A Progress Report on

# Keeping Our Bridges Safe

January 2009

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## SUMMARY

Approximately a year has passed since MaineDOT published its report, "Keeping Our Bridges Safe." The report was requested by Governor John E. Baldacci by Executive Order and tasked MaineDOT with reviewing policies and processes related to bridge maintenance and capital actions. It is appropriate to issue an update regarding MaineDOT's progress toward the goals outlined in that report, and to discuss other activity.

Maine bridges are still safe. Additional funding provided by LD 2313 An Act to Keep Bridges Safe and Roads Passable, and implementation of the many recommendations contained in the original report, will continue to improve Maine bridge safety.

Over the next six months, MaineDOT intends to advertise $130 million worth of bridge work. It is well known that there are discussions in Congress concerning a stimulus bill, which would authorize substantial additional funding for immediate use for highway and bridge improvements. It is uncertain at this point how much funding may become available or if it will actually occur. However, LD2313 provided the early commitment to funding bridge improvements. The associated activity has positioned MaineDOT well to take advantage of additional funding, and many bridge projects have been identified that could be advertised within the likely constraints of the legislation.

By combining capital funding increases from LD2313 and possible stimulus money with the continued implementation of the report's other recommendations, MaineDOT will be able to continue to make overall improvements in the state's bridge inventory.

## INTRODUCTION

Approximately a year has passed since MaineDOT published its report, "Keeping Our Bridges Safe." The report was requested by Governor John E. Baldacci by Executive Order, and it tasked MaineDOT with reviewing policies and processes related to bridge maintenance and capital actions.

And in April, 2008, LD2313, An Act to Keep Bridges Safe and Roads Passable, was enacted by the Maine Legislature and signed into law by the Governor.

Accordingly, MaineDOT has prepared this report as an update to inform the public as to how the above actions have improved bridge safety in the State of Maine.

"Keeping Our Bridges Safe" contained 25 specific recommendations and this update addresses actions taken or planned on each. This update also contains additional information related to the increase in funding authorized by LD2313 and its impacts.

## PROGRESS ON RECOMMENDATIONS FROM "KEEPING OUR BRIDGES SAFE"

The following list of recommendations comes directly from the "Keeping Our Bridges Safe" report. Each is followed by a statement of "Complete" or a date of anticipated completion. For more detail on each, please see Appendix A.

**Inspection-Related Recommendations**

1. Complete Scour Plans of Action and implement the plans. November 2009

2. Evaluate tidal and unknown foundations in accordance with FHWA's pending guidelines. March 2011

3. Create statewide water-basin maps in order to evaluate critical bridges during high water events. Complete

4. Prioritize and implement scour countermeasures on critical routes. July 2010

5. Document at least one stream cross-section at each bridge for baseline comparison and iden tification of scour-susceptible bridges. November 2009

6. Review plans and other documentation of existing bridges and perform structural analysis as needed to identify all potentially problematic connections and fracture-critical members. 2012

7. Create schematics of the above connections and any fracture-critical members for ready ref erence in the bridge inspector's file for each bridge. 2012

8. Develop special written procedures for inspecting and monitoring critical members and connections. July 2009

9. Monitor and evaluate the research into new technologies and techniques for inspection and evaluation of connectors and fracture critical members, and implement them, if appropriate. Ongoing

10. Review the quality assurance procedures of the inspection and posting processes, information systems, and data gathering. Some parts complete, some ongoing.

11. Adopt a new posting policy. Complete

12. Improve documentation of bridge inspection policies and procedures. November 2009
13. Respond to upcoming changes in National Bridge Inspection Standards (NBIS) Quality Assurance (QA) procedures. November 2009

14. Develop guidelines for triggers requiring field review and load rating by a professional engineer. November 2009

15. Implement a 24-month inspection cycle in place of the current biennial cycle in order to more fully comply with federal standards. March 2009

16. Implement enhanced communication procedures for town bridges. Complete

**Maintenance and Operations-Related Procedures**

17. Continue to replace or repair overhead concrete structures that pose a hazard to the public. Ongoing

18. Focus maintenance attention on work that will reduce exposure to corrosive elements on critical structural members and connections, thereby extending service life. Ongoing

19. Work with the trucking industry on enabling legislation to allow enforceable photo/WIM technology on critical bridges where weight compliance is particularly necessary to ensure public safety. 2009

**Capital-Related Recommendations**

20. Repair or replace critical deteriorated bridges or components before they become a safety issue requiring a bridge to be closed or posted. Ongoing

