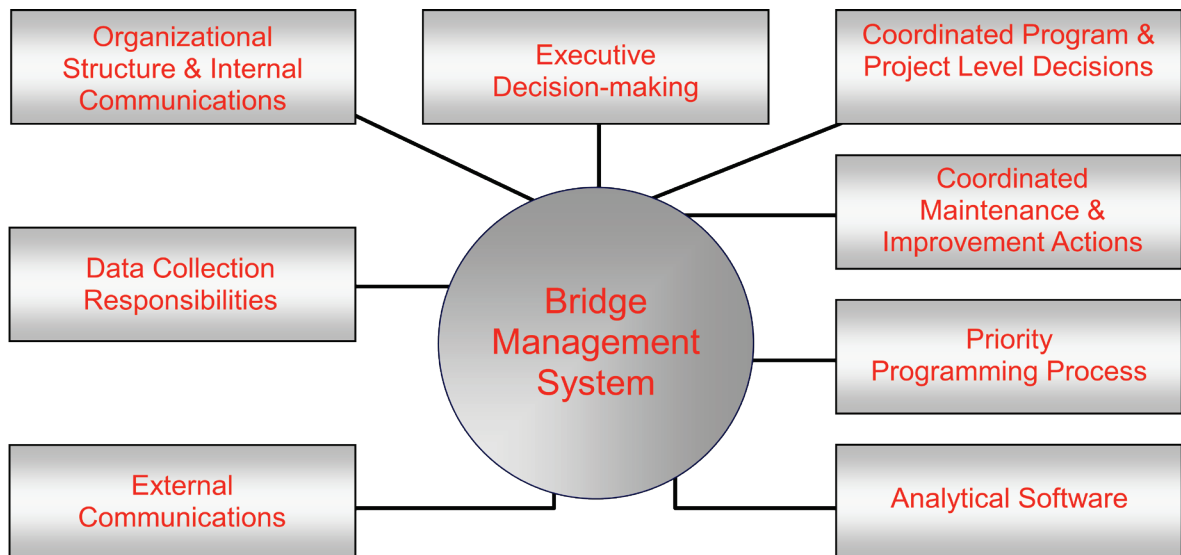


# Bridge Management Questionnaire Report



Source: AASHTO Guidelines for Bridge Management Systems, NCHRP Report 20-7, Task 46

FHWA Office of Asset Management  
December, 2010

**About the Cover:** The chart on the cover comes from the AASHTO Guidelines for Bridge Management Systems<sup>1</sup> that was developed under NCHRP Report 20-7, Task 46. It is placed on the cover of this report to emphasize the complexity and interaction of a number of things including analytical software that are part of and that make up a bridge management system.

A number of respondents to the questionnaire implied that the analytical software is equivalent to the BMS. This chart demonstrates that this is simply not the case. Our goal with the Office of Asset Management is to promote the use and understanding of what bridge management systems are and are not. Emphasizing the use of a BMS to assist bridge owners in being able to do the right activity, to the right bridge, at the right time and at the right cost is paramount to preserving our transportation infrastructure in general and our highway bridges in particular.

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<sup>1</sup> This document is also referenced in 23 CFR 500.107 the regulation that governs management systems. This regulation states that, “An effective BMS for bridges on and off Federal-aid highways that should be based on the **AASHTO Guidelines for Bridge Management Systems** [emphasis added] and that supplies analyses and summaries of data, uses mathematical models to make forecasts and recommendations, and provides the means by which alternative policies and programs may be efficiently considered. An effective BMS should include, as a minimum, formal procedures for: (a) Collecting, processing, and updating data; (b) Predicting deterioration; (c) Identifying alternative actions; (d) Predicting costs; (e) Determining optimal policies; (f) Performing short- and long-term budget forecasting; and (g) Recommending programs and schedules for implementation within policy and budget constraints.” This language is placed here for reader convenience.

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## Executive Summary

**Introduction.** On January 12, 2009, the Office of Inspector General (OIG) of the U. S. Department of Transportation (DOT) provided the results of its audit of the National Bridge Inspection Program (NBIP). The report evaluated the Federal Highway Administration's (FHWA) efforts to promote State use of bridge management systems (BMS). The OIG recommended that the FHWA: a) initiate a program to collect data regularly on the States' use of BMS, b) evaluate the data to identify States needing help in implementing an effective BMS, and c) provide technical assistance and training resources to them. To fulfill recommendation (a) a questionnaire was developed to assist with responding and was completed by the FHWA Division Office Bridge Engineers in coordination with their State DOT counterparts. Using the BMS questionnaire responses this report has been compiled and comments summarized. This report fulfills recommendation (b), however; FHWA plans to repeat the questionnaire process biennially.

**State Bridge Management Processes.** Through Division Office response, a number of State bridge management processes were identified that could be shared with other states. For instance, assist states that are not using analytical software product(s) or method(s) or tool(s) to: a) to capture and store planned project information; b) to predict future deterioration of bridge elements; c) to identify preservation, maintenance, rehabilitation, improvement (i.e. widening, raising, strengthening) and replacement practices/strategies. The FHWA plans to share information on states use of analytical software beyond simply collecting inspection information with Division Offices and their states.

Also, assist states that lack upper management support, dedicated funding, appropriate staffing levels through discussions with management regarding the tangible benefits of a viable bridge management program. Coupled with this, promote assistance with changes that are needed to ingrain bridge management into the state's business practice. Marketing the benefits of bridge management, promoting changes to a state's business practices would in all likelihood be targeted to this audience, i.e. Chief Engineer, Director of Transportation, Commissioner, State Highway Commission, etc. The FHWA plans to market bridge management to Division Offices and their states.

**Benefit Cost Analysis and Life Cycle Cost Analysis.** Some thirty-one Division Offices indicated that their states are not using life cycle costs in bridge management decision-making. The FHWA will promote the use of economic analytical tools and procedures to include benefit cost analysis (BCA) and life cycle cost analysis (LCCA) in bridge management decision process. The FHWA plans to share information on BCA and LCCA with Division Offices and their states.

**Bridge Management Issues for future resolution.** A number of Division Offices indicated that their states identified a number of needs. These were arbitrarily lumped in twenty-six distinct category of needs. Assistance was noted in a number of areas, however; the following general categories seem in line with the other assistance identified above to include: a) bridge management awareness, effectiveness, and bridge management requirements; b) Life cycle cost analysis; c) exchanges, what other states are doing; and d) case studies.

**Bridge Management Technical Assistance Plan.** The FHWA plans to conduct bridge management case studies, training, regional bridge management peer exchanges, targeted bridge management process improvement reviews of select states, sponsor a National Bridge Management, Inspection and Preservation Workshop, lastly develop a bridge management marketing plan to address these issues subject to fiscal constraints.

## Bridge Management Questionnaire Report

**Introduction.** On January 12, 2009, the Office of Inspector General (OIG) of the U. S. Department of Transportation (DOT) provided the results of its audit of the National Bridge Inspection Program (NBIP). The report evaluated the Federal Highway Administration’s (FHWA) efforts to promote State use of bridge management systems (BMS). The OIG recommended that the FHWA: a) initiate a program to collect data regularly on the States’ use of BMS, b) evaluate the data to identify States needing help in implementing an effective BMS, and c) provide technical assistance and training resources to them.

To fulfill recommendation (a), a questionnaire<sup>2</sup> was developed to assist with responding and was completed by the FHWA Division Office Bridge Engineers in coordination with their State DOT counterparts. We thank each of the Division Offices for completion of this questionnaire and help with this initiative in this matter of national importance.

Using the BMS questionnaire responses we have compiled this report and summarized response comments. Recommendation (b) is fulfilled by this report, however; FHWA plans to repeat the questionnaire process biennially.

The report is organized as follows:

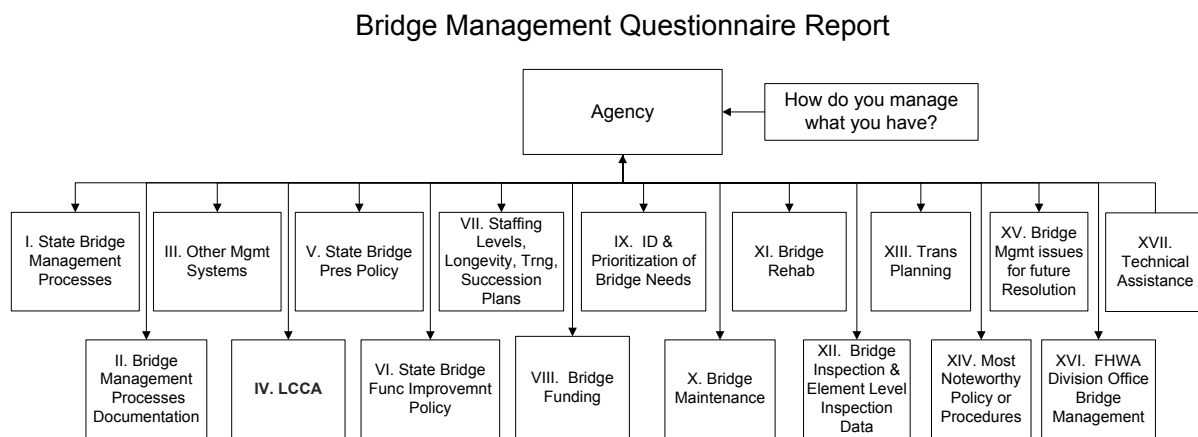


Figure 1

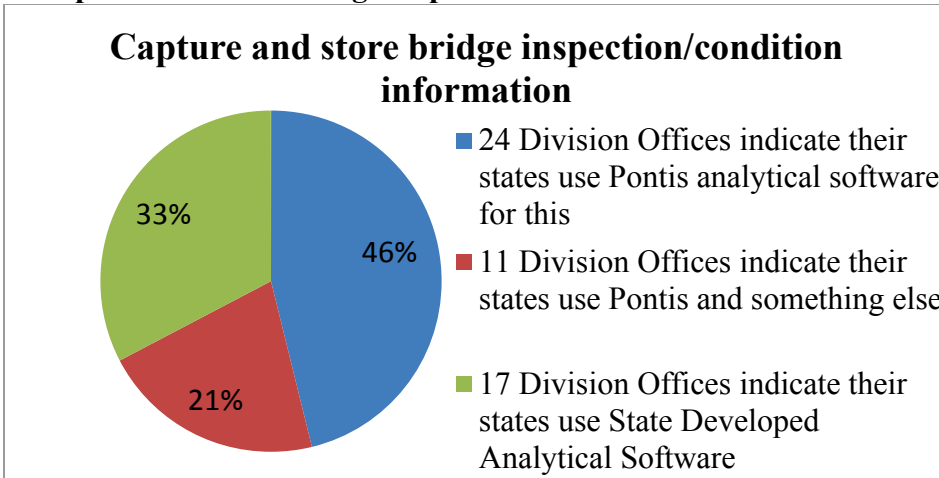
**Questionnaire Responses.** Please also note that responses are provided by the FHWA Division Offices for their respective State. This report is based on analysis of comments submitted in response to the questionnaire.

**I. State Bridge Management Processes (Q3 – Q11).** This report section deals with trying to understand how the states manage their bridge management processes including the tools they use to do this. From the responses that follow, states use a variety of tools and procedures to do this. A bridge management system can consist of many tools in a states bridge management analytical tool box.

<sup>2</sup> See Appendix B for the questionnaire used in this survey.

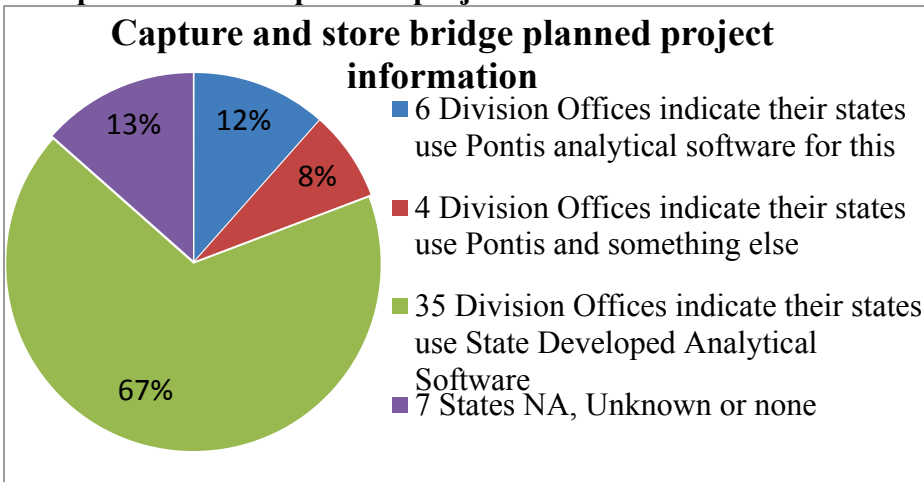


**Q3. What software product(s) or method(s) or tool(s) does the State use to:  
a. Capture and store bridge inspection and condition information?**



**Findings.** Results in this graph indicate that Division Offices show that their states are using a variety of software to capture and store bridge inspection and condition information the majority of which are using Pontis or Pontis along with something else.

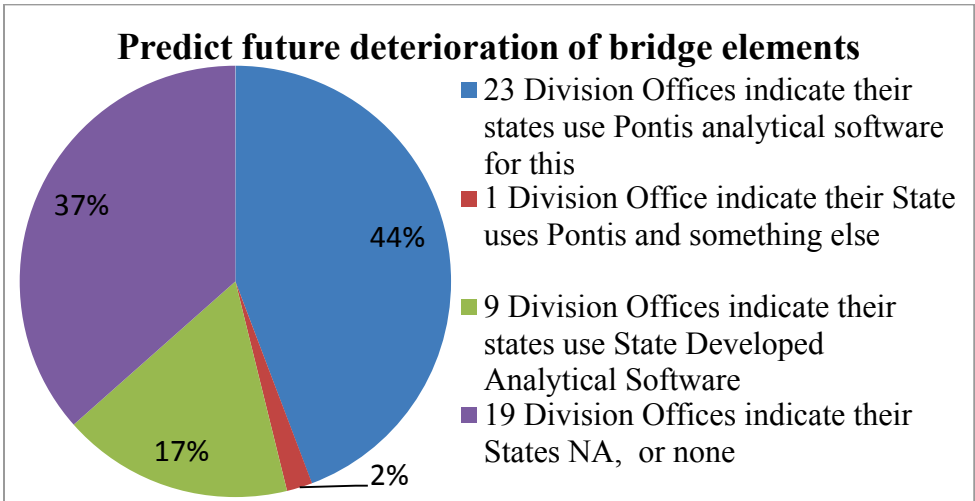
**Q3. What software product(s) or method(s) or tool(s) does the State use to:  
b. Capture and store planned project information?**



**Findings.** Results in this graph indicate that Division Offices show that their states are using a variety of software types and methods to capture and store planned project information.

