waste
drinking water
aviation
levees

ports
transportation
bridges
waterways
roads
hazardous waste
rail

REPORT CARD FOR MAINE'S INFRASTRUCTURE

2016

dams
waste water
parks
schools
energy

ASCE
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/maine

November 28, 2016

Executive Summary

Civil engineering is a broad field dealing with the planning, design, construction, maintenance and management of infrastructure networks and the resulting safety of the public. Civil engineering includes power plants, electrical distribution, bridges, roads, railways, airports, structures, retaining walls, foundations, water supply & distribution, irrigation, sewer, flood control, waste management, transportation and the protection of the natural environment. The maintenance and improvement of Maine's infrastructure is vital to our economy, health, safety, security, and the environment. Decisions about infrastructure the public uses, which we all pay for through user fees and taxes, as well as private investments, need to be made based on long-term comprehensive planning, with sustainable and reliable funding sources.

As with the national Report Cards produced by ASCE, the purpose of this state Report Card is to raise public awareness of the importance of modern and well-maintained infrastructure. Our infrastructure cannot be taken for granted and requires on-going maintenance and continuous planning. We believe discussion of the issues detailed in this Report Card will lead to a greater understanding of the current and future needs of our state, prompting decision makers in our communities, the state legislature, and our congressional delegation to formulate policies and provide the necessary funding to address our infrastructure needs.

The 2016 Report Card on Maine's Infrastructure gave the state an overall grade of C-. Maine ASCE analyzed the following fundamental components of each infrastructure area: Existing Conditions, Capacity, Operations & Maintenance, Innovation & Resiliency, Public Safety, and Funding/Investment needs. Of the 14 categories, only two infrastructure categories are in good condition (B-), eight categories ranged in the fair to mediocre range (C+, C or C-), and four categories were considered to be in poor condition (D+ or D). Of more concern are the 8 areas that are showing a decline. The good news is there are solutions to all these challenges, and we can raise Maine's infrastructure grades.

Get the full story on the Report Card for Maine's Infrastructure
www.infrastructurereportcard.org/maine

Ask your elected leaders what they're doing to make sure your infrastructure is reliable for the future. Use your zip code to find your list of elected officials at www.infrastructurereportcard.org/take-action.

The Maine Section of the American Society of Civil Engineers (Maine Section ASCE) represents over 700 civil engineering professionals who live and work in Maine. As a public service to the residents of Maine, 32 ASCE infrastructure leaders and a team of industry experts volunteered hundreds of hours in 2016 to review publically available data and provide an overview of the state of infrastructure in Maine.

Email: ReportCard@asce.org

REPORT CARD FOR MAINE'S INFRASTRUCTURE

2016

OUR GRADES

Contaminated Site Remediation	Dams & Levees	Energy (Electricity)
C-	D+	B-
Municipal Drinking Water	Municipal Wastewater	PreK-12 Schools
C+	D+	C
Solid Waste	State Parks	Airports
C-	C+	C+
Bridges	Ports & Waterways	Passenger Transportation
C-	B-	D+
Railroads	Roads	
C	D	

Overall Grade: C-

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November 28, 2016

CONTAMINATED SITE REMEDIATION

Grade: C-

Overview

The U.S. Environmental Protection Agency (EPA) and the Maine Department of Environmental Protection (DEP) administer six programs that oversee contaminated site investigation, remediation, and redevelopment, including the EPA's Superfund Program. As of August 2016, Maine has 16 sites on the Superfund's National Priority List (NPL). Additionally, DEP maintains an on-going listing of sites that have required remediation in all the programs overseen by DEP and/or EPA. That listing has 155 active sites in need of resources, the majority of which are sites contaminated by fuel oil and kerosene and former municipal landfills that were closed (capped) but that require remediation of contamination related to past landfilling activities. Federal and state policies and programs to investigate, remediate, and redevelop sites have been adequate. Formulas for funding have improved, however, available funds are not enough to cover the cost of all sites requiring clean-up.

Background

The Maine Department of Environmental Protection (DEP) together with the Maine Legislature have developed regulations and passed laws intended to limit the potential for spills and mishandling of hazardous substances such that those substances will not pose a risk to human health or the environment. However, spills do continue to occur and past contamination continues to be discovered. Some former municipal landfills that were closed (capped) to meet the standards of the day still require remediation of contamination related to the past landfilling activities. DEP provides funds to municipalities (cost sharing) for the on-going remediation activities at these landfill sites. Collectively, the U.S. Environmental Protection Agency (EPA) and the Maine DEP administer six programs that oversee contaminated site investigation, remediation, and redevelopment:

- EPA's Superfund Program;
- DEP's Uncontrolled Sites Program;
- DEP's Petroleum Clean Up Program;
- DEP's Voluntary Response Action Program (VRAP);
- EPA's and DEP's Brownfields Programs; and
- DEP's Landfill Closure Program

DEP maintains an on-going listing of sites in Maine that have required remediation. The list includes sites in all phases of remediation, from investigation to remedy in place, and in all the programs overseen by DEP and/or EPA. As of August 16, 2016, the listing contained 2,339 sites of which 1,646 were listed as remediation activities completed. The remaining 693 sites are "active", of which 155 were listed as "in need" and awaiting resources.

Condition and Adequacy

EPA's Superfund: The federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) was enacted in 1980 to respond to the improper disposal of hazardous substances that occurred prior to the regulation of waste disposal, and it allows EPA to clean up sites and compel potentially responsible parties to perform cleanups or reimburse the government for EPA-led cleanups. It is commonly called the "Superfund" program because of the large trust fund established by the law to pay for the cleanup activities. As part of the program, the "dirtiest discovered" sites are placed on the EPA's National Priority List (NPL) after initial investigation indicates that federal involvement is warranted.

As of August 2016, 16 of the nation's 1,836 NPL sites are located in Maine. The Superfund law also requires the federal government to identify and address environmental problems from past activities at current and former military installations, even when the environmental issue is not eligible for the NPL. Three military installations - the former Brunswick Naval Air Station, the former Loring Air Force Base, and the Portsmouth Naval Shipyard - are included in the 16 Maine sites on the NPL.

The Superfund cleanup process is complex, with several distinct steps from discovery to cleanup to post-remedial-construction monitoring before removal from the NPL. The Federal Superfund law and subsequent amendments established an $8.5 billion national trust fund for investigation and cleanup of NPL sites. In 2014 EPA reviewed the Superfund program for inefficiencies with the objective of sustaining an effective program despite resource (funding) constraints.

DEP's Uncontrolled Sites Program: Maine's Uncontrolled Hazardous Substance Sites Program (Uncontrolled Sites Program) was created in 1983 and is Maine's equivalent of the federal Superfund program. The program was created in response to threats or potential threats to human health and the environment posed by abandoned hazardous waste sites not eligible for Federal NPL status (intervention by EPA is not deemed necessary and, therefore, Federal funds are not available). This Program's founding legislation authorizes DEP to issue orders to potentially responsible parties requiring them to conduct DEP-approved cleanup actions. If there are no viable potentially responsible parties, the legislation authorizes DEP to undertake necessary remedial actions. State-led remediation is funded through bonds.

DEP's Petroleum Clean-Up Program: Maine remains reliant on bulk liquid petroleum products for residential heat. Investigation and remediation of petroleum contamination is managed by DEP's Petroleum Clean-Up Program that was established in 1991. Sites contaminated by fuel oil and kerosene from home heating above-ground storage tanks accounted for approximately 72 percent of the sites referred for long-term clean-up activities in calendar year 2014, the latest year for which data is published. In 4 of the 5 years between 2010 and 2014, more new sites were listed than were removed (cleaned-up) from DEP's Petroleum Priorities List, resulting in a backlog of around 500 sites that remains relatively constant from year to year. DEP's Petroleum Priorities List includes only those petroleum-contaminated sites referred to DEP's Technical Services for long-term remediation and does not include the approximately 2,500 spills that DEP's Response Services address each year. Remediation of sites impacted by petroleum is funded by Maine Ground and Surface Waters Clean-up and Response Fund (Fund), which is discussed later.

According to the DEP, one of the largest challenges is how to reduce the number of new discharges of oil and their severity. Because the rules for underground oil storage have become more restrictive since the 1990s, the majority of oil storage and, therefore, spills now occur above ground rather than underground where the leak / discharge typically remains undetected for longer periods. As a result of rule changes, older non-corrosion resistant underground storage tanks are being removed or abandoned in place, and new storage is in above-ground tanks. Prompt response to above ground spills continues to be the key to minimization of damages and the associated clean-up costs. However, surficial spills still pose an imminent threat to or have resulted in contamination of private and public drinking water supplies, surface water and soil. Therefore, more restrictive rules for siting aboveground oil storage facilities were enacted in 2010 with the intent of limiting contamination of groundwater.

Voluntary Response Action Program (VRAP) and Brownfields Program: An unintended consequence of the Superfund law is that properties with an industrial past are assumed to have insurmountable environmental liability. By definition, brownfield sites are property, whose expansion, redevelopment, or reuse is impeded because of contamination, real or perceived. DEP cites the following benefits of brownfields redevelopment: the protection of public health and the environment through the cleanup of commercial and industrial properties; slowing urban sprawl by encouraging reuse of properties; the use of existing infrastructure; the increased tax revenues and creation of jobs; and the revitalization of declining commercial and industrial communities.

In 1993, Maine legislation established the Voluntary Response Action Program (VRAP) that allows and encourages applicants to voluntarily investigate and remediate properties to the DEP's standards in exchange for protections

from DEP enforcement actions, including the uncontrolled and petroleum priority sites discussed above. Remediation of many brownfield sites is through the VRAP process. Remediation of brownfield sites conducted with oversight of the VRAP process is privately funded, but can result in the release of environmental liability (to the extent allowed by the VRAP law). The VRAP incentive has been very successful in Maine (i.e., lenders for brownfield development often require VRAP approval as a condition of financing).

VRAP applicants often discover site-specific eligibility for partial reimbursement through the (petroleum clean-up) Fund due to contamination from an oil storage location on the brownfields site. In 2014, DEP noted that VRAP-petroleum-related reimbursements were down relative to prior years, thereby, decreasing the demand on the Fund. This is believed to be related to the economic downturn and related decline in development of brownfields sites, so demands on the Fund are anticipated to increase again as the economy improves.

