Pennsylvania State Transportation Advisory Committee

TAC Work Order #4

FINAL REPORT

Evaluation of PennDOT's Bridge Program

The Historic Past

The Recent Past

The Present

APRIL 2000

ACKNOWLEDGEMENTS

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Executive Summary

Introduction

In August 1999, the Pennsylvania State Transportation Advisory Committee (TAC) initiated a study to review the effectiveness of PennDOT's current maintenance and asset management practices of bridges in the Commonwealth. In establishing this study, the TAC expressed interest in a broad, wide ranging review of the bridge program's effectiveness. TAC also examined PA bridge needs in the early 1980's, a study that contributed to the establishment of the billion dollar bridge program.

Project Background

A key study focus was a review of existing bridge conditions in relation to a historic trend analysis of spending for bridge construction, improvements and maintenance. The basic concept is to determine if the bridge system is improving relative to the investments made. The report also reviews the Department's bridge project delivery process. This is especially relevant in light of the increasing time and cost involved in getting a bridge project ready for construction bidding. And finally, the report reviews the various funding requirements and policies for each bridge program.

Key Findings

The following sections present a summary of the key findings of the study. The findings are divided into three key areas involving the bridge program:

- condition assessment,
- funding and
- project delivery.

Condition Assessment

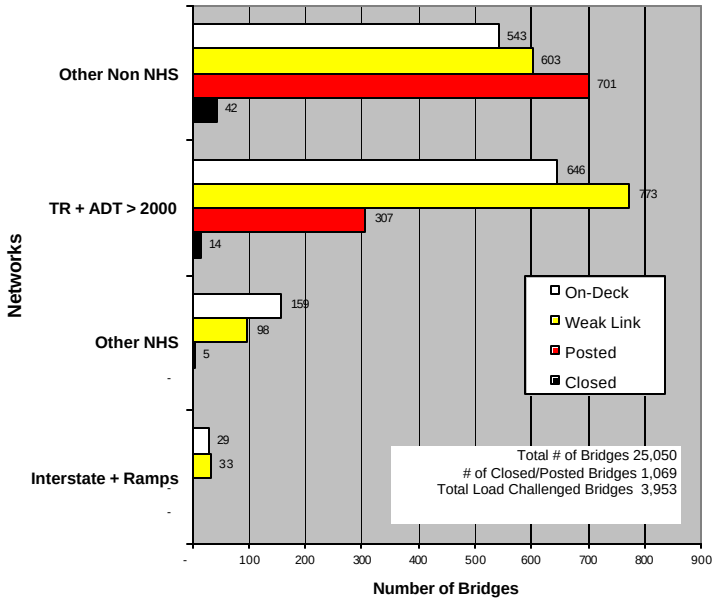
The assessment of existing and historical bridge conditions in Pennsylvania was derived from a variety of sources, including the National Bridge Inventory data, PennDOT's Bridge Management System (BMS), *Better Roads* magazine and PennDOT's Chief Engineer's FY2000-2001 Business Plan. Meetings were also held with members of PennDOT's bridge staff. Key findings are:

- The percentage of substandard bridges has been constant over the last few years, but the number of bridges eligible for replacement using federal bridge funds is decreasing...the magnitude of deficiency is decreasing.
- The total number of Pennsylvania bridges is increasing slightly from year to year, yet the total number of substandard bridges has been steadily decreasing since 1994…positive developments with trend lines moving slowly in opposite directions.

- In its BMS, the Department has an effective information tool in place to monitor progress of its bridge program and to build an even stronger asset management program.
- PennDOT does not have reliable data on the number of local bridges that are less than 20 feet in length. Many bridges in this category go underreported.
- Pennsylvania from year to year consistently has 38 percent of its bridge stock as "substandard". This is six percentage points lower than that of local bridges, although the condition of local bridges have been improving over the past five years (from 47 percent deficient in 1994 to 44 percent in 1999).

Load Challenged Bridges (1999)

State Bridges > 8' Length



Numbers are current as of June 1999. The reader should note that these numbers are dynamic and subject to change quickly.

- A major indicator of PennDOT's performance in the bridge program is that the number of load-challenged bridges (i.e., posted, closed, etc.) statewide on higher-order networks such as the National Highway System (NHS) have been declining and are expected to be eliminated altogether by 2003. This demonstrates that aggregate numbers can be misleading. What is more important is the *network* that the bridge is on. If the number of load-challenged bridges is relatively constant, but with a greater proportion on low volume bridges, then the Department is making formidable progress.
- Network definition changes over the years have made time-series analysis (trend evaluation) difficult.

Despite the large number of deficient bridges, PennDOT believes that public safety is not being compromised. The Department takes appropriate steps to load post bridges to a limit that is safe for travel, and closes the ones that are unsafe for public use. In addition, its aggressive safety inspection program is verified by the first and one of two, statewide inspection QA programs in the country.

Based on its review of the various condition data in this study, the TAC believes that bridge investments in Pennsylvania are resulting in improved bridge conditions.

Funding

Key findings relative to funding/bridge spending were obtained through meetings with various PennDOT personnel, as well as other sources including the 1999 Transportation Program Financial Guidelines and Local Bridge Operational Manual. The key findings are:

- While expanding project delivery-related regulations poses as a formidable issue, funding affects bridges more than any other factor.
- Bridges less than 20 feet in NBIS length are not eligible for Federal Critical Bridge funds for replacement or rehabilitation. If no federal money is available, then local municipalities must provide a 20 percent match. This has been a burden for many smaller communities.
- A bridge project must be included in an approved Bridge Bill Capital Budget to be eligible for funding with state Bridge Bill funds.
- Statewide, bridge spending has increased from $345 million to $431 million per year over the past five years.
- Current BMS dollar needs are approximately $5.5 billion. ("Needs" represents the elimination of all deficiencies to bring all bridges to a Sufficiency Rating equal to or greater than 80.0. This currently represents approximately 9,100 bridges in the Commonwealth.)

Project Delivery

Key findings concerning the Project Delivery Process were obtained from interviews with over 70 professionals from FHWA, PennDOT, PA Department of Environmental Protection, US Army Corps of Engineers, PA Historical and Museum Commission, Environmental Protection Agency, local municipalities and other states. The key findings are:

- The cycle time from the time a bridge project is funded for design to construction award varies from one year to over eight years.
- The cost of the design phase of the projects has increased over the last 10 years or so from approximately 10 percent of the construction cost to 50 percent, at times.
- Within the Project Delivery Process, the three sub-processes that can be extremely time consuming are:
  - Environmental Approval
  - Right-of-Way Clearance
  - Consultant Agreement
- Four environmental areas which are impacting the timeliness of bridge projects are:
  - Wetlands
  - Threatened & Endangered Species
  - Cultural Resources
  - Section 4(f) US DOT Transportation Act of 1966

Many initiatives are already being implemented by the Department to improve the Environmental Approval Process, Right-of-Way Clearance Process and Consultant Agreement Process. Continued efforts are needed however, to improve the efficiency of these processes in order to reduce bridge project cost and delay.

Key Recommendations

The recommendations outlined in the report also cover the three areas of focus: condition assessment, funding and project delivery.

Condition Assessment

PennDOT has already established goals related to improving bridge conditions, as outlined in the FY2000-2001 Business Plan from the Chief Engineer's Office. These goals are described in the report, and summarized below:

- Improve overall bridge conditions through an increase in bridge project lettings.
- Eliminate and prevent all posted and closed bridges on NHS routes by the year 2003.
- Reduce the number of closed bridges on traffic routes with ADT >2000 by 90 percent by 2003. For posted bridges, reduce by 50 percent.
- Recommendations for "weak link" bridges are limited to the NHS. The Department has set a goal of reducing the total number of "weak link" bridges ("load challenged" bridges within 110 percent of their legal load limit) from 131 in 1999 to just 50 by 2003.

Funding

A few of the major recommendations related to funding include:

- Pennsylvania needs more flexible funding arrangements for the maintenance, preservation and repair of posted and closed bridges.
- Prior to the passage of the December 1999 Capital Budget, the previous Capital Budget was approved in 1994, nearly five years earlier. This source of funding authorization has been too infrequent. Capital Budget passage should generally be in sync with updates of the Commonwealth's12 Year Program. Placement on the Capital Budget should not be a requirement for replacing or rehabilitating an existing bridge. Removing this requirement would give PennDOT the flexibility it needs in reaching its programming goals.
- Obtain blanket Capital Budget authorization for the rehabilitation or replacement of all existing bridges. (Rehabilitation can include preventative maintenance activities, including bridge painting.) Capital Budget authorization would only be required for the construction of new bridges where none previously existed. Obtaining Capital Budget authorization for all existing bridges would aid in streamlining the Project Delivery Process.

Project Delivery

Recommendations related to project delivery are proposed within each subsection of the Report. Selected recommendations are featured below. All recommendations are listed in the full report in their entirety.

- Implement the proposed "Statewide Wetland Banking Memo of Agreement."

- Develop databases and information on the "Threatened and Endangered Species" and "Cultural Resources" to enable quick decision making and reduce number of studies.
- Obtain approval for PennDOT to issue permits internally.
- Develop a database to track the cycle time of the bridge projects and set standards for processing the projects.
- Develop a 360 degree "report card" to facilitate feedback at all levels to enable continuous improvement of the Project Delivery Process.
- Provide public education on the Environmental Clearance Process to build an awareness of the complexity of the process.
- Develop partnership with PHMC to develop Best Practices for replacing bridges in historic districts

Conclusions

PennDOT has been doing a commendable job considering the resources that exist to meet the needs of the bridge program (relative to total needs), and particularly its performance in keeping weight-challenged bridges off of the Commonwealth's higher-order networks, such as the National Highway System (NHS). The most salient aspects of the bridge program can be highlighted as follows:

- The Commonwealth's bridge network is large, ranking third in size in the nation.
- The Commonwealth's bridge stock is aging, with the average age of a Pennsylvania bridge at 50 years. A majority of the older bridges are predominately in District 6-0, in the southeastern portion of the Commonwealth.
- Given the maturity of Pennsylvania's bridges, one would expect to find numerous posted and closed bridges on the Commonwealth's network of bridges; however, quite to the contrary, the system is actually *improving* overall, when analyzed using specific units of measurement. Some key evidence supports this claim:
    - Historically, there have been few closed bridges on the higher-order networks such as the NHS. This situation still exists today. Numbers of load-challenged bridges on lower-order networks are also decreasing and are expected to decline dramatically with an increase of bridge projects between now and 2003.
    - The sufficiency ratings of bridges eligible for federal rehabilitation and replacement funds are increasing, not decreasing. In sum, the total number of deficient bridges is staying relatively constant, yet the sufficiency ratings of these deficient bridges are increasing.

These improvements are the results of several factors - most notably, the tremendous investments being made courtesy of funding increases in state Bridge Bill funding and federal funding through TEA-21. The Commonwealth continues to rely on user fees, not general funds, for transportation financing.

What makes these strides all the more remarkable over the past decade is that PennDOT's ability to cost-effectively deliver the bridge program has been strained by a myriad of complex

environmental processes that place extensive time and resource demands in getting a bridge project to letting.

The TAC does not challenge the policy intent of any resource agency, but at the same time, the TAC would like to go on record to the Governor's Office, the State Transportation Commission, and the General Assembly, that the streamlining of these processes – without compromising the requirements of environmental and right-of-way regulations, etc. - would be in the best interest of Pennsylvania. The recommendations outlined in this report should facilitate further streamlining of the Project Delivery Process.

Glossary

Betterment – Large effort maintenance activities, generally (but not always) performed by PennDOT contractors. Examples of betterment activities include maintenance repairs on a large bridge, major rehabilitation/replacement work on a small bridge, or the complete replacement of a small bridge. The difference between the terms maintenance and betterment is normally associated with the personnel performing the work (i.e. PennDOT or contractor). See also Maintenance.

Bridge Management System (BMS) – Mainframe-based computer system implemented in 1986 to provide information management functionality for various bridge activities. Consists of several subsystems, including Data Maintenance, Bridge Rehabilitation/Replacement, Management Reporting and Inspection.

Culvert – Drainage structure beneath an embankment.

Deck – Portion of a bridge that provides direct support for vehicular and pedestrian traffic carried by the bridge structure.

Deficiency – Defect in a component or element of a bridge or culvert that makes the bridge/culvert less capable or less desirable for use.

District Office – For the purposes of this requirements report, refers to one or all of the eleven PennDOT Engineering Districts.

FHWA – Federal Highway Administration

Functionally Obsolete – A bridge that has inadequate deck geometry (e.g. too narrow), is improperly aligned with the roadway, has insufficient vertical clearance, or has inadequate load-carrying capacity.

Improvement – For the purposes of this requirements report, a rehabilitation or replacement action. Generally, any action that increases the ability of a structure to meet user demands.

Load Capacity – Carrying capacity of a structure usually expressed in terms of an Inventory Rating (maximum load a structure can carry indefinitely) or an Operating Rating (absolute maximum possible load).