**FHWA has identified the following focus areas:** Assist states that are not using analytical software product(s) or method(s) or tool(s) to capture and store planned project information. Share information regarding states that do use analytical software with those that do not.

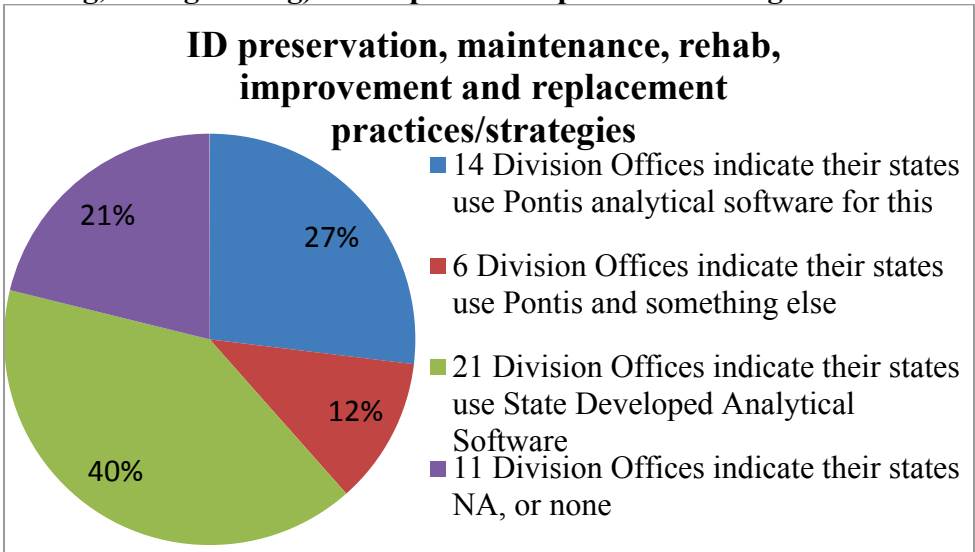
**Q3. What software product(s) or method(s) or tool(s) does the State use to:  
c. Predict future deterioration of bridge elements?**



**Findings.** Results in this graph indicate that Division Offices show that their states are using a variety of software types and methods to predict future deterioration of bridge elements.

**FHWA has identified the following focus areas:** Assist states that are not using analytical software product(s) or method(s) or tool(s) to predict future deterioration of bridge elements. Share information regarding states that do use analytical software with those that do not.

**Q3. What software product(s) or method(s) or tool(s) does the State use to:**  
**d. Identify preservation, maintenance, rehabilitation, improvement (i.e. widening, raising, strengthening) and replacement practices/strategies?**



**Findings.** Results in this graph indicate that Division Offices show that their states are using a variety of software product(s) or method(s) or tool(s) to identify preservation, maintenance, rehabilitation, improvement and replacement practices/strategies.

**FHWA has identified the following focus areas:** Assist states that are not using analytical software product(s) or method(s) or tool(s) to identify preservation, maintenance, rehabilitation, improvement (i.e. widening, raising, strengthening) and replacement

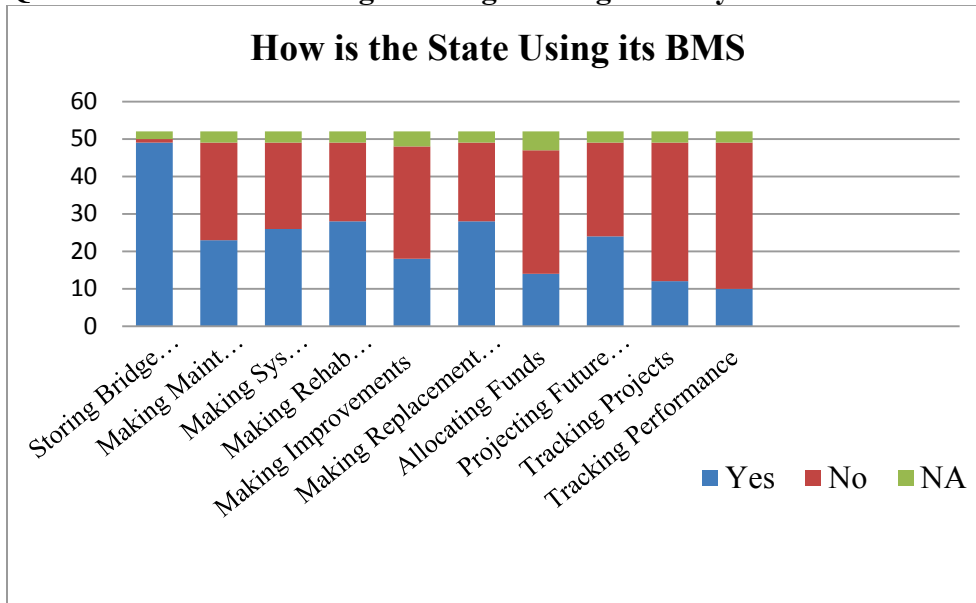
practices/strategies. Share information regarding states that do use analytical software with those that do not.

**Q3. What software product(s) or method(s) or tool(s) does the State use to:**  
**e. None, please explain.**

**Findings.** Some Division Offices indicate that their states are having issues with using Pontis analytical software, only using Pontis for capturing inspection data (i.e. limited use of this product), or not having a BMS that meets the definition contained in the questionnaire.

**FHWA has identified the following focus areas:** Assist states that have issues with using Pontis analytical software, and or only using Pontis for capturing inspection information (i.e. limited use of this product). Share information regarding states use of Pontis beyond simply collecting inspection information. Assist States and or Division Offices which may not have a clear understanding of what a BMS is and is not.

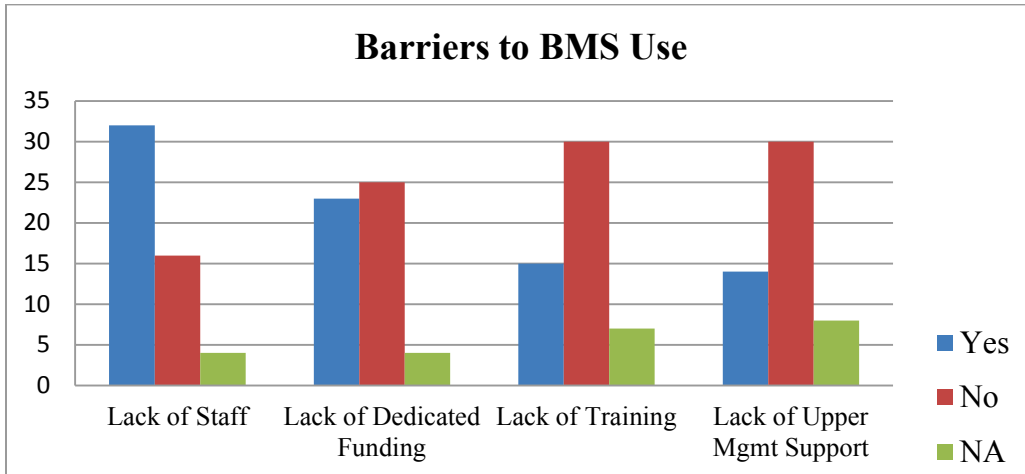
**Q4. How is the State using its bridge management system?**



**Findings.** Results in this graph indicate that Division Offices show that the majority of their states are using their BMS to store bridge information.

**FHWA has identified the following focus areas:** Assist states to use their BMS beyond simply storing bridge information.

**Q5. If the State is not using the full capability of a BMS for decision-support what are the barriers that need to be overcome to implement BMS use?**



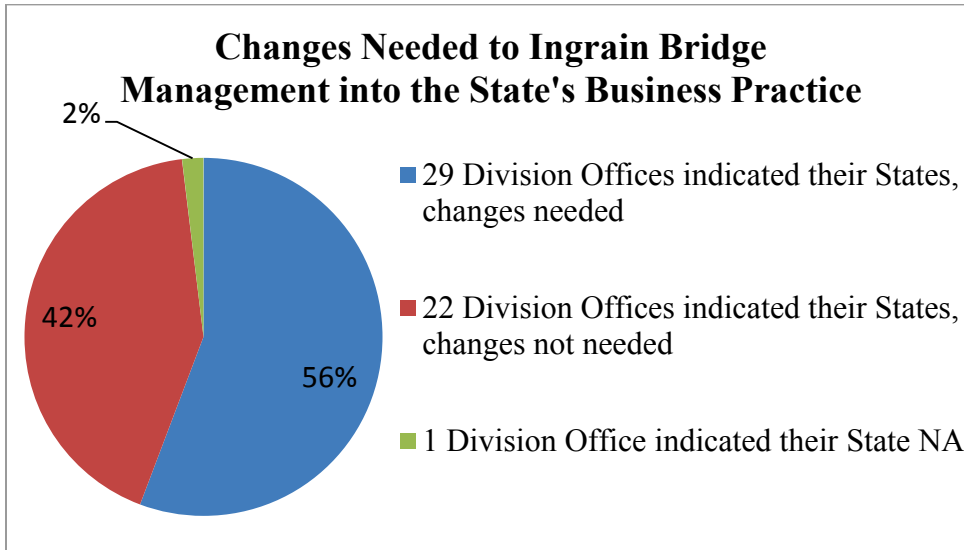
**Findings.** Results in this graph indicate that Division Offices show that in their states the majority feel that lack of staff is noted as a barrier that needs to be overcome to implement full BMS, followed by a lack of dedicated funding, followed by lack of training and lastly lack of support by upper management.

**FHWA has identified the following focus areas:** Assist states that lack upper management support, dedicated funding, appropriate staffing levels through discussions with management regarding the tangible benefits of a viable bridge management program. These discussions will translate into proportional funding and staffing of bridge management operations to levels which varies in proportion to the size and complexity of the agency’s bridge program.

**Q5. If the State is not using the full capability of a BMS for decision-support what are the barriers that need to be overcome to implement BMS use?**

**e. Other, please explain** In one State, they are “not convinced of the benefits from the effort”. In another State, finding the time to implement a BMS is an issue. While in still another State, it’s fully implemented. From one state’s perspective, on a national level, there is “still a need to use the worst first and Federal eligibility status is an issue”.

**Q6. Are changes needed to ingrain bridge management into the State’s business practice?**

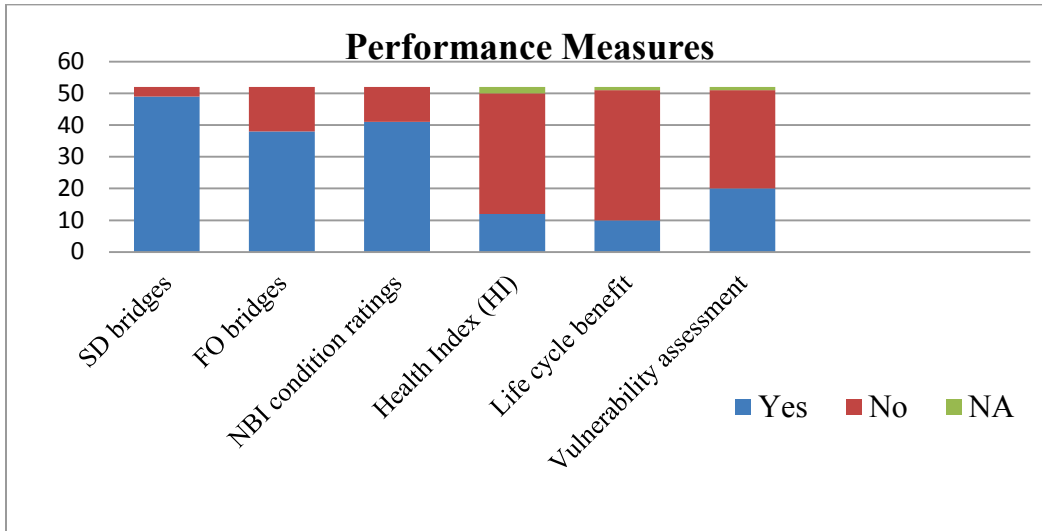


**Findings.** Results in this graph indicate that the majority of states changes are needed to ingrain bridge management into the state’s business practice. In one State, the Division Office indicated that the State has incorporated bridge management into their business practice.

If yes, what are the recommended changes: a) From one State, it relates to possible staff reorganization. Need to use BMS products so people can understand the benefits and gain confidence in the output; b) From another State, it would be helpful to have success stories from other DOTs that have implemented a BMS and can show positive, quantifiable results; c) From another State, State management and politicians need to set priorities based on bridge management systems rather than political will; d) From another State, educate the State on the benefits of long term planning rather than crisis management; e) From another State, there needs to be a commitment of funding of projects as recommended by a BMS and ability to convince upper management that the long term results are worth the staff requirements.

**FHWA has identified the following focus areas:** Promote assistance with changes that are needed to ingrain bridge management into the state’s business practice.

**Q7. What bridge-related performance measures are used by the State?**



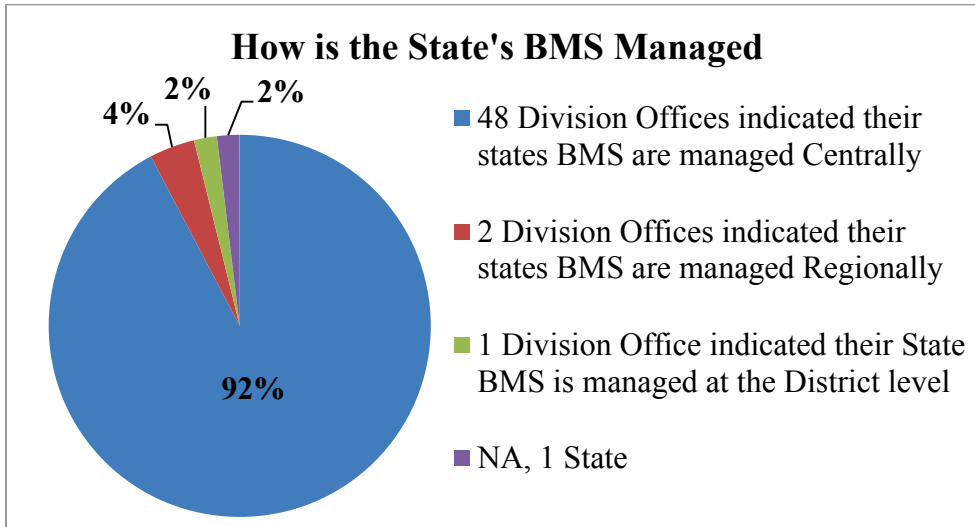
**Findings.** Results in this graph indicate that Division Offices show that their states use structurally deficient (SD) bridges as the primary bridge related performance measure, followed by NBI condition rating, then functionally obsolete (FO) bridges, then vulnerability assessment, then health index (HI) and lastly life cycle benefit.