While remediation under the VRAP process is primarily privately funded, the EPA does provide some funding for brownfield redevelopment through two competitive grant programs, primarily to benefit municipalities' focused on economic development. Both programs require DEP involvement through the VRAP process and impose additional requirements (e.g., assessment of redevelopment potential, etc.) and/or limitations (e.g., grant budget of $50,000 or less, achieve clean-up standards before development begins, etc.). As of August 16, 2016, 161 brownfield grant sites and an additional 764 VRAP sites have been remediated since the inception of the programs, which is a significant increase from 2012 (i.e., 87 brownfield grant sites and 607 VRAP sites). DEP's list of remediation sites (as of August 16, 2016) included 214 brownfield grant sites and an additional 162 VRAP sites where remediation work remains in progress.

Landfill Closure Program: In 1987, Maine enacted legislation that established a remediation and closure cost sharing program for municipal landfills. Since the program was established by the legislature in 1987, there have been numerous statutory changes made, with the most recent change occurring in 2015. The 2015 modification extended the DEP cost sharing for landfill closure-related costs until 2025. The goal was to continue to assist with remedial or corrective actions at landfills that contaminate, or threaten to contaminate groundwater that persisted at certain landfills after the landfills had been closed to the standards of the day. As of August 16, 2016, the remediation division's sites list included 420 landfill closure sites, of which 395 were listed as closed and of the remaining 25 active sites, 21 were listed as "in need" (awaiting resources).

Funding

DEP's Uncontrolled Sites Program is funded primarily through voter-approved bonds, with the last bond referendum for contaminated site clean-up predating 2005. Remediation under the VRAP process is primarily privately funded. The EPA provides some funding for brownfield redevelopment, most of which is through two competitive grant programs that primarily benefit municipalities' focused on economic development. EPA monies provided to Maine municipalities, regional planning and economic development organizations, and Tribal and State entities have totaled $72.2M between 1994 and July 2016.

Prior to 2013, funds for DEP's Landfill Closure Program had been a mix of voter-approved bonds and general fund appropriations. According to the DEP's website, Maine voters approved $77.3 million in bond funds for landfill closure and remediation since 1987. An additional $4.25 million in state general funds was also made available. Despite these monies, DEP was unable to reimburse municipalities for remedial activities they had approved for cost sharing. In 2013, the Maine Legislature imposed a fee on the disposal of construction and demolition debris (CDD) and the residue from the processing of CDD. Revenue from this fee (currently $2.00/ton) is to be used only for the state cost-share for closure and remediation of municipal landfills. Though there is a revenue source, many Maine municipalities still remain on a waiting list for reimbursement.

Based on 2015 legislation, the remediation of sites impacted by petroleum is funded by the Maine Ground and Surface Waters Clean-up and Response Fund (Fund). The 2015 legislation essentially combined two competing funds to better manage resources with allocations based on need rather than available money. The fund's income is derived from fees on the importation of petroleum into Maine, registration fees from oil storage facilities, fines, and

reimbursements (e.g., from potentially responsible parties). The main sources of revenue into the Fund are fees on each barrel of petroleum transferred into Maine by ship, road or rail. In 2015 the fees were increased to the following, the base fees are 3¢ per barrel of unrefined crude oil and liquid asphalt, 41¢ per barrel of gasoline, 22¢ per barrel of most other refined petroleum products and 7¢ per barrel of #6 fuel oil. Additionally, a surcharge of up to 20¢ per barrel of gasoline and up to 10¢ per barrel of other refined petroleum products is imposed when the balance in the Fund falls below $6 million dollars.

In 2008, the prior funding source risked insolvency as a result of an unusually large number of grossly contaminated sites undergoing remediation. Consequently, DEP implemented a variety of strategies to reduce expenditures, prioritize spending and control costs such as targeting removal of contaminated soils using health-based clean-up guidelines, and considerations for the reuse of properties. Likewise, regulations have been adopted that are intended to reduce spills and, therefore, the demand on the Fund. These include establishing more restrictive siting requirements for above ground petroleum storage and adopting additional spill prevention and control measures.

Summary and Conclusions

Established policies and programs at the federal and state levels provide guidelines and partial funding to investigate, remediate, and redevelop contaminated sites once they are discovered. In general, these policies and programs are adequate, but available funds are not enough to cover the cost of all sites requiring clean-up.

DEP's VRAP incentives together with Brownfields grants have been successful in revitalizing many communities throughout Maine. DEP made significant adjustments to the source and administration of the petroleum clean-up Fund and associated policies and programs to reduce the demand on the Fund. Legislation in 2015 realigned funding sources to achieve further efficiencies and sustainability based in part on changes to the means for petroleum importation into the State. These changes appear to be maintaining solvency of the Fund.

Limited funds are available for brownfield redevelopment and are currently limited to grants from EPA. Bond money has not been sought since before 2005 to support DEP's Uncontrolled Sites Program, although the clean-up of multiple sites is awaiting resources. DEP's cost-sharing program related to post-closure remediation of municipal landfills has been extended until 2025 and a funding source has been established though it is not adequate to meet current demands. Maine ASCE gives contaminated site remediation a grade of C-.

Recommendations

Maine ASCE makes the following recommendations:

- Continue to provide additional funding in the form of bonds for the "Fund" to ensure the multi-million dollar backlog of petroleum remediation projects are brought to successful closure;
- Continue to evaluate and revise regulations to achieve a balance of protection and workability, with the intent of reducing the need for these funds in the future;
- Determine the best use of available funds. This determination must be made by risk-based prioritization of identified sites in and across the multiple programs and through accountability;
- Shift focus from reactive to proactive, such as enforcing the preventative aspects of existing regulations;
- Consider a bond to pay municipalities for overdue cost-share reimbursements, with the landfill closure funding source used to repay the bond; and
- Continue to leverage EPA cost sharing opportunities for remediating sites in Maine.

Sources:

- Division of Remediation Sites List accessed on August 16, 2016. (This list represents the public record of past and current sites located in Maine that are in the Voluntary Response Action Program, the Brownfields Program, the Landfill Closure Program, the Federal Facilities Program, the Superfund Program, and/or the Uncontrolled Sites Program. Sites are listed alphabetically by the municipality they are located in, and the database includes information regarding location, status, and if the property has institutional controls.)
- "Annual Report of the Fund Insurance Review Board Submitted to the Joint Standing Committee on Environment and Natural Resources," prepared by DEP, dated February 2015 (latest available);
- Website of the United States Environmental Protection Agency (http://www.epa.gov/superfund/) last accessed in August 2016;
- Website of the Bureau of Remediation and Waste Management, Maine DEP (http://www.maine.gov/dep/spills/uncontrolledsites/) accessed in August 2016;
- Testimony of Patricia Aho, Commissioner Maine Department of Environmental Protection, Speaking in Favor of L.D. 1303 - An Act to Stabilize and Streamline the Department of Environmental Protection Ground Water Oil Clean-Up Fund and the Maine Coastal and Inland Surface Oil Clean-Up Fund, made before the Maine Legislature's Joint Standing Committee on Environment And Natural Resources; Date of Hearing: April 29, 2015;
- http://www.maine.gov/treasurer/debts_bonds/bonds_on_ballot.html; and
- https://www.epa.gov/brownfields/maine-brownfields-funding-history.

November 28, 2016

DAMS & LEVEES

2016 Grade: D+

Overview

Maine has over 1,000 dams registered with the Maine Emergency Management Agency (MEMA). Of these, 191 are classified as dams of significant- and high-hazard potential, in which failure would result in considerable damages or loss of life. Approximately half of those are in fair or unsatisfactory condition and Maine's compliance with the Association of Dam Safety Officials (ASDSO) *Model Dam Safety Program* is well below the national average. Maine also has five federally-supported levees with an average rating of "minimally acceptable." Lack of comprehensive planning and underfunded dam and levee safety programs add to the concern. However, options for increasing funding exist; consideration of environmental and social benefits is improving decision making; and the Model Dam Safety Program can be leveraged to develop funding and legislative action.

Background

Dams: Dams are artificial barriers built across rivers or streams to impound or divert water. Dams in Maine are operated for a variety of purposes but hydropower, fish and wildlife management, and flood control are the most often-cited[1]. There are over 1,000 dams in Maine (Figure 1) currently registered with the Maine Emergency Management Agency (MEMA)[2]; these dams range from non-engineered masonry mill dams to highly-engineered hydropower facilities. In contrast to most civil infrastructure in the United States, the majority of dams in Maine are privately owned (48%); the remaining dams are owned by utilities (6%) and Federal (8%), state (12%), or local (26%) entities[3].

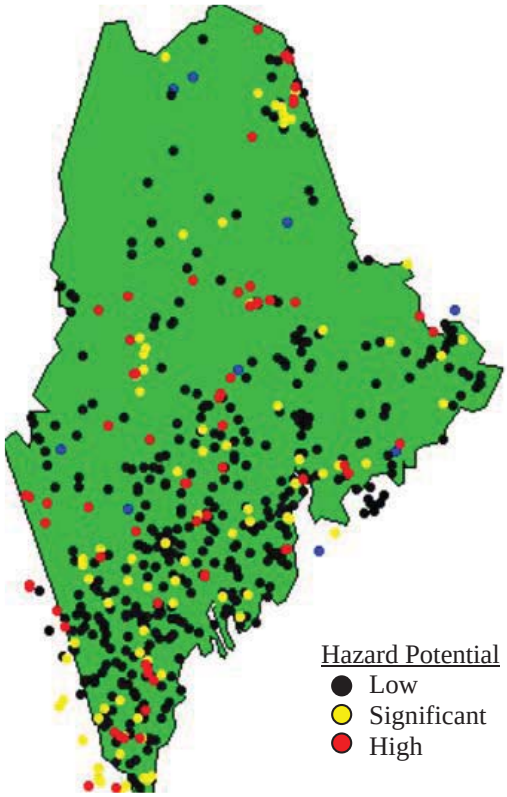

Figure 1: Hazard Potential of Maine's Dams[8]

Of the 1,000 registered dams in Maine, 816 are subject to regulation based on their height and storage volume – such dams are either 1) greater than 25 feet in height with a storage capacity greater than 15 acre-feet (approximately the volume of 7.5 Olympic swimming pools) or 2) greater than 6 feet in height with a storage capacity greater than 50 acre-feet (25 Olympic swimming pools)[4,5]. However, as a state statute requiring registration of dams was repealed in 1993[6,7], the actual number of dams in Maine is unknown. Dams in Maine are regulated by several agencies including MEMA, the Federal Energy Regulatory Commission (FERC), New Hampshire Department of Environmental Services (NHDES), and the International Joint Commission (IJC)[1]. Most hydropower facilities are regulated by FERC and the IJC. The NHDES regulates most dams on the Maine-New Hampshire border or dams on rivers that eventually flow into New Hampshire. MEMA regulates the remaining dams. Maintenance requirements of dams vary by the hazard potential of the dam, or the possible adverse consequences if a dam were to fail or be misoperated[5]. Most Maine dams are low-hazard dams, but 191 are significant- and high-hazard potential dams in which failure would result in significant damages or loss of life (Table 1, Figure 1)[4].