Maintenance – Activities required for the preservation and upkeep of a bridge including all of its elements in serviceable condition, as near to its originally constructed condition as is practical. Generally performed by PennDOT work crews. Minor maintenance represents activities of limited scope, costing limited budgetary amounts, utilizing limited manpower, equipment and other resources and usually considered within the province of the regular PennDOT maintenance

organization. Major maintenance, sometimes referred to as betterment, is extensive, with a scope of work that is too time consuming or manpower intensive for PennDOT crews. See also Betterment.

MPO – Metropolitan Planning Organization.

National Bridge Inventory (NBI) – The aggregation of structure inventory and appraisal data collected to fulfill the requirements of the National Bridge Inspection Standards. Each State prepares and maintains an inventory of all bridges subject to the NBIS.

National Bridge Inspection Standards (NBIS) – Federal regulations establishing requirements for inspection procedures, frequency of inspections, qualifications of personnel, inspection reports, and preparation and maintenance of a State bridge inventory. The NBIS apply to all structures defined as bridges located on all public roads.

NBIS Bridge Length – A structure including supports erected over a depression or an obstruction, such as water, highway or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the roadway of more than 20 feet between undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes. It may also include multiple pipes, where the clear distance is less than half of the smaller contiguous opening. The NBIS length is not necessarily the same as the structure length.

NHS – National Highway System.

Operating Rating – Absolute maximum permissible load level to which a structure can be subjected for a vehicle type.

Posting – Specifying the maximum load level (weight) and/or height of a vehicle type that is permitted to use a bridge or culvert. Normally refers to a structure that has deteriorated and cannot support its originally-designed load (i.e. a regulatory sign is posted to indicate reduced weight limit).

Preventative Maintenance – Those bridge maintenance activities performed to preclude the future degradation of the bridge and which preserve the bridge as close as practical to its original as-constructed condition.

Reconstruction – Upgrades a bridge or culvert so that it can carry more load and/or traffic than designed for originally.

Rehabilitation – The restoration of bridge or culvert elements to bring the bridge/culvert back to its original load carrying capacity (or higher) and to otherwise restore the bridge/culvert to its original strength, serviceability and as-constructed condition. For older bridges, the load-carrying capacity may be required to be raised above its original capacity to the level needed for modern heavy traffic.

Replacement – Construction of a new bridge or culvert in lieu of a previously existing bridge or culvert at or near the same location.

Structure Length – The overall length of a structure as measured along the centerline of a roadway from paving notch to paving notch or back to back of backwalls of abutments, if present. For a culvert, this includes single or multiple boxes or pipes, etc., where the clear distance between multiple openings is less than half of the smaller contiguous opening (*see also NBIS Bridge Length*).

Structurally Deficient – A bridge that has identified structural weaknesses or inadequate waterway.

Substructure – Portion of a bridge consisting of the piers, abutments, piles, fenders, footings and other bridge components below the deck and girders/stringers.

Sufficiency Rating – a federal formula that uses four separate factors in obtaining a numeric value indicative of bridge sufficiency to remain in service. The result of this method is a percentage in which 100 percent would represent an entirely sufficient bridge and zero percent would represent an entirely insufficient or deficient bridge. Indicates the degree to which a structure is sufficient in meeting public needs, based upon structural adequacy and safety, functional obsolescence and serviceability. Sufficiency Ratings are used by FHWA to determine the local allocation of federal funds to each state for bridge and culvert maintenance, rehabilitation and replacement. It is also used at the individual structure level to determine the structure's eligibility for federal improvement funds. NBIS structures with a Sufficiency Rating less than eighty (80) are eligible for federal rehabilitation funds: those with a Sufficiency Rating less than fifty (50) are eligible for federal replacement funds.

Superstructure – Portion of a bridge consisting of the railing, joints, beams/girders, bracing, bearings and other components above the substructure.

1.0 Introduction

There are approximately 55,000 bridges in the Commonwealth of Pennsylvania. Of this number, PennDOT is responsible for inspecting, maintaining, preserving, repairing, rehabilitating and replacing approximately 25,000 of these structures greater than eight feet in length. Bridges are critical to the overall highway network. A good network of bridges is essential in improving Commonwealth residents' access to activities, goods and services. Ongoing preservation, improvement and expansion of the Commonwealth's highways and bridges, serves to bolster economic development and mobility.

The purpose of this report is to:

- Assess the overall effectiveness of PennDOT's bridge program, looking at existing conditions and spending.
- Review the project delivery process.

A key study focus is a review of existing bridge conditions in relation to a historic trend analysis of bridge construction and improvement spending. The basic concept is to determine if the bridge system is improving relative to the investments made. The report also reviews the Department's bridge project delivery process. This is especially relevant in light of the time and cost involved in getting a bridge project ready for construction bidding. And finally, the report reviews the various funding requirements and policies for each bridge program. In establishing this study, The TAC expressed interest in a broad, wide ranging review of the bridge program's effectiveness. TAC also previously examined PA bridge needs in the early 1980's, a study that was a consideration in the establishment of the Billion Dollar Bridge program.

2.0 Background and Purpose

Early on, the TAC Bridge Task Force saw the need for this study to identify actions to reduce the barriers to efficient programming of bridge projects. The study was structured and managed to achieve the following overall objectives:

- **Prepare** an analysis of the overall cost-effectiveness of bridge spending in the Commonwealth through an historic trend analysis of spending in relation to bridge conditions.
- **Analyze** how bridge maintenance and improvement planning and programming occurs. Determine the degree to which such "interventions" occur at an optimal time with respect to cost effectiveness and efficiency.
- **Review** the various funding requirements and policies for each program and assess if there are ways to achieve greater flexibility.

3.0 Assessing Bridge Conditions in the Commonwealth

A core study focus was to examine the relationship of expenditures to bridge performance. At issue is whether bridge conditions are generally improving in line with capital improvements and maintenance investments. Local bridges were included in the analysis as they represent an important link in our overall transportation system, even where they carry low volumes of traffic. In rural areas, for example, farm to market roads often include locally owned bridges.

According to the National Bridge Inspection Standards published in the Code of Federal Regulations, a bridge is:

> "a structure including supports erected over a depression or an obstruction, such as water, highway or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet between undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; it may also include multiple pipes, where the clear distance between openings is less than half the smaller contiguous opening."

A primary goal as outlined in PennDOT's Chief Engineer's FY 2000-2001 Business Plan is to preserve and enhance the infrastructure of Federal-aid highways with an emphasis on the National Highway System (NHS) — which includes Interstate Highways as well as other high volume roads that carry the majority of traffic. One indicator of measuring success is the number of deficient bridges over time in the National Bridge Inventory (NBI). FHWA has developed aggressive goals with respect to improving bridge conditions nationally, including:

- Improving the condition of NHS bridges so that by 2006 less than 20 percent are classified as deficient, and
- Improving the condition of *all* bridges so that by 2006 less than 25 percent are classified as deficient (down from the present percentage of 29 percent).

The broad support and active participation of PennDOT and its districts are essential in meeting these initiatives. This will be a challenge for the Department, in the face of increasing time constraints related to resource agency coordination and compliance and negotiating other administrative hurdles. Paradoxically, PennDOT for several decades has frequently been viewed as one of the most progressive and management savvy DOT's in the country, yet with respect to project delivery the Department must often respond to external requirements that are oft times highly cumbersome. Clearly, methods should be sought to delegate to PennDOT responsibility for complying with environmental and other policy while being responsible for the administrative and managerial approaches to ensuring such compliance.

Primary data sources used in this study included:

- **PennDOT's Bridge Management System** (BMS), an important source of bridge data since its inception in December 1986. PennDOT's BMS is a dynamic database,

estimating costs and assisting in prioritizing needs as it provides the Department with a daily "snapshot" of progress. The BMS produces monthly reports. There are no dramatic changes from month to month, and even annual trends are not significant, except in cases where definitions have changed or regulations tightened. PennDOT continuously strives to ensure the data's accuracy. While the BMS provides a wealth of good information, the Department is moving toward using it from a mere inventory of data to a bona fide asset management system. At this writing, PennDOT is in the process of selecting a consultant for reengineering the system to improve it.

- ***Better Roads* magazine,** which lists information on the Internet for all states back to 1979. Information is provided from state DOTs.
- **National Bridge Inventory Data** from FHWA's Office of Bridge Technology. This database includes a comprehensive array of data on subjects ranging from age of bridges to the number of bridges shared with other states.
- **Chief Engineer's FY 2000 Business Plan (June 1999),** which includes Departmental initiatives for specific areas of focus, including bridge improvements.

3.1 Data Analysis

Bridges that are termed "load capacity challenged" are either posted for a weight limit, closed or have substantially reduced load capacity, which restricts commercial goods traffic. These general measures of bridge performance are outlined below.

3.1.1 Total Bridges

By sheer number of bridges, PennDOT by far has the greatest responsibility in maintaining the Commonwealth's system of bridges:

Figure 1: Estimated Number of Bridges in Pennsylvania

System	Span Length		Total
	8' to < 20'	20'+	
State	9,500	15,900	25,400
Local (Nonstate)	22,500*	6,500	29,000
Total	32,000	22,400	54,400

Source: PennDOT BMS, 6/99

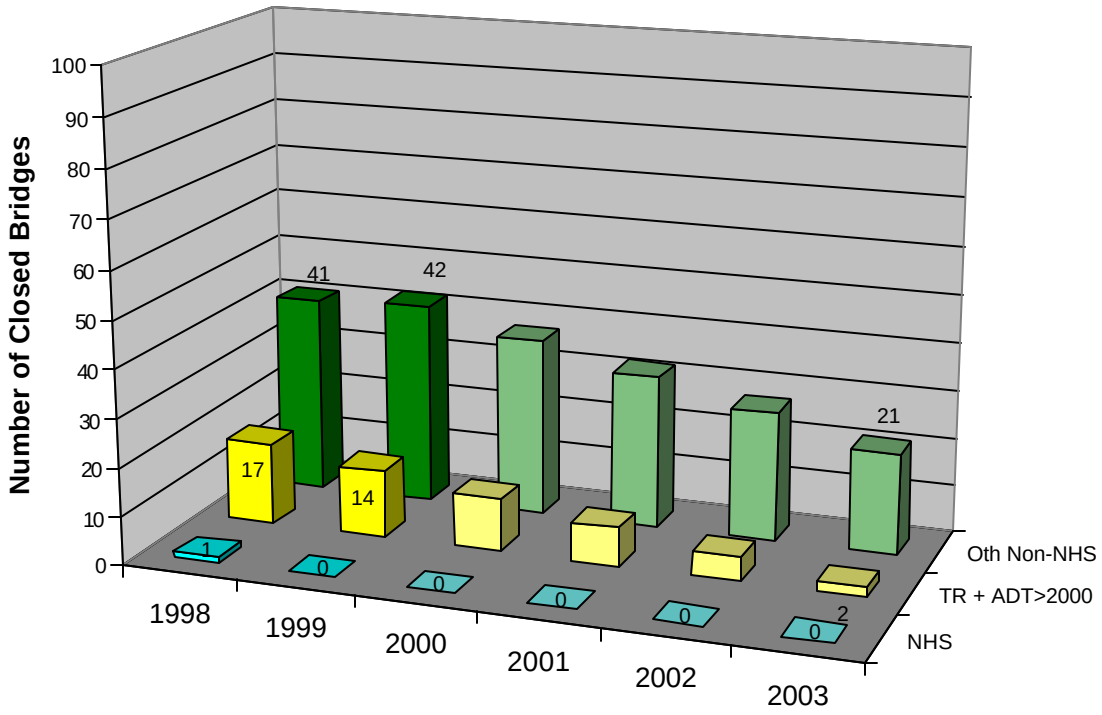
*Locals are not required to report bridges < 20' to PennDOT's BMS so exact number is not known.

3.1.2 Bridge Closings and Postings

One of the obvious measures of bridge performance that can be tracked from state to state is that of bridge closings and postings as a percentage of total state bridges greater than 20 feet in length. Each state must report these conditions in order to be eligible for federal bridge replacement and rehabilitation funds. Posted and closed bridges negatively impact emergency response, goods movement, and commerce in general. While most posted and closed bridges are on lower-system roads, this does not minimize their importance to the Commonwealth's economy.

A Department goal has been to keep higher-order networks such as the NHS free of closed bridges and to prevent any from becoming load posted. On lower order networks (Traffic Routes with AADT >2000), the goal is to reduce the total number of closed bridges by 90 percent by 2003 and for posted bridges, 50 percent in the same time period. See Figure 6 for the breakdown of "load-challenged" bridges by network.