A sampling of other performance measures include: a) deficiency ranking for each structure is created to measure bridge deficiency based on four levels of service (LOS); b) load posted and scour critical bridges; c) on-time bridge inspections and completion of preventative/reactive bridge maintenance.

**FHWA has identified the following focus areas:** Promote development of performance measures<sup>3</sup> that indicate viable bridge management programs and strategies associated with a successful program. Promote the use of less widely used performance measures such as HI, life cycle benefit, vulnerability assessment and levels of service.

**Q8. How is the State’s BMS managed, i.e. from a central office, district or regional office location?**

<sup>3</sup> Also, identifying activities to achieve network level objectives.



**Findings.** The results in this graph show that the majority of states are managed centrally.

**Q9. At what level(s) of the State organization are bridge project programming decisions made?**

**Findings.** States make bridge project programming decisions at a variety of levels: a) Central Office; b) Central and District; c) District; d) Chief Engineer; e) Chief Engineer and Director of Transportation; f) State Highway Commission; g) Commissioners Office etc.

**FHWA has identified the following focus areas:** Marketing the benefits of bridge management, promoting changes to a state’s business practices would in all likelihood be targeted to this audience, i.e. Chief Engineer, Director of Transportation, Commissioner, State Highway Commission etc..

**Q10. What information needed for decision-support is not currently supplied by the existing BMS?**

**Findings.** In general, lack of forecasting and modeling are factors for eleven states. The need for additional data in general is an issue in three states. Data quality is an issue in one State. Ability to analyze vulnerability and risk are factors in three states. Cost related data is an issue in seven states. Maintenance related data is an issue in one State.

**FHWA has identified the following focus areas:** Promote assistance from various means and sources with states related to deficiencies indicated in the general areas of a) forecasting and modeling; b) Data beyond what is currently collected along with data quality; c) Cost related data; d) Maintenance related data. For those items related to Pontis analytical software, assistance can be obtained via AASHTO through service unit support.

**Q11. How does the State incorporate risk<sup>4</sup> into bridge management decisions?** e.g. Type of risks may include increased / accelerated degradation of the system’s established performance level; Safety to the public; Scour; Seismic; etc..

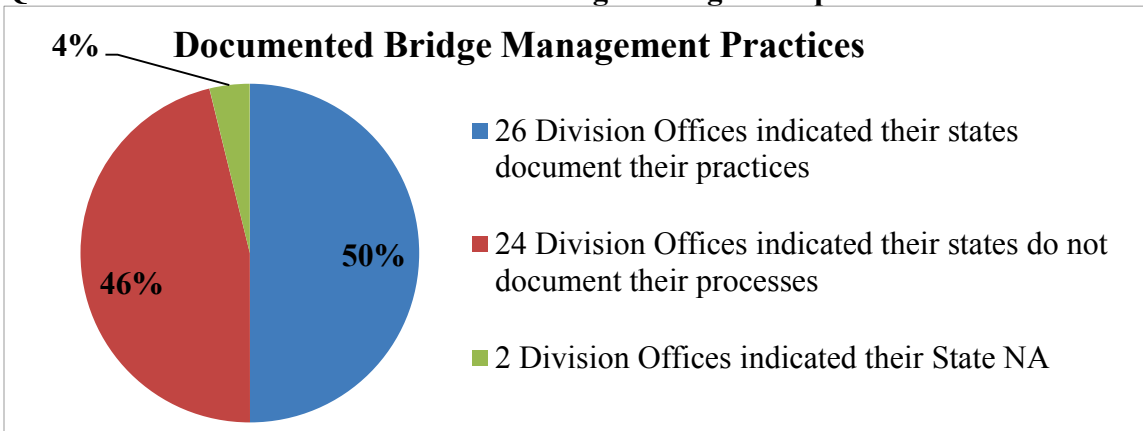


**Findings.** The majority of the states incorporate risk into the bridge management risk decision making. The evaluation of risk varied from State to State. For instance, in one State risk was measured and evaluated by creation of a State Deficiency Ranking System (DRS) whereas in another state risk is addressed on a case by case basis rather than a systematic analysis.

**FHWA has identified the following focus areas:** Promote inclusion of risk into the bridge management decision process for states not currently including it.

**II. Bridge Management Processes Documentation (Q12). This report section sought to understand whether or not State DOTs are documenting their processes.**

**Q12. Does the State have documented bridge management practices?**



**Findings.** From the results in this graph, roughly half the states have not documented bridge management practices.

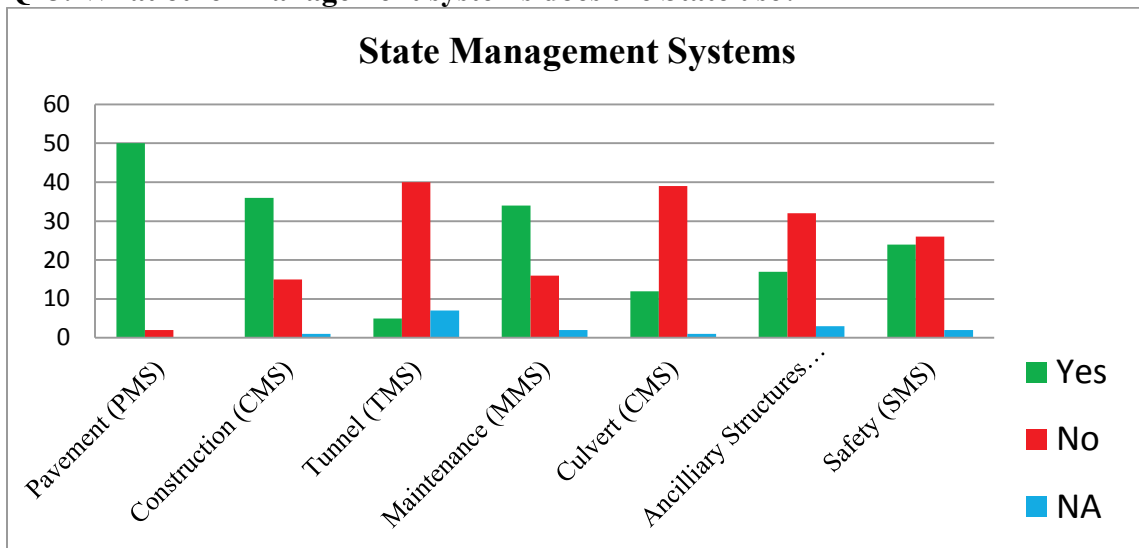
<sup>4</sup> **Risk** is a future event that may or may not occur and has a direct impact on the program to the program’s benefit or detriment. Events are the things that happen sometime in the future that will trigger your opportunity or threat. A risk is a *threat* if the effect is a detriment to your ability to deliver the Federal-aid highway program. A risk is an *opportunity* if it offers a benefit to your ability to deliver the Federal-aid highway program. Source: FHWA 2007 Guidance document.



**FHWA has identified the following focus areas:** Promote documentation of bridge management practices. Documentation can take differing forms from providing process maps, flow charts that document the processes to more narrative standard operating procedures. Documentation is not only for current but also for future employees. Having processes and procedures defined and documented can be helpful with succession planning at both the State and Federal level of government.

**III. Other Management Systems<sup>5</sup>(Q13 – Q14). This report section deals with trying to understand how the state’s management systems are tied together to interact with each other.**

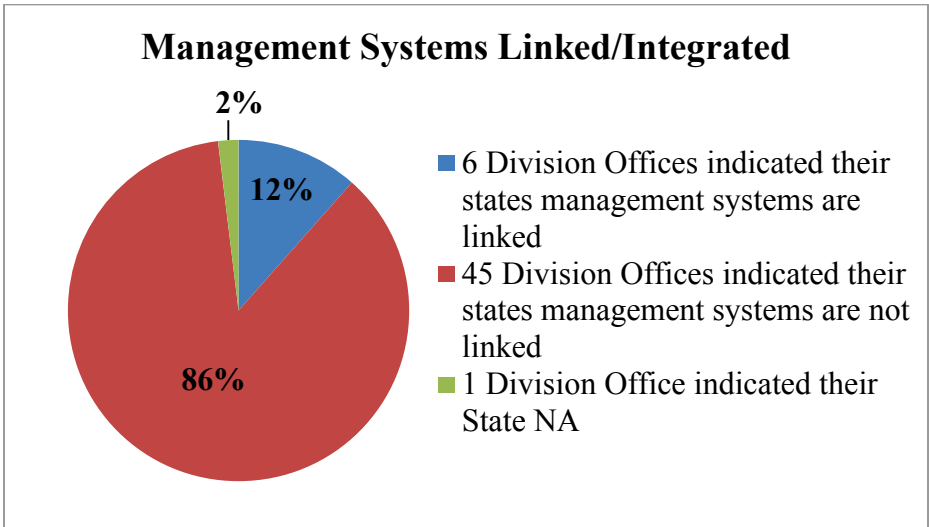
**Q13. What other management systems does the State use?**



**Findings.** Results in this graph indicate that Division Offices show that the majority of their states have pavement management systems. Other management systems for example include: Consolidated Projects Management System (CPMS) where all financial expenditures including State and Federal funded projects are tracked; financial management system; and congestion management system at the local level.

**Q14. Are the State’s other management systems linked/integrated (e.g. is the BMS linked to the maintenance management system (MMS) and vice versa)?**

<sup>5</sup> **Management system** means a systematic process, designed to assist decision makers in selecting cost effective strategies/actions to improve the efficiency and safety of, and protect the investment in the nation’s infrastructure. A management system includes: identification of performance measures; data collection and analysis; determination of needs; evaluation, and selection of appropriate strategies/actions to address the needs; evaluation of the effectiveness of the implemented strategies/actions. Source: 23 CFR 450.104 Definitions.

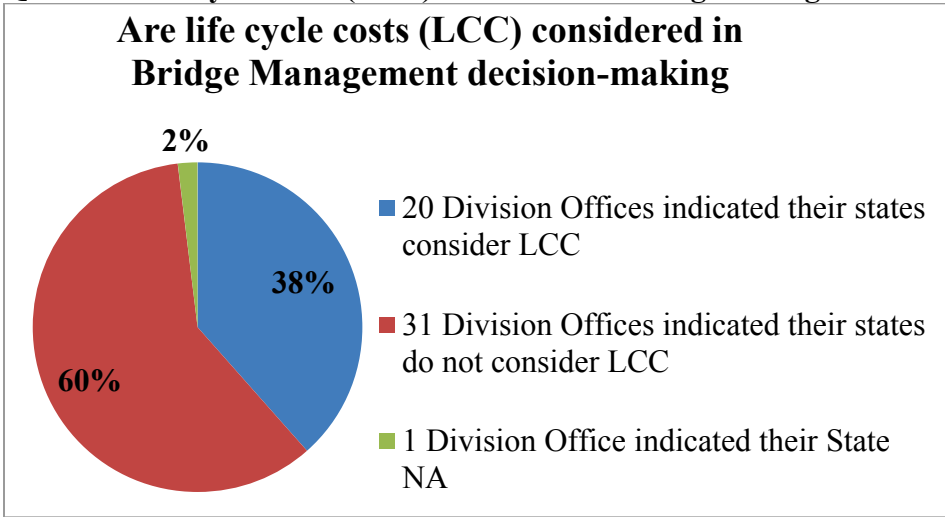


**Findings:** Results from this graph the majority of states do not have their management systems linked and or integrated. In one State, their BMS, PMS and MMS will be linked once they complete their BMS update.

**FHWA has identified the following focus areas:** Promote linkage of management systems by states not currently doing so. In Asset Management the goal is to move away from silos and become integrated across transportation infrastructure assets. Through management system linkage managers can use the linked information to more readily decide where to spend resources, and on what asset and to what extent.

**IV. Benefit Cost Analysis (BCA) and Life Cycle Cost Analysis (LCCA) (Q15 – Q16). This report section deals with trying to understand if the states use economic tools to assist in making long term economical decisions in the bridge management processes.**

**Q15. Are life cycle costs (LCC) considered in bridge management decision-making?**



**Findings.** Results from this graph indicate that a majority of states are not considering LCC in the bridge management decision making process.

**FHWA has identified the following focus areas:** Promote the use of economic analytical tools and procedures to include benefit cost analysis (BCA) and life cycle cost analysis (LCCA) in bridge management decision process. BCA and LCCA can be used to determine how bridge management decisions that return the best benefits at the least cost for bridge management activities. These tools can assist in making decisions in managing bridge performance and expectations from a project and network level. The focus is to apply preservation strategies to extend the life of bridges at the least life-cycle costs. Two trend needs were identified: a) support for economic analysis (i.e. how it's done and available tools, as well as case study examples), and b) data integration with other assets especially financial systems (provides the basis for better decision making).

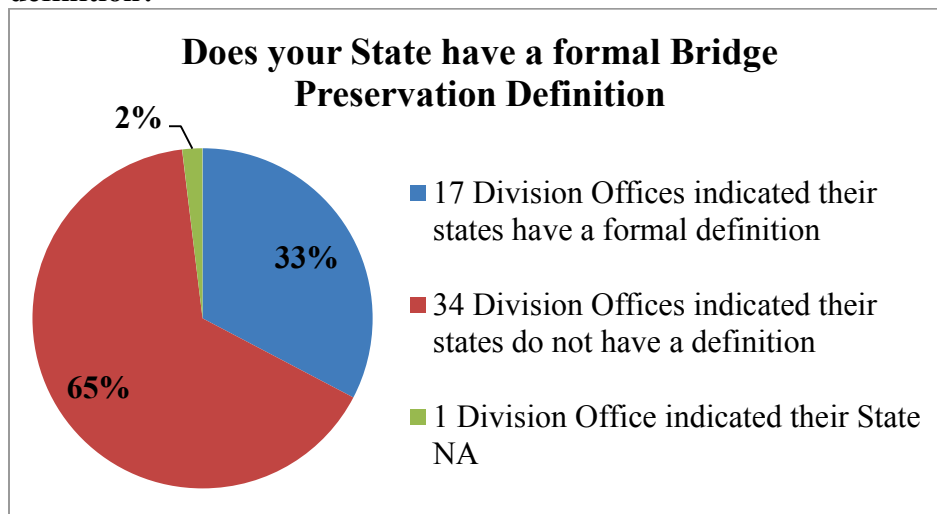
**Q16. How does the State optimize its budget with respect to prioritizing bridge preservation, rehabilitation, improvement (i.e. widening, raising, strengthening) and replacement projects?**

**Findings.** As reported by Division Offices, thirteen states (23%) indicated that they are not optimizing their budgets with respect to prioritizing bridge preservation, rehabilitation, improvement (i.e. widening, raising, strengthening) and replacement projects. Other states seemed to simply describe their programs of how decisions were made. These states did not seem to indicate that there was a formal process in place to optimize the budget across bridge preservation, rehabilitation, improvement and replacement projects.

