASB 34 might be the use of federal-aid funds to pay for the costs of asset management systems and processes used by infrastructure agencies to better manage their highway assets over the long term, while also effectively responding to the infrastructure reporting requirements of GASB 34. This could help to defray the up-front costs of GASB 34 compliance and response efforts.

Asset Securitization, Bond Financing, and Shadow Tolls

With the decline in Treasury bills due to the efforts of the federal government to pay off its debt, the public finance community is seeking creative vehicles to use the proceeds from mutual funds and other investment vehicles productively. With several trillion dollars in capital assets about to appear on the books of state and local governments, the securitization of infrastructure provides an innovative way to convert these assets from merely sunk costs to productive resources that stimulate further investment in infrastructure.

As shown in Figure 6, GASB 34 establishes the basis for securitizing infrastructure by requiring these assets to be valued. Asset securitization refers to the process of dedicating the value of a physical asset or its related cash flow stream, or both, to provide the money or collateral to repay the costs of debt service associated with public bonds issued or loans obtained on behalf of these assets.

Once infrastructure assets are identified and valued as the first step in GASB 34 compliance, state and local governments could issue bonds secured by the following:

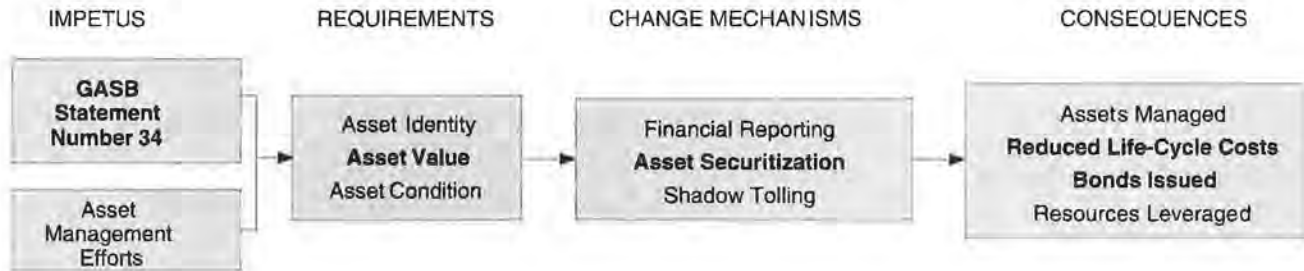


FIGURE 6 Asset securitization.

- Value of these assets, as a basis for collateralizing and possibly privatizing selected infrastructure assets
- Reduced cost stream resulting from asset preservation efforts
- Potential revenues derived from these assets:
 - Tolling new or existing roads and bridges (where permitted by law)
 - Taxing real-estate development along new or improved highway rights-of-way
 - Increasing or dedicating a portion of user fees related to highway infrastructure

Securitization allows state and local governments to capitalize today long-term program savings that can accrue from proper asset preservation efforts. By including infrastructure in the pool of securitized assets, state and local governments can generate significant up-front funds to pay for

- Complying with GASB 34's infrastructure reporting requirements,
- Developing and deploying asset management processes and systems, and
- Renewing deteriorated infrastructure so it can be more cost-effectively preserved.

Having information on the characteristics, value, and condition of infrastructure assets will better enable state and local governments to evaluate the advantages and disadvantages of privatizing selected infrastructure assets on the basis of a clearer understanding of the asset values involved. This might stimulate privatization efforts to turn over road and bridge assets to a financial and operating consortium that can restore and preserve the assets at significantly lower long-term costs.

One of the key features of this approach to funding infrastructure creation and improvement is the fiscal and administrative discipline imposed on the issuers of securitized bonds. Bond covenants define the obligations of the issuing agency for the protection of the bondholders. Representative bond covenants include

- Relative sequence for applying available revenues or funds to pay for operations and maintenance, preservation, debt service, capital rehabilitation and renewal, and capital improvement or expansion;
 - Periodic asset inspection and condition assessment and reporting (typically every 2 to 3 years);
 - Annual revenue and cost estimates and certifications;
 - Debt service coverage from estimated revenues or other dedicated funding sources; and
 - Recourse to other forms of collateral or financial backing that reduces the risks associated with bonds (so-called double-barrel arrangements that identify a third party to cover shortfalls that may be incurred by the sponsoring agency).