Figure 2: Closed Bridges
State Bridges > 8' in Length

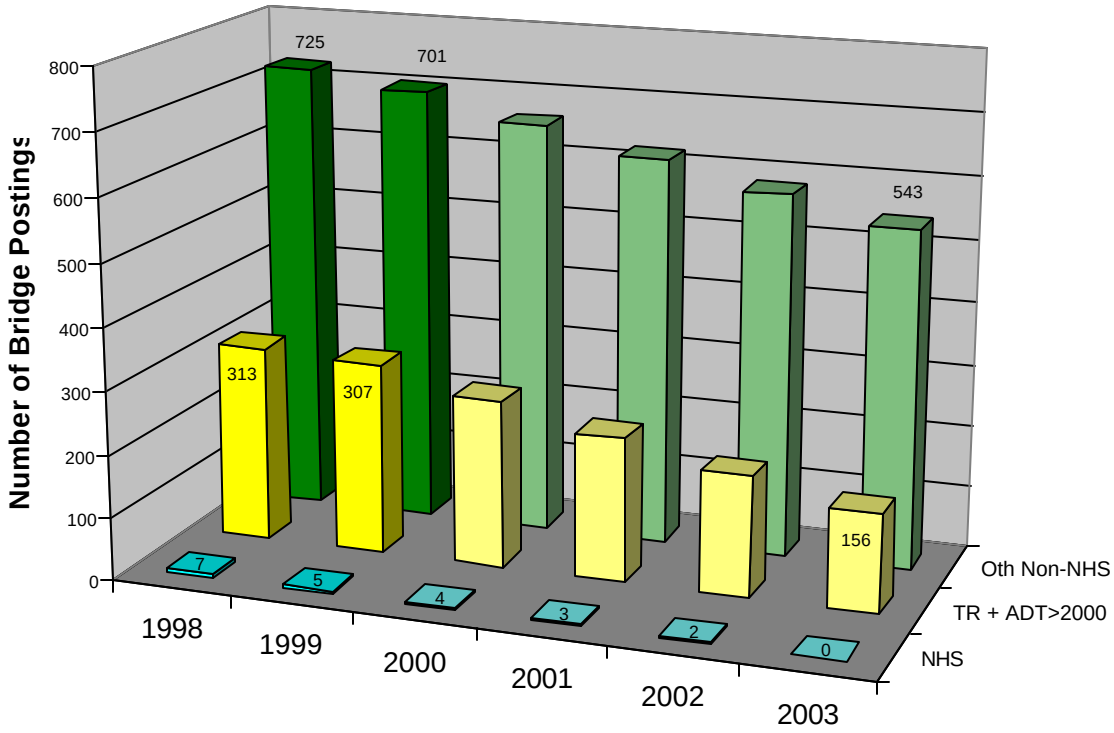


PennDOT's Bridge Improvement Goals with respect to Closed Bridges include:

- No closed bridges on NHS routes
- Reduce by 90 percent on Traffic Routes and SRs with ADT's greater than 2000
- Reduce by 50 percent on other, non-NHS SRs

Source: Chief Engineer's FY2000 Business Plan

Figure 3: Posted Bridges
State Bridges > 8' in Length



PennDOT's Bridge Improvement Goals with respect to Posted Bridges include:

- Eliminate and prevent on the NHS (none by 2003).
- Reduce on Traffic Routes with ADTs greater than 2000 by 50 percent, from 307 in 1999 to 156 in 2003.
- Reduce on other non-NHS routes by 25 percent, from 701 in 1999 to 543 in 2003.

Source: Chief Engineer's FY2000 Business Plan

Figure 4: Closed and Posted Trends
State Bridges > 8' in Length

Year	Closed	Posted
1999	56	1013
1998	59	1044
1997	49	1025
1996	74	1059
1995	55	1111
1994	57	1105

Source: PennDOT Bureau of Design

3.1.3 "Weak-link" and "On Deck" bridges

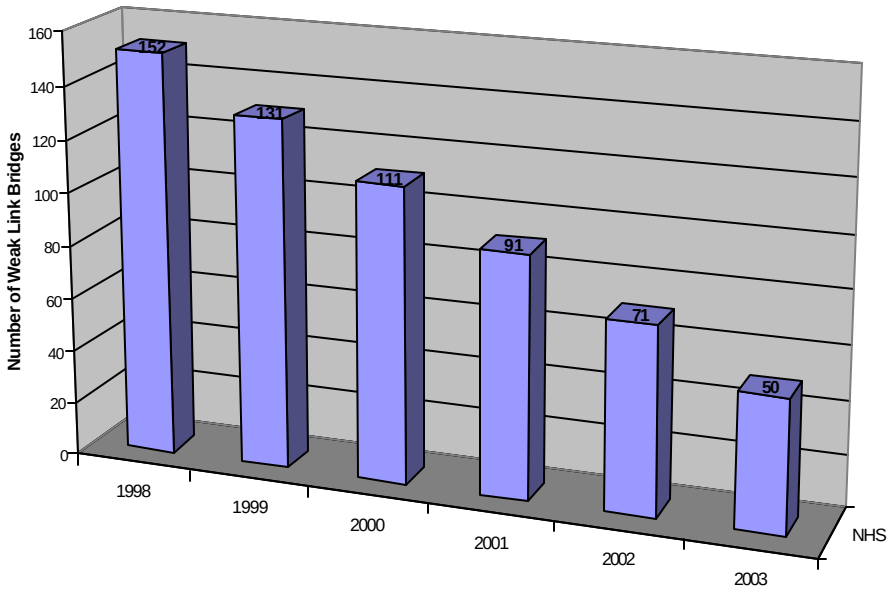
The Weak Link bridge designation is a relatively new and prospective way of categorizing bridges that are not yet weight restricted, but are close to being posted. The actual definition is a structure that is within 110 percent of its legal load limit. The new designation, along with the "On Deck" bridge definition (max. safe capacity is 110 to 120 percent of legal loads), is a good asset management tool that has been and should continue to serve the Department well. Definitions are based on operating ratings found in the Department's Bridge Management System (BMS) and serve as indicators of the lowest factor of safety. Operating ratings describe the maximum permissible live load to which a structure may be subjected for a finite time or number of cycles. Postings at this level tend to shorten the life of a structure as a trade-off for capacity. Without preventative maintenance to extend their useful service lives, load-challenged bridges are pasted, closed or prime candidates for load postings in the very near future. Load-Challenged bridges (Weak Link, On-Deck, etc.) also include some bridges that have temporary support to prevent closing but can quickly become posted or closed.

A commendable goal from the Department's Chief Engineer's Business Plan is to reduce the number of "weak link" bridges on the NHS to 50 by 2003 (*see figure 5, below*). This represents an example of strong asset management by improving these structures **before** the fix would be potentially more costly.

3.1.4 Substandard Bridges (Structurally Deficient/Functionally Obsolete)

A bridge that is **structurally deficient** does not imply that a bridge is likely to collapse or is unsafe. Rather, it means that a structure is unable to carry the vehicle loads or tolerate the speeds that would normally be expected for that particular bridge in its designated system. They do not meet current criteria for live load capacity and traffic capacity. With proper load posting and enforcement, most structurally deficient bridges can continue to serve traffic safely when restricted to the posted maximum loads.

Figure 5: Weak Links on NHS
State Bridges > 8' in Length

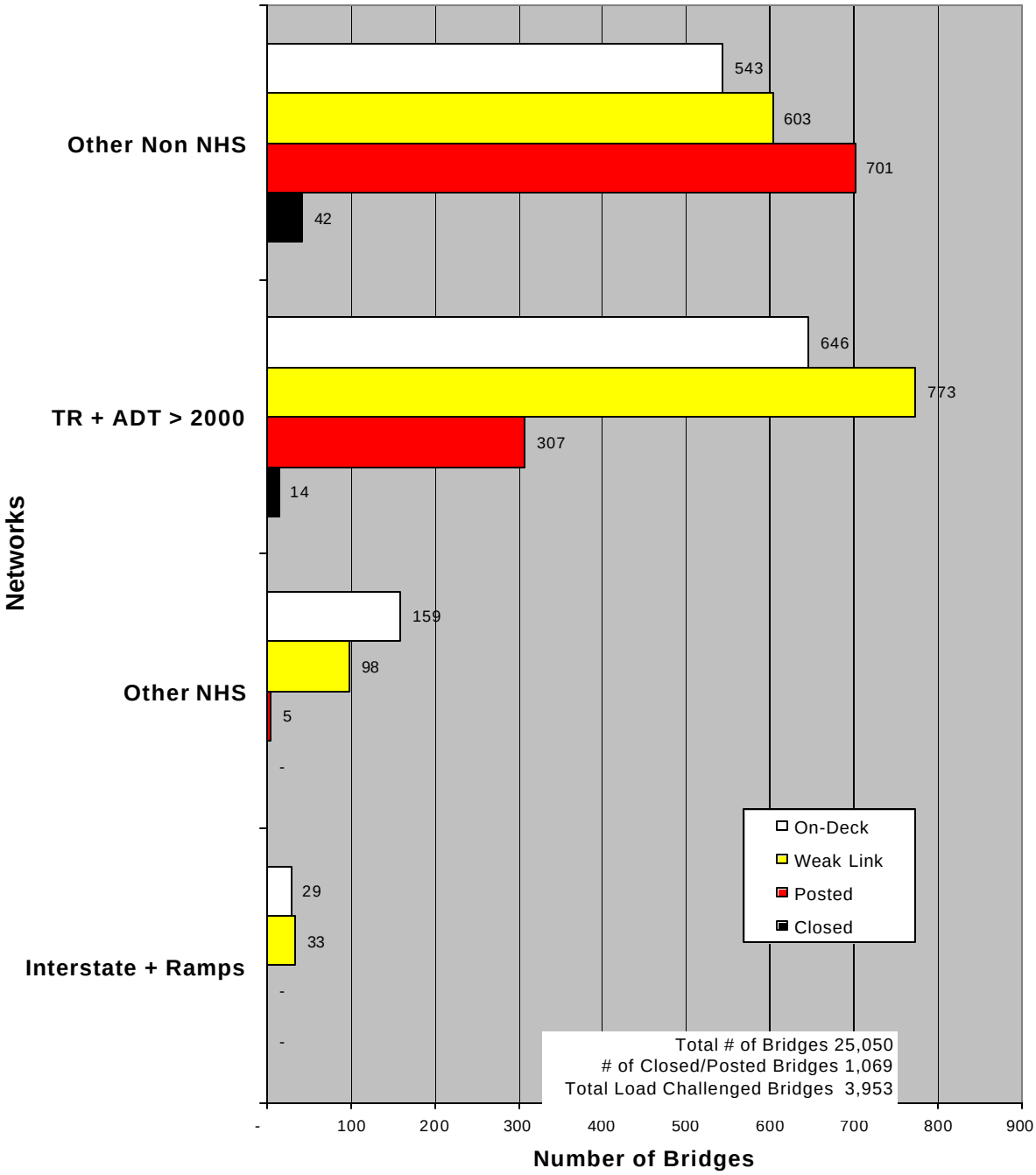


PennDOT's Bridge Improvement Goal with respect to "Weak Links" on the NHS includes:

- Reducing the total number of "weak link" bridges from 131 in 1999 to 50 by 2003.

Source: Chief Engineer's FY2000 Business Plan

Figure 6: Load Challenged Bridges (June 1999)
State Bridges > 8' in Length



Functional obsolescence refers to a bridge with inadequate width or vertical clearance for its associated highway system...a "choke point." In some cases, bridges become functionally obsolete simply due to highway improvements on the adjoining approaches, such as lane additions or widening of approaching roads. In other cases, a bridge may be classified as functionally obsolete through an upward redefinition of desired standards.

Clearance and width are just two factors that affect ratings. Functionally obsolete bridges may be too narrow, but can still be structurally sound. Vertical deficiencies are not tracked, although there are some isolated cases on higher functionally classified roadways.

For those who employ a cursory review of bridge data, care should be given to ensure that bridges that are deemed "functionally obsolete" do not imply "hazardous." As a performance measure, the "structurally deficient/functionally obsolete" tag is a good one, as the measure is used by FHWA in determining eligibility for federal funding. Every state must submit the numbers, which makes data comparison relatively easy.

According to the National Bridge Inventory, there are 16,317 state bridges in Pennsylvania greater than 20 feet in length. This number has been static over the past number of years, while

Figure 7: PA: Total Bridges/Substandard Bridges, 1994-99

State bridges > 8' in length

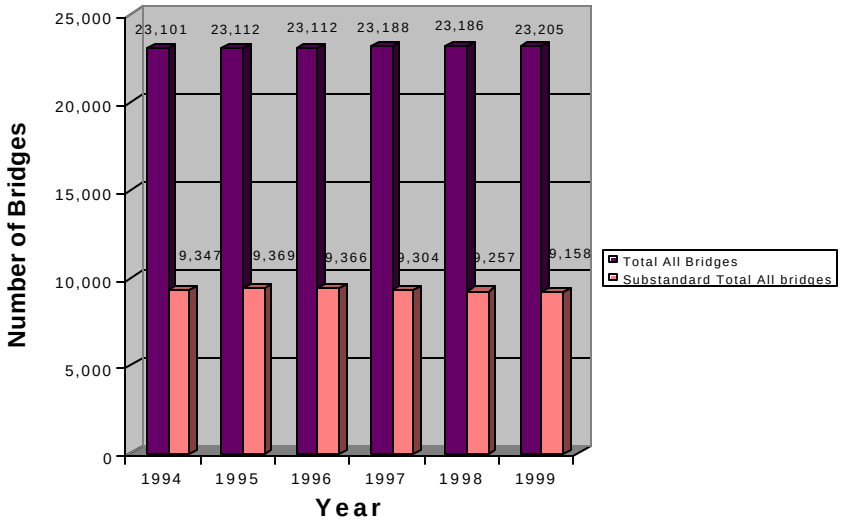
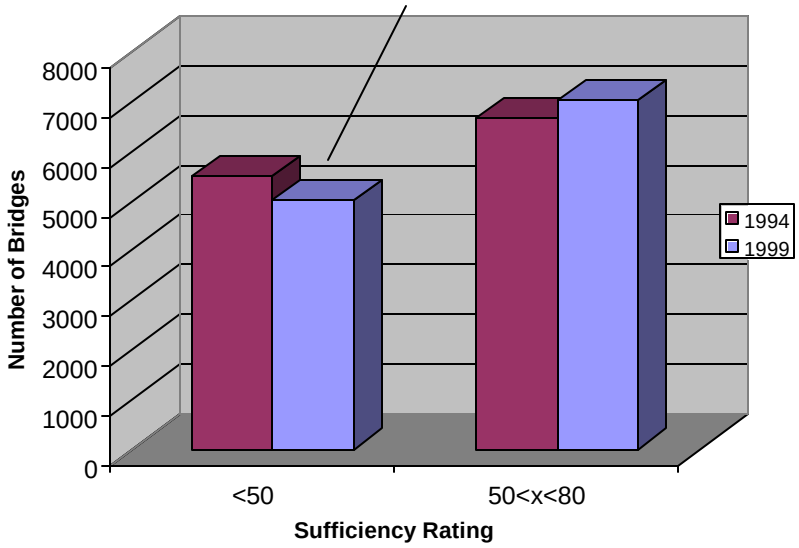


Figure 8: Fewer Bridges Eligible for Replacement



Source: PennDOT Bridge Management System Monthly Statistics Report

the percentage of substandard bridges (i.e. a combination of bridges that are structurally deficient and functionally obsolete) has also remained roughly the same, at 38 percent.