Table 1 Summary of Maine State Dams by Hazard Potential and Regulatory Authority[4]

Hazard Potential	Number of Dams Regulated			
	By MEMA	By FERC / IJC	By NH DES	Total
Low [a]	494	121	10	625
Significant [b]	73	9	30	112
High [c]	28	33	18	79
Total	595	163	58	816

[a] No probable loss of human life and low economic losses or environmental damage if dam fails/misoperates
[b] No probable loss of human life but major economic losses or environmental damage if dam fails/misoperates
[c] Probable loss of human life if dam fails/misoperates

Levees: Levees are engineered earth embankments or flood wall structures used to contain, control, or divert the flow of water. In contrast to dams, levees are generally located parallel to a river and are used for local flood protection. Maine has five levees listed on the U.S. Army Corps of Engineers (USACE) National Levee Database (NLD) that are operated and maintained by their respective municipalities, with support from USACE[9]. The NLD includes levees that have been identified by FEMA and USACE but may not include all levees within Maine. The five levees are located on the Penobscot River in Old Town, the Saint John River and Fish River in Fort Kent, the Sebasticook River and Sebasticook River/Moose Lake bypass channel in Hartland, and the Aroostook River in Fort Fairfield and protect a combined area of 112.4 acres from flooding[9].

Condition

Dams: Most of Maine's dams are over 50 years old and are showing signs of deterioration. A significant number of Maine's dams were built over 100 years ago and may not have been formally engineered. In general, FERC dams are maintained in good condition as a requirement for their re-licensing, which generally occurs every several decades. Further, as FERC dams generate revenue for their owners, funding is more readily available for repairs and maintenance[3]. Of the 150 significant- and high-hazard dams for which condition ratings are available, approximately half of such dams are in satisfactory condition (Table 2)[1]. When excluding FERC-regulated dams, which generate revenue and as such are generally better maintained, approximately 70% of Maine's dams are in less than satisfactory condition[4]. Of four high-hazard potential dams identified as being in unsatisfactory condition by MEMA in their 2011 Rapid Condition Assessment, one has been repaired, one will be repaired this year, and the other two are operating at reduced head[4]. It should also be noted that regular inspection of low-hazard dams is not required under Maine law (only verification of their hazard potential once every 12 years)[5] and, as such, the 494 MEMA-regulated low-hazard dams receive little attention and, presumably, are in worse condition than significant- and high-hazard potential dams.

Table 2 Condition of Maine's Dams by Hazard Potential [1]

Hazard Potential	Assessed Condition			
	Satisfactory	Fair	Unsatisfactory	Total
Low [a]	N/E	N/E	N/E	N/E
Significant [b]	32 (38%)	25 (29%)	28 (33%)	85
High [c]	42 (65%)	17 (26%)	6 (9%)	65
Total	74 (49%)	42 (28%)	34 (23%)	150

N/E = no estimate

Levees: According to the NLD, Maine's levees were constructed between 1976 and 1983, except the Fort Fairfield levee which was constructed in 2001. The levees reportedly are designed to manage flows from a 100-year storm frequency. The NLD indicates the levees were last inspected in September 2011 to September 2013, and were rated from "unacceptable" (Sebasticook River Left Bank) to "minimally acceptable." The Saint John River and Fish River levee in Fort Kent was rated as "acceptable" in September 2012[9] however, this levee overtopped in May 2008.

Safety

Dams: Maine laws require owners of all significant- and high-hazard potential dams in Maine to prepare Emergency Action Plans (EAPs) for their dams[5]. EAPs are used to assess the impact of a potential dam failure or mis-operation and to prepare emergency responders to respond to such an incident. Typical components of an EAP include a map of the inundation extents, identification of access routes that may be inundated and inaccessible to emergency responders during an incident, and identification of potentially affected property owners. The percentage of significant- and high-hazard potential Maine dams with updated EAPs outperforms the national average of 77% with 96% and 100% completion for significant- and high-hazard potential dams, respectively[4]. Beyond compliance, MEMA has invested significant effort to make sure that EAPs are "living documents" that are reviewed and practiced with emergency responders and municipal officials[3].

While EAPs are effective tools to identify risk and develop mitigation strategies in the event of a dam incident, much of the risk to the general public is the responsibility of dam owners who are responsible for maintaining their dam – the risk of an incident occurring is lower for a well-maintained dam. However, most owners of non-hydropower dams lack the financial resources to maintain their dam in acceptable condition. Furthermore, the authority of MEMA to order such maintenance, upgrades, or repairs to decrease risk is limited to those situations where the dam constitutes a threat to public safety[5]; MEMA does not have the authority to order preemptive actions to decrease the risk of a dam in the absence of a threat to public safety.

While threats to public safety can be identified as part of regular inspections of dams, the 494 MEMA-regulated low hazard dams are not required by law to be regularly inspected[5]. Unregistered dams pose another threat to public safety as their hazard potential and condition are unknown. Per an informal database, there are hundreds of unregistered dams in Maine. An example of the risk posed by unregistered dams is exemplified by Meserve Dam, which failed in 2010 and caused over $100,000 damages. At the time of its failure, Meserve Dam was not registered.

Levees: In May 2008, heavy rainfall combined with snow melt pushed the Saint John and Fish Rivers in Fort Kent to record levels until they overflowed their banks, flooding homes and businesses. More than 600 of Fort Kent's 4,233 residents were evacuated. Aroostook County was declared a Federal disaster area. A report titled, "Living Behind the Levee, Fort Kent, Maine: Knowing the Threat (and) Anticipating the Vulnerability[14]," issued in early 2010 warns of the levee's potential weaknesses to future events which have not been addressed at the time of this report. An article titled, "Fort Kent to Hold Public Hearing on Levee Project[15]" dated June 7, 2016 discusses the town's plans to increase the levee's freeboard height to provide long-term protection against flooding.

Funding, Operation and Maintenance, & Future Need

The regular inspection and hazard potential rating of dams are the responsibility of regulatory agencies (MEMA, FERC, etc.)[5] and the responsibility for operating, maintaining, or repairing a dam is the responsibility of a dam's owner. MEMA's Maine Dam Safety Program (MDSP) receives less funding than other New England states and the national average (Figure 2)[8,10], despite having a significantly larger geographic area (thus requiring additional travel time) for which they are responsible.

The current level of funding limits the capacity of MDSP to inspect dams, identify and mitigate potential risks to public safety, and administer Maine's dam safety program. While the MDSP has been efficient in using available funding to improve dam safety in the state, their efforts, by necessity, have been focused on meeting state requirements and "problem dams" that pose the most imminent and significant risk to the public. Additional staff, and thereby additional funding, would be necessary to improve dam safety through registration of unregistered dams, more frequent and thorough inspections of regulated dams, improvement of EAPs, and more frequent review of EAPs with emergency responders. Several options for increasing funding exist: increased allocations from the Maine state government, procurement of additional grants, and legislation imposing fees on dam owners. The latter recommendation would provide a constant source of funding that is collected from those that most directly benefit from MDSP services – similar to how tolls collected from users of the Maine Turnpike are used to fund maintenance, operation, and improvement of the Maine Turnpike.

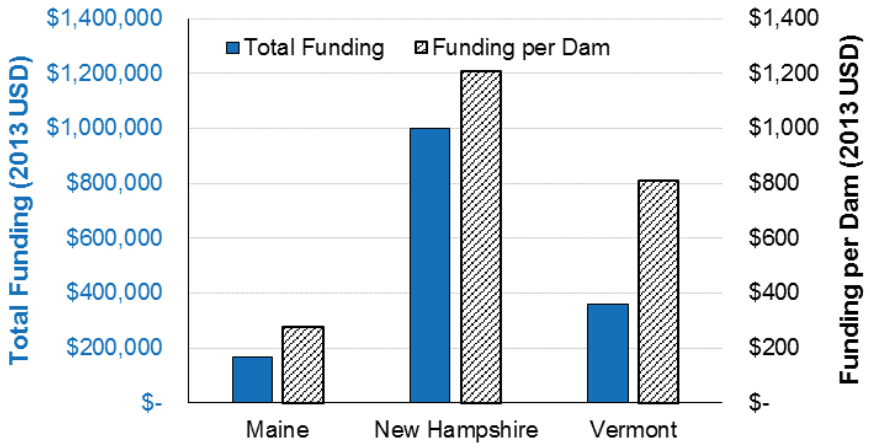

Figure 2. Total Funding and Funding per Dam in Maine, New Hampshire, and Vermont.

Public funding for dam safety in Maine is significantly less than peer states New Hampshire and Vermont. In addition, Maine has less private investment than New Hampshire and Vermont.

Many dam owners lack the financial resources to maintain or repair their dams. In 2011, Maine established the *Dam Repair and Reconstruction Fund*, a revolving fund to loan municipalities and quasi-municipalities low-interest funds to maintain, upgrade, and repair their dams[5]. Despite the need for such actions, the revolving fund has not been utilized since its inception[3]. The *Water Resources Act of 2016* (*WRDA*) provides another vehicle for funding: Section 3004 of *WRDA* provides funding for the repair, rehabilitation, or removal of non-Federal, non-hydropower, non-agricultural high-hazard potential dams, of which there are over a dozen in Maine. As of October 2016, the U.S. Senate and U.S. House passed differing versions of *WRDA.* After differences in the versions are negotiated in a conference committee, *WRDA* will be sent back to the U.S. House and U.S. Senate for a vote later this year.

The Association of Dam Safety Officials (ASDSO) *Model Dam Safety Program* provides a resource that can be used to develop funding and legislative actions to address current shortfalls. As of 2015, Maine's compliance with the ASDSO's *Model Dam Safety Program* was 56% compared to the national average of 78%. However, Maine showed 100% compliance for Enforcement, EAP, and Response, but only 17%, 17%, and 8% compliance for Inspection, Public Relations, and Permitting, respectively[8].