21. Provide cathodic protection (a technique for steel protection using a sacrificial metal, there fore preserving the structure) for substructure units that are exposed to corrosive environments. 2009

22. Implement a technical career track for bridge designers, to provide an avenue for advancement without their having to leave their bridge design work to enter the management career ladder. Complete

23. Increase capital bridge funding $50 to $60 million per year (from approximately $70 million per year today), to between $120 to $130 million per year. Partial success

24. Continue reviewing MaineDOT's current bridge-related programming to ensure that bridge safety remains adequately considered. April 2008

25. Enhance bridge preservation actions to increase average bridge service life. Ongoing

## PROGRESS ON SCOUR RECOMMENDATIONS

Although scour recommendations and progress were mentioned in the above section, this subject is prominent enough to warrant additional discussion.

Scour is the single leading cause for bridge failure and was responsible for the two high-profile bridge failures over the last few years: Passaconway Bridge in York and Tucker Bridge in Moro Plantation. These bridges each sustained failure of a pier due to fast moving water removing material from under the foundation.

The Federal Highway Administration (FHWA) has issued a directive requiring states to establish scour Plans of Action (POA) for all bridges determined to be scour-critical. Aided in part by funding provided by LD 2313, MaineDOT has contracted with two consulting firms to provide these POAs, with an expected completion date of November 2009. This information will allow MaineDOT to proceed with programming capital improvements to minimize our exposure to this risk.

Continuous training for engineers is always important, and additional scour training is scheduled for February. This will be helpful for designers in their approach to identifying potential issues and designing appropriate countermeasures. Much national research is being conducted in this area, including updates to recurrence intervals of different-sized flood events and field verification of predicted scour for different analytical models.

*Tucker Bridge, Moro Plantation*

## PROGRAMMING UPDATE

One of the primary recommendations of "Keeping Our Bridges Safe" was an increase in capital funding. Using two different approaches to evaluating the historic adequacy of our funding, the report determined that our capital bridge programming needed to be increased by 70 to 85 percent.

The Maine Legislature acted on this recommendation and passed LD 2313, An Act to Keep Bridges Safe and Roads Passable in April of 2008. This bill provided an additional $40 million per year for four years, an increase in annual funding of more than 50%. The bill was accompanied by a list, prepared by MaineDOT, of proposed capital bridge projects. As more information has become available and more time has allowed further analysis of the bridge need, the list of proposed projects has been updated.

Twenty-five projects from that list were advanced by re-allocating preliminary engineering funds, to get a head start on using available construction money. All but three will be ready to be advertised by the end of June 2009, thus enabling MaineDOT to immediately use the additional funding at the beginning of the fiscal year. The remaining three projects are all large bridges and two will be advertised by the end of September 2009. Veterans Memorial Bridge between Portland and South Portland is a very large replacement project that is being expedited by using the design-build project-delivery process. This project will be ready for construction by the fall of 2009.

The availability of this funding has also made a positive impact on bridge safety in Maine by allowing us to react quickly to new information. A recent inspection of the New Mills Bridge in Gardiner using MaineDOT's underbridge crane discovered advanced deterioration. This bridge had been identified as a replacement candidate and preliminary engineering was ongoing. However, no construction money had yet been funded. The additional funding authorization and bonding capability provided by LD2313 allowed this bridge replacement to be fast-tracked, reducing the impacts to the traveling public.

In summary, the additional funding authorized for bridge improvements has already made a positive impact on bridge safety and has allowed MaineDOT to aggressively schedule bridge improvements into the near future.

| South side view | | Looking toward dam | |
|---|---|---|---|
| 2605 | Gardiner | New Mills | 10-17-2008 |

| Deck stringer bottom flange separated from web | | Knife edge web | |
|---|---|---|---|
| 2605 | Gardiner | New Mills | 10-17-2008 |

## POSTINGS AND CLOSURES

One of the expected positive impacts from the additional bridge funding is a reduction in bridge load-postings and closures. However, complete elimination of load restrictions or closings is not likely, nor desirable from a network planning perspective. There may be cases where a load-posting carries very little economic impact but will greatly extend the life of a low-traffic bridge. Considering the needs of the entire network may dictate that capital funds be directed elsewhere.

It is likely that these actions will decrease in the future due to system improvements from the additional funding. But overall postings may increase due to the new bridge posting policy. Historically, bridges have been posted due to deterioration and a reduction in carrying capacity. The new policy calls for posting a bridge according to its computed capacity, even without deterioration, if the design does not meet present standards.

Appendix B contains a spreadsheet detailing bridge postings or closures from 2005 to the present. There were three to five such actions per year.