3.1.5 Bridges by Sufficiency Rating

Bridge load ratings reported to the National Bridge Inventory (NBI) factor heavily in the determination of bridge Sufficiency Ratings. Load ratings are also relied upon and used extensively by the FHWA and others in the preparation of highway needs studies, Congressional reporting, cost allocation studies, truck size and weight studies, and numerous other bridge management tasks. The sufficiency rating factors heavily in FHWA's allocation of bridge funds to the states.

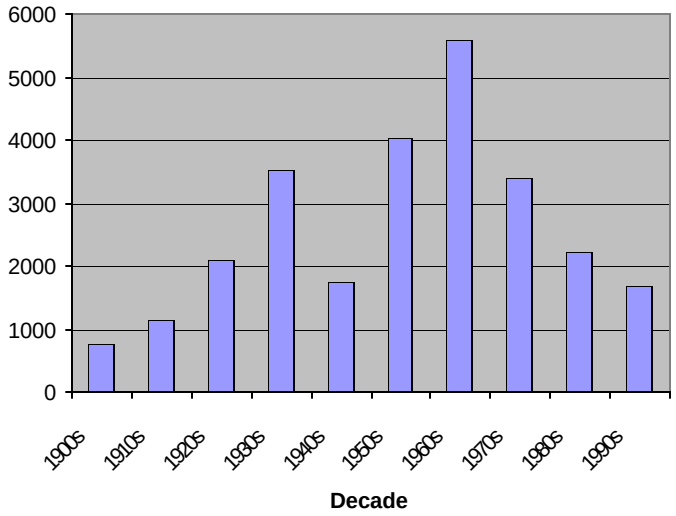
The Department of Defense (DoD) also uses NBI load ratings to determine the adequacy of bridges on defense highways to safely carry special military loadings. States, in addition, use the ratings in prioritizing projects, distributing bridge funds to local governments, posting bridges, and issuing load permits. These uses require that bridge load ratings are reliable, uniformly consistent, and current.

While the total number of substandard bridges in Pennsylvania has been declining slightly, the *sufficiency ratings* of these structures have been improving to the extent where there are now fewer bridges eligible for federal replacement funds, as compared to just six years ago (*see Figure 8*). Bottom line: while the number of substandard bridges has remained relatively constant, the overall quality of those bridges in that "mix" has been improving, as the worst bridges are being improved.

3.1.6 Time Series Analysis

Figure 9 depicts an aging inventory of Pennsylvania bridges. As the bridge inventory continues to age, the Department will be faced with a greater stock of interstate-era bridges (read: 1950s and 60s construction) that are maturing and requiring greater maintenance and rehabilitation attention. Depression-era bridges also represent a large number of the Commonwealth's bridge stock (about 30 percent) and are nearing the end of their useful design life and will need to be replaced altogether. Many of these spans are deteriorating and beginning to show the effects of the daily pounding with loads that exceed their designed capacity.

Figure 9: An Aging Inventory



Source: USDOT - National Bridge Inventory

About 27 percent of the NBI bridges in Pennsylvania are less than 30 years old. The average bridge in Pennsylvania is 50 years old.

The remaining 40 percent were built during the Interstate Era. These structures are currently just past the middle of their expected lifespan where traditionally, upkeep is still low. However, this large cohort of bridges will move into the latter life cycle stage when maintenance needs become more frequent and costly. Moreover, trucks of the past were not as numerous nor as heavy as what our network of bridges is experiencing today, which further complicates the challenge of upkeep for older bridges. Maintenance needs will accelerate as the bridges that were built during the Interstate construction boom continue to age and deteriorate to the point where rehabilitation or replacement is needed.

Compared to more recent years, relatively little new bridge construction takes place today. (One reason being the size or area of deficient bridges is decreasing.) This phenomenon will be changing soon, as the Department seeks to meet its bridge goals through an increase in the number of bridge projects being let. The current number of bridge project lettings should increase 50 percent from 209 in 1999 (actual) to 300 per year by 2003 (projected). (*See figure 17.*)

One factor that has raised the difficulty of time-series analysis has been the definitional change of higher-order networks that has taken place since the advent of ISTEA. Pursuant to the ISTEA legislation, Congress designated the 155,000 mile National Highway System (NHS) in December 1995. The NHS essentially replaces the former "federal-aid" system, and consists of interconnected urban and rural principal arterials and highways (including toll facilities) which serve major population centers, international border crossings, ports, airports, public transportation facilities, other intermodal transportation facilities and other major travel destinations. All routes on the Interstate System are a part of the National Highway System.

The emergence of the NHS designation as a new network has added to the difficulty in drawing comparisons to the similar, higher-order networks of the past.

3.1.7 Bridge Type

Recognizing that each type of bridge has a different life expectancy, it is important to examine material type as another variable in evaluating bridge needs and future performance. According to the Department's monthly reports, the main material type distribution of state/local bridges over 20 feet in length in the Commonwealth is:

- Steel (inc. concrete encased steel) 10,382
- Concrete (Cast and Pre-cast) 6,887
- Pre-stressed concrete 6,567

Current improvements in design and construction practices will result in longer life spans for bridges.

3.1.8 Comparing Pennsylvania

PennDOT staff recommended that the project team compare Pennsylvania bridges with those of neighboring northeastern states, where systems are typically older and subjected to more inclement weather conditions than their counterparts in the South and West.

While Pennsylvania boasts the fifth-largest highway network in the nation, it ranks third in the total number of state-owned bridges greater than 20 feet (16,317, according to the National Bridge Inventory), trailing only Texas and North Carolina. Nationally, Pennsylvania ranks fourth in the *total number* of bridges that are substandard (but still structurally safe) and sixth in the percentage of state-owned facilities that are substandard.

Figure 10: Leading States
State Facilities (>20') Substandard

By total number…

• Texas	10,592	22½%
• Oklahoma	9,466	41½%
• Missouri	9,458	41½%
• **Pennsylvania**	**9,158**	**41.7%**
• New York	8,928	51.7%

…and by percentage

• New York	8,928	51.7%
• Hawaii	541	51.0%
• Massachusetts	2,467	49.6%
• Rhode Island	366	48.7%
• West Virginia	2,853	43.0%
• **Pennsylvania**	**9,158**	**41.7%**
• National Average	- - - - - - - - - - - - - - -	29.6%

Source: 1998 NBIS Data

4.0 Funding

From an historical perspective, there has been a variety of bridge funding programs, most notably beginning in 1982, with the state legislature's passage of Act 235, which later became known as the "Billion Dollar Bridge Bill." The Billion Dollar Bridge Bill allocated funding for the programming of 979 state, local, and orphan bridges in the Commonwealth's Twelve Year Program at a total cost of $1.4 billion.

In order to finance the Billion Dollar Bridge program, a dedicated source of funding was established. These registration fees and fuel taxes supply the more than $120 million per year necessary for bridge construction and maintenance in the Billion dollar Bridge Program.

In order for a bridge to be eligible for funding with state Bridge Bill funds, a project must be included in an approved Bridge Bill Capital Budget and be programmed in the Commonwealth's Twelve Year Transportation Program. In order for a bridge to qualify for federal critical bridge funding, the bridge must be either structurally deficient or functionally obsolete, with a sufficiency rating equal to or less than 80.0 for rehabilitation and less than 50.0 for replacement. In addition to the sufficiency rating, the *existing* bridge must have a span greater than 20 feet. To receive state funding, a bridge only needs to have a span exceeding 8 feet in length. An important point to note is that federal bridge funds are not system dependent and, unlike most other funds, extend even to rural minor collectors.

Since the implementation of the Billion Dollar Bridge Bill, more than 9,600 state and local bridge projects have been authorized at a cost of more than $9 billion. The funding for these projects includes federal, state, and local funds.

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) brought a new and greater emphasis on the role of project planning and an increase in financial flexibility for transportation planners. The new Transportation Equity Act for the 21st Century (TEA 21) has continued the visionary policies of its predecessor and promises to continue this advancement through the life of the spending plan.

PennDOT's BMS lists dollar needs currently at $5½ billion. ("Needs" represents the elimination of all deficiencies to bring all bridges to a Sufficiency Rating greater than or equal to 80.0. This currently represents approximately 9,100 bridges in the Commonwealth.) The TAC emphasizes the importance of long-term and reliable bridge funding at all levels of government in light of this extensive need coupled with the aging of our bridge system.

4.1 Local Bridge Funding

All local bridge projects included in an approved Bridge Bill Capital Budget are eligible for funding with state Bridge Bill funds. Bridge projects must meet the following federal eligibility requirements…

- Span longer than 20 feet
- Sufficiency rating lower than 80.0 for rehabilitation
- Sufficiency rating lower than 50.0 for replacement

…and may be funded at the following rates:

- 80 percent federal,
- 15 percent state, and
- 5 percent local funds.

Figure 11: Eligibility Requirements for Local Bridges

On Bridge Bill Capital Budget	On 12YP	Funding Eligibility
Yes	Yes	Federal/state/local
No	Yes	Federal/local
Yes	No	Not eligible for reimbursement

Bridge projects not eligible for federal HBRRP funding (Highway Bridge Rehabilitation and Replacement) can be funded with 80 percent state and 20 percent local funds, or a combination of Federal NHS, STP and state and local matches[1]. If the project involves a railroad bridge, and there is a contribution of funds by the railroad (either by mutual agreement or at the order of the Public Utility Commission), the railroad contribution will first reduce the local project share and any remaining funds will then be used to offset the state or federal project share.

In 1991 the state legislature approved **Act 26** which provided a dedicated state funding source for eligible county-owned bridges. All county owned covered bridges are eligible for Act 26 funding to be used in lieu of the local match. Other county owned bridges are eligible for Act 26 funding only if the county is included on the county eligibility list based on a high unemployment rate. The eligibility list is updated annually and the eligible counties are notified by PennDOT District Office personnel.

4.1.1 Retroactive Reimbursement

Local bridge projects can advance to construction without state funding participation. Upon completion, the project may be eligible for the reimbursement of the state portion of the cost, provided the municipality can document that the project has been completed to the satisfaction of the state, is on the Twelve Year Program and the Bridge Bill Capital Budget requirements have been satisfied. Retroactive reimbursement projects are not eligible for federal funds.

4.2 State Bridge Funding

4.2.1 Eligibility

To be eligible for funding with state Bridge Bill funds, a project must be included in an approved Bridge Bill Capital Budget and it must be programmed in the Commonwealth's Twelve Year Transportation Program. State funding is only available for structures that have a span greater than 8 feet.

[1] Under the current Federal Bridge Program procedures, Highway Bridge Rehabilitation and Replacement (HBRR) funds can only be used on structurally deficient or functionally obsolete bridges that have sufficiency ratings less than or equal to 80.0. Eligible improvements to the bridges must be such that major deficiencies are removed.

4.2.2 Funding

State Funds*

- A-185 – Capital bridge expenditures
- A-187 – Maintenance bridge expenditures (does not require capital budget approval).
- EA-231 – Executive Authorization from Act 26. Supplements EA 284 and EA 289.
- EA-232 – Act 26 funds. State matching funds to counties without a local match (generally to counties with high unemployment rates).
- EA-284 – State funds for local-owned bridges.
- EA-289 – State appropriation for state-owned bridges.

* Accounting terminologies: A = Appropriation; EA = Executive Authorization

State funding for bridge projects is funded in part by PennDOT Appropriations 284 and 289 for bridge capital projects. State bridge funding is allocated to planning regions based on needs factors identified in the Commonwealth's Bridge Management System. Specifically, square feet of deck area of deficient bridges are used to determine the percentage of the bridge funding each region receives. Posted and closed bridges are weighted by a factor of 1½ when determining this distribution factor. Additional funding for bridge projects is supplied through Highway Appropriations Fund (A-185) and the Highway Maintenance Appropriations (A-187). PennDOT can use A-187 funds without capital budget approval.