**FHWA has identified the following focus areas:** Promote optimizing budgets with respect to prioritizing bridge preservation, rehabilitation, improvement (i.e. widening, raising, strengthening) and replacement project among states not currently doing this.

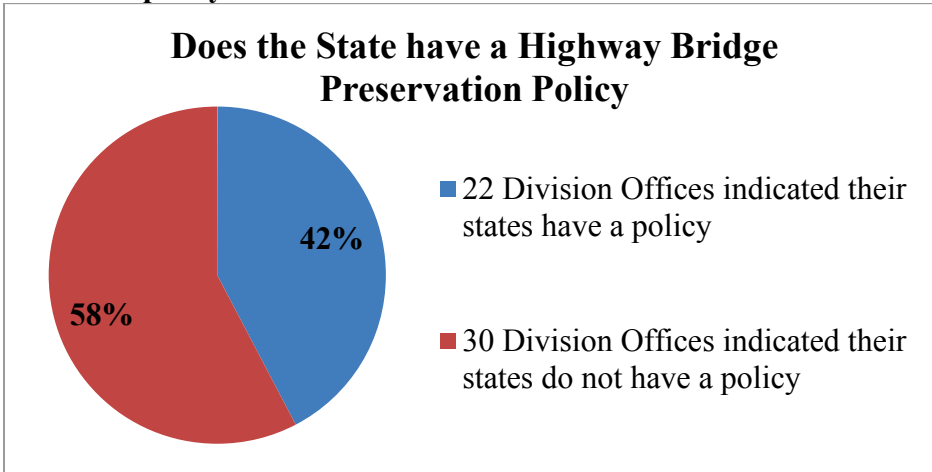
**V. State Bridge Preservation Policy (Q17 – Q18). This section of the report deals with trying to understand how states define preservation, is it a formal statutory definition and the kinds of activities that they consider are preservation. Also, does the State have a bridge preservation policy that sets goals and performance targets?**

**Q17. Does your State have a formal bridge preservation definition? If yes what is the definition?**



**Findings.** Results of this graph indicate that a majority of states do not have a definition. The majority of states that claim they have a definition seem to be more of the kinds of activities included in bridge preservation.

**Q18. Does the State have a highway bridge preservation<sup>6</sup> policy? If yes, please explain what that policy is.**



**Findings.** From the results of this graph Division Offices show that the majority of their states have a highway bridge preservation policy. The following is an example of a State that does have a policy. This State has a Fix-it-First philosophy, ensuring that all system preservation funding needs are met before budgeting for new transportation projects. The goal is to sustain the state’s bridges so at least 97% of all State-maintained bridges exceed the minimum threshold for General Appraisal (a rating system unique to this State that measures the structural conditions of bridges, as opposed to the Federal sufficiency rating which measures traffic volumes, geometrics and use along with structural condition).

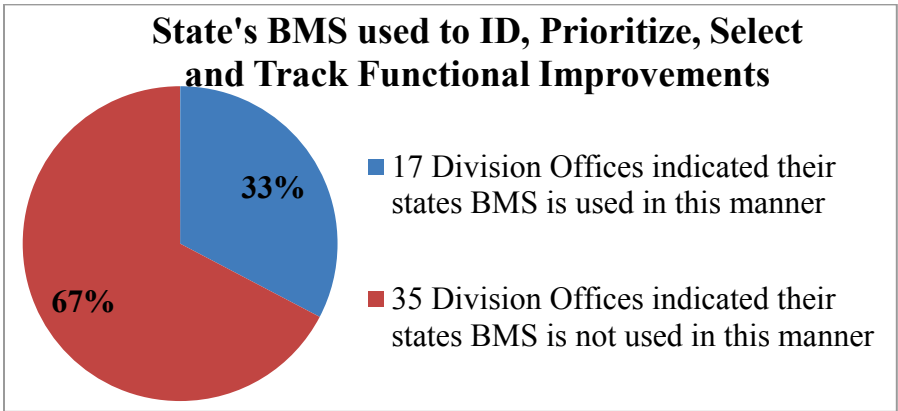
**FHWA has identified the following focus areas:** For states that do not have one, there is a need to develop a highway bridge preservation policy. This policy sets goals and performance targets.

**VI. State Bridge Functional Improvement Policy (Q19). This report section deals with the issue of functional improvements and whether or not the State has issued a policy dealing with this.** The NBI shows that roughly half of the bridges in the inventory are functionally obsolete.

**Q19. How is the State’s BMS used to identify, prioritize, select and track bridge functional improvements (widening, raising, strengthening,) for State projects?**

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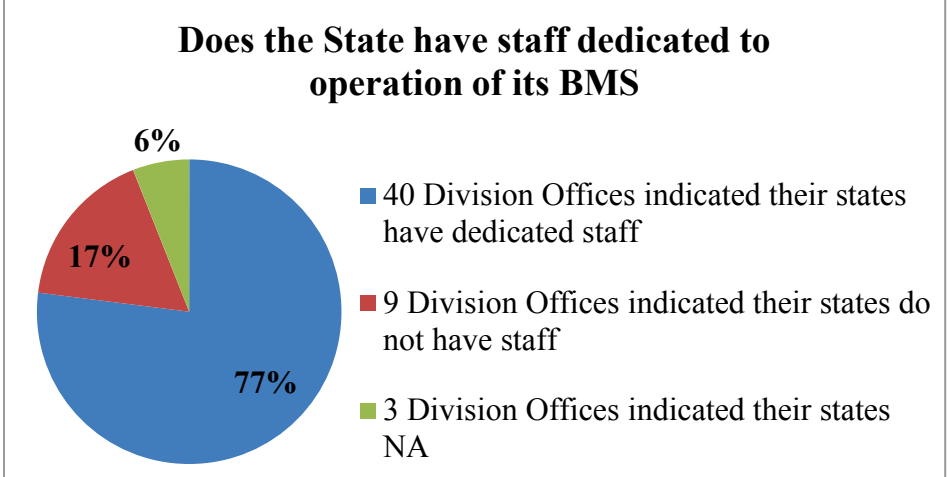
<sup>6</sup> **Bridge Preservation** consists of actions to deter or correct deterioration of a bridge to extend its useful (service) life; does not entail structural or operational improvement of an existing bridge beyond its originally designed strength or capacity. Source: Draft AASHTO definition.



**Findings.** From the results of this graph Division Offices show that the majority of their state's BMS is not used to identify, prioritize, select and track functional improvements.

**VII. Staffing Levels, Longevity, Training, Succession Plans (Q20 – Q22). This report section deals with the issue of staffing and does an agency have enough employees i.e. full time equivalents (FTE) to manage a viable bridge management program.**

**Q20. Does the State have staff dedicated to operation of its BMS?**



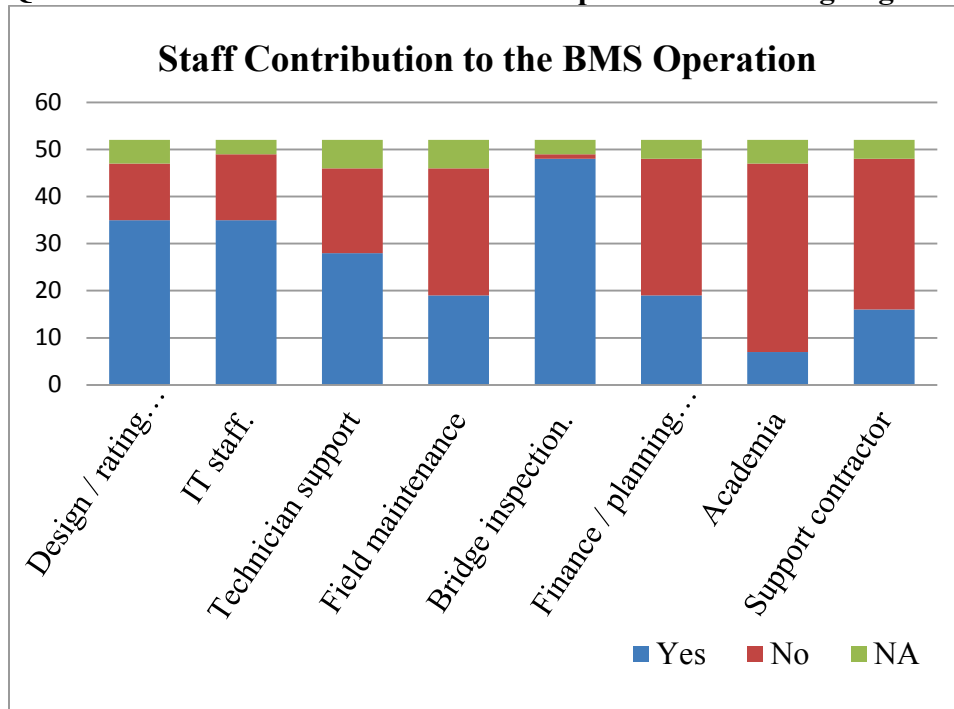
**Findings.** From the results of this graph Division Offices show that the majority of their states do have staff that are dedicated to operation of its BMS. Full time equivalents or FTEs range from .5 in Alaska and North Carolina to 14 in Tennessee with the majority of states with 1 or 2 FTEs.

**FHWA has identified the following focus areas:** Promote the practice of having appropriate staffing levels to operate a BMS. In general and depending on the size, scope and complexity of a bridge program, a State needs at least one, dedicated FTE for upkeep and operation of the analytical software. Using the broad definition on the cover, more than one person would be required beyond the analytical software.

**FHWA has identified the following focus areas:** Promote the practice of having a trained and experienced staff as well as succession planning which is tied directly in having processes documented (see Q12). While the question of longevity was not directly asked it

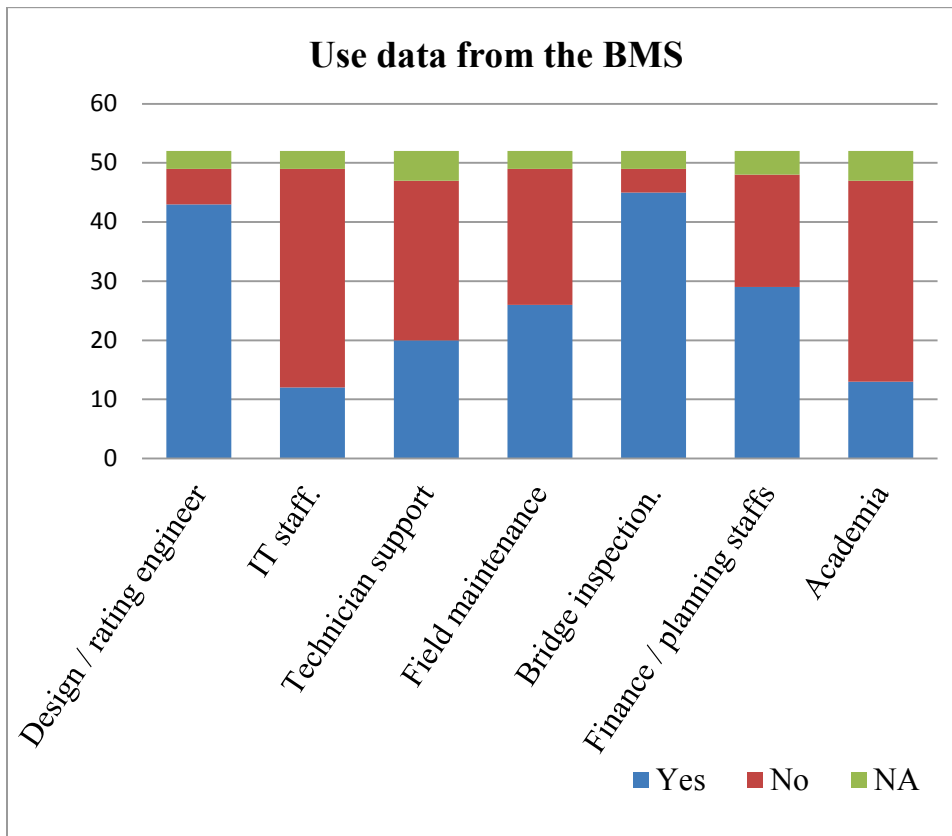
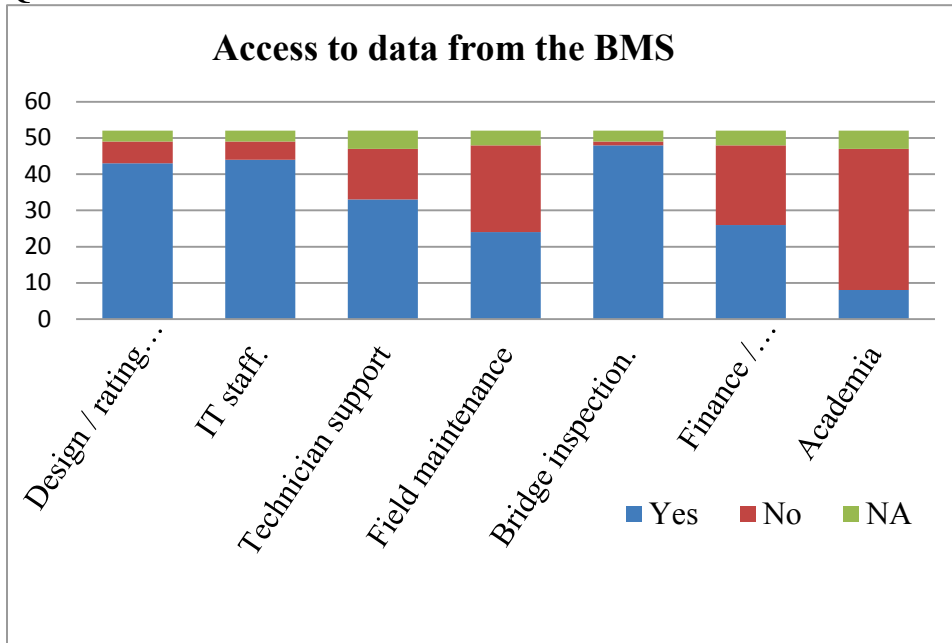
has to do with the extent of experience, have the staff been there awhile or are they fairly new? Also, regarding succession planning that is a tough issue at both the State and Federal levels, are agencies planning for staff turnovers for whatever reason (e.g. retirements, promotions etc...). Having processes documented through written procedures, SOPs, and process maps will provide information to give to new employees in the likely event of staff turnovers.

**Q21. Which staff contribute to the BMS operation on an ongoing basis?**



**Findings.** From the results of this graph Division Offices show their states use a variety of people that contribute to the BMS operation on an ongoing basis. The majority of which seem to be bridge inspection, followed by design/rating engineer, IT staff, technician support and so on.