# APPENDICES

# APPENDIX A

| | | Deliverables/Products: | Lead unit or Team: | Completion Date: | Resources Required: | Comments: |
|---|---|---|---|---|---|---|
| | *Inspection-Related Recommendations* | | | | | |
| 1 | **Complete *Scour Plans of Action* and implement the plans.** | 240+ Plans of Action need to be completed in accordance with FHWA guidance/ regulations. | Bridge Maintenance | November 2009 | Two consultants hired to complete effort | Implement the plans by programming the work in the BMAP or Work Plan, or through the Six-Year plan. In the interim, monitoring will be continued through the inspection program and documented on inspection reports. |
| 2 | **Evaluate tidal and unknown foundations in accordance with FHWA's guidelines.** | Awaiting guidance for tidal bridges. We will document our own procedures. Conduct document research to determine the unknown foundations. | Bridge Maintenance | Unknowns documented by March 2011 | Inspection and engineering resources plus consultants. | Many of the unknowns can be determined by records research and a site visit. The true unknowns are a much smaller number than what is presently shown in the system. |
| 3 | **Create statewide water-basin maps in order to evaluate critical bridges during high water events.** | Maps and plans | Bridge Maintenance | Complete | Internal GIS, planning map group | This is a matter of producing maps with the appropriate information so that closure decisions can be made expeditiously when a scour critical structure is involved during high water events. |
| 4 | **Prioritize and implement scour countermeasures on critical routes.** | BMAP, Work Plan, Six-Year Plan projects | Bridge Maintenance/ Planning | July 2010 | In-house resources | Identify critical routes and detours and identify scour - critical bridges on these routes. Plan capital investments to prioritize those countermeasures to assure safe travel on critical routes. |
| 5 | **Document at least one stream cross-section at each bridge for baseline comparison and identification of scour-susceptible bridges.** | Phase I – Scour-Critical - 11/09<br>Phase II-Unknown/tidal - 03/11<br>Phase III - Spread Footing - 2011<br>Phase IV – Pile-Supported - 2011 | Bridge Maintenance | November 2009 | Inspection Team/Dive Team/Survey Team N | /A |
| 6 | **Review plans and other documentation of existing bridges and perform structural analysis as needed to identify all potentially problematic connections and fracture-critical members.** | List of steel bridges that have details meeting the above criteria. B | ridge Program | 2012 | UMO grant application, Consultant, Bridge Maintenance, and Senior Structural Engineers | This is a long-term effort to identify steel bridges in the transportation inventory that have fracture-critical members and problematic connections such as poor fatigue details. |

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| 7 | **Create schematics of the above connections and any fracture-critical members for ready reference in the bridge inspector's file for each bridge.** | Schematics in Pontis. First generation pilot by December 2008. Reconfigure Pontis - Planning | Bridge Maintenance | 2012 | Detailers from Bridge Program, Planning | This effort will be accomplished concurrently with the previous effort to identify susceptible details on steel bridges. |
| 8 | **Develop special written procedures for inspecting and monitoring critical members and connections.** | Written procedures | Bridge Maintenance | July 2009 | Winter work with inspectors | This is part of an overall effort to document processes and procedures of inspecting bridges in conformance with NBIS. This is a concise document giving specific guidance to the inspection staff. |
| 9 | **Monitor and evaluate the research into new technologies and techniques for inspection and evaluation of connectors and fracture-critical members and implement them, if appropriate.** | Ongoing | Research | Ongoing | Dale Peabody G | rant application pending for bridge sensors. |
| 10 | **Review the quality assurance procedures of the inspection and posting processes, information systems, and data gathering.** | Written QA process for information/data | Planning | August 2009 | Internal | Inspection and posting processes QA/QC are covered by other recommendations. This is specific to data quality in our systems and reports. |
| 11 | **Adopt a new posting policy.** | New policy | Posting Committee | March 2008 | Posting Committee | N/A |
| 12 | **Improve documentation of bridge inspection policies and procedures.** | Bridge Inspection Manual | Bridge Maintenance | November 2009 | In-house resources requested | N/A |
| 13 | **Respond to upcoming changes in National Bridge Inspection Standards (NBIS) Quality Assurance (QA) procedures.** | QC/QA section in the Bridge Inspection Manual to be developed | Bridge Maintenance | November 2009 | In-house resources requested. | N/A |
| 14 | **Develop guidelines for triggers requiring field review and load rating by a professional engineer.** | Written guidelines to be included in Bridge Inspection Manual | Bridge Maintenance | November 2009 I | n-house resources | This should be accomplished in alignment with the bridge posting policies and guidance. This guidance is a major policy that will be reviewed and approved by the Chief Engineer. |