The following definitions of bridge construction work are chargeable to A-187 funds:

- Any project located on an existing trafficway, which basically preserves or restores the existing asset rather than to make an improvement in capacity or ingress/egress.
- Bridge replacements of 20 feet and under
- Any of the items identified in the A-185 Appropriation which have a state funds cost under $100,000.

The following definitions of bridge construction work are chargeable to Highway Improvement (A-185):

- Bridge replacements greater than 20 feet with state funds of $100,000 or more *and* with capital budget approval.
- Improvements to existing trafficways, which increase capacity or ingress/egress with state funds cost of $100,000 or more *and* with capital budget approval.

Figure 12: Billion Dollar Bridge Program Expenditures (in $000s)

Year	EXPENDITURES			
	State	Federal	Other	Total
82-83	$3,003	$7,554	$0	$10,557
83-84	$28,696	$45,155	$0	$73,851
84-85	$64,870	$92,014	$234	$157,118
85-86	$75,002	$132,564	$146	$207,712
86-87	$149,676	$85,321	$34,466	$269,463
87-88	$60,739	$70,158	$65,416	$196,313
88-89	$22,528	$91,555	$56,848	$170,931
89-90	$47,788	$116,392	$37,518	$201,698
90-91	$53,878	$108,083	$46,819	$208,780
91-92	$34,304	$107,804	$33,234	$175,342
92-93	$59,706	$120,360	$2,134	$182,200
93-94	$25,098	$129,146	$40,394	$194,638
94-95	$40,523	$132,560	$26,046	$199,129
95-96	$74,653	$113,103	$2,660	$190,416
96-97	$81,963	$130,368	$888	$213,219
97-98	$93,394	$111,568	$873	$205,835
98-99	$85,727	$146,097	$1,286	$233,110

Note: The Department began bond-financing bridge bill projects, reflected in the other spending category, between FY86-87 and FY94-95.

Figure 13: Highway Construction (A-185) Bridge Expenditures (in $000s)

Year	EXPENDITURES		
	State	Federal	Total
FY94	$18,322	$92,931	$111,252
FY95	$15,042	$80,507	$95,548
FY96	$14,091	$75,013	$89,104
FY97	$18,402	$74,821	$93,223
FY98	$41,263	$112,067	$153,330

Source: PennDOT Bureau of Fiscal Management

Figure 14: Highway Maintenance (A-187) Bridge Expenditures (in $000s)

Year	EXPENDITURES		
	State	Federal	Total
94-95	$21,687	$13,178	$34,865
95-96	$23,435	$12,085	$35,520
96-97	$24,810	$12,373	$37,183
97-98	$27,237	$14,523	$41,760
98-99	$29,378	$15,177	$44,555

Source: PennDOT Bureau of Fiscal Management
Note: There is no way to accurately track the amount of funding for bridges contained in these appropriations due to the fact that the funds are allocated for highway projects which may contain numerous bridges.

Figure 15: Total Bridge Expenditures (in $000s)

Year[1]	Expenditures			
	Billion Dollar Bridge Program	Highway Construction	Highway Maintenance	Annual Total
94-95	$199,129	$111,252	$34,865	$345,246
95-96	$190,416	$95,548	$35,520	$321,484
96-97	$213,219	$89,104	$37,183	$339,506
97-98	$205,835	$93,223	$41,760	$340,818
98-99	$233,110	$153,330	$44,555	$430,995

4.2.3 Discretionary Funding

Discretionary, or "Spike" Funding is used to offset the high costs of major construction or reconstruction projects. These projects are too large and expensive to be financed entirely by other means. The distribution of "Spike" funding is at the discretion of the Secretary of Transportation in consultation with the State Transportation Commission. Some factors used in making these decisions are:

- To address available projects on priority corridors across the state.
- To cover any carryover projects from the previous year which are beyond the means of a region's funding target.
- To recognize the efforts of regions which place a premium on preservation of the existing system with the funding which is available to them.
- To recognize projects of a statewide or multi-regional priority.

[1] 1994 is used as the base year in this table based on data availability for each bridge funding category.

4.3 Federal Bridge Funding

Eligibility

Bridges must be programmed in the Commonwealth's Twelve Year Transportation Program. Federal HBRR (Highway Bridge Rehabilitation and Replacement) funding is only available for structures that have a span greater than 20 feet. Most maintenance activities (i.e, deck repairs, cleaning, bridge spot and zone painting, etc.) are not eligible for this funding.

Funding

Federal law allows each state to transfer up to 50 percent of its federal bridge funding to highway funding categories. In the past there was no penalty for doing so, and Pennsylvania utilized this option every year of the ISTEA era. TEA-21 includes a penalty for such a transfer. If Pennsylvania transfers the full 50 percent from bridge to highway, it would amount annually to approximately $170 million. The penalty could be a reduction in the next year's apportionment of about $9 million. In order to meet highway needs, it appears that the transfer of funds will continue for the near future.

Federal Funds

Federal Critical Bridge Funds

- On system (NHS)
- Off system
- Bridge (on/off)

The following is an estimate of available bridge funding for fiscal years 1999-2002.

Figure 16: Total Bridge Funding (in $000s)

Funds	1999	2000	2001	2002	TOTAL
Federal	344,339	346,553	354,758	361,142	1,406,792
State	145,000*	83,000	83,000	83,000	394,000
Total	489,339	429,553	437,758	444,142	1,800,792

* The 1999 state funding level of $145 million included $62 million carried over from prior years.

4.3.1 Assessment

Bridge funding over the past five years has increased nearly every year. This steady increase has resulted in a decrease in the number of functionally obsolete and structurally deficient bridges on the major roadways throughout the state. Funding appears to be sufficient in order to make a steady headway in decreasing the number of substandard bridges. Increased funding would accelerate the rate at which the bridges are repaired or reconstructed, however, the money would have to be taken from the highway budget and could have a serious affect on the amount of roadway reconstruction that could be accomplished.

4.4 Key Funding Recommendations

Major recommendations related to funding include:

- Obtain blanket Capital Budget authorization for the rehabilitation or replacement of all existing bridges. Rehabilitation is to be defined to include preventive maintenance activities including bridge painting. Capital Budget authorization would only be required for the construction of new bridges where none previously existed. Obtaining Capital Budget authorization for all existing bridges would aid in streamlining the Project Delivery Process.
- Prior to the passage of the December 1999 Capital Budget, the previous Capital Budget was approved in 1994, nearly five years earlier. This authorization has been too infrequent. Capital Budget passage should generally be in sync with PennDOT 12 Year Program updates.
- The Department should consider publishing an annual report on bridges, reviewing progress, identifying and setting overall goals for the year to come which could serve as a "state of the bridge" report out of the Highway Administration office. Maintenance goals and related progress in meeting said goals could also be included in such a report.
- PennDOT should seek federal legislation that eliminates the TEA-21 penalty for transferring funds from highway funding categories to bridge funding categories.
- PennDOT and MPOs should develop a way to properly address the dollar needs in the planning phase of project development. Current means of assessing are too difficult.
- PennDOT should seek federal funding eligibility for local projects greater then eight feet.
- PennDOT should continue to seek the use of HBRR funding for maintenance and preservation needs. A more flexible use of HBRR funds would allow the Department to avoid the "hoops" related to sufficiency ratings and substandard bridges, and thereby "catching" these bridges before they deteriorate to unacceptable levels. In addition, these changes to the Bridge Rehabilitation and Replacement program would be similar to those that allow Federal funds to be expended on the Interstate System for preventive maintenance projects.

5.0 Summary of Bridge Project Delivery Issues

The Project Delivery Process is a core process for the improvement of bridges. It is an extremely complex and time-consuming process. PennDOT has been making great strides in reducing the time in the Process. In order to continue to improve the condition of bridges, the Project Delivery Process must be further streamlined. In order to aid in further streamlining the Process, the Transportation Advisory Committee decided to review the Process further. The objectives were to:

- Review the current Project Delivery Process
- Identify opportunity areas
- Propose recommendations

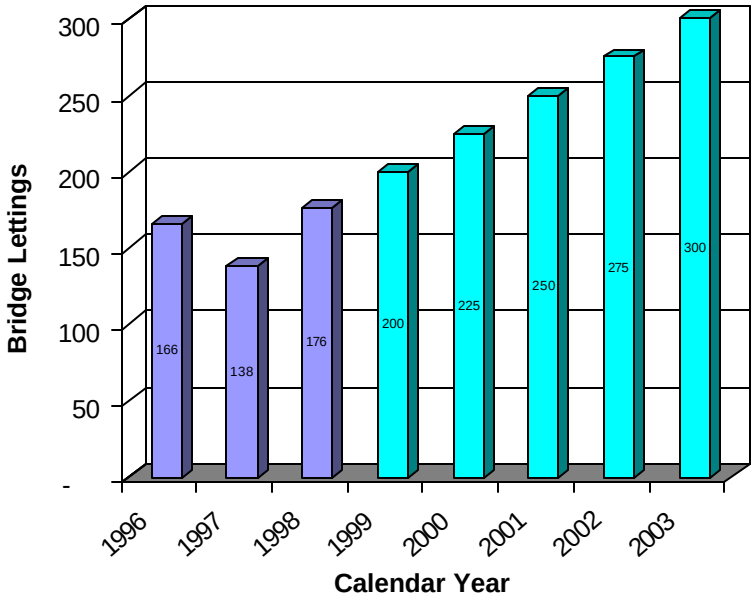
The information presented in this report has been obtained from interviews with over 75 professionals from:

- FHWA, Pennsylvania Division
- PennDOT Central Office (Highway and Planning Administrations)
- PennDOT staff in district offices
- PA Department of Environmental Protection
- PA Historical and Museum Commission
- US Army Corps of Engineers
- Environmental Protection Agency
- Pennsylvania Turnpike Commission
- Local Municipalities
- Other States: Iowa DOT, Kentucky Transportation Cabinet, and Wyoming DOT

5.1 Project Delivery Process Issues

PennDOT has set aggressive goals to award construction contracts for major bridge improvements by 2003. Figure 17 depicts the number of construction contracts awarded annually from 1996-1998, and goals set for years 1999-2003. Figure 17 indicates a steady increase of 25 projects per year starting in 1999.

Figure 17: Bridge Lettings



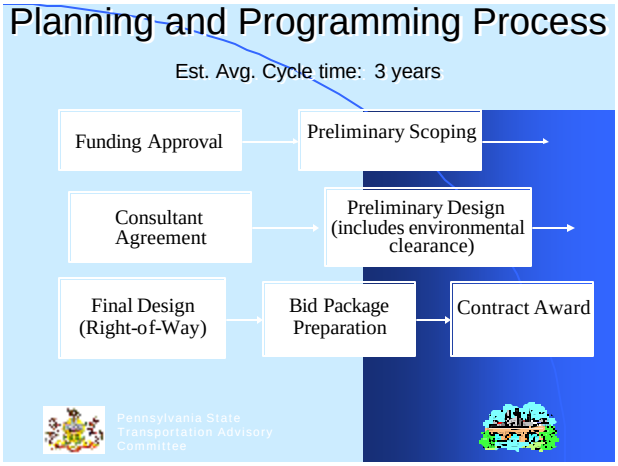
Source: Chief Engineer's FY2000 Business Plan

The goals for awarding bridge construction projects are very aggressive. In order to meet the goals, the Project Delivery Process, which is the core process, will need to be streamlined. The following Process Flow Chart identifies the steps of the process at a macro level.

Cycle Time

A survey was sent to the districts to sample approximately ten projects in each district to evaluate the cycle times. According to the information from the districts, and information from the Project Management System, the range of cycle times for each subprocess varies greatly:

- Consultant Agreement—6 months to 2 years
- Preliminary Design (including environmental clearance)—1 to 8 years
- Final Design (including Right-of-Way Clearance)—6 months to 2 years
- Letting and Awarding of construction contract— approximately 4 months



The average cycle time, from the time a bridge project is funded to construction award, is approximately three years. However, the time can vary greatly. It can vary from one year for a very simple project, to over eight years for projects with many environmental impacts, right-of-way issues, etc. In the Project Delivery Process, three components that can be extremely time consuming are the Environmental Clearance Process, Right-of-Way Clearance Process, and the Consultant Agreement Process.

Other States Research

In addition to the survey sent to the Districts, a survey was sent to other states, through AASHTO e-mail, requesting the following information:

1. What is the average cycle time for bridge projects from funding to construction contract award phase?
2. Where is the majority of time spent in the project delivery process?
3. What improvements are being pursued to improve the project delivery process?

The following Figure summarizes the information from the respondents to the survey.