Levees: Maine currently does not have a state levee safety program and relies on the USACE and FEMA instead. According to a report by the Government Accountability Office (GAO), the USACE and FEMA have made little progress in implementing key national levee-safety-related activities required in the Water Resources Reform and Development Act (WRRDA) of 2014. More specifically, the Corps has been working to develop a national levee inventory, but the agencies have taken no action on the remaining key national levee-safety-related activities for which they are responsible under the act. Per the GAO's report, the USACE and FEMA officials indicated that resource constraints were the primary reason for their lack of progress and that "not implementing these activities could potentially result in safety risks and federal financial risks for disaster relief, among other impacts[11]."

Innovation & Resilience

The Penobscot River Restoration Project (PRRP) has become a national example of a new trend of considering the cumulative economic, environmental, and social benefits and impacts of multiple dams, rather than each dam in isolation. As part of the PRRP, several hydropower companies, conservation groups, state and Federal agencies, and the Penobscot Indian Nation agreed to a comprehensive plan to remove two dams on the Penobscot River, decommission a third dam, improve fish passage at four dams, and increase energy production at six dams. The cumulative result was a significant improvement to anadromous fish runs and the environment, a net decrease in annual operation and maintenance expenditures, decreased risk to public safety, and increased resiliency of the system, all while maintaining or increasing the power-generating capacity of the dams[10,12]. Although the PRRP was highly successful, the process is likely not repeatable for the majority of Maine's dams as the FERC hydropower re-licensing process was the driving force behind the PRRP; there is no such driver for non-FERC regulated dams.

Conclusions and Recommendations

There are 5 federally-supported levees and over 1,000 dams (800 regulated) within Maine; however, there is no comprehensive database that includes all of Maine's levees and dams. Of the 191 high- and significant-hazard potential dams in Maine, approximately half are in fair or unsatisfactory condition. Of four high-hazard dams assessed in unsatisfactory condition in 2011, two have yet to be repaired and are being operated at reduced reservoir levels. The condition of most low-hazard and unregistered dams may be worse than for high- and significant-hazard dams, as Maine statutes do not require condition assessments of low-hazard dams. Maine's Dam Safety Program receives less funding than the national average and other New England states, limiting the capacity of the program. Despite funding challenges, the Maine Dam Safety Program has overseen the submittal of updated Emergency Action Plans with 100% and 94% compliance for high- and significant-hazard potential dams, respectively; well above the national average (for high-hazard dams) of 77%. By improving fish passage, reducing risk through the removal of two dams all while maintaining or increasing hydropower generation capacity, the Penobscot River Restoration Project has become a national example of new innovations in dam planning.

The US Army Corp of Engineers (USACE) National Levee Database indicates Maine's five Federally-supported levees have not been inspected since 2011 to 2013 where *Routine Inspections* are to occur annually and *Periodic Inspections* are to occur every five years according to the USACE Levee Safety Program.

Considering the capacity, condition, safety, funding, operation, future need, resilience, and innovation of dam and levee infrastructure in Maine, the Maine Chapter of the American Society of Civil Engineers (ASCE) gives Maine dams and levees a grade of D+**.** This grade has not changed from the 2012 Report Card.

Maine ASCE makes the following recommendations:

- Revise Maine's Revised Statutes to require registration and regular inspections of all dams;
- The US Congress should fully fund the National Dam Safety Program and National Levee Safety Program at the authorized levels and the Maine state legislature should increase the funding for the Maine Dam Safety Program to $800,000 annually to achieve a funding-per-dam comparable to New Hampshire and Vermont;
- Establish multiple zones for the Maine Dam Safety Program, each with its own State Dam Inspector responsible for dam safety in that zone. This will reduce travel time in comparison to travel from Augusta and increase time available for other responsibilities. Alternatively, if long-term funding is unavailable, one-time funding could be used to contract with local, independent engineering consultants to provide inspection of dams and levees;
- Develop a long-term strategic program and plan that includes: identifying possible funding sources; addressing the need and/or feasibility to investigate, repair, upgrade, operate, or remove aging state, municipal, and privately owned dams; and increases accountability of dam owners; and
- Develop a public awareness campaign to educate federal and state representatives and the public on the location and condition of dams and levees in their area and the benefits and risks associated with this infrastructure.

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November 28, 2016

ENERGY (ELECTRICITY)

Grade: B-

Overview

Maine remains a net exporter of electricity generated primarily by a diverse mix of hydro, natural gas, wind, and other renewables. Maine produces more electricity from renewable energy than any other state east of the Mississippi River. Much of Maine's electric transmission infrastructure is 30 to 40 years old, and requires further investment – like the $1.5 billion Maine Power Reliability Program – to ensure reliable, resilient, and cost-effective delivery of electricity. In June 2016, Maine had the lowest average retail electricity price to all use sectors of the New England states, but was 11th highest in the country and 18% higher than the national average.

Background

The electrical market is divided into two distinct sectors, generation and transmission and distribution (T&D), which are regulated to different degrees by separate entities. This briefing discusses these two areas separately in the discussion below. The Northeast Power Coordinating Council (NPCC) establishes standards for regional generation and transmission system reliability. These standards are administered by ISO New England (ISO-NE), the region's independent system operator and regional transmission organization.

Current Condition and Adequacy

Generation – Maine has been a net exporter of electricity since 2000. In 2015, total generation capacity in Maine was approximately 3,200 Megawatts (MW) (compared to 3,300 in 2007 and 3,500 in 2011) with peak demand at 2,200 MW.[i] Regionally, Maine currently ranks 4th of the six New England states in annual generation and 3rd in consumption[ii], and currently offers approximately 8% of New England's total generation capacity.[iii] Nationally, Maine ranked 44th among the 50 states in both total electricity generation and consumption in 2015.[iv]

NPCC's resource adequacy reliability criterion is a loss of supply expectation of 0.1 days per year or one day per ten years for both the reference (baseline peak with 50% chance of being exceeded) and high (extreme peak with 10% chance of being exceeded) demand load forecasts.[v] The New England region experienced record electricity use on August 2, 2006, when consumer demand peaked at 28,130 MW due to above average temperatures and humidity.[vi] This event triggered ISO-NE to implement several standard operating procedures which included delivery of electricity sales from outside their operating region and summoning of demand resources, with little to no impact on consumers. Similarly, electricity demand approached this record on July 19, 2013 at 27,379 MW.[vii] ISO-NE's forecasting and Forward Capacity Market auction indicate that there is sufficient power generation capacity in the ISO-NE system to meet demand over the next several years.

Figure 1 represents Maine's 1998 to 2014 actual generation levels and mix of generation sources[viii] from its over 100 independently-owned generation facilities.[ix] Prior to the closing of the Maine Yankee nuclear power plant in 1997, nuclear power represented approximately one-third of Maine's power generation. Natural gas generation, which is in direct supply competition with the heating industry and can be impacted by supply constraints coming into Maine, was as high as 73% in 2002, falling to 49% in 2010 and 34% in 2014.[x] From December 2014 to December 2015, Maine reduced its consumption of natural gas for electricity generation by 8% compared to a national increase of 20%.[xi]

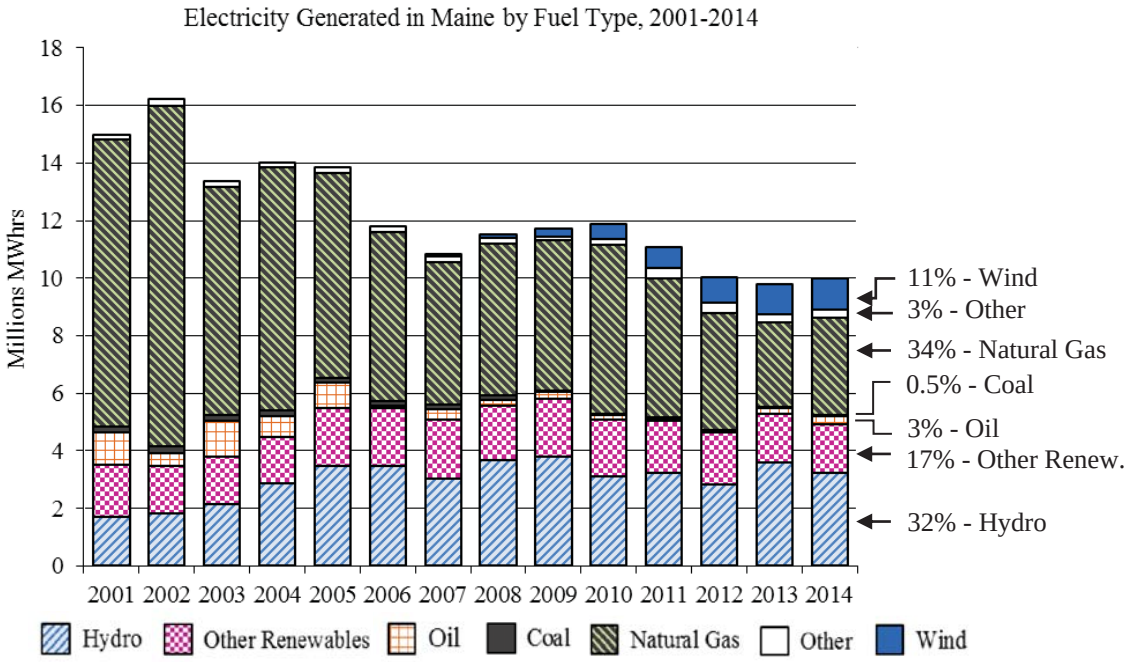

Figure 1: Electricity Generated in Maine by Fuel Type, 2001-2014

Maine is now one of 20 states without nuclear generation capacity and one of eight states with insignificant coal-fired generation.[xii] This spares Maine from the large-scale generation retirements that some other states are facing trying to comply with evolving environmental regulations and challenging nuclear licensing renewals.