Securitization Opportunity

Securitization represents a major opportunity to better leverage public investments in infrastructure. It provides a potential win-win situation for public officials, technical staffs, contractors, construction workers, and the public by making more cost-effective use of infrastructure assets. The success of this innovative financing approach will depend on the application of fiscal discipline and reporting-based accountability imposed by bond covenants—which is consistent with the requirements of GASB 34's infrastructure reporting requirements.

Securitization Challenge

The biggest challenge to securitizing non-toll-highway assets is the lack of specific revenue-generating resources. Bond underwriters and ultimately bondholders will need to be convinced that the reduction in long-term costs brought about by proper asset management and preservation can generate sufficient savings to more than offset the debt service costs associated with the public offering. Research has shown that \$1 spent on preventive maintenance at the appropriate time in the

life of pavement may save up to \$4 in future rehabilitation costs (2, p. 2). If proper asset management can save 70 to 90 percent of today's outlays for public infrastructure over the long term (including both capital and maintenance expenditures), savings could be quite substantial and more than offset the costs of debt service associated with asset securitization. Indeed, there will likely be funds available for infrastructure rehabilitation, new construction, and even noninfrastructure programs.

What is required is the fiscal discipline to ensure that necessary preventive maintenance efforts are performed on an annual basis. While spending will likely be somewhat higher in the short term than under a deferred maintenance approach, significant life-cycle cost savings will accrue over the long term because of the ability to vastly extend the service life of the asset. A portion of those cost savings could be used to pay for ongoing asset preservation, or debt service if bonds were sold to fund major capital improvements at the outset. The key is converting a "negative cost stream" (reduced spending) into a "positive revenue stream" (dedicated cash flow) that can be pledged to bondholders or used to fund yearly pay-as-you-go expenses.

Shadow Tolling Mechanism

An innovative highway financing technique recently introduced in Europe may have applicability in the United States in connection with GASB 34: shadow tolls. Shadow tolls have been used successfully in Britain, Portugal, and Finland to finance highway capital improvements and related operating and maintenance costs using private-sector vendors. Under shadow tolling, a private consortium enters into a concession agreement with a governmental entity under which the private-sector group finances certain improvements to a road and agrees to maintain it at a predefined service level for a certain time period (e.g., 20 years). The governmental unit (which could be national, state, or local) agrees to make annual payments to the firm on the basis of the level of traffic using the roadway, drawing on either transportation-related or general revenues.

The heavier the traffic, the greater the physical depreciation, and the higher the shadow toll payments. In this way, a self-regulating mechanism could be set in place that would effectively require the highway agency to monetize a portion of the implicit cost savings realized from proactive asset management. That stream, in the form of shadow toll payments by the government, would fund the necessary annual operating and maintenance expenditures and debt service.

The documentation and reporting requirements of GASB 34 provide a major impetus for performing infra-

structure asset management and establishing a sizeable market for infrastructure securitization bonds. The covenants associated with public bond offerings could provide the fiscal discipline to ensure that the responsible agency abides by the terms of the agreement—thereby ensuring proper preventive asset maintenance and freeing up resources for the payment of debt service—throughout the terms of the bonds. Shadow tolls provide a possible mechanism for generating the positive revenue stream to support infrastructure securitization bonds.

SIBs as a Vehicle for Securitizing Infrastructure Assets

SIBs represent an ideal vehicle for coordinating and consolidating infrastructure securitization efforts among public agencies and authorities in states where a SIB exists. Participants may include the state department of transportation, metropolitan planning organizations, councils of governments, cities, counties, townships, and authorities.

Instead of each jurisdiction securitizing its own infrastructure assets, SIBs could serve as a financial intermediary to pool infrastructure assets and coordinate with bond underwriting companies to achieve the lowest statewide financing and administration costs. Proceeds from the resulting bond sales could be allocated to each participating jurisdiction on the basis of the amount and quality of the revenue stream pledged to secure its loan. A single bond offering involving multiple jurisdictions, thereby reducing overhead and administrative costs, would represent a more efficient way to process the offering. Each participating jurisdiction would then be obligated to abide by the covenants of the infrastructure-securitized bonds. In the case of covenants relating to asset management, GASB 34's infrastructure reporting requirements would serve to reinforce compliance with these covenants.