Figure 18: Summary of Other States Research

State	Cycle time (years)	Majority of Time Spent	Improvements
Illinois DOT	1-2 years (simple) 6-8 years (complex)	Environmental and Right-of-Way	• Coordination Agreements with resource agencies with set thresholds (i.e. for wetlands, etc.). • Programmatic Agreements • Making decisions based on info. already available (i.e., National wetland inventory, aerial photography)
Iowa DOT	2.5 - 3 (simple) 7 years + (complex)	Environmental (Archaeology, specifically) and Right of Way	• Start Environmental Process earlier • Survey a larger area for environmental process • Right of way clearance process concurrent with final design
Kentucky	2-3 years	Environmental, Right-of-Way and utility relocation	• Performing phases concurrently
New Jersey	1-10 years (depending on complexity)	Environmental and Right-of-Way	• Design-build process • Established a Project Management unit; One project manager throughout project. • Historic Bridge preservation plan
New York	2-4 years (simple) 8 years + (complex)	Environmental (Archaeology, specifically); Consultant Acquisition and Right-of-Way	• Combine project phases • Streamline consultant acquisition • Minimize project documentation • Minimize/simplify design details
Ohio	1-4 years (simple) 5 years + (complex)	Environmental (Historic Bridges) and Right-of-Way	• Start Right-of-Way process before NEPA clearance • Holds no coordination meetings • Perform design and right-of-way acquisition with state funds. • Established an agreement with state and federal agencies on which projects they need to review. • Routine projects with minimal impact--approved in-house
Wyoming	2-3.5 years	Environmental and Right-of-Way	• Identifying environmental impacts early in the process

The information from the other states indicates that the cycle time for the Project Delivery Process is approximately 2 – 3 years. The majority of the time in the Process is spent on the environmental clearance and right-of-way clearance. The improvements being pursued in other states are similar to those being considered in PennDOT. The sample "mirrors" the Pennsylvania experience.

5.1.1 Opportunities for Improvement

There are many actions underway in PennDOT to streamline the Project Delivery Process. A "Bridge Program Delivery Manager" position has been designated for expediting bridge projects in Central Office. "Bridge Project Expediters" are also assigned in each of the District offices to expedite the projects. Many systems enhancements are being performed, such as Engineering & Construction Management System, Electronic Document Management system, Expert Systems, etc. Additionally, there are many gap closure teams assembled to improve the process.

The Project Delivery Process continues to be streamlined by PennDOT. This study will further identify opportunities for improvement. In the Project Delivery Process, three sub-processes which can be extremely time consuming - are as follows:

- Environmental Approval
- Right-of-Way Clearance
- Consultant Agreement
- Utilities Relocation

5.1.2 Issue Category 1: Streamlining the Environmental Approval Process

Environmental approvals are required on almost every bridge construction project. The review process varies from simple to complex, depending on the impacts. The cost of the design phase of the projects has increased over the last ten years or so from approximately 10 percent of the construction cost to 50 percent, at times. Additionally, the length of time for a project to progress from the time it is funded to construction contract award has increased dramatically. This also increases cost of the projects due to inflation.

The Environmental Approval Process is the process which evaluates the bridge projects' impacts on the environment. There are two main environmental impact categories: "Conservation and Preservation" and "Socio-Economic Areas". The following are some of the environmental impact subject areas, within each category:

<u>Conservation and Preservation</u>

- Streams, Rivers, etc.
- Wetlands
- Plants and Vegetation
- Threatened & Endangered Species and Candidate
- Cultural Resources

  - Archaeological
  - Historic structures
- Air Quality
- Noise and Vibration
- Others

Socio-economic Areas

- Parks and Recreation Facilities
- Cultural Resources
- Regional and Community Growth
- Public Facilities and Services
- Community Cohesion
- Displacement of people, businesses or farms
- Others

A typical bridge project may impact one or more of the environmental areas listed above. The length of time for obtaining environmental clearance will depend on the level of impact and the related mitigation for each impact area. Currently, there are four environmental areas which are impacting bridge project delivery significantly:

- Wetlands
- Threatened & Endangered Species
- Cultural Resources
- Section 4(f) US DOT Transportation Act of 1966

PennDOT is well aware of the hurdles in the Project Delivery Process and has many initiatives underway for streamlining the process. The environmental approval process requires review by resource agencies, which can be time intensive. PennDOT currently funds positions in the following agencies and is evaluating expanding this initiative:

- Environmental Protection Agency (1 position)
- PA Department of Agriculture (1)
- PA Department of Environmental Protection (3)
- PA Fish and Boat Commission (2)
- PA Game Commission (1)
- PA Historical and Museum Commission (2)
- US Fish and Wildlife Service (2)

Funding positions in these agencies expedites the review process as these positions are dedicated to reviewing PennDOT projects only. It appears that this is a cost effective way to expedite projects.

Wetlands

Wetlands are "those areas that are inundated or saturated by surface or groundwater at a frequency and duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." If a bridge construction project impacts wetlands, the US Army Corps of Engineers is the agency responsible for review and approval of the impact. However, when a wetland is less than an acre in area, the PA Department of Environmental Protection has been delegated the authority to perform the review and approval process. This is accomplished through a "PA State Programmatic General Permit" (PASPGP) dated January 17, 1995, which states:

> Section 404(e) of the Clean Water Act (CWA) (33 U.S.C. 1344) allows for the issuance of State Programmatic General Permits (SPGPs), which operate in conjunction with a State regulatory program that protects the aquatic environment in a manner equivalent to the Department of the Army regulatory program, provided that the activities permitted under a SPGP are similar in nature and result in no more than minimal individual or cumulative adverse effects on the environment. This SPGP is issued pursuant to Section 404(3) and is based on and consistent with the Guidelines described in Subsection 404(b)(1) of the Clean Water Act.

Through the PA State Programmatic General Permit, the wetlands process is working well overall. Many round table discussions have been held to streamline the process by reducing paperwork, etc. There is, however, one area which seems to encounter problems: Erosion and Sedimentation Control Plan. An Erosion and Sedimentation Control Plan is required to be submitted, for approval, with the 105 Waterway Permit Application, by regulation. Typically, however, the Erosion and Sedimentation Control Plan is not prepared until close to the construction phase. Subsequently, the 105 Waterway Permit is withheld until the Erosion and Sedimentation Plan is approved.

Current Initiatives

1. Erosion and Sedimentation Control Plan Initiative

A task force with membership from PennDOT, PA Department of Environmental Protection, PA Association of County Conservation Districts, and Natural Resource Conservation Service is currently working on the issue with the Erosion and Sedimentation Control Plan. Their goals are to:

- Streamline the process by developing a Programmatic Agreement
- Develop proactive stream protection
- Develop state-of-the-art practices
- Improve communication/coordination with County Conservation Districts
- Enhance training for all parties

2. Statewide Wetland Banking Memorandum of Agreement (MOA)

A "Statewide Wetland Banking Memorandum of Agreement" has been proposed to streamline the wetland approval process. The Memorandum of Agreement approves the use of pre-established wetland mitigation banks for compensation of authorized impacts to wetlands. (Some PennDOT Districts have already established wetland banks). When a project impacts wetlands which are less than one acre in area, the wetland bank would be debited a certain amount, in accordance with set criteria. The wetland banks have several benefits:

- Minimizes the search for the replacement of wetlands
- Monitoring is completed in a few locations, instead of in multiple locations
- Larger wetlands are typically more successful
- Large wetlands typically receive more attention for maintenance

Recommendations

1. Implement the proposed "Statewide Wetland Banking Memorandum of Agreement (MOA) (dated October 10, 1999)." -- The purpose of this MOA is to "establish a wetland banking system to provide effective compensatory mitigation for unavoidable, minimized impacts to wetlands of the United States and the Commonwealth resulting from transportation construction or maintenance activities." The goal of the wetland banking system is to "provide an efficient and effective means to replace wetland functions and values in advance of their loss or alteration by the authorized construction or maintenance of transportation facilities. Wetland banks should be designed to ensure the maintenance, restoration, and when feasible, improvement of the physical, chemical, and biological integrity of wetlands."

There are many benefits to implementing the "Statewide Wetland Banking Memorandum of Agreement." Mitigation banking can reduce permit preparation and evaluation time for qualifying projects. Mitigation banks may be more resilient to natural environmental cycles and may provide increased ecological benefit in comparison to numerous small mitigation sites of equal area. Mitigation banks can be monitored and maintained with greater ease than numerous small mitigation sites.

2. Develop Wetland Banks -- Develop wetland bank(s) in each District, in accordance with the "Statewide Wetland Banking Memorandum of Agreement".

3. Section 105 Permit -- Obtain approval from the Department of Environmental Protection to allow PennDOT to receive Section 105 Waterway Permits with the condition that an Erosion and Sedimentation Plan will be approved by the County Conservation District.

Threatened and Endangered Species

The Federal Endangered Species Act, PA Fish and Boat Code, PA Game Code, Act 18 of 1995 and the Conservation and Natural Resource Act, Section 305 lists those plants, animals, fish and reptiles which are threatened or in danger of extinction. The bridge projects which impact upon any of these threatened and endangered species must submit the impact study to the US Fish and Wildlife Service for review and approval, which is allowed to take a maximum of 135 days for review and consultation. Additionally, the projects may be submitted to the following state agencies for review: PA Game Commission, PA Fish and Boat Commission, PA Department of Conservation and Natural Resources. Bridge projects can be significantly delayed when they potentially or actually impact the species protected under the Federal Endangered Species Act. Some of the delay factors are:

The number of federally listed Threatened and Endangered Species (T&E) is increasing. Critical habitat for many of them are water or wetland dependent and therefore are likely to affect the bridge program in critical areas. Such species include the Clubshell and Riffletoe mussels in the Allegheny River, Bog Turtle in eastern Pennsylvania, and the Massasanga Rattlesnake in northeastern Pennsylvania. Last year, there was a substantial increase in fish species added to the threatened and endangered species list.

Impacts to T&E species are evaluated on a project by project basis, which necessitates highly specialized exploration and evaluation studies, which are expensive and time-consuming.

Seasonal limitations --The threatened and endangered species are visible only during certain seasons, times of day, etc. Subsequently, if the search has not begun during the particular season, then the project is delayed until the following season, which could be one year later.

No comprehensive species database are available; those databases which are currently available are not fully populated or maintained adequately.

Limited availability of resource experts --There are a limited number of certified resource experts available in the specialty fields. For example, there are only two certified "Malacologists" in Pennsylvania. Malacologists study crustaceans, such as fresh water mussels which are impacting projects in PA, particularly in the Allegheny River.

Current Initiatives

- Expand the funded positions in the following agencies to assist in the Threatened & Endangered consultation and regulatory reviews:
  - US Fish & Wildlife Service
  - PA Fish & Boat Commission
- A handbook is being written to provide guidance on regulatory requirements and process information.
- A project to survey potential species and to develop information regarding location, unique characteristics, etc. is being conducted.
- The U.S. Geological Survey, Biological Research Division, has a Memorandum of Understanding (similar to an open-end contract), to identify and quantify species and perform related studies.

Recommendations

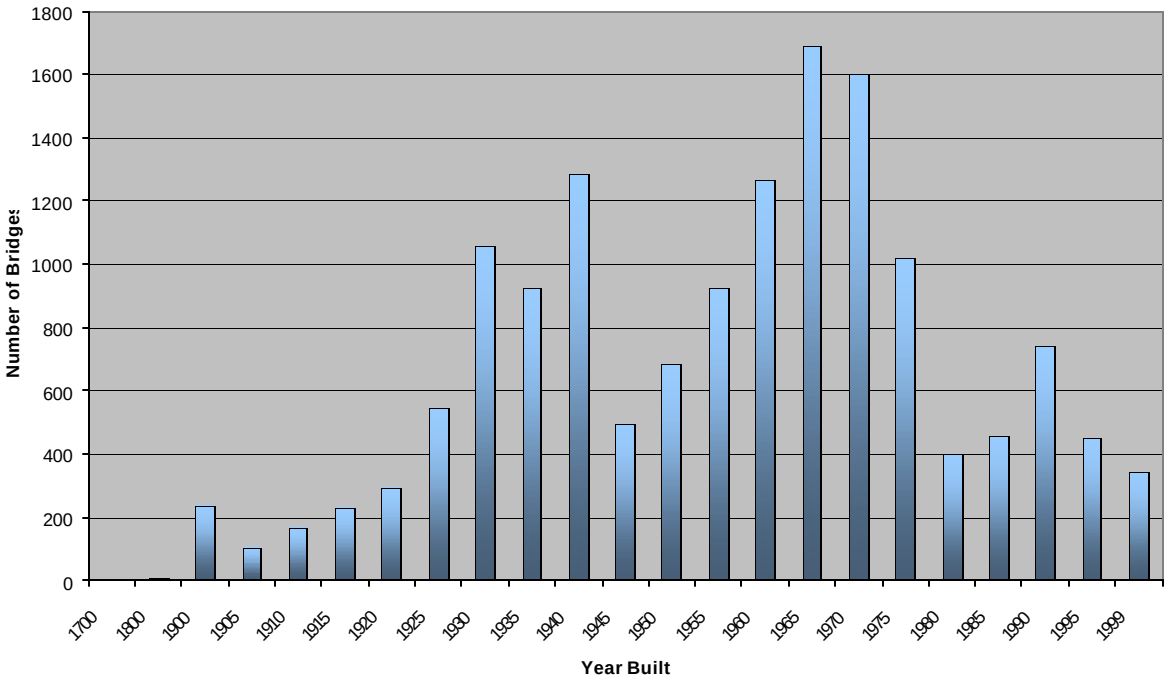
1. Develop a GIS database--Develop a database, using GIS, which will provide information on all species with emphasis on the threatened and endangered species. This database should include technical information about the species itself, possible locations of habitation, etc. The database must be internet accessible.