**Q22. Who has access to and / or use data from the BMS?**



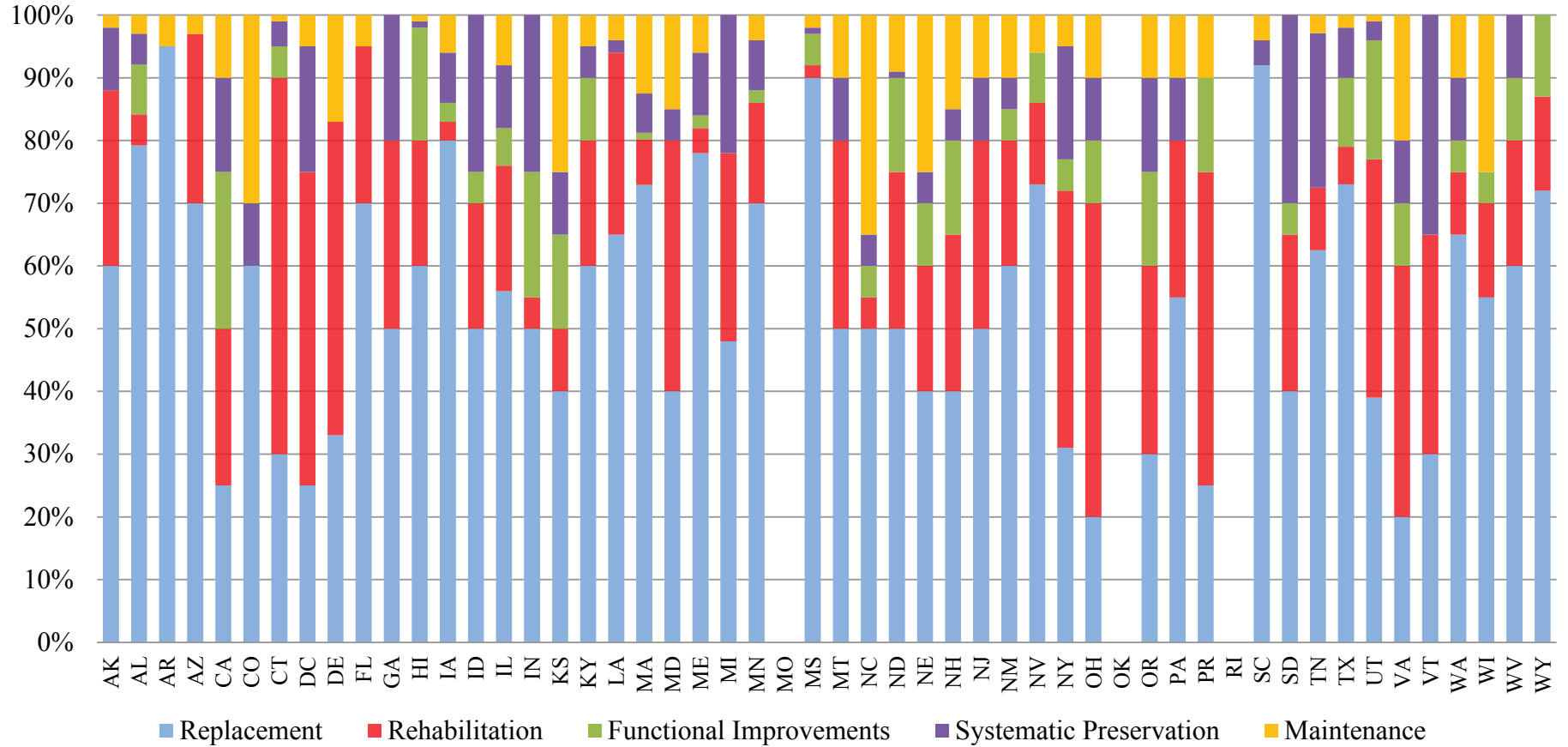
**Findings.** From the results of this graph Division Offices show their state's greatest users seem to be the bridge inspection staff, followed by design/rating engineers, then finance /planning staffs, then field maintenance. It is interesting to note who has access to and who uses data from the BMS.

**VIII. Bridge Funding (Q23).** This report section is about funding various aspects of the bridge program and how those funds are being spread across a spectrum of needs.

**Q23.** What approximate percentage of total annual bridge funding (from all sources) goes toward the following: a. Replacements, b. Rehabilitation, c. Functional Improvements, d. Systematic Preservation and e. Maintenance?



### Q23. Total Annual Bridge Funding



Notes:

1. CA: 75% of bridge fund spread over Replacement, Rehabilitation, & Functional Improvements.
2. FL: Do not separate Functional Improvements & Systematic Preservation from the others.
3. LA: Functional Improvements is included in Rehabilitation fund.
4. MT: Functional Improvements is included in Replacement fund.
5. MO: Unknown funding allocation across all activities.
6. OK: Funding allocation not available.
7. RI: No response.

**Findings.** Most agencies use the bulk of funds for bridge replacements ranging from 25% to 95%. The range for rehabilitation is from 0% to 75% and for functional improvements 0% to 75%. Systematic preservation ranges from 0% to 30% and lastly maintenance which runs from 0% to 30%.

**FHWA has identified the following focus areas:** For agencies showing zero or low percentages in the systematic preservation or maintenance categories may not be placing enough emphasis on preservation and maintenance which may also be indicative of using a worst first approach for bridge management, this being the case, promote moving away from the worst first approach and keeping good bridges good.

**IX. Identification and Prioritization of Bridge Needs.** This part of the report sought to address how an agency identifies and prioritizes bridge needs. If some sort bridge management system is not being used, just how does the agency manage this aspect of the bridge program? If a BMS is being used how effective is its use.

**Q24. If the State does not use a BMS as previously defined, how are bridge needs identified, prioritized, and tracked?**

**Findings.** As reported by Division Offices, eight states indicated that they work closely with the district office to coordinate work needed to be performed. For instance in one State, districts identify bridge needs and provide prioritized lists of bridge needs to the Central Office who prioritizes projects on a statewide basis. In another State, the data from the TMS is used to identify FO and SD bridges, work items, suggested rehabilitation or preventive candidates, etc. The districts and Central Office then use this data and more to identify and prioritize projects. The ongoing projects are tracked in other software packages such as bloodhound, SIMS, STIP data, Site Manager (Construction). In another State, the State uses a bridge priority list. In another State, all projects are selected and programmed by use of regional needs identification teams and then tracked through the FIIPS system.

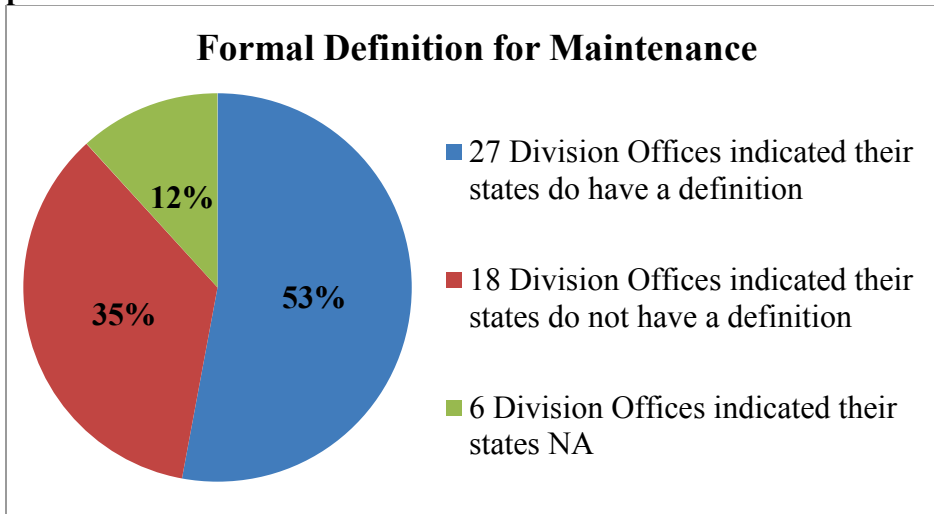
**Q25. How does the State prioritize the highway bridge needs in relation to other assets, such as pavement, roadside, etc.? In other words how do they juggle a high number of needs with limited funding?**

**Findings.** As reported by Division Offices, states have a variety of methods they use to prioritize highway bridge needs in relationship to other assets. One State uses the worst first approach. In another State, they have developed an Organizational Performance Index (OPI) which is used to rate the performance of various operations within the State there are four bridge related OPIs. Management distributes funds to districts based on the index measures to improve conditions. The OPI consists of 65 major performance indicators such as bridge and pavement conditions, operating costs, basic roadway appurtenances, personnel levels and so on. Each OPI measure has an acceptable level, each has a quarterly reporting process and each has broad institutional recognition. By meeting these OPI levels each quarter, all aspects of ODOT's operation will be performing acceptably. In another State, they provide a Prioritized Critical Bridge List (Structurally Deficient Bridges Only), Detailed Preservation Program List, Performance Measures (Number of Bridges in Good, Fair, Poor condition. In

another State, their Operations Planning Division works with the District Maintenance Engineers, Central Office Divisions and other stakeholders to prioritize the highway needs and allocate funds accordingly. This State places great emphasis on funding bridge and pavement needs to achieve desirable performance and service levels.

**X. Bridge Maintenance<sup>7</sup>(Q26 –Q29). This report section addresses bridge maintenance and the kinds of activities a State includes under bridge maintenance.** Some of the work is done with State forces some done under contract.

**Q26. What is your State’s formal definition of maintenance<sup>8</sup> and what types of work are considered maintenance? Also, what is considered routine and what is considered preservation?**



**Findings.** As reported by Division Offices a majority of states have a maintenance definition. One State defines maintenance as the preservation and upkeep of a structure, including all its appurtenances, in its original condition (or as subsequently improved). Maintenance includes any activity intended to maintain an existing condition or to prevent deterioration. The states that have an informal definition seem to reflect more of the kinds of activities included under bridge maintenance.

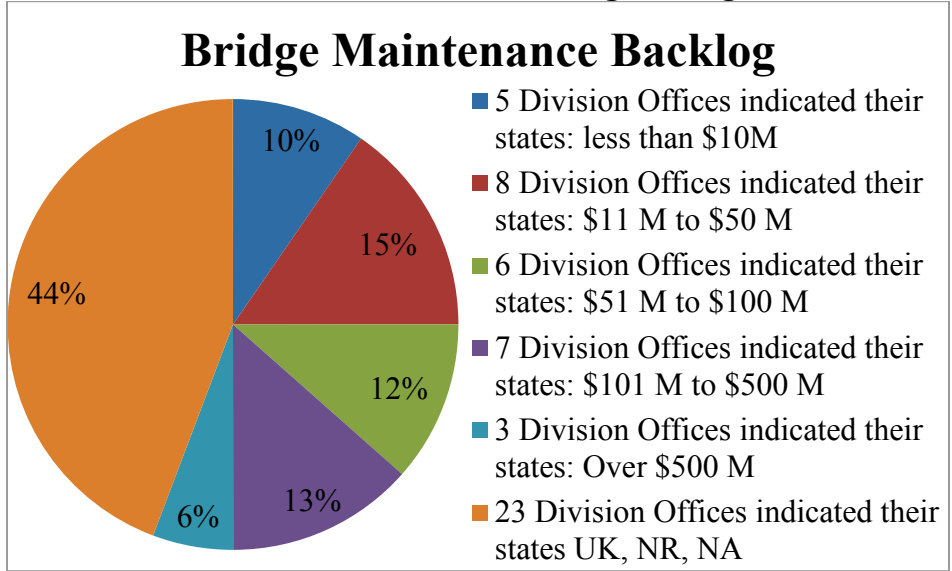
**Q27. What types of maintenance work are done by State forces and what types are performed under contract?**

**Findings.** As reported by Division Offices, two state’s maintenance work is done by contract. Other states do work by both State and contract forces. In general the more complex type maintenance work is done by contract forces. For instance in one State contract work includes, deck overlay, jacking bridge for bearing repair, repairing approach slabs, installing scour countermeasures, seismic upgrades, girder repair, etc.

<sup>7</sup> **Bridge Maintenance** has been defined as work performed to keep a facility in its current condition. Source: FHWA, Bridge Maintenance Training Manual.

<sup>8</sup> The Federal definition for the term “**maintenance**” means the **preservation** of the entire highway, including surface, shoulders, roadsides, **structures**, and such traffic-control devices as are necessary for safe and efficient utilization of the highway. Source: 23 U.S.C. 101(a)(14).

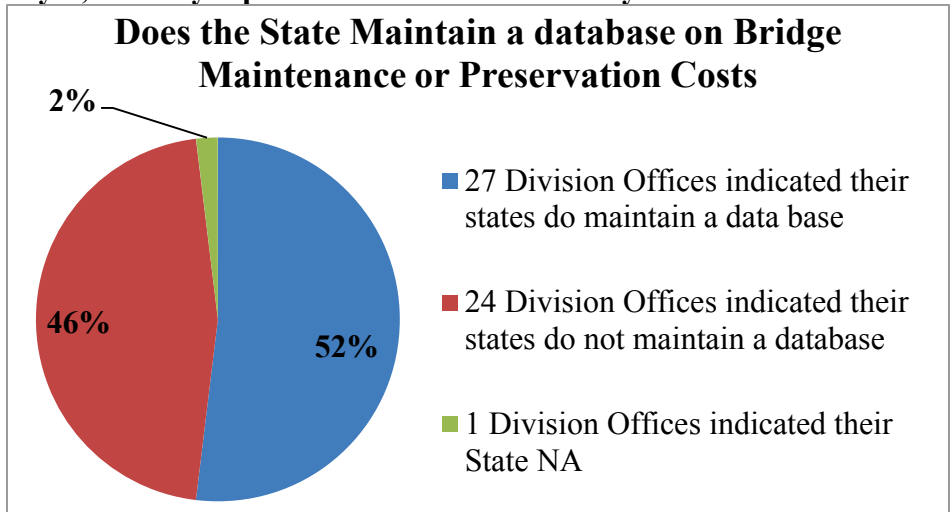
**Q28. In terms of dollars, what is the backlog of bridge maintenance?**



**Findings.** Most agencies have a bridge maintenance backlog ranging from none to billions of dollars. Some agencies do not know their backlog. For one agency that indicated billions of dollars, they are not spending any resources on preservation and maintenance. All of their funding goes toward replacements.