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| 15 | **Implement a 24-month inspection cycle in place of the current biennial cycle in order to more fully comply with federal standards. (For a description of MaineDOT's Bridge Inspection Program, see Appendix D.)** | Proposal to FHWA and approved by FHWA | Bridge Maintenance M | arch 2009 | In-house | N/A |
| 16 | **Implement enhanced communication procedures for town bridges.** | Implement letters procedure and develop Web site | Bridge Maintenance M | arch 2009 | In-house | N/A |
| 17 | **Continue to replace or repair overhead concrete structures that pose a hazard to the public.** | Ongoing BMAP, Work Plan and Six-Year Plan. Identify problematic structures | Bridge Maintenance | Ongoing | Bridge Maintenance crews and Highway Maintenance crews | N/A |
| 18 | **Focus maintenance attention on work that will reduce exposure to corrosive elements on critical structural members and connections, thereby extending service life.** | BMAP | Bridge Maintenance | Ongoing | Bridge Maintenance workforce | N/A |
| 19 | **Work with the trucking industry on enabling legislation to allow enforceable photo/WIM technology on critical bridges where weight compliance is particularly necessary to ensure public safety.** | Legislation drafted and enacted | Chief Engineer's office | April 2008 or next session I | n-house | N/A |
| 20 | **Repair or replace critical deteriorated bridges or components before they become a safety issue requiring a bridge to be closed or posted.** | Support ongoing budget requests, BMAP and Work Plan. | Department O | ngoing | In-house, legislative support N | /A |
| 21 | **Provide cathodic protection (a technique for steel protection using a sacrificial metal, therefore preserving the structure) for substructure units that are exposed to corrosive environments.** | Develop research program to determine candidates for cathodic protection and program where appropriate. | Research | 2009 | Research funding N | /A |

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| 22 | **Implement a technical career track for bridge designers to provide an avenue for advancement without their having to leave their bridge design work to enter the management career ladder.** | Completed. Two senior structural designers have been hired | Bridge Program | Done | N/A | N/A |
| 23 | **Increase capital bridge funding by $50 to $60 million per year (from approximately $70 million per year today) to between $120 to $130 million per year.** | Funding package | Legislature w/MaineDOT support N | /A | N/A | This is a major effort to acquire additional funding to "keep our bridges safe". |
| 24 | **Continue reviewing MaineDOT's current bridge-related programming to ensure that bridge safety remains adequately considered.** | Document work plan selection and priority process to insure safety is adequately considered. | Bridge Review Team A | pril 2008 I | n-house | First meeting held. |
| 25 | **Enhance bridge preservation actions to increase average bridge service life.** | Develop process to quantify bridge service life. B | ridge Team J | uly 2008 | In-house | N/A |

**APPENDIX B**

## Bridge Postings and Closings - 2005-2008

| Bridge # | Town | Name | Owner | Posting Mtg. | Recommendation |
|---|---|---|---|---|---|
| 203 | Freeport | Pritham's | State | 4/1/2005 | 3 Tons |
| 439 | Wilton | Canal St. | State | 8/16/2005 | 3 Tons |
| 3008 | Prospect- | Verona Waldo-Hancock | State | 10/17/2005 | restore legal loads w/ monitoring |
| 567 | Oakland | Emerson Stevens | State | 2/27/2006 | 10 Tons |
| 317 | Bridgton | Walkers Shop | State | 6/8/2006 | Close |
| 3626 | Patten | BARR Station | State | 11/15/2006 | 3 Tons |
| 463 | Ellsworth | Graham Lake Dam | State | 12/14/2006 | 20 Tons & one lane |
| 2023 | Willimantic | Arnold | State | 12/20/2006 | 16 Tons |
| 2594 | New Sharon | Muddy Brook | State | 3/20/2007 | Close |
| 6134 | Union | Fairgrounds | State | 6/9/2007 | 15 Tons |
| 978 | Bowdoin | Dead River | State | 8/20/2007 | 10 Tons |
| 259 | Gray | Knights | Town | 9/19/2007 | 10 Tons |
| 3312 | South Berwick | Varney's | State on private dam | 10/10/2007 | Close |
| 5052 | Portland | Veranda Street Overpass | State | 1/10/2008 | 15 Tons |
| 203 | Freeport | Pritham's | State | 2/8/2008 | Close |
| 2605 | Gardiner | New Mills | State | 10/21/08 | 10 Tons |

**Sorted by date of action**