2. Determine presence of species--Develop methodologies and protocols to determine the presence or absence of species, the condition of species and species populations and the habitat usage to include migrations and movements. Provide technical guidance documents, preferably on a web site.

3. Research "survivability" of species--Research the "survivability" of the threatened and endangered species. This will provide knowledge on how to assure a higher rate of survival, when the species has to be moved, etc. Provide this information in the database noted above.

4. Develop conservation plan-- Develop conservation plan or "Safe Harbor Agreements" for selected species proposed or indicated to be proposed for federal listing. Overlay the

Figure 19: Number of Bridges Built in PA
State Owned > 20' in Length



information about species on the construction projects. Determine which projects will be affected and the extent of the effect by a team of stakeholders through a consensus building process.

5. Perform regional/corridor based studies-- Perform studies of species with emphasis on the threatened and endangered species on a "regional/corridor" basis in areas with potentially high concentrations of T&E Species and planned or programmed bridge projects. Perform the studies of the existence of the species on a wide pre-established "regional/corridor" area, rather than on a project by project basis.

6. Transportation Development Process--Develop a process and procedures on how to address species of concern during the transportation development process.

Cultural Resources

The Pennsylvania State History code and the National Historic Preservation Act (NHPA) of 1966 refers to "Any activity that may demolish, alter, or transfer control of any property that may be of historical, architectural or archaeological significance". This Act applies to bridges or any structures in the project area over 50 years old. Figure 19 indicates the number of bridges built which are greater than 20' in length (federal definition). From this figure, it is evident that many bridges are already over 50 years old. Many bridge projects will need to be assessed for compliance with the PA Historic Preservation Act.

The archaeological and historical studies for bridge projects are processed on a case by case basis. Each project is treated as an individual case. The information gathered on previous projects may be applied to subsequent projects, but is not substituted. This increases the time and cost of a project.

Current Initiatives

- There are many actions underway to streamline the process of the review of Cultural Resources. In August 1999, the FHWA delegated certain consultation responsibilities under the NHPA to qualified personnel within PennDOT, while retaining ultimate responsibility. A "Programmatic Agreement for Minor Transportation Projects" has been executed by the FHWA, the Advisory Council on Historic Preservation and the State Historic Preservation Office to streamline compliance with Section 106 of the NHPA for many rehabilitation projects.
- The Engineering & Construction Management System's Cultural Resource Team identified 86 tasks to streamline the process. These tasks include such initiatives as developing an archaeological database, developing an historic bridge program, use of Programmatic Agreements, elimination of unnecessary reports and increase training and delegation of authority.
- Guidelines are being developed to train the PennDOT Districts regarding the application of the revisions to 36 CFR 800 (NHPA regulation on Cultural Resources).
- A historic bridge study, currently underway, will determine which bridges are eligible for the National Register of Historic Places and identify any critical historical factors of significance (e.g., a famous historical figure marched troops across the bridge, etc.)
- PennDOT has hired several professional archaeologists and historians, both internally and on a contract basis. These professionals will be staffed at the districts to expedite decision- making at the District level. It is projected that much time will be saved in the process, and will reduce the number of reviewers required, as the quality improves.
- There are three Transportation Enhancement Applications for TEA-21 funding, which should also aid in streamlining the Cultural Resources process, when implemented.

    - Historic Bridge Management Plan Application -The expected outcomes of the "Historic Bridge Management Plan" are:

      1. Development of a rating system for all structures determined eligible for the National Register, the outcome of which is a list of bridges to be preserved. One of the products of this initiative will be a list of eligible bridges that require no further coordination. This will result in significant savings of time and resources.

      2. Development of a Programmatic Agreement for compliance with Section 106 of the National Historic Preservation Act and a concurrent programmatic (4f), establishing agreement on bridges to be rehabilitated and/or maintained." Guidance on how to complete rehabilitation and maintenance on historic bridges will be compiled.

      3. Revision of existing guidance for the rehabilitation and maintenance of historic bridges, as well as decision-making guidance on rehabilitation versus replacement. A database detailing best preservation practices for historic bridges will also be developed.

      4. Establishment of a process to integrate the preservation plan into PennDOT activities.

5. Generation of greater public awareness of historic bridges in Pennsylvania through an outreach campaign.

- Application for the "The Publication of a Synthesis of Pennsylvania Archaeology"- Currently, PennDOT conducts approximately 100 archaeological investigations annually, at a cost of between five and ten million dollars. The research questions used in compliance-related archaeological projects are frequently weak and repetitive. The same general questions are asked and thus, not systematically advancing the knowledge of past behavior. The purpose of the proposed project is to:

    1. Publish a synthesis of the archaeological information accumulated over the past twenty years;
    2. Develop a process for the regular updating of this information and disseminate it to the general public;
    3. Develop a four volume series publication, concerning prehistoric archaeology, historic archaeology, special topics and a summary volume.

- Application for the "Development of Prehistoric Settlement Pattern in Upland Settings" ($ 6,000) (Total project cost—$15,945)

  The purpose of the "Development of Prehistoric Settlement Pattern in Upland Settings" is to:

    1. Study three watersheds.
    2. Synthesize existing settlement data for uplands.
    3. Identify gaps in the information.
    4. Make recommendations for future surveys.

Recommendations

1. Develop a Historic Bridge Management Plan and a Programmatic Agreement--The Historic Bridge Study currently underway will determine which bridges are eligible for the National Register of Historic Places. Once the eligibility is determined, establish which bridges will be preserved. This can be accomplished through the consensus of the stakeholders in the process. Develop a Programmatic Agreement to address the handling of routine and minor recurring issues.

2. Fund the following projects-- (if the TEA-21 funds do not become available)

- Historic Bridge Management Plan--$240,000
- Publication of a Synthesis of Pennsylvania Archaeology--$170,000 (PA Historical & Museum Commission has committed $34,000 for a total project cost of $204,000).
- Development of Prehistoric Settlement Pattern in Upland Settings -- $6,000

3. Develop Best Practices for Context Sensitive Design—Develop best practices for context sensitive design of bridge replacements within historic districts, in partnership with PHMC and local governments.

Section 4(f)

Section 4(f) of the U.S. Department of Transportation (DOT) Act of 1966 states the following:

> "The Secretary of Transportation may approve a transportation program or project requiring the use of publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge, or land from a historic site of national, state, or local significance (as determined by the Federal, State, or local officials having jurisdiction over the park, recreation area, refuge, or site) only if:
>
> - There is no prudent and feasible alternative to using that land; and
> - The program or project includes all possible planning to minimize harm to the public park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use."

Section 4(f) applies to publicly funded transportation projects only - not to the private sector. There is a similar Commonwealth Statute, "71 Purdons Statute Section 512" which has similar language and is also very directive. Compliance with Section 4(f) is a highly procedural and rigid process. When historic properties are involved, the Cultural Resource Process (in accordance with Section 106 of the National Historic Preservation Act) and Section 4(f) Process present requirements for document circulation, prescribe review periods, consultation and legal sufficiency review prior to decision-making.

Current Initiatives

If a bridge project is in a historical area or is impacting a public park, recreation area, or wildlife and waterfowl refuge, etc. then Section 4(f) applies and the process can be time consuming. PennDOT has been providing training internally and to resource agencies on how to determine "prudent and feasible" with case studies, etc. The training should expedite the process.

There is also a Nationwide Programmatic Agreement for Section 4(f) which covers bridge replacement/rehabilitation. While the same analysis is required, the approval process is different and does not require circulation/comment period (reduces 45 days in the process).

Recommendations

1. Recommend changes to the state regulation "71 Purdons Statute, Section 512" to allow the following, for projects with state funding only:

Give property owners of parks, wildlife refuges, historic structures, etc. the choice on the decision on how they wish the impact to be handled. For example, if a project impacts a small area of a public park, the park authorities may accept monetary compensation for the loss of the land. The authorities may accept compensation for the loss of the land to enable them to purchase recreation equipment, etc.; or they may accept land elsewhere as similar replacement. If the above stated changes to the state regulations are implemented, it would not be necessary to prove whether the impact was "prudent or feasible."

2. Encourage US DOT Headquarters to issue streamlined Section 4(f) regulations—If Section 4(f) impact is minor, encourage USDOT to issue streamlined regulations to reduce applicability of Section 4(f) requirements to projects which involve minor takes from non-contributing elements of historic properties.

5.1.3 Issue Category 2: Right-of-Way Clearance Process

The Right-of-Way Clearance Process typically occurs near the end of the final design phase. The following components are required to be in place to begin the Right-of-Way Clearance process:

- Funding availability
- Final plans
- Environmental clearance

Once the environmental clearance process is completed, the final design process begins. The Right-of-Way clearance process occurs during final design and must be complete prior to letting a project. The final right-of-way plan is developed only after the final alignment of the project is established which generally occurs a third of the way through the final design process. This creates great pressure to complete the Right-of-Way clearance phase in order to expedite the letting of the project. Obtaining right-of-way clearance can be a time consuming process.

Current Initiatives

- In one PennDOT district, a right-of-way pilot is underway to expedite the clearance process. In the pilot, the right-of-way limits are set during the preliminary design phase. The design must accommodate the set right-of-way limits. This facilitates the completion of the final drawings for right-of-way acquisition, in advance. Once the environmental clearance is obtained, all the right-of-way information is ready and prepared to begin the process. In some cases, the final right-of-way plans are still being revised when the environmental clearance process has been completed.
- The contracting process to bring professionals on board has been streamlined. Real estate appraisers are now available through an "Invitation to Qualify". This provides quicker access to contract with such professionals.

Recommendation

1. Begin Right-of-Way Process Earlier--Where feasible, begin the Right-of-Way Clearance process as early as possible. Setting the right-of-way limits early in the process expedites the preparation of complete Right-of-Way Plans. It is not possible to implement this recommendation in all projects. The reason for this is that some property owners may argue that more right-of-way than required will be acquired since the detailed final design has not yet been completed.

5.1.4 Issue Category 3: Consultant Agreement Process

The Consultant Agreement Process is the contracting process to bring a consultant on board for the design of a project. The entire process ranges, on the average, from six months to one year.

The following limits have been raised on the "open-end contracts" to provide another vehicle to contract with consultants:

Raised the total dollar value from $6 million to $15 million per district, at any given time.
Increased maximum amount for design work orders from $250,000 to $500,000.
Raised maximum Open-end agreement from $1 million to $2 million.

Current Initiatives

A process reengineering initiative for the Consultant Agreement Process is underway in PennDOT, called Engineering and Construction Management System (ECMS). (ECMS includes the reengineering of many more processes.) The estimated goals for the Consultant Agreement process are:

- Agreement cycle time: 6 to 8 months
- Supplement cycle time: 3 months

Recommendations

1. Implement Engineering & Construction Management System—Continue to implement the action items in the Engineering & Construction Management System already underway.

5.1.5 Issue Category 4: Local Projects

The bridge Project Delivery Process can be a time consuming process. Experienced engineers, environmental managers, designers, etc. encounter hurdles in expediting bridge projects daily. Local municipalities face several challenges in the Project Delivery Process:

- ***Limited funding availability for local match*** – The local match varies from 5 percent to 20 percent of the total cost of the project. Funds at the local municipalities are limited and there are many priorities upon the available funds.
- ***Unfamiliarity with the Project Delivery Process*** – Local municipalities and, at times, their consultants are unfamiliar with the Project Delivery Process requirements. The number of bridge projects the local municipalities process are very few. They do not have the benefit of the experience that processing many projects brings.

Current Initiatives

- ***Reengineering of the Local Bridge Delivery Process*** - PennDOT reengineered the process for the delivery of local bridge projects. The outcome of the reengineering is the revision of the following publications to ensure continuity in the guidance:
  - Publication #9—Policies and Procedures for Liquid Fuel Tax
  - Publication #39—Procedure for Administration of Federal Aid Municipal Projects
  - Local Bridge Program Manual
- ***Pennsylvania Infrastructure Bank*** –The National Highway System Designation Act of 1995 established the program for State Infrastructure Banks. The Pennsylvania Infrastructure Bank

is an innovative transportation project financing tool that provides new flexible financing capabilities by offering a wide range of loan and credit enhancement opportunities to eligible projects. The Pennsylvania Infrastructure Bank can lend money to sponsors of transportation projects, or provide loan guarantees or other credit enhancements. As loans are repaid, funds are recycled to provide new loans. The interest rate is one half of the current Prime Lending Rate as determined by the Federal Reserve.

- ***Project Management*** –In order to facilitate the letting of more local bridge projects, several project management options are being implemented in PennDOT. An open-end contract was established in one district to serve as liaison with the municipalities. The consultant will assist in reducing the backlog of local bridge projects. Another project management initiative being implemented is the local municipalities serving as project managers on several bridge projects. An example of this is the Lancaster County Planning Commission, which will be acquiring a consultant for design and managing the overall design process for several projects.