**FHWA has identified the following focus areas:** Promote knowing what the bridge maintenance backlog is important.

**Q29. Does the State maintain a database on bridge maintenance or preservation costs? If yes, are they separate data bases or are they the same?**

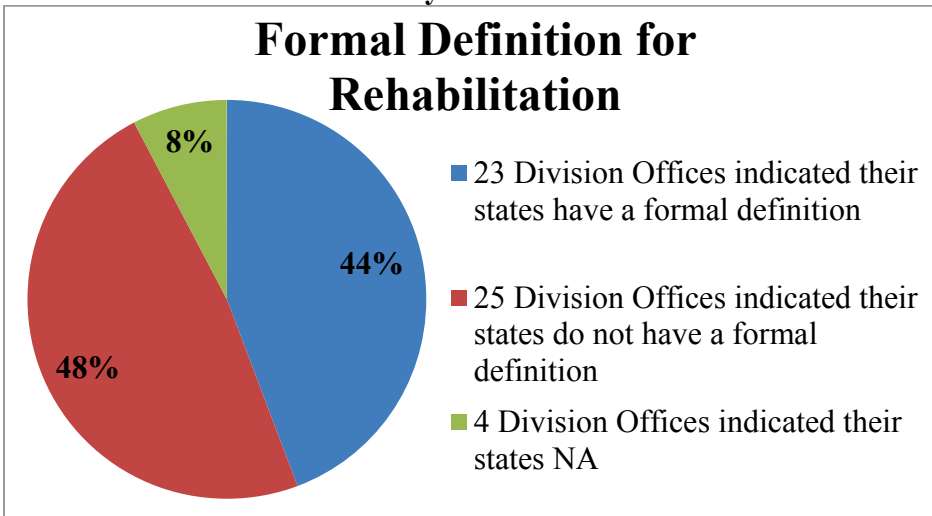


**Findings.** Most states maintain a database on bridge maintenance or preservation costs. The response on whether or not they were separate data bases was mixed.

**FHWA has identified the following focus areas:** Promote maintaining a database on bridge maintenance and preservation costs by bridge owners.

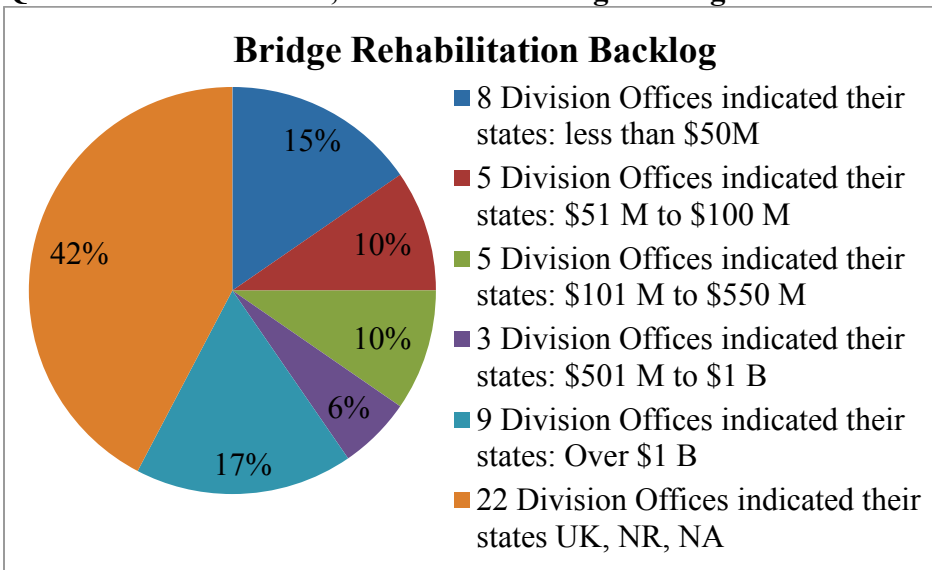
**XI. Bridge Rehabilitation (Q30 – Q31).** This report section sought to understand how the states define rehabilitation and what kinds of activities are included under rehabilitation. The Federal definition is footnoted below, however; the State in using State resources on this activity may define rehabilitation differently.

**Q30. What is your State’s formal definition of rehabilitation<sup>9</sup> and what types of work are considered rehabilitation by the State?**



**Findings.** Most states do not have a formal definition for bridge rehabilitation. The ones that have a formal definition seem to reflect more of the kinds of activities included under the category of bridge rehabilitation.

**Q31. In terms of dollars, what is the backlog of bridge rehabilitation needs?**



<sup>9</sup> The Federal definition for **Rehabilitation** is as follows. The major work required to restore the structural integrity of a bridge as well as work necessary to correct major safety defects. Source: 23 CFR 650.403(c)

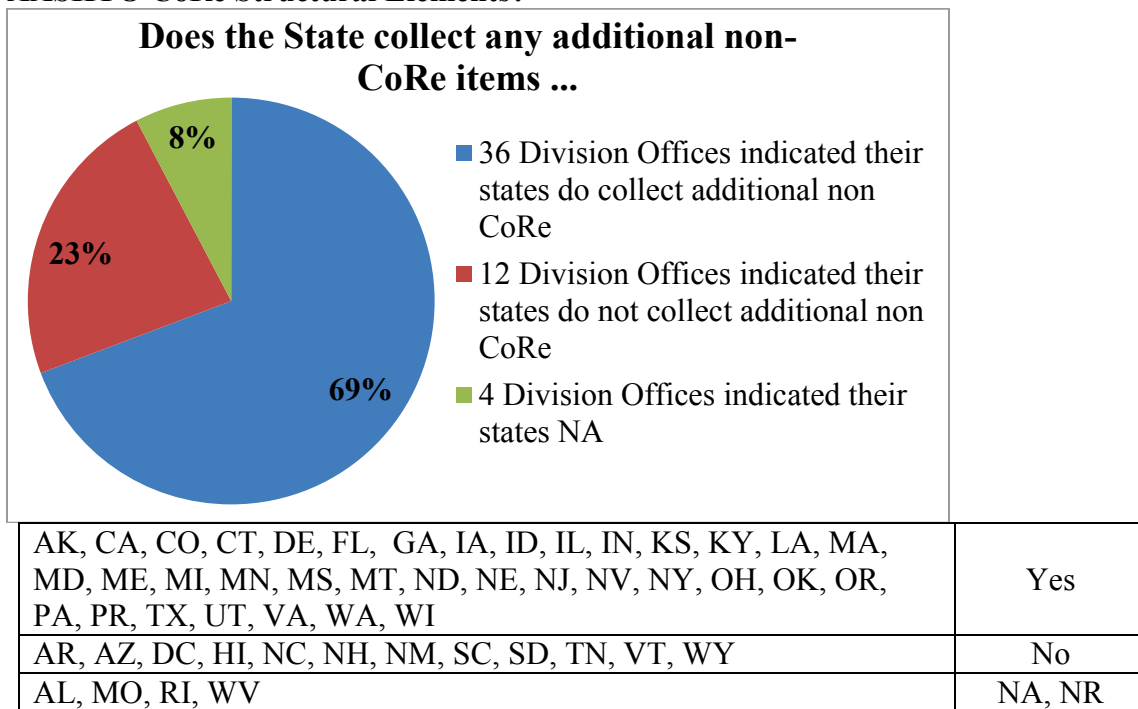
**Findings.** It appears that most agencies have a backlog of bridge rehabilitation needs ranging from \$28M to \$11B. A number of agencies do not know what their backlog of bridge rehabilitation needs are.

**FHWA has identified the following focus areas:** Promote knowing and tracking of the backlog of bridge rehabilitation needs.

**XII. Bridge Inspection and Element Level Inspection Data (Q32).** This report section deals with bridge inspection and element level inspection data which are a key component to any bridge management system that a State may be using and without which a BMS is not viable/possible.

Element level inspection data is much more granular than NBI data and thus more suited to bridge management. NBI data was originally conceived as part of a national bridge safety inspection program.

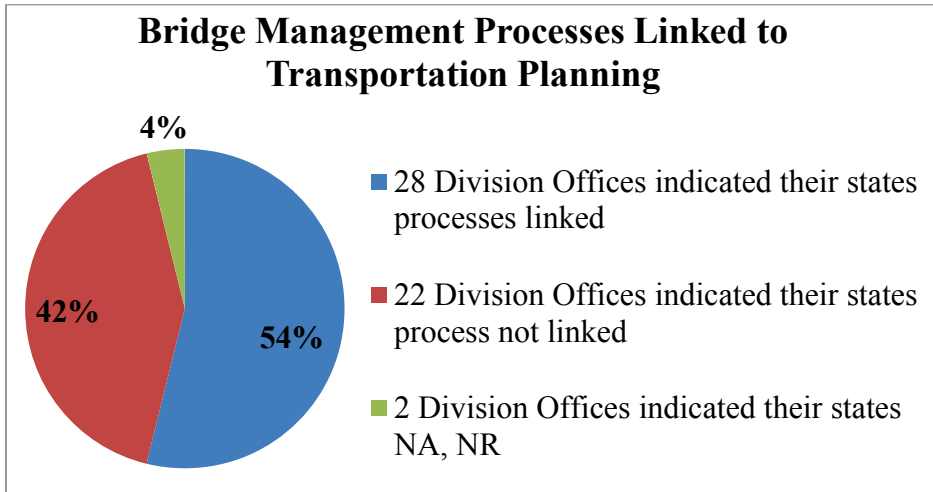
**Q32. Does the State collect any additional non-core items beyond the ones specified in AASHTO CoRe Structural Elements?**



**Findings.** A majority of states collect additional non-CoRe element items.

**XIII. Transportation Planning (Q33).** This report section deals with transportation planning in general and how bridge management is linked to transportation planning both in the short term and long term.

**Q33. Are the bridge management processes linked to transportation planning within the State?**



**Findings.** Results of this graph indicated that the majority of state’s bridge management processes are linked to transportation planning within the State. As far as how is the information derived from the state’s BMS used to prepare the states long range transportation plan (LRTP), only four states mention ties to the LRTP as well as the State transportation improvement program (STIP). While the twenty-eight states bridge management processes are linked to transportation planning only four of those states link to LRTP development.

**FHWA has identified the following focus areas:** Promote the widespread use of linking bridge management processes to transportation planning and LRTP development.

**XIV. Most noteworthy policy or procedure(s) (Q34). This part of the report deals with identification of noteworthy practices at the State as well as the Division Office (DO) levels.** Typically noteworthy policies or procedures are shared with other states who are always interested in learning what neighboring states practices and procedures are. The FHWA has been performing a series of Bridge Management Peer Exchanges since 2008 where noteworthy policy or procedures are shared.

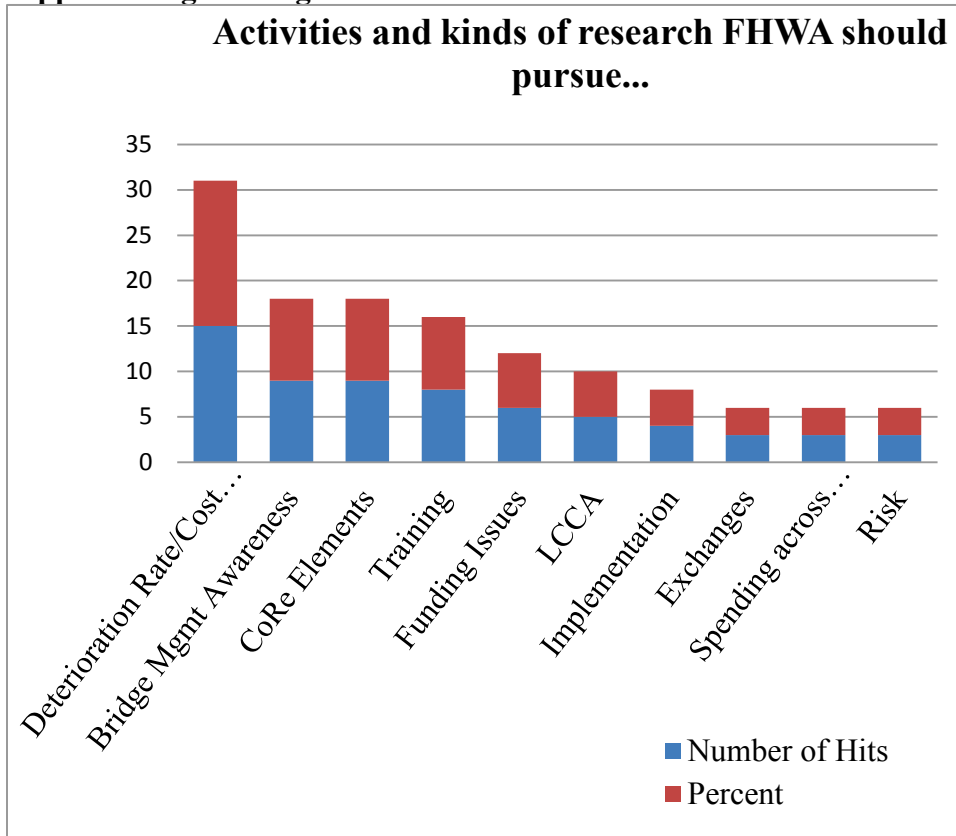
**Q34. What is the state’s most noteworthy policy or procedure(s) that enhances quality and improves effectiveness in performing bridge management?**

**Findings.** Without a viable bridge inspection program one cannot have a viable bridge management system. This being said, a number of noteworthy policies or procedures dealt with having good inspections, well trained inspectors, QA/QC procedures including visiting regional and local agency offices, collecting element level inspection data as well as a data base to house the data collected. A number of states are using in-house developed programs and procedures for ranking bridges, for instance one State uses a bridge deficiency ranking process; another State uses Pontis and a Priority Formula; another State uses a decision matrix spreadsheet system; another State is using a Post Pontis Optimizer; and another State uses a prioritization system tool to rank bridges. Another State performs a tour of candidate structures and another State does something similar with a field review by a review team to confirm bridges in need of work.

**XV. Bridge management issues for future resolution (Q35). In order to determine specific areas where technical assistance is required this part of the report sought to**

**understand areas of need not only at the State level but also the Division Office (DO) level.** Technical assistance could be in the form of National Highway Institute type training, webinar training, bridge management peer exchange participation, bridge management review or a national workshop.

**Q35. What types of activities as well as kinds of research should the FHWA pursue to support bridge management needs within the State?**



**Findings.** As reported by Division Offices, the preceding table presents the category of needs that were provided in response to Q35.

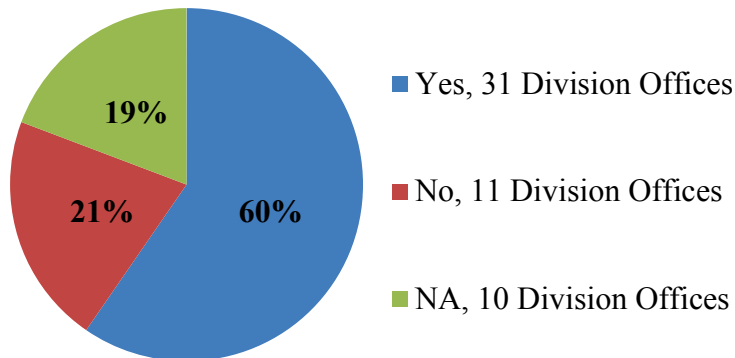
**FHWA has identified the following focus areas:** Pursue the following category of needs: a) bridge management awareness, effectiveness and BMS requirements; b) CoRe element training (moving to new NBEs); b) promoting LCCA, c) exchanges i.e. what other states are doing, best practices and d) case studies.