Highway Infrastructure Database Development and Financing

GASB 34 requires state and local governments to identify, value, and periodically assess the condition of their infrastructure assets. These requirements provide a strong rationale for establishing a nationwide infrastructure database. This has been a long-time objective of the federal government, through the efforts of the Federal Geographic Data Committee and the National Partnership for Reinventing Government. These agencies recently sponsored an intergovernmental task force to determine how best to facilitate the development of

the NSDI (6), a key component of the National Information Infrastructure. Its purpose is to enable governments to work together to solve problems faster and at less cost to the taxpayer. One of the four goals of the NSDI is to "use community-based approaches to develop and maintain common collections of geospatial data for sound decision-making."

Because of the network characteristics of infrastructure data, geographic information systems and other related spatial data technologies are well suited to help infrastructure agencies cost-effectively store, manage, and display this kind of information (7, pp. 10-13). Examples of spatial data technologies that are currently available for documenting and retrieving infrastructure data are shown below.

- Georeferencing technologies
 - Global positioning systems
 - Distance measuring instrument
 - Inertial navigation system
 - Range finders
- Descriptive technologies
 - Keyboard
 - Voice recognition
 - Digital image capture
 - Automatic image processing
- Nonroadway data collection technologies
 - Digital electronics
 - Artificial intelligence
 - Lasers
 - Microwaves
 - Advanced satellites
 - Advanced computers
 - Remote-control helicopters
 - Automatic target recognition systems

Beyond supporting the data reporting needs of individual jurisdictions, these technologies could also be applied through an open-architecture system to develop the NSDI. An open-architecture database system could link infrastructure data from federal, state, and local government sources. Components of such a system could include physical, functional, conditional, and operational characteristics. Real-time utilization information could be obtained from the various intelligent transportation systems being installed along many of the nation's highways.

The major challenge to realizing a national infrastructure database will be agreeing to a common set of spatial data elements and protocols resulting from GASB 34 infrastructure reporting and other database requirements. GASB 34 allows wide latitude in how individual jurisdictions respond to the infrastructure reporting requirements. GASB only requires that each respondent use a consistent approach in reporting infra-

structure information from one year to the next. Consequently, GASB 34 infrastructure data initially provided by individual jurisdictions will likely be highly inconsistent. Over time, the nature of reported infrastructure data will become more consistent as jurisdictions compare their annual financial reports and refine their reporting approaches.

The many potential beneficiaries of a national infrastructure database include

- Federal agencies (Defense Advanced Research Projects Agency, Federal Emergency Management Agency, U.S. Department of Transportation),
- State and local agencies (emergency preparedness, planning, public works, transportation),
- Private firms (motor carriers, package express carriers, shippers, vehicle navigation firms), and
- The traveling public (incident notification, navigation, road conditions, trip planning, weather conditions).

These major beneficiaries represent a potential source of funding and requirements for developing and maintaining a national infrastructure database system.

CONCLUSIONS

GASB 34 represents a major impetus for change in the way public infrastructure is financed, developed, managed, and documented across the United States. Through its financial reporting requirements, GASB 34 will bring together disparate groups involved in supporting infrastructure programs, including finance, engineering, maintenance, and operations personnel—groups that have traditionally functioned independently of each other. The potential consequences of GASB 34 can be more far-reaching than merely achieving compliance with Generally Accepted Accounting Principles. They include significant reductions in long-term infrastructure costs, opportunities for innovative financing of asset management and infrastructure renewal, and use of reporting information to establish national spatial databases for infrastructure.

GASB 34 provides state and local governments the opportunity to demonstrate their stewardship of infrastructure by documenting and reporting the value of infrastructure assets and the efforts applied to preserve them. These requirements may also provide the impetus for establishing several innovative techniques for financing infrastructure asset development, preservation, and documentation.