Recommendations

1. Assist with financing—Continue to assist local municipalities with financing mechanisms through the PA Infrastructure Bank.

2. Project Management—PennDOT can contract with consultants to coordinate the local bridge projects to expedite the Project Delivery Process. Also consider more partnering options with local organizations for project management.

3. Provide better guidance and direction to local municipalities and their consultants **--** Continue to develop the Local Bridge Delivery Manual based on recommendations from past Local Bridge Reengineering efforts.

5.1.6 Issue Category 4: Utilities Relocation

Subsurface utilities are located in the project area or on the bridge itself. These utilities require relocation, in some projects. The relocation itself can be time consuming for the following reasons:

- **Accurate information—**The utility plans do not always have accurate information about utilities. The information presented may have been derived from dated drawings, etc. The utilities may have been relocated already and not accurately kept up to date. The inaccurate information leads to delays during the construction phase and can adds significant cost to the project.

- **Deregulation Effect—**Due to deregulation in the utility industry, the utilities are reducing the staff. This leads to slower response from the utilities, at times.

- **Additional Workload—**The aggressive goals for improving bridges in Pennsylvania adds additional workload to the utility industry. Prior to the aggressive goals, the projects were being delayed due to utility relocations. With additional workload, the utility relocations will require even more time.

Recommendations

1. **Subsurface utilities engineering—**Perform subsurface utilities engineering prior to the design phase. Performing the subsurface utilities engineering would enable

incorporation of the utilities accurately in the design phase itself. This would facilitate the utilities relocation in the construction phase. Some of the projects have implemented this already, however, more projects need to incorporate subsurface utilities engineering.

6.0 Overall Recommendations for the Project Delivery Process

1. Begin study of environmental resources much earlier in the process -- Immediately following the identification of a project, preliminary environmental studies could commence on issues such as wetlands, Threatened &Endangered Species and cultural resources. As the project design begins, environmental resources would already be identified, and possibly cleared.

2. Develop a "conflict resolution" process -- Develop a timely, efficient "conflict resolution" process with the input and consensus of key stakeholders, to deploy when necessary. (This concept applies to all environmental aspects, and is not limited to Threatened & Endangered Species.) The Resolution Process would help resolve issues in a timely and agreeable manner. It appears that there is a greater need for balance in environmental problem solving. Without the recommended process, TAC believes that PennDOT can be sometimes overly accommodating for a valid reason -–to not jeopardize the environmental clearance process for the current project or future projects. PennDOT has learned a great deal about environmental needs. It is now time for more balance in the problem solving process.

3. Obtain approval for PennDOT to issue permits, where and when feasible -- Develop, through a consensus process, an approval process that delegates the responsibility for issuing permits, where legally permissible by third party delegation. The resource agencies can set the standards for PennDOT to follow, as well as a quality assurance program to ensure compliance. The commitment can be stated in a "Memorandum of Understanding" with signatures of all the stakeholders.

4. Develop a "360 degree feedback system" -- A 360 degree feedback system is a feedback system at all levels, agency to agency. The 360 degree feedback system would enable all the key stakeholders in the process to evaluate performance and provide feedback to each other. (This recommendation is applicable to all entities involved in the entire environmental clearance process and is not limited to "cultural resources".)

5 Conduct field views with all parties present -- If all the key stakeholders attend the field views, decision making can be expedited. Additionally, many reports may be eliminated, as decisions can be made from the field views, instead of reports, etc.

6. Implement "Context Sensitive Design" – Implement the "Context Sensitive Design" pilot being implemented in, Kansas, Kentucky, Maryland, Utah and Vermont. (This concept applies to all environmental aspects, and is not limited to Threatened & Endangered Species.) Context Sensitive Design is a holistic approach to design. It involves evaluation of the environmental resources affected in the project area at the very beginning of the design process. After the environmental resources are evaluated, and their impact is determined, then the project design begins.

7. Process owner for the Bridge Project Delivery Process -- Assign a "process owner" for the Bridge Project Delivery Process. The definition of a "process owner" is "someone who feels the most gain or pain in the process." The process owner has control over the entire process or can influence the entire process, at a fairly high level in the organization. (PennDOT has already taken steps towards this recommendation with the identification of the "Bridge Program Delivery Manager.")

8. Track cycle time -- Develop a database to track the cycle time of the bridge projects. Set standards and goals for the processing of bridge projects. Systems are in place to track parts of the Project Delivery Process, or some milestones. However, the data is not easy to track when changes in dates occur. Also, the current data is not available in one database. (This will aid in streamlining the Bridge Project Delivery Process for all projects, not just those with local funding.)

9. Evaluate Bridge Letting Goals -- Evaluate whether it is feasible to accomplish the bridge letting goals of 300 by Year 2003. Readjust goals accordingly, if required.

10. Review Memorandums of Understanding -- Review existing Memorandums of Understanding such as the "PA Interagency Document" (1/10/96), "Agency Coordination Meeting Operating Procedures", "Environmental Streamlining National Memorandum of Understanding (US DOT TEA-21 and Environmental Streamlining)" etc. and update, as necessary to foster better relationships and partnerships among resource agencies, environmental managers and engineers.

11. Public education on Environmental Clearance Process -- Develop and provide public education on the environmental clearance process. This will build an awareness of the complexity of the process.

12. Implementation Strategy -- Develop an Environmental Implementation Strategy to deploy the recommendations listed above. Develop the strategy with the participation of all the key stakeholders.

Appendix A: Project Delivery Contacts

PENNDOT

1. Terry Adams, District 8-0
2. Jim Arey, Center for Program Development and Management
3. Ron Arner, Bridge Engineer, District 3-0
4. Dave Azzato, Chief, Contract Management, Bureau of Design
5. Tom Boyd, Center for Program Development and Management
6. Greg Brown, District 6-0
7. Craig Chelednik, District 10-0
8. Don Childs, Consultant Agreement
9. R. Scott Christie, Bridge Engineer, Bureau of Design
10. William Cressler, Office of Chief Counsel
11. Joe Cribben, Bureau of Maintenance and Operations
12. Dain Davis, Environmental Manager, District 9-0
13. Richard Fusia, District 11-0 Municipal Services
14. Mike Gillespie, District 8-0
15. Mike Gismondi, Center for Program Development and Management
16. Gary Graham, PA Turnpike Commission
17. Brian Hare, Bridge Program Delivery Manager, Bureau of Design
18. Myron Hartis, 12-0, Right of Way Unit
19. Jeff Haste, Director, Bureau of Municipal Services
20. Barry Hoffman , 8-0, District Engineer
21. Gary Hoffman, Chief Engineer
22. John Hrubovcak, Office of Chief Counsel
23. Chris Johnston, Special Assistant, Local & Area Transportation
24. Mike Keiser, District 8-0
25. Ray Kennedy, 3-0, Environmental Manager
26. George Khoury , 2-0, District Engineer
27. Larry King, Deputy Secretary for Planning
28. Wayne Kober, Bureau of Environmental Quality
29. Bill Kohler, 1-0, Bridge Engineer
30. Bob Kunselman, 9-0, Bridge Engineer
31. Denny Lebo, Center for Program Development and Management
32. Terry Leer, Bureau of Personnel
33. Doug Lehr, Right-of-Way, Bureau of Design
34. Susan McDonald, Bureau of Environmental Quality
35. Bob Momich, Center for Program Development and Management
36. Earl Neiderheiser, 9-0, District Engineer
37. Jonathan Oravec, Bureau of Design
38. Hari Parikh, 8-0, Bridge Engineer
39. Bob Peda, Director, Bureau of Maintenance and Operations

40. Bill Pickering, Division Chief, Right of Way Division, Bureau of Design
41. John Proud, Right of Way, Bureau of Design
42. Hal Rogers, Bureau of Design
43. Jim Rowan, Sverdrup Civil
44. Michael M. Ryan, Deputy Secretary for Highway Administration
45. Foster Sankey, 4-0 Bridge Engineer
46. Lou Schultz, Director, Center for Program Development and Management
47. Dean Schreiber, Director, Bureau of Design
48. Frank Shenk, Right of Way
49. Jim Smedley, Center for Program Development and Management
50. Tom Smith, 12-0 Permit Coordinator
51. Dan Stewart, Bureau of Design
52. Charlie Thompson, KPMG, ECMS Project
53. Doug Tobin, ECMS Project Manager (deferred to Charlie Thompson)
54. Sherri Zimmerman, Manager, Agility Center

OTHER AGENCIES

PA Department of Environmental Protection

55. John Blacksmith
56. Larry Busack, Southwestern Region
57. Kelly Hefner
58. Jim Newbold, Southeastern Region
59. Al Seaver, North Central

Environmental Protection Agency

60. Barbara Okorn

PA Fish & Game Commission

61. J. Holtzmaster
62. David Spotts

PA Historical Museum Commission

63. Brenda Barrett
64. Dan Deibler
65. Kurt Carr

US Army Corps of Engineers

66. Paul Wettlaufer

Municipalities

67. Dave Royer, HATS
68. Ron Wagenmann, Upper Marion Township
69. Jack Smythe, (Boles, Smythe Associates) (Upper Marion Township Consultant)

Federal Highway Administration (FHWA)
70. William Williams

Other States
71.Peter Frantz, Chief of Environmental Office, Illinois DOT
72.Gary Novey, Iowa DOT
73. Richard Powell, Kentucky Transportation Cabinet
74. Miriam Crum, Division of Project Management, NJ DOT
75. Mary Ivey, Office of Engineering, NY DOT
76. Keith McCarthy, Bridge Division, NY DOT
77. Tim Hill, Administrator, Office of Environmental Services, Ohio DOT
78. Greg Frederick, Bridge Division, Wyoming DOT
79. Tim Stark, Environmental Manager, Wyoming DOT

Appendix B: PA Bridges by County (June 99)

	No. >20ft	No. 8-20 ft.	99 Total	94 Total	Change	20+	8 to 20
Adams	269	205	474	477	-3	272	205
Allegheny	1265	504	1769	1739	30	1244	495
Armstrong	278	171	449	446	3	275	171
Beaver	303	156	459	452	7	302	150
Bedford	415	200	615	619	-4	441	178
Berks	639	226	865	852	13	623	229
Blair	341	97	438	433	5	338	95
Bradford	415	242	657	658	-1	419	239
Bucks	675	250	925	930	-5	681	249
Butler	400	142	542	538	4	400	138
Cambria	292	145	437	437	0	291	146
Cameron	59	36	95	93	2	57	36
Carbon	138	68	206	204	2	138	66
Centre	299	148	447	444	3	296	148
Chester	633	274	907	884	23	616	268
Clarion	198	89	287	287	0	202	85
Clearfield	321	166	487	485	2	321	164
Clinton	206	81	287	275	12	195	80
Columbia	290	113	403	403	0	291	112
Crawford	423	246	669	650	19	423	227
Cumberland	355	156	511	501	10	345	156
Dauphin	447	121	568	569	-1	449	120
Delaware	369	92	461	462	-1	368	94
Elk	113	55	168	165	3	111	54
Erie	446	246	692	692	0	447	245
Fayette	383	169	552	556	-4	384	172
Forest	66	27	93	91	2	65	26
Franklin	300	164	464	464	0	300	164
Fulton	160	68	228	230	-2	163	67
Greene	322	173	495	499	-4	324	175
Huntingdon	254	144	398	397	1	255	142
Indiana	331	194	525	515	10	329	186
Jefferson	216	106	322	314	8	216	98
Juniata	183	115	298	298	0	181	117
Lackawanna	350	148	498	461	37	338	123
Lancaster	810	317	1127	1122	5	799	323
Lawrence	266	125	391	390	1	269	121
Lebanon	235	96	331	332	-1	235	97
Lehigh	366	129	495	496	-1	367	129
Luzerne	450	232	682	681	1	450	231
Lycoming	471	170	641	639	2	472	167
McKean	229	93	322	319	3	226	93

	No. >20ft	No. 8-20 ft	99 Total	94 Total	Change	20+	8 to 20
Mercer	455	218	673	670	3	453	217
Mifflin	176	45	221	209	12	163	46
Monroe	308	121	429	430	-1	309	121
Montgome	755	250	1005	992	13	752	240
Montour	116	49	165	167	-2	118	49
Northampt	341	104	445	450	-5	346	104
Northumbe	300	141	441	445	-4	305	140
Perry	198	154	352	351	1	199	152
Philadelphi	587	18	605	590	15	573	17
Pike	164	72	236	238	-2	165	73
Potter	218	91	309	307	2	218	89
Schuylkill	380	122	502	503	-1	380	123
Snyder	165	120	285	283	2	165	118
Somerset	450	162	612	595	17	445	150
Sullivan	124	67	191	191	0	123	68
Susquehar	274	200	474	474	0	275	199
Tioga	404	223	627	623	4	405	218
Union	162	93	255	255	0	163	92
Vanango	196	107	303	287	16	192	95
Warren	218	122	340	339	1	219	120
Washingto	628	342	970	978	-8	621	357
Wayne	263	117	380	377	3	263	114
Westmorel	635	345	980	982	-2	631	351
Wyoming	140	85	225	223	2	140	83
York	597	326	923	923	0	595	328
	23235	10393	33628	33381	247	23136	10245