**XVI. FHWA Division Office Bridge Management (Q36 – Q38). The FHWA Division Offices are important to the success of the bridge management program.** This part of the report deals with the level and extent of DO support in promoting bridge management; supporting regional bridge management peer exchanges (BMPE) and work closely with their State DOT counterparts in the bridge management arena.

**Q36. Is the FHWA Division Office involved in the investment strategies being performed by the State DOT to improve the conditions and extend the service life of highway bridges?**



## Division Office Involvement in State Investment Strategies



**Findings.** The majority of Division Offices are involved in the investment strategies being implemented by the State DOTs.

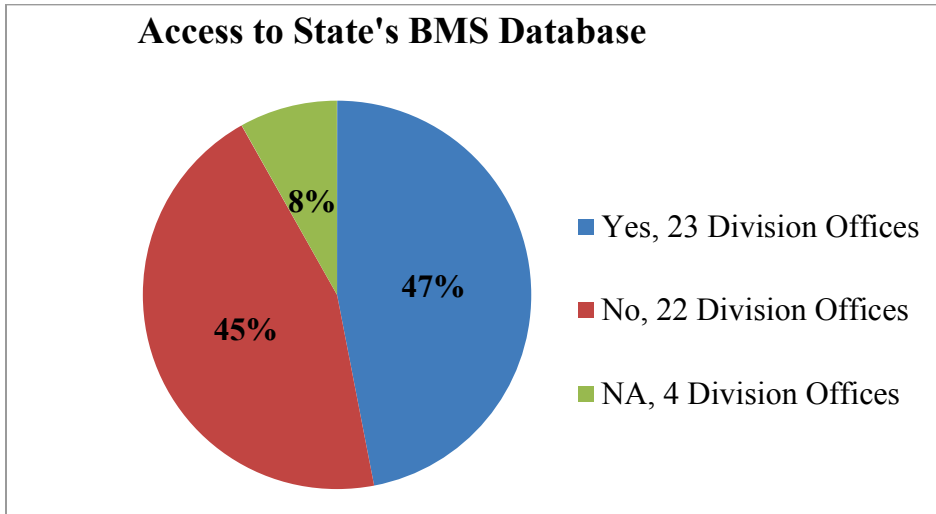
**FHWA has identified the following focus areas:** As stewards of the highway trust fund, the twenty-one division offices not actively engaged in State investment strategies need to become engaged. Update the FHWA Bridge Program Manual to reflect the approach and guidance to do this.

### **Q37. How is the FHWA Division Office promoting strategies to ensure wise investments within the highway bridge program?**

**Findings.** Division Offices provided wide and varied responses to this question. For example, Alaska and Massachusetts mentioned involvement in STIP process. For Delaware, Hawaii, and West Virginia discussed development of systematic preventive maintenance agreements while in Illinois they are trying to promote this. Adherence with Federal guidelines was mentioned for Arizona, California, Colorado, DC and Wisconsin. Promoting Pontis and or bridge management along with improving inspection data was described by Georgia, Iowa, Indiana, and Oklahoma. Promoting LCC was mentioned by Florida, Idaho, New Jersey, Ohio and Virginia. Kansas, indicated promoting quality inspection program. Technology transfer discussed in Alabama, Maryland and Minnesota. Performance measures mentioned in North Dakota and New Hampshire. Preventive maintenance review discussed in New York. Pennsylvania, indicated promoting preventive maintenance strategies. Texas, bridge management peer exchange involvement. Tennessee, mentioned alternative funding sources. In Maine, indicated investment strategies. In North Carolina, promoting development and implementation of preservation and rehabilitation strategies.

**FHWA has identified the following focus areas:** The Division Offices need to promote strategies to ensure wise investments of Federal funds. Update the FHWA Bridge Program Manual to reflect the approach and guidance to do this.

### **Q38. Does the FHWA Division Office have access to the State's BMS database?**



**Findings.** Roughly half of the Division Offices have access to their States BMS data base.

**FHWA has identified the following focus areas:** For the Division Offices that do not have access to states analytical database need to gain access even if only read only.

#### **XVIII. Technical Assistance.**

**State Bridge Management Processes.** Through Division Office response, a number of State bridge management processes were identified that could be shared with other states. For instance, assist states that are not using analytical software product(s) or method(s) or tool(s) to: a) to capture and store planned project information; b) to predict future deterioration of bridge elements; c) to identify preservation, maintenance, rehabilitation, improvement (i.e. widening, raising, strengthening) and replacement practices/strategies. The FHWA plans to share information on states use of analytical software beyond simply collecting inspection information with Division Offices and their states.

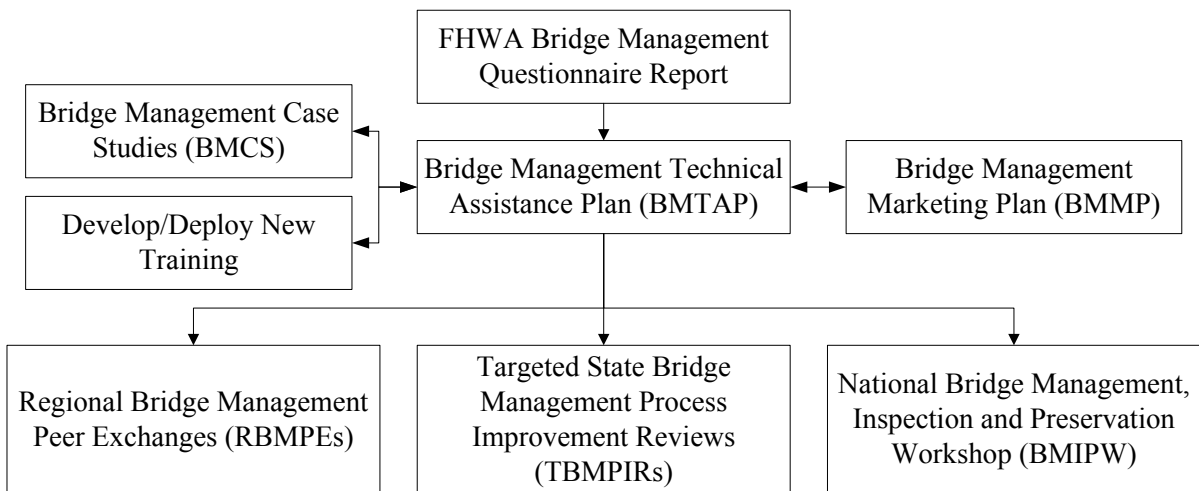
Also, assist states that lack upper management support, dedicated funding, appropriate staffing levels through discussions with management regarding the tangible benefits of a viable bridge management program. Coupled with this, promote assistance with changes that are needed to ingrain bridge management into the state's business practice. Marketing the benefits of bridge management, promoting changes to a state's business practices would in all likelihood be targeted to this audience, i.e. Chief Engineer, Director of Transportation, Commissioner, State Highway Commission etc. The FHWA plans to market bridge management to Division Offices and their states.

**Benefit Cost Analysis and Life Cycle Cost Analysis.** Some thirty-one Division Offices indicated that their states are not using life cycle costs in bridge management decision-making. The FHWA will promote the use of economic analytical tools and procedures to include benefit cost analysis (BCA) and life cycle cost analysis (LCCA) in bridge management decision process. The FHWA plans to share information on BCA and LCCA with Division Offices and their states.

**Bridge Management Issues for future resolution.** A number of Division Offices indicated that their states identified a number of needs. These were arbitrarily lumped in twenty-six distinct category of needs. Assistance was noted in a number of areas, however; the following general categories seem in line with the other assistance identified above to include: a) bridge management awareness, effectiveness, and bridge management requirements; b) Life cycle cost analysis; c) exchanges, what other states are doing; and d) case studies.

**Bridge Management Technical Assistance Plan.** The FHWA plans to conduct bridge management case studies, training, bridge management peer exchanges, bridge management process improvement reviews of select states, sponsor a National Bridge Management, Inspection and Preservation Workshop, lastly develop a bridge management marketing plan to address these issues subject to fiscal constraints.

The FHWA will provide assistance to the states through a Bridge Management Technical Assistance Plan (BMTAP) that will use the focus areas recommendations identified within this report to guide technical assistance and training activities via three primary venues (see figure below).



The BMTAP will include a bridge management marketing plan that will guide how various aspects of technical assistance will be provided. In general, the BMTAP will be accomplished through a three pronged approach: a) Regional Bridge Management Peer Exchanges (RBMPEs); b) Targeted Bridge Management Process Improvement Reviews (TBMPIRs) and c) National Bridge Management, Inspection and Preservation Workshop (BMIPW). For more detail please see figure shown below.

**Fiscal and Resource Constraints.** Because of fiscal constraints the BMTAP will be limited to the resources available. The BMMP, BMPEs and BMPIRs have no identified funding at this time. If funding is identified and provided, then the BMMP, RBMPEs and TBMPIRs can be accomplished. The NBMIP Workshop is partially funded and will require full funding otherwise the State DOTs and DOs will not be able to support and participate in the workshop.

		Bridge Mgmt Technical Assistance Plan					
		Internal Effort			External Effort		
Category	FHWA Focus Area	Bridge Mgmt Marketing Plan	Bridge Mgmt Case Studies	Develop and Deploy Training - **	Regional Bridge Mgmt Peer Exchanges	Targeted Bridge Mgmt Process Improvement Reviews -*	National Bridge Mgmt, Inspect, and Preservation Workshop
I. State Bridge Mgmt Processes	Q3b. Assist states that are not using analytical software product(s) or method(s) or tool(s) to capture and store planned project information.		X		X	X	
	Q3c. Assist states that are not using analytical software product(s) or method(s) or tool(s) to predict future deterioration of bridge elements.		X		X	X	
	Q3d. Assist states that are not using analytical software product(s) or method(s) or tool(s) to identify preservation, maintenance, rehabilitation, improvement (i.e. widening, raising, strengthening) and replacement practices/strategies.		X		X	X	
	Q3e. 1) Promote the use and understanding of what bridge management systems are and are not.	X	X		X	X	
	Q4. Assist states to use their BMS beyond simply storing bridge information.				X	X	
	Q5. Assist states that lack upper management support, dedicated funding, appropriate staffing levels through discussions with management regarding the tangible benefits of a viable bridge management program.	X					
	Q6. Promote assistance with changes that are needed to ingrain bridge management into the state's business practice.	X			X	X	X
	Q7. Promote development of performance measures that indicate viable bridge management programs and strategies associated with a successful program.				X	X	
	Q9. Marketing the benefits of bridge management, promoting changes to a state's business practices would in all likelihood be targeted to this audience, i.e. Chief Engineer, Director of Transportation, Commissioner, State Highway Commission etc	X					
	Q11. Promote inclusion of risk into the bridge management decision process for states not currently including it.					X	X
II. Bridge Mgmt Processes Documentation	Q12. Promote documentation of State bridge management practices.				X	X	
III. Other Mgmt Systems	Q14. Promote linkage of management systems by states not currently doing so.				X	X	X

		Bridge Mgmt Technical Assistance Plan					
		Internal Effort			External Effort		
Category	FHWA Focus Area	Bridge Mgmt Marketing Plan	Bridge Mgmt Case Studies	Develop and Deploy Training - **	Regional Bridge Mgmt Peer Exchanges	Targeted Bridge Mgmt Process Improvement Reviews -*	National Bridge Mgmt, Inspect, and Preservation Workshop
IV. BCA & LCCA	Q15. Promote the use of economic analytical tools and procedures to include benefit cost analysis (BCA) and life cycle cost analysis (LCCA) in bridge management decision process.		X	X	X	X	X
V. Bridge Preservation Policy	Q18. For states that do not have one, there is a need to develop a highway bridge preservation policy. This policy sets goals and performance targets				X	X	
VII. Staffing Levels...	Q20. Promote the practice of having appropriate staffing levels to operate a BMS.				X	X	
VII. ... Trng.	Q21. Promote the practice of having a trained and experienced staff as well as succession planning which is tied directly in having processes documented (see Q12).				X	X	
X. Maint	Q28. Promote knowing what the bridge maintenance backlog is important.	X			X	X	
X. Maint	Q29. Promote maintaining a database on bridge maintenance and preservation costs by bridge owners.		X		X	X	
XI. Rehab	Q31. Promote knowing and tracking of the backlog of bridge rehabilitation needs.				X	X	
XIII. Trans Planning	Q33. Promote the widespread use of linking bridge management processes to transportation planning and LRTP development.	X			X	X	
XV. Bridge Mgmt Issues for Future Resolution	Q35. Pursue the following category of needs: a) bridge management awareness, effectiveness and BMS requirements;	X		X	X	X	
	Q35. Pursue the following category of needs: b) CoRe element training (moving to new National Bridge Elements);			X			
	Q35. Pursue the following category of needs: c) promoting LCCA;	X		X	X	X	X
	Q35. Pursue the following category of needs: d) exchanges i.e. what other states are doing, best practices.				X		
	Q35. Pursue the following category of needs: d) case studies.		X				
<b>Footnotes:</b>		*- Targeted technical assistance primarily focused on states in most need of assistance from the FHWA.					
		**- Develop and deploy training either on-site or offsite via webinars.					