The advent of GASB 34 infrastructure reporting will open a new era of fiscal responsibility and accountability. How state and local jurisdictions respond to these new reporting requirements will determine their success

in leveraging the scarce resources available for infrastructure development and preservation. Those that seek merely to comply with the minimum requirements of GASB 34 will marginally benefit from the exercise. Those that structure their response around the needs of both their infrastructure managers and users will reap significant benefits in terms of extended infrastructure service lives, reduced replacement costs, and better information with which to manage these critical assets.

Because of the long time frame needed to demonstrate the benefits of asset management and preservation, many will view GASB 34's infrastructure reporting requirements as unfunded mandates, at least in the short term. This is particularly true for elected and appointed officials of state and local governments, whose terms of office necessarily limit their ability to focus on long-term consequences. This is why it is essential that some way be found to realize the long-term benefits of infrastructure asset management in the short term.

Infrastructure securitization bond financing provides such a mechanism by using the resources of the public financial community to provide up-front funds to pay for the costs of responding to GASB 34's infrastructure reporting requirements, developing and implementing asset management approaches and systems, and rehabilitating infrastructure assets that could be more cost-effectively preserved if renewed. Infrastructure securitization bond financing represents a win-win situation for state and local officials, technical staffs, contractors, construction workers, and the public by enabling infrastructure managers to become better stewards of their assets.

Applying innovative financing approaches requires a careful consideration of the attendant risks and returns. Securitization of infrastructure assets without a defined positive revenue source (such as a toll or tax) will require both the public finance community and the responsible jurisdictions to redefine how they view infrastructure assets. Shadow tolling provides a possible mechanism for generating the positive revenue stream needed to support infrastructure securitization bonds.

Instead of sunk costs with only cost outlays to be incurred, infrastructure assets should be viewed as tangible assets whose inherent value can be used to stimulate further economic activity. Spatial data technology can be used to cost-effectively capture and display infrastructure information required by GASB 34. The ability to link this information across jurisdictional boundaries provides an opportunity to create a national spatial database of high-

way infrastructure, whose broad benefits could stimulate interest and possible funding from a variety of federal and state agencies.

The infrastructure needs of the United States continue to outpace the availability of resources, despite increased funding levels provided by TEA-21 and the growing willingness of the private sector to enter into partnerships with the public sector to expedite the development or expansion of needed facilities. Addressing these needs will require concerted and collective efforts that go beyond traditional approaches to infrastructure funding and development. The impetus provided by GASB 34's infrastructure reporting requirements will propel jurisdictions with the vision and creativity to institute innovative financing and asset management strategies that fully leverage their capabilities and resources. As noted earlier, "What gets measured gets done." The challenge of GASB 34 is to see beyond the financial reporting requirements of the statement and to capitalize quickly on the opportunities for creative asset management and financing.

REFERENCES

1. *GASB Statement No. 34: Basic Financial Statements—and Management's Discussion and Analysis—for State and Local Governments*. Governmental Accounting Standards Board, Norwalk, Conn., June 1999.
2. Geoffroy, D. N. *NCHRP Synthesis of Highway Practice 223: Cost-Effective Preventive Pavement Maintenance*. TRB, National Research Council, Washington, D.C., 1996.
3. Martin, T., and R. Roper. *A Parametric Study of the Influence of Maintenance and Rehabilitation Strategies on Network Life-Cycle Costs*. Research Report 306. ARRB Transport Research, Ltd., Victoria, Australia, Sept. 1997.
4. *Asset Management: Advancing the State of the Art into the 21st Century Through Public-Private Dialogue*. Federal Highway Administration and American Association of State Highway and Transportation Officials, 1996.
5. *Asset Management Primer*. Office of Asset Management, Federal Highway Administration, U.S. Department of Transportation, 1999.
6. Cahan, B. B. *Financing the NSDI: Aligning Federal and Nonfederal Investments in Spatial Data, Decision Support and Information Resources*. Feb. 10, 2000.
7. Karimi, H. A., J. E. Hummer, and A. J. Khattak. *NCHRP Report 437: Collection and Presentation of Roadway Inventory Data*. TRB, National Research Council, Washington, D.C., 2000.