M.R.S. 35-A §3210 was enacted in 2008 which requires Maine to increase its Renewable Portfolio Standard (RPS) with new renewables annually 1% per year up to 10% by 2017 (Class I) in addition to the 30% share of the market for existing renewable energy capacity resources (Class II) set in 1999. This statute requires competitive electricity providers to meet this portfolio standard through renewable energy certificates (RECs) or alternative compliance payments into the Energy Efficiency and Renewable Resource Fund. Maine's compliance with RPS requirements has been met almost completely through the acquisition of RECs. 99% of Maine's 2014 Class I RECs were produced within the state of Maine with biomass being the major resource at 92%, followed by wind and hydroelectric at 7% and 1%, respectively. Hydroelectric represents the major compliance resource for Class II at 78%. Renewable resources located in Maine contributed significantly to new RPS compliance in other states, such as Connecticut and Massachusetts. Maine has 81% of the planned renewable projects in NE currently listed in the March 2016 ISO-NE queue with the majority being wind, which will exceed the 2017 RPS compliance needs.[xiii]

From 2002 to 2014, Maine's total renewable energy generation has increased from 22% to 60%.[xiv] In 2015, US-EIA reports that two-thirds of Maine's net electricity generation came from renewable energy resources, with 30% from hydroelectricity, 26% from biomass (mainly wood products), and 10% from wind. Maine produces more electricity from renewable energy than any other state east of the Mississippi River and its national rank has grown from 11th in 2010 to 5th in 2012. In 2012, Maine ranked 1st in the U.S. generating electricity from biomass and 1st in hydropower east of the Mississippi. Maine ranked 2nd in the U.S. in off-shore and 24th in on-shore wind capacity (1st in NE in total wind), but only ranked 36th in solar capacity.[xv]

The Wind Energy Development Act, enacted in 2007, set a goal of 2,000 MW of wind power generation installed statewide by 2015, 3,000 MW by 2020, and 8,000 MW (5,000 MW from off-shore) by 2030.[xvi] As of the end of

2015, Maine had 12 or more operating large-scale on-shore wind energy facilities with a total capacity of 611 MW (compared to 346 MW in 2012 and 42 MW in 2008) with at least 10 in the planning and permitting phases. Wind generation has increased from 1% in 2008 to 11% in 2014. However, Maine only met 31% of the 2015 goal. The 2020 goal is still considered feasible due to larger projects with higher capacity turbines and rapid advancement of off-shore wind technology, although proposed projects have encountered some local opposition.[xvii]

Transmission and Distribution – Maine's electric grid is comprised of three general regions: the southern region, which is connected directly to the remainder of New England; the northeastern region, which is directly connected to New Brunswick, Canada; and the northwestern region, which is non-electrified. The majority of Maine's electric transmission and distribution system is centered on the larger load centers and greatest population located in the southern portion of the state.

The majority of Maine's transmission system is administered by ISO-NE, shown in Figure 2 in blue.[xviii] Maine's transmission system interfaces with the New England bulk power grid via multiple 345 kV and 115 kV lines at the New Hampshire border and interfaces with the New Brunswick Power (NBP) transmission system via two 345 kV transmission lines in eastern Maine. The more rural northeastern region of Maine's transmission, shown on Figure 2 in white, is administered by Northern Maine Independent System Administrator (NMISA) and interfaces with the NBP transmission system via 138 kV and 69 kV transmission lines and is not directly connected to the energy market in southern Maine and the rest of the United States.[xix]

Figure 2

The non-electrified northwestern region, shown on Figure 3 in white, is the least populated region, and comprises approximately 8,500 square miles, or ¼ of the state.[xx] The Maine Municipal and Rural Electrification Cooperative Agency Act was created in 1987 to address the serious deficiency in the ability of municipalities and rural electric cooperatives to finance the infrastructure necessary to service both electrified and non-electrified areas of Maine.[xxi] However, current proposals for significant funding of electric infrastructure in the non-electrified areas of Maine are limited to transmission investments in on-shore wind generation projects.

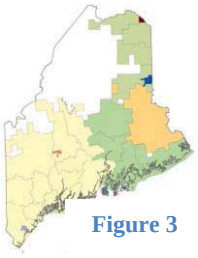
Figure 3

Maine's electricity is delivered to consumers by two investor-owned utilities: Central Maine Power Company (CMP, an AVANGRID company), and Emera Maine (EME, formerly Bangor Hydro Electric Company and Maine Public Service Company), in addition to ten consumer-owned utilities. CMP, EME, and the ten consumer-owned utilities combined, serve approximately 80%, 15%, and 5% of the total state load.[xxii]

The Maine Power Reliability Program, a $1.5 billion electric reliability project, and the largest capital construction project in Maine's history, includes the addition of significant new 345 kV and 115 kV transmission facilities and new 345 kV autotransformers at key locations in Maine. Most of the MPRP project entered service by the first half of 2015. Remaining portions of the project are scheduled to enter service in 2017. The MPRP provides infrastructure needed to increase the ability to move power between New Hampshire and Maine and improves the ability of the transmission system within Maine to move power into local load pockets as necessary.[xxiii] As of June 2016, CMP lists over $150M of planned and proposed reliability projects in addition to MPRP.[xxiv]

Resiliency

Electric serviceability from the customer's perspective can be measured by the frequency and duration of outages. Today's periodically high load demands and restricted supply are more accurately predicted and managed by increasingly robust monitoring and switching systems. This increased attention and investments in the bulk power grid reliability is in large part a result of the 2003 northeast blackout. In 2012, Superstorm Sandy knocked out power to over 8 million customers in the northeast U.S.[xxv] and in 2013 a well-planned sniper attack disabled a high voltage substation in southern California[xxvi]. Both of these events heightened awareness of the need for resiliency against increasing threats to our electric infrastructure from extreme weather (i.e., flooding, snow/ice, wind, seismic

and geomagnetic disturbance), accidental or technical failures (car strikes, animal intervention, human error, etc.), and acts of terrorism and cyber-threats.[xxvii] In Maine, the leading cause of transmission outages were a result of faulty equipment / human error, whereas the largest outage impact felt by customers is due directly or indirectly to severe weather and high winds (i.e., tree strikes).[xxviii]

Maine's lower voltage distribution network, which represents approximately 90% of the total length of T&D lines in Maine, are often located along roads and near trees, and are most vulnerable to the indirect effects of severe weather. Vegetation management, along with restoration responsiveness and circuit re-routing, is a key component to improving resiliency and mitigating outage frequency and duration. CMP invests approximately $20M annually as part of its five-year cycle of vegetation clearing, inspection, and repair, maintaining nearly 25,000 miles of roadside distribution lines.[xxix] Over the last seven years, CMP's annual maintenance as measured by the number of spans cleared and poles inspected have increased 15% and 8% respectively. Over this same period, their customer interruption duration index (CAIDI) and system interruption frequency index (SAIFI) have trended downward 3%, and 23%, respectively. J.D. Power ranked CMP 6th in residential customer satisfaction out of the 17 large electric utilities in the East Region of the U.S.[xxx]

Innovation

In 2010, the Maine Public Utilities Commission (MPUC) issued a request for proposals for long term contracts involving deep off-shore wind (25 MW) and tidal energy (5 MW) pilot and demonstration projects in response to the Ocean Energy Act. Ocean Renewable Power Company's (ORPC) tidal demonstration project in Cobscook Bay was granted the first U.S. tidal purchase power agreement with connection to the grid in April 2012. The 150 kW facility began commercial operation in September of 2012 and has intermittently produced power. ORPC has plans to expand with additional installations up to a total of 5 MW after the initial project.[xxxi] [xxxii]

The first application for wind turbines in federal waters off the coast of Maine was filed in 2011, and a floating grid-connected test turbine was installed in 2013 near Castine (Volturn US).[xxxiii] The University of Maine-led DeepCwind Consortium's mission is to establish the State of Maine as a national leader in deep water offshore wind technology through a research initiative funded by the U.S. Department of Energy (DOE), the National Science Foundation, and others. In 2014, the MPUC approved a 20-year power purchase agreement for the Maine Aqua Ventus offshore wind project (12 MW) proposed by DeepCwind. The Aqua Ventus project applied for $40 million in competitive U.S. Department of Labor construction funding, in addition to the $10 million already awarded by DOE for design and development. In May 2016, the project was awarded top tier status meaning that it will receive the full funding level if it continues to meet its milestones. Construction is planned to be complete in 2020.[xxxiv]

Maine has no utility-scale solar photovoltaic (PV) generation, but about 20 MW of distributed solar PV panels are installed on homes and businesses and produced about 0.1% of the state's power in 2015. A 50-megawatt solar PV project is in development for the Sanford, Maine airport. If built, it would be New England's largest solar generator.[xxxv]

Investment Needs

Following the completion of the MPRP, Maine's electric transmission and distribution infrastructure requires further investment of $500 million to $1 billion to satisfy the identified current and near-term needs of the state. ISO-NE has identified investment needs to address the general performance of the long 345 kV and 115 kV corridors, and to ensure sufficient system security to meet demand in the face of thermal and voltage performance issues and stability concerns. The 115 kV lines are exceeding their ability to serve load efficiently and effectively and are insufficient to reliably integrate the multiple proposed northern Maine wind generation projects. In many instances, demands on the 34.5 kV, 46 kV, and 69 kV lines are also exceeding their capabilities. ISO-NE is conducting transmission system reliability assessments to identify the nature of the transmission system reinforcements necessary to integrate significant amounts of wind resources into the system.[xxxvi]

The MPUC has been investigating ways to improve the reliability of Maine's NMISA-administered transmission system owned by EME. Potential solutions include adding local generation and demand response in northern Maine, adding transmission reinforcements with New Brunswick, and directly interconnecting the currently NBP-supplied transmission system to the rest of New England. The initial analysis recommended making relatively minor upgrades to existing infrastructure and continuing to investigate interconnection options with southern Maine and the rest of New England.

MPUC regulates the operations and rates of Maine's transmission and distribution utilities, except for transmission rates, which are regulated by the Federal Energy Regulatory Commission (FERC).[xxxvii] The most expensive electric rates for all consumers are in the more geographically isolated states: Hawaii, Alaska, California, and the New England states. Being geographically isolated, Maine's consumers paid 18% more for electricity than the national average in June 2016.[xxxviii] Maine had the lowest average retail electricity price to all use sectors of all the New England states, but was the 11th highest in the country.[xxxix] Additional investment and improvements to Maine's T&D system may improve this metric, but it is difficult to establish that with any certainty as there are many regional and political factors at play that also affect electricity rates to consumers.

New electrical generation is typically privately funded, but may be supplemented with state and federal research and development funding and/or tax credits. It is critical that Maine improve its gas supply in preparation for satisfying peak demands, and continue to diversify its generation sources to become less dependent on the competitive and dynamic natural gas market. Continued promotion and subsidy of alternative energy technology development and commissioning is a key factor in meeting this need. Maine ASCE estimates that $500 million to $1 billion of generation and gas supply related investment is needed to satisfy the identified current and near-term needs of the state.

Conclusions and Recommendations

Over the last decade, significant improvements have been made to Maine's electric energy infrastructure. The move away from nuclear, oil, and coal, and investments in natural gas and wind generation have allowed Maine to be a leader in cleaner energy, with fewer concerns for near term retirements. An overall decreasing trend in total in-state generation capacity, along with potential natural gas shortages during cold snaps, threaten Maine's long term independence of out-of-state or foreign electricity supply.[xl]

Recent investments in rebuilding Maine's bulk power grid and increased maintenance of the distribution network have improved the overall reliability and resiliency of Maine's electrical T&D infrastructure. System planning continues to evaluate and forecast future resources and loads in accordance with federal mandates for system reliability. Although the minimum standard for resiliency against the increasing threats of natural and man-made disasters have not yet been established, utility owners continue to evaluate and address such threats independently.