APPENDIX A  
Acronyms used within this Report

AASHTO – American Association of State Highway Transportation Officials  
ADOT–Arizona DOT  
ADT – average daily traffic  
ADTT– average daily truck traffic  
ABIMS – Alabama Bridge Information and Management System  
ABISS–Arizona Bridge Inspection Storage System  
ALDOT– Alabama DOT  
ASMS–ancillary structure management system  
BAMS – bridge analysis and monitoring system  
BCFS – bridge condition forecast system  
BDMS –bridge data management system  
BDR–bridge deficiency ranking  
BIMS –bridge inspection management system  
BIRIS – bridge inspection records information system  
BIS – bridge inspection system  
BME– bridge management elements  
BMPE–bridge management peer exchange  
BNAM–bridge needs assessment model  
BMS – bridge management system  
BMIS – bridge management and information system  
BMPE – bridge management peer exchange  
BMS–bridge management system  
BP – bridge preservation  
BPP – bridge preservation programs  
Bridgit–bridge information technology<sup>10</sup>  
BSA–bridge safety assurance (program)  
BROMS –Bridge Office Management System  
CANSYS – control section analysis system  
CDOT– Colorado DOT  
CEPO– capital expenditure and program office  
CIF– critical inspection finding  
CPMS – construction management system  
CPW– capital program worksheets  
CoRe – commonly recognized  
ConnDOT– Connecticut DOT  
DC–District of Columbia  
DCIS – design and construction information system  
DDOT–District of Columbia DOT  
DelDOT– Delaware DOT  
DO – Division Office  
DOT – Department of Transportation  
DRS–deficiency ranking system

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<sup>10</sup> This term came from NCHRP Project 12-28(2) A & B entitled BRIDGIT BMS

dTIMS – Deighton total infrastructure management system  
FAR– follow-up action required  
FDOT– Florida DOT  
FDT–funding distribution team  
FMIS– financial management information system  
FMS– financial management system  
FTE– full time equivalents  
FHWA– Federal Highway Administration  
FIIPS– financial integrated improvement program system  
FO – functionally obsolete  
4D– 4<sup>th</sup> Dimension  
GIS–global information system  
HI – health index  
HBP – Highway Bridge Program  
HDOT– Hawaii DOT  
HTTP– hyper text transfer protocol  
HQ–headquarters  
HSIS– Highway structure inventory system  
HTTP– hyper text transfer protocol  
IDIQ – indefinite delivery indefinite quantity  
IDOT–Illinois DOT  
IT – information technology  
FHWA – Federal Highway Administration  
FTE – full time equivalents  
KDOT– Kansas DOT  
LADOTD– Louisiana Department of Transportation Department  
LCCA – life cycle cost analysis  
LCB–life cycle benefit  
LCC–life cycle cost  
LOS – level of service  
LRTP – Long Range Transportation Plan  
MATS – maintenance asset tracking system  
MBC – maintenance by contract  
MDOT–Mississippi DOT  
MDSHA–Maryland State Highway Agency  
MDT–Montana transportation  
MMS– maintenance management system  
MODOT–Missouri DOT  
MOF–maintenance and operations first  
MPO – metropolitan planning organization  
MRR–maintenance, repair, rehabilitation  
NA – not applicable  
NBI–National Bridge Inventory  
NBIAS–National Bridge Investment Analysis System  
NBIP – National Bridge Inspection Program  
NBIS – National Bridge Inspection Standards  
NCDOT– North Carolina DOT

NCHRP–National Cooperative Highway Research Project  
NDOT– Nevada DOT  
NDDOT–North Dakota DOT  
NHS– National Highway System  
ODOT–Oregon DOT  
OIG – Office of Inspector General  
OPI – organizational performance index  
OTC– Oregon Transportation Commission  
P3– performance programming process  
PE–professional engineer  
PHP– personal home page  
PLAT–project level analysis tool  
PM – preventive maintenance  
POA– plan of action  
PPMIS–project and program management information system  
PPMS– Program Planning Management System  
PPO–Post Pontis Optimizer  
PPRM– Program Project Resource Management  
PPS– program planning system  
PRHTA –Puerto Rico Highway Transportation Authority  
PSS – project scheduling system  
QA– quality assurance  
QC– quality control  
RIMS– Roadway Information Management System  
RMS–resource management system  
RPC–regional planning commission  
RSL – remaining service life  
RSMT – regional structures management team  
SAFE–structural adequacy functionality exposure.  
SBIS– state bridge inventory system  
SC–South Carolina  
SCC–self consolidating concrete  
SD – structurally deficient  
SF–square foot  
SHOPP – State Highway Operation Protection Plan  
SIIA–structural inspection inventory and analysis  
SIMS– STIP information management system  
SIIMS - Structure Inventory and Inspection Management System  
SIS – structural information system  
SPMS–scheduling project management system  
SQL – structure query language  
SR–sufficiency rating  
STA– State Transportation Agency  
STIP – State Transportation Improvement Program  
STRM – structure inventory mainframe system  
TC–traffic control  
T&I–technology and innovation



TDOT–Tennessee DOT  
TMS – transportation management system  
TOPS –tracking of projects program  
TRIMS– Tennessee roadway information management system  
TXDOT–Texas DOT  
UBIV– under bridge inspection vehicle  
UDOT–Utah DOT  
VDOT–Virginia DOT  
VAOT – Vermont Agency of Transportation  
WIGINS– wearable inspection grading inspection network system  
WisDOT–Wisconsin DOT

## APPENDIX B

September 16, 2009 ver

### Bridge Management Systems Questionnaire

#### Point(s) of Contact Information

1. Please provide your contact information (questionnaire respondent's name)\_\_\_\_\_
2. Has response been coordinated with the State?  **yes**,  **no** If yes, what is the name of the State DOT person contacted?\_\_\_\_\_

#### State Bridge Management Processes

3. What software product(s) or method(s) or tool(s) does the State use to:
  - a. Capture and store bridge inspection and condition information?
  - b. Capture and store planned project information?
  - c. Predict future deterioration of bridge elements?
  - d. Identify preservation, maintenance, rehabilitation, improvement (i.e. widening, raising, strengthening) and replacement practices/strategies?
  - e. None, please explain:\_\_\_\_\_
4. How is the State using its bridge management system<sup>11</sup> (BMS)?
  - a. Storing bridge information  **yes**,  **no**
  - b. Making maintenance recommendations  **yes**,  **no**
  - c. Making system preservation recommendations  **yes**,  **no**
  - d. Making rehabilitation recommendations  **yes**,  **no**
  - e. Making improvements (i.e. widening, raising, strengthening)  **yes**,  **no**
  - f. Making replacement recommendations  **yes**,  **no**
  - g. Allocating funds  **yes**,  **no**
  - h. Projecting future conditions  **yes**,  **no**
  - i. Tracking projects  **yes**,  **no**
  - j. Tracking performance of preservation materials, techniques and strategies  **yes**,  **no**
  - k. Other (please specify the other uses of the State's BMS)\_\_\_\_\_
5. If the State is not using the full capability of a BMS for decision-support what are the barriers that need to be overcome to implement BMS use?
  - a. Lack of staff  **yes**,  **no**
  - b. Lack of dedicated funding  **yes**,  **no**
  - c. Lack of training  **yes**,  **no**
  - d. Lack of support by upper management  **yes**,  **no**
  - e. Other, please explain\_\_\_\_\_.

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<sup>11</sup> A **BMS** is defined as formal procedures and methods for gathering and analyzing bridge data for the purpose of predicting future bridge conditions, estimating network maintenance and improvement needs, determining optimal policies, and recommending projects and schedules within budget and policy constraints. A BMS includes a network-level computerized database and decision-support tool that supplies analyses and summaries of the data, uses models and algorithms to make predictions and recommendations, provides the means by which alternative policies and programs may be efficiently considered, and facilitates the ongoing collection, processing, and updating of necessary data. Source: AASHTO Guidelines for BMS, 1993.

6. Are changes needed to ingrain bridge management into the State's business practice?  **yes**,  **no**. If yes, what changes are recommended?
7. What bridge-related performance measures are used by the State?
  - a) Structurally deficient (SD) bridges  **yes**,  **no**
  - b) Functionally obsolete (FO) bridges  **yes**,  **no**
  - c) NBI condition ratings  **yes**,  **no**
  - d) Health Index (HI)  **yes**,  **no**
  - e) Life cycle benefit  **yes**,  **no**
  - f) Vulnerability assessment  **yes**,  **no**
  - g) Other, please explain \_\_\_\_\_.
  - h) Not applicable  **yes**
8. How is the State's BMS managed, i.e. from a central office, district or regional office location?  **central** ;  **regions**;  **districts**.
9. At what level(s) of the State organization are bridge project programming decisions made?
10. What information needed for decision-support is not currently supplied by the existing BMS?
11. How does the State incorporate risk<sup>12</sup> into bridge management decisions? *e.g. Type of risks may include increased / accelerated degradation of the system's established performance level; Safety to the public; Scour; Seismic; etc..*

### **Bridge Management Processes Documentation**

12. Does the State have documented bridge management practices?  **yes**,  **no**.

### **Other Management Systems<sup>13</sup>**

13. What other management systems does the State use?
  - a. Pavement (PMS)  **yes**,  **no**
  - b. Construction (CMS)  **yes**,  **no**
  - c. Tunnel (TMS)  **yes**,  **no**
  - d. Maintenance (MMS)  **yes**,  **no**
  - e. Culvert (CMS)  **yes**,  **no**

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<sup>12</sup> **Risk** is a future event that may or may not occur and has a direct impact on the program to the program's benefit or detriment. Events are the things that happen sometime in the future that will trigger your opportunity or threat. A risk is a *threat* if the effect is a detriment to your ability to deliver the Federal-aid highway program. A risk is an *opportunity* if it offers a benefit to your ability to deliver the Federal-aid highway program. Source: FHWA 2007 Guidance document.

<sup>13</sup> **Management system** means a systematic process, designed to assist decision makers in selecting cost effective strategies/actions to improve the efficiency and safety of, and protect the investment in the nation's infrastructure. A management system includes: identification of performance measures; data collection and analysis; determination of needs; evaluation, and selection of appropriate strategies/actions to address the needs; evaluation of the effectiveness of the implemented strategies/actions. Source: 23 CFR 450.104 Definitions.

- f. Ancillary Structures (ASMS)  **yes**,  **no**
- g. Safety (SMS)  **yes**,  **no**
- h. Other, please explain\_\_\_\_\_.

14. Are the State’s other management systems linked/integrated (e.g. is the BMS linked to the MMS and vice versa)?  **yes**,  **no**, If yes, please explain.

**Life Cycle Cost Analysis (LCCA)**

15. Are life cycle costs (LCC) considered in bridge management decision-making?  **yes**,  **no**

16. How does the State optimize its budget with respect to prioritizing bridge preservation, rehabilitation, improvement (i.e. widening, raising, strengthening) and replacement projects?

**State Bridge Preservation Policy**

17. Does your State have a formal bridge preservation definition?  **yes**,  **no** If yes what is the definition?

18. Does the State have a highway bridge preservation<sup>14</sup> policy?  **yes**,  **no**, If yes, please explain what that policy is.

**State Bridge Functional Improvement Policy**

19. How is the State’s BMS used to identify, prioritize, select and track bridge functional improvements (widening, raising, strengthening,) for State projects?

**Staffing Levels, Longevity, Training, Succession Plans**

20. Does the State have staff dedicated to operation of its BMS?  **yes**,  **no** If yes, in terms of full time equivalents (FTE), how many FTE would you estimate are dedicated to its bridge management operation?

21. Which staff contribute to the BMS operation on an ongoing basis?

- a. Design / rating engineer.  **yes**,  **no**
- b. IT staff.  **yes**,  **no**
- c. Technician support.  **yes**,  **no**
- d. Field maintenance.  **yes**,  **no**
- e. Bridge inspection.  **yes**,  **no**
- f. Finance / planning staffs.  **yes**,  **no**
- g. Academia.  **yes**,  **no**
- h. Support contractor  **yes**,  **no**
- i. Other, please identify:\_\_\_\_\_

22. Who has access to and / or use data from the BMS?

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<sup>14</sup> **Bridge Preservation** consists of actions to deter or correct deterioration of a bridge to extend its useful (service) life; does not entail structural or operational improvement of an existing bridge beyond its originally designed strength or capacity. Source: Draft AASHTO definition.

- a. Design / rating engineer. Access to  **yes**,  **no** ; use data  **yes**,  **no**
- b. IT staff. Access to  **yes**,  **no** ; use data  **yes**,  **no**
- c. Technician support. Access to  **yes**,  **no** ; use data  **yes**,  **no**
- d. Field maintenance. Access to  **yes**,  **no** ; use data  **yes**,  **no**
- e. Bridge inspection. Access to  **yes**,  **no** ; use data  **yes**,  **no**
- f. Finance / planning staffs. Access to  **yes**,  **no** ; use data  **yes**,  **no**
- g. Academia. Access to  **yes**,  **no** ; use data  **yes**,  **no**
- h. Other, please identify: \_\_\_\_\_

**Bridge Funding**

23. What approximate percentage of total annual bridge funding (from all sources) goes toward the following: (*Note: should total 100%*)
- a. \_\_\_\_\_ Bridge Replacements
  - b. \_\_\_\_\_ Bridge Rehabilitation
  - c. \_\_\_\_\_ Functional Improvements (widening, raising, strengthening)
  - d. \_\_\_\_\_ Systematic Preservation
  - e. \_\_\_\_\_ Maintenance

**Identification and Prioritization of Bridge Needs**

24. If the State does not use a BMS as previously defined, how are bridge needs identified, prioritized, and tracked?
25. How does the State prioritize the highway bridge needs in relation to other assets, such as pavement, roadside, etc.? In other words how do they juggle a high number of needs with limited funding?

**Bridge Maintenance<sup>15</sup>**

26. What is your State’s formal definition of maintenance<sup>16</sup> and what types of work are considered maintenance? Also, what is considered routine and what is considered preservation?
27. What types of maintenance work are done by State forces and what types are performed under contract?
28. In terms of dollars, what is the backlog of bridge maintenance?
29. Does the State maintain a database on bridge maintenance or preservation costs?  **yes**,  **no**, If yes, are they separate data bases or are they the same?

**Bridge Rehabilitation**

30. What is your State’s formal definition of rehabilitation<sup>17</sup> and what types of work are

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<sup>15</sup> **Bridge Maintenance** has been defined as work performed to keep a facility in its current condition. Source: FHWA, Bridge Maintenance Training Manual.

<sup>16</sup> The Federal definition for the term “**maintenance**” means the **preservation** of the entire highway, including surface, shoulders, roadsides, **structures**, and such traffic-control devices as are necessary for safe and efficient utilization of the highway. Source: 23 U.S.C. 101(a)(14).

<sup>17</sup> The Federal definition for **Rehabilitation** is as follows. The major work required to restore the structural integrity of a bridge as well as work necessary to correct major safety defects. Source: 23 CFR 650.403(c)

considered rehabilitation by the State?

31. In terms of dollars, what is the backlog of bridge rehabilitation needs?

**Bridge Inspection and Element Level Inspection Data**

32. Does the State collect any additional non-core items beyond the ones specified in AASHTO CoRe Structural Elements?  **yes**,  **no**.

**Transportation Planning**

33. Are the bridge management processes linked to transportation planning within the State?  
 **yes**,  **no**. If yes, how is the information derived from the state's BMS used to prepare the state's Long Range Transportation Plan (LRTP) and State Transportation Improvement Program (STIP)?

**Most noteworthy policy or procedure(s)**

34. What is the state's most noteworthy policy or procedure(s) that enhances quality and improves effectiveness in performing bridge management?

**Bridge management issues for future resolution**

35. What types of activities as well as kinds of research should the FHWA pursue to support bridge management needs within the State?

**FHWA Division Office Bridge Management**

36. Is the FHWA Division Office involved in the investment strategies being performed by the State DOT to improve the conditions and extend the service life of highway bridges?  
 **yes**,  **no**. If yes, please elaborate on the Division Office involvement.

37. How is the FHWA Division Office promoting strategies to ensure wise investments within the highway bridge program?

38. Does the FHWA Division Office have access to the State's BMS database?  **yes**,  **no**.