The energy generation, transmission, and distribution systems in Maine require continued significant investment to ensure reliable, efficient, and cost-effective delivery of electricity. However, the overall health of the energy generation and transmission system in Maine has improved from a C+ in 2012 with the incorporation of new, more diverse generation facilities, near-completion of the $1.5 billion MPRP, planning of other system reinforcements, and introduction of smart grid technology. Maine ASCE gives Maine's current energy infrastructure a B-.

Maine ASCE recommends the following:

- Continue to diversify power generation sources and expand renewable energy generation projects and research in order to maintain Maine's energy independence and to meet the State's Renewable Portfolio Standard (M.R.S. 35-A §3210);
- Improve capacity and reliability, integrate the northeastern region into ISO-NE, and provide opportunity for electrification and wind generation in northwestern Maine with the upgrade and expansion of transmission infrastructure through the center and northern reaches of the State;

- Address localized reliability concerns through general upgrades to the aging transmission and distribution system, including lower level distribution systems;
- Continue inspection, maintenance, and upgrade of the transmission and distribution system including responsible vegetation management and new technology to continue to improve reliability and resiliency; and
- Fund capital improvement projects totaling $1 billion to $2 billion to satisfy the current and near-term needs identified in Maine's electric transmission and generation infrastructure.

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November 28, 2016

MUNICIPAL DRINKING WATER

Grade: C+

Overview

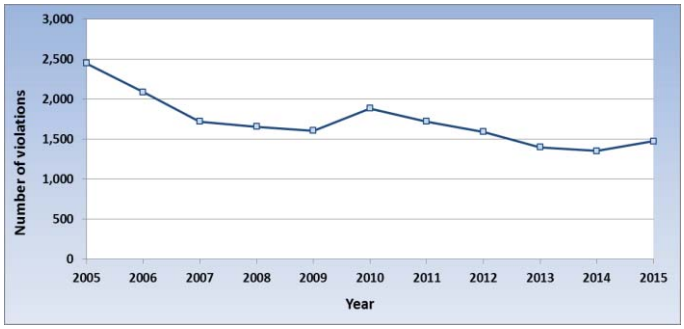
An estimated two-thirds of Maine residents are served by 151 public community drinking water systems. Significant investments in water treatment systems, including installation of disinfection with ultra-violet light and ozone has enhanced water quality from these water systems. However, aging underground transmission lines remain a serious issue for Maine's water utilities with replacement cycles exceeding the 100-year target by 10-50 years, depending on the system. This is largely due to project funding needs exceeding available federal and state funding. While there has been improvement in treatment, storage, and security issues, approximately $59 million per year is needed over the next 20 years for infrastructure projects – which equates to an annual $22 million shortfall in funding need.

Background

In Maine, 151 public water systems are either a municipal water department, a separate water district or a privately owned water company. All three charge user rates and are all therefore regulated by the Maine Public Utilities Commission (PUC). As of 2016, Maine had approximately 1,950 active drinking water supply systems, which range from large systems supplying entire communities to small systems that provide water to seasonal facilities such as campgrounds, hotels and restaurants, all of which are classified as "public". This report applies specifically to the 151 systems that charge user fees are regulated by the PUC, and which provide drinking water to two-thirds of Maine's residents. In addition, many Maine residents utilize private wells.

The Drinking Water Program (DWP), which is part of the Maine Center for Disease Control and Prevention (CDC), within the Department of Health and Human Services (DHHS), is responsible for ensuring that all public water systems comply with federal and state regulations on drinking water. In 1976, the DWP began administering the federal Safe Drinking Water Act (SDWA) in Maine. Despite variations in facilities, regulatory oversight of Maine's public systems is firmly rooted in the SDWA. The 1996 amendments to the SDWA required that new public water systems have sufficient capacity to meet federally mandated drinking water requirements. A primary responsibility of the DWP is oversight of compliance with and enforcement of United States Environmental Protection Agency (EPA) National Primary Drinking Water Standards.

Condition and Adequacy



A well-maintained public drinking water infrastructure is critical for public health and strong businesses. The condition of drinking water infrastructure has a direct correlation to the quality of water received by the public. Its maintenance is vital to the overall well-being of public water consumers. The graph on right shows more than a 40 percent decrease in the number of violations issued to public water systems in Maine between 2005 and 2015 and is based on data furnished by EPA. Approximately ten large public water systems have completed treatment plant

upgrades with installation of UV disinfection treatment in the past five years, and two additional water systems are planning significant replacements of aging treatment plant systems over the next ten years:

Kittery Water District; The Francis L. Hatch Water Treatment Facility which is over 55 years old, will be replaced. The District's largest customer is the Portsmouth Naval Shipyard.

Maine Water Company – Biddeford Saco Treatment Plant; One of the nation's oldest water treatment plants, the 130-year old Maine Water Company facility on the Saco River in Biddeford will be replaced. This facility serves the communities of Saco, Biddeford, Old Orchard Beach and Scarborough.

A section of aging cast iron water main clogged with internal rust deposits is shown on left. Aged underground transmission lines remain the most serious issue for Maine's water utilities. Annual water main replacement rates for the last 10 years, average approximately 0.7% for larger systems and 0.9% for smaller systems. These represent replacement cycles between 110 and 150 years. The minimum target replacement rate is 1%, which would keep all mains less than 100 years old.

Recent issues include:

Portland Water District – A broken 20-inch water main in Cumberland dropped pressure and disrupted service to the entire community in June of 2016. (Ref. 4)

Bangor Water District – A broken water main on Hammond Street resulted in a 30-foot geyser in Bangor. Of the 200-plus miles of water pipes that thread through the city, about 30 percent are more than a century old, according to the water district. (Ref. 5)

Lead

Recent national attention has focused on lead in drinking water. The amount of lead pipes remaining in Maine's distribution systems is very small. Water quality sampling demonstrates that Maine's Water Systems have successfully implemented and maintained corrosion control treatment strategies to reduce the potential for lead or copper leaching from public infrastructure. Additional efforts have encouraged public water systems to collect samples from schools and daycare facilities where water quality issues may arise due to a building's internal plumbing. Lead issues may remain in other public systems that are not included in this report.

Security - Resilience

Since the completion of the Maine Water Protection Security Grant provided by EPA and Department of Homeland Security, the DWP has continued efforts to increase security for public water systems. Drinking Water State

Revolving Fund (DWSRF) Capacity Development funds offer financial support for Security and Emergency Preparedness training. Effective response to natural or man-made events requires understanding of water system vulnerabilities and means to communicate those special considerations to responders. DWP is active in the Maine Water Agency Response Network (WARN) organization and supports outreach such as visiting municipal systems to address emergency preparedness and communication via the creation of response plans.

Funding

The 1996 SDWA authorized the EPA to set up grants to states for maintenance of public water system infrastructure. This federal money serves as the basis for funding the Maine DWSRF loan program for capital improvements. Since 1997, the program has provided over $231 million in loans and grants to public water systems in Maine. (Ref. 1)

Over the past three years the "revolving nature" of the DWSRF program has made available in grants and loans to public water systems an average $16.4 million per year. This amount includes federal DWSRF funds averaging $8.7 million per year. However, the total project funding requests from public water systems for critically needed projects continue to exceed available money in this program. For example, in 2015 only 50% of applicants were able to receive DWSRF funding. The DWP estimates that $22 million of necessary water projects remain unfunded due annually. While Congress has mandated improvements in water quality standards, federal funding for water infrastructure in Maine has remained stagnant. Table 2 summarizes funding for water infrastructure in Maine over the last 3 years based on publicly available information.

Federal and State Funding Sources for Municipal Drinking Water

	2013	2014	2015
DWSRF	$ 12,777,515	$ 17,415,798	$ 19,100,000
DECD-CDBG	$ 1,505,000	$ 1,647,500	$ 500,000
USDA-RD	$ 5,928,500	$ 6,330,000	$ 434,000
Total Federal & State Sources	**$ 20,211,015**	**$ 25,393,298**	**$ 20,034,000**
		3-year Average	**$ 21,879,438**
MMBB Issue -Revenue Bonds	$ 3,046,033	$ 18,085,275	$ 9,351,546

Sources: Maine Drinking Water Program, Department of Economic Development, United States Department of Agriculture-Rural Development, and Maine Municipal Bond Bank.

Additional funding for public water systems includes:

- Grants and loans from the United States Department of Agriculture - Rural Development for communities with populations of fewer than 10,000 averaged $4.2 million per year in 2013, 2014, and 2015.
- The State of Maine Department of Economic Development Community Development Block Grant (DECD-CDBG), which represents federal and state funds with available funding levels averaging $1.2 million per year in the same time period.
- User fees collected by all public water systems, including private utilities and quasi-municipal water districts. These fees are regulated by the PUC, and are to be used for capital projects, repayment of loans and funding an annual budget.
- Property taxes, which pay a portion of public water system maintenance by way of public fire protection fees to municipalities.

- User charges for system depreciation. These can be a significant source of funding when implemented and used for system maintenance. Unfortunately, the depreciation calculation allowed under MPUC rules is a percentage of the initial infrastructure cost, not its replacement cost. This may significantly reduce the available funds for replacements in today's dollars. Industry estimates indicate that the ten largest public water systems in Maine have more than $10 million in depreciation every year, which is built into their utility rates. (Ref. 7)

An August, 2015 report, titled Financial Health of Maine's Larger Water Utilities for the Years 2004-2014 (Ref. 3) provides a number of measures reflecting the financial health of Maine's larger water utilities including detail on:

- ✓ Debts carried by public water systems show an average of increase 16% over the last 10-year period.
- ✓ Average Residential User Fees have increased 19% over the 10-year study period.

Recently formed Regional Councils include the Southern Maine Regional Water Council and the Five Rivers Regional Water Council. Such councils facilitate regional long-range planning efforts for investment in infrastructure to support growth, economic development and cost savings.

Conclusions and Recommendations

The drinking water grade applies to the 151 community water systems. Many of the underground transmission and distribution mains for drinking water are more than 100 years old, information that is specific to each system. Despite improvements in other areas of water supply systems, water main breaks and leaks have highlighted the critical nature of underground distribution lines and this has impacted Maine ASCE's assessment of the grade. No systems are known to have significant violations of the Safe Drinking Water Act. Most systems are in full compliance and provide high quality water to customers. No uncovered storage tanks or unprotected unfiltered surface water systems remain. No water borne disease outbreaks have been attributed to these systems since the early 1980s. Maine's municipal water systems have little known lead in distribution lines and have an active program for corrosion control to prevent leaching of lead into drinking water. Aside from line leaks and breaks, system failures are extremely rare, even when storms occur. Many systems have implemented significant improvements in security, and treatment upgrades. From the period 2004 to 2014, approximately $500 million was invested in system infrastructure to meet new treatment requirements. However, aging distribution system infrastructure is not being replaced at an adequate rate in many systems. Without increases in rates or public funding, repairs and replacements will not catch up to need. Since release of the 2012 report, additional funding sources have been added, however overall funding remains below what is needed. Overall, Maine ASCE gives drinking water a grade of C+.

Maine ASCE makes the following recommendations:

- Support full cost user fees and educate the public on sustainable operations through self-funding;
- Continue to work with the federal government and Congress to increase funding levels for the Drinking Water State Revolving Fund and the USDA-Rural Development programs;
- Continue providing a sustainable funding method for the required 20% State Match to access the federal DWSRF funds;
- Continue coordination among funding agencies (MMBB, USDA-RD, CDBG, DWSRF, CWSRF);
- Continue to assess and monitor the potential impacts of the Water Infrastructure Finance and Innovation Authority (WIFIA) to assure it will not result in a reduction in the DWSRF program for Maine;

- Advocate for collaborative efforts among water systems for sharing of resources, equipment and personnel to reduce operating costs, such as regionalization of utility management and systems;
- Maintain the terms and conditions of grants or loans, require timely updating of Comprehensive System Facilities Plans (CSFP) and all operational performance measures including asset management, water audits, and leak detection programs; and
- Encourage water systems to explore innovative main replacement and rehabilitation techniques such as directional boring techniques and main lining strategies as costs become competitive.

Sources:

1. Maine Drinking Water Construction Project Report -2015, Program Website: http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/imt/documents/2015DWSRFProjectReport.pdf
2. Drinking Water in Maine - Annual Compliance Report -2015, Program Website: http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/documents/DWPAnnualComplianceReport.pdf4. DHHS, Drinking Water Program & Maine Municipal Bond Bank, Drinking Water State Revolving Fund, (DWSRF) 2016 Intended Use Plan. http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/imt/documents/2016DWSRFIUP.pdf
3. Financial Health of Maine's Larger Water Utilities, January 31, 2014, Maine Water Utilities Finance Officer' Group
4. Portland Press Herald, June 2, 2016, "Water Main Break affects service in Cumberland"
5. Bangor Daily News, July 25, 2016, "Water main break results in 30-foot geyser on Bangor Street"
6. "Financial Health of Maine's Larger Water Utilities for the Years 2004-2014", prepared by the Maine Water Utilities Finance Officers' Group
7. Review comments by A.E. Hodsdon, 8/22/2016

November 28, 2016

MUNICIPAL WASTEWATER

Grade: D+

Overview

Maine communities face challenges with their aging collection systems, particularly systems that get overwhelmed with stormwater and lead to combined sewer overflow (CSO). According to the Maine 2012 Clean Water Needs Survey, CSO abatement represents the largest obligation of Maine's estimated $1 billion wastewater infrastructure need. Most communities do not have user rates and fees that are adequate to self-fund their capital needs causing reliance on federal and state loan and grant funding that historically have not been adequate to cover the known needs in the state. This adversely affects public health and the environment. Wastewater infrastructure has two primary categories: collection systems, which collect waste from homes and businesses and transfer it to the second category, the treatment facility. Maine has 162 publicly owned treatment facilities – some facilities have had little or no major upgrades.

Background

Maine cities, towns, and utility districts are facing a significant challenge to repair and upgrade old or failing infrastructure in their wastewater collection and treatment systems. Limited financial resources and other community demands have postponed or hindered the repair, upgrade, and modernization of wastewater infrastructure that is a vital component of a community's public health, environmental stewardship, and economic vitality. In conjunction with the need to rehabilitate a significant portion of the existing wastewater infrastructure, federal and state regulatory requirements on wastewater and stormwater are becoming more stringent. These increasingly strict conditions and effluent limits are intended to reduce pollutant loads on receiving waters and usually require advanced wastewater treatment improvements. Over the past several years, stormwater pollution has become more of a concern to regulatory agencies. Communities, utilities, and private and public entities are now implementing a variety of stormwater management efforts. These efforts and related costs are expected to increase in the coming years.

Wastewater infrastructure can be broken down into two primary categories: (1) Publicly-Owned Treatment Works (POTW) facilities; and (2) collection systems comprised of pipes, manholes, pump stations and other subsurface components that convey wastewater to POTW facilities. Collection systems that collect and carry both stormwater flow and sewage are known as combined sewer systems. Combined sewer systems are common in older collection systems in a number of towns and cities in the State. Combined sewer systems are typically designed with hydraulic relief points to protect downstream assets including the treatment plant. In addition to downstream protection, the hydraulic relief points also provide protection for upstream public infrastructure and private property, i.e. preventing backups. When stormwater overwhelms the combined system's capacity, the hydraulic relief points discharge a portion of the untreated wastewater and stormwater directly to a receiving waterbody. This overflow is referred to as a combined sewer overflow (CSO). In addition, the surge of wastewater to the treatment facility prior to and during CSO events is often disruptive to the treatment plant and can cause short-term compliance issues. CSO abatement such as separation of stormwater from sanitary wastewater by creating separate stormwater sewers, adding additional wet weather storage capacity, or increasing the POTW treatment capacity have been regulatory priorities for many years, beginning with the publication of the National CSO Control Strategy by the Environmental Protection Agency (EPA).

CSO abatement projects have become major areas of investment for many municipalities in Maine. There has been positive progress in CSO reduction in Maine with an estimated 85% - 92% reduction in annual statewide CSO volume since 1989.[1] The separation of stormwater creates a separate discharge that can contain significant pollutants washed off during rain events. Wastewater and stormwater discharges are addressed through the Clean Water Act permitting process called the National Pollutant Discharge Elimination System (NPDES) as well as other state- wastewater and stormwater management programs.

Communities in Maine and across the nation are addressing CSOs discharges of polluted stormwater. As an example, Portland[1] which has the largest CSO volume in Maine, accounting for about 58% of the total CSO volume in Maine in 2015, has made significant improvements and has significant work remaining to address this issue. In 2014 Portland entered into Tier III of their CSO abatement plan. Portland is projecting $170 million in direct capital needs over the next 15 years to address the next round of CSO reduction work contained in Tier III. This work is primarily to increase storage in the combined system. Separation and green infrastructure projects are also part of the plan.

Portland projects are projected to significantly increase sewer rates for local ratepayers. The increased sewer rates are to be incorporated into a Stormwater Utility, which will levy both CSO abatement costs and a new stormwater runoff management fee to equitably distribute costs to Portland landowners. The overall utility investment, regardless of how it is funded, is expected to be the largest municipal infrastructure investment in the city's history. This approach has been implemented at several CSO communities nationwide.

Bangor, Auburn, Augusta and Lewiston also continue to make significant investments in CSO abatement, and have either implemented or proposed utility funding mechanisms. Thirty communities (including most of those discussed previously) are regulated for stormwater discharges under the state's delegated NPDES Municipal Separate Stormwater Sewer System (MS4) general permit and face increasing requirements for asset management, discharge reduction and pollution prevention. MS4 permits are re-issued every 5 years and may require communities to comply with the EPA's Capacity Management Operations & Maintenance (CMOM) program, which sets drainage, collection and treatment system requirements. The requirements are best practices for sustainably maintaining collection system infrastructure and they do have implications on funding. Portland has estimated that $2 to $4 million per year will be required to maintain and operate their drainage collection system given useful life and condition ratings.

Condition and Adequacy

Wastewater infrastructure got a boost in Maine in the 1930s when Civilian Conservation Corps projects led to the development of the earliest systems. The second leap in development of municipal wastewater infrastructure was in the 1970s and 1980s in response to the Clean Water Act and the subsequent funding programs that provided generous grant funding for building wastewater collection and treatment facilities. According to the 2016 Status of Dischargers report, there are 162 POTWs around the state. Through the years, widespread economic growth has expanded developed areas in Maine (both in land area and population), increasing the demand on the existing POTWs. Now many communities are faced with the reality of maintaining an infrastructure that is over 30 years old and in many cases may be approaching or exceeding its design life and unable to achieve the increasing effluent limitations. Funding opportunities for these communities is largely loan-based through the CWSRF program. There are also other funding opportunities as described below.

Many larger communities in the state have completed one or more upgrades of their treatment processes; however, a larger percentage of facilities, generally in the smaller, more rural communities, have had little or no upgrades. Federal and state grant funding for these communities has, in some instances, not been available or has been limited. Financing of upgrades through loans is more difficult for smaller communities due to the low number of users and the relative high cost per user to repay the necessary loans. User fees are typically designed to cover operating and regular maintenance costs and generally do not address the need for major renovation or replacement. The low average annual income of ratepayers makes the payment of higher user fees to support the upgrades and replacement of aging infrastructure challenging.

In addition to the treatment facilities, communities face additional challenges with their aging collection systems. In many systems, stormwater and groundwater infiltrates the collection systems through unintentional openings like cracks and holes in the pipes and structures. This infiltration and inflow (also referred to as I&I) adds additional flow to the system, and sometimes accounts for a large percentage of the system's capacity and can be a contributing factor to Sanitary Sewer Overflow (SSO) events. Without complete repairs to the collection systems, the full effect of other downstream repairs will not be achieved. Rehabilitation and replacement needs will be an ongoing financial challenge for many communities.

Investment Needs

According to the 2012 Clean Water Needs Survey (the most recent results available), conducted by the Maine Department of Environmental Protection (DEP) and submitted to the EPA for inclusion in the EPA 2012 Clean Watersheds Needs Survey 2012 Report to Congress, the total wastewater funding need in Maine is approximately $1 billion. A summary breakdown of this estimate is provided in the table below.

Summary of Maine Clean Watersheds Needs Survey 2012

EPA Needs Catagory[1]	Needs ($M))	Percent
Secondary Wastewater Treatment	$213	22.0%
Advanced Wastewater Treatment	$11	1.1%
Infiltration / Inflow (I/I) Correction	$36	19.0%
Replacement / Rehabilitation of Sewers	$148	
New Collector Sewers	$120	19.3%
New Interceptor Sewers	$67	
CSO - Traditional Infrastructure	$375	38.7%
CSO- Green Infrastructure	NR[2]	
Stormwater Management	NR	NR
Recycled Water Distribution	NR	NR
	$970	100%

[1] EPA Clean Watersheds Needs Survey 2012 - Report to Congress

[2] Not Reported

CSO abatement in Maine is the largest (38.7%) needs category as defined in the Clean Watersheds Needs Survey. To date, Maine CSO Communities have reported spending $504 million to implement their CSO abatement projects since 1989. In the 2015 Annual CSO Progress Reports submitted to the state, these communities reported spending almost $23 million on abatement work.

The overall needs estimate for Maine and nationally decreased from the 2008 Clean Watersheds Needs Survey. While this may appear to be positive news, this does not indicate that the need has actually decreased. Rather it is attributable to changes in the data gathering, including (1) data gathering relies heavily on planning documentation and limited municipal budgets between 2008 and 2012 reduced the size and amount of planned projects; (2) Data gathering standards changed with stricter requirements from the EPA for acceptable documentation; and (3) Stormwater Management was not tracked in the 2012 survey. The general result is an under reporting of needs.

Funding Sources

In recent years, the Efficiency Maine Trust has provided grant funding to organizations in Maine including wastewater treatment facilities. The trust provides wastewater treatment facility owners with cash incentives and/or competitive grants to achieve electrical power and energy savings. Over the past nine years several wastewater projects have received incentive funding for projects that had energy savings as a key component of the project.

Funding for the necessary investment in infrastructure improvements has primarily come from the CWSRF, Rural Development (RD), Community Development Block Grants (CDBG), other grants and commercial loans and bonds. To be eligible for CDBG funding the project area, or service area in the case of treatment plants, needs to consist of 51% or more low to moderate income households. RD programs are based on a community's median household income, as compared against other Maine communities, as well as other considerations including current and anticipated user fees. Recent examples of RD funding were in a 2014 news release in which loan and grant funding were announced for wastewater projects in Hartland, Eagle Lake Water and Sewer District, Gardner, Indian Township Passamaquoddy Reservation and Bingham. The funding assistance totaled $1.8 Million in loans and $4.3 Million in grant funds.

The CWSRF provides interim funding for projects at an interest rate of 1% and provides long term loans, up to 30 years, at an interest rate that is 2% below the current market rate at the Bond Bank, with a minimum interest rate of 1%. RD offers a mix of loans and grants, but in recent years the loan portion has dominated the financing package. RD loan rates are slightly more than SRF long term rates. RD rates are currently 1.625% to 2.75%. RD can only service communities with a population of 10,000 or less. It is not uncommon for public infrastructure projects to have participation from multiple agencies and resources to obtain the level of funds necessary to finance infrastructure and facility improvements.

With the passage of the Water Resources Reform and Development Act (WRRDA) of 2014, projects that involve the repair, replacement, or expansion of a POTW financed by the CWSRF are required to develop and implement a fiscal sustainability plan (FSP). An FSP is an asset management plan that takes into consideration the evaluation of water and energy conservation efforts. From 2012-2014 the CWSRF provided $240,000 in principal forgiveness as an incentive to two borrowers for the development and implementation of asset management plans. With the passage of WRRDA, the CWSRF has shifted this incentive to the development of new or improvements to an existing FSP. Starting in 2015, the CWSRF is offering up to $50,000 per borrower in principal forgiveness for work on an FSP. The offer requires an equal financial match from the borrower. In 2015 and 2016, 12 borrowers received a total of $445,000 in principal forgiveness to develop or improve an FSP.

The capital investment needs for the wastewater treatment facilities and conveyance systems and stormwater management programs are greater than allocated funding. The needs represent the capital investment necessary to plan, design, build, replace or rehabilitate publicly-owned wastewater treatment and collection facilities, eliminate CSO discharges and establish and implement stormwater management programs. The total CWSRF loan amount available for 2016 is $51 million. The CWSRF program will remain a major component in funding wastewater projects; however, it is expected that reduction in federal funding resources will decrease the resources of the CWSRF program in coming years. In 2017, RD is hoping to be funded to the level of funding in 2016 which was a $14.9 million loan and $4.32 million grant.

An encouraging development has recently occurred (at the time of writing this Report Card). The Governor of Maine has asked for and received a proposal from the DEP for a $50 million wastewater bond. The intent of the bond is to provide funding for wastewater infrastructure / water quality programs for four years and will be targeted at the communities that cannot affordably sustain their wastewater systems solely through local rate payers. It is estimated that, if approved, the bond money will leverage about $121 million in federal and state funds.

Conclusions

The most influential factor preventing consistent investment has been setting sustainable user rates and fees. Rates are typically set to cover operating and regular maintenance costs and generally do not address the need for major renovations or upgrades. In some instances, the funds have been directed to other projects. This has led to a dependence on borrowed money through SRF and grant programs. In addition, the needs based assessments that direct a portion of the flow of loan and grant money can favor poor behavior, directing money to systems that are in dire need of repair and upgrade because of a lack of investment in capital and maintenance. As a whole, the wastewater industry model of funding capital projects is not sustainable. The industry must educate their users on the true cost of the services and benefits provided by this essential infrastructure. The industry must invest in people and planning to determine true costs to run and maintain their facilities and set rates accordingly.

Communities need to invest in determining the condition of system assets and developing asset management plans and multiyear capital improvement plans that consider their future plans and the condition of their collection and treatment system assets. Basic asset management principles based on asset condition and criticality could then be used to create a risk-based plan that prioritizes and schedules capital projects over many years. These plans in conjunction with operations, maintenance, depreciation and contingency planning budgets will allow communities to set rates necessary to operate and maintain their wastewater facilities.

The need for low interest money and grants for communities will continue and it is encouraging to see the state preparing for a $50 million wastewater bond at this time. The bond will offer much needed assistance to many communities. Bonds and other State funding will be an important component to achieving sustainable State-wide wastewater infrastructure funding but will not by themselves fill the funding gap.

Good planning will help sustain low interest loan and grant programs as they face continued pressure and the likelihood of reduced funding in future years. By insuring that each community is properly planning capital expenditures and maximizing their ability to self-fund through sustainable rate structures, these funding programs will be extended for those most in need.

The State of Maine Wastewater Industry Stakeholders need to explore new means to generate money for low interest money and grants to those most in need. One option is to set up a State Clean Water Infrastructure Fund which will

be a continuous source of funding (vs. Bond funding). This approach has been used in the State of Minnesota where the fund is financed through sales tax revenue. The lack of funding for infrastructure investment and proper maintenance adversely affects Maine's ability to protect the public health. The general condition of Maine's wastewater infrastructure suffers from declining condition, decreasing reliability, limited capacity for future growth, security issues, environmental stewardship concerns and sustainability problems. Current federal, state and local funding levels are insufficient to support existing funding needs for major upgrades and CSO separation. No major effort has been undertaken to understand the statewide collection system conditions and it is likely that the actual need is substantially larger than identified, therefore environmental impacts will continue to increase. Maine ASCE gives municipal wastewater a grade of **D+**.

Recommendations

Maine ASCE makes the following recommendations to the Maine Wastewater Industry Stakeholders including ASCE:

- Work with federal government and State officials and Congress to fully fund the CWSRF program and reduce the list of needed projects;
- Work with State officials and wastewater stakeholders to set a minimum set of standards and enforcement mechanisms for maintenance and operations as a condition of eligibility for principle forgiveness in the CWSRF program. The purpose of this will be to ensure that communities are responsibly utilizing loan and grant funding to minimize the life cycle cost of all assets under their control therefore reducing overall costs and dependence on funding. This will also help insure that the available loan and grant funding is extended to those most in true need;
- Work with State officials and wastewater stakeholders to set up detailed Asset Management Programs for each community and utility. Ideally, these programs would have a complete list of assets with detailed conditions assessments including remaining useful life estimates and depreciation schedules as well as likelihood of failure and criticality determinations;
- Work with State officials and wastewater stakeholders to encourage each community and utility to maintain a capital reserve fund equal to the depreciated value of their assets. This will require communities to assess the condition of their assets in order to develop and estimate remaining useful life. Conditions assessments are part of a detailed asset management program (see recommendation above);
- Work with State officials, legislators and wastewater stakeholders to explore the creation of a reliable statewide funding mechanism, such as a state wastewater infrastructure fund that would provide both low interest loans and grants for infrastructure investment. The availability and access to sufficient and economically attractive funding resources would help utilities most in need make the necessary investments to their systems;
- Work with State officials and wastewater stakeholders to encourage all communities and utilities to invest in a multiyear Capital Improvement Plan based on condition and criticality assessments of the wastewater collection and treatment system assets. The work conducted in order to establish a well devised Asset Management Program (see recommendation above) is foundational to developing a well devised multiyear capital improvement plan;
- Encourage communities and utilities to implement full cost user rate pricing, which covers both capital and maintenance costs, and educate the public as to the importance of sustainable operations. Determination of realistic full cost pricing will be aided by the establishment of a well devised capital spending plan (see recommendation above) and
- Advocate for the consolidation or regionalization of utilities throughout the state to reduce operational costs.

Sources:

Maine Department of Environmental Protection Clean Water State Revolving Fund Federal Fiscal Year 2016 Intended Use Plan (IUP), Document No. DEPLW1220-F-2016
Maine Department of Environmental Protection report "Summary Information for Licensed Discharges " dated June 2016
Maine Department of Environmental Protection 2012 Clean Water Needs Survey dated January 2012
EPA Clean Watersheds Needs Survey 2012 Report to Congress
Maine Combined Sewer Overflow 2014 Status Report dated May 2016
USDA Rural Development Announces Five Maine Communities to Receive $6.1 Million Investment in Water and Wastewater Projects – News Release, Emily Cannon 10/23/2014

November 28, 2016

PreK-12 SCHOOLS

Grade: C

Overview

Maine schools face an estimated $914 million capital funding gap, a much lower estimate then previously reported, and after five years of funding well below the allowable debt ceiling, 14 major projects are in the planning or construction process, including two with vocational components. Systems for standardization and oversight for major capital projects have improved since 2012. The new projects, especially the vocational schools, include more expensive components. School consolidation and construction of some regional schools have resulted in closure of some deficient schools, though many temporary classrooms and facilities in poor condition remain in use. The student population is approximately 183,000 pupils and continues to drop, by 2.7% since the 2012 report.

Background

Maine has over 600 school districts with an enrollment of approximately 183,000 pupils from pre-kindergarten through 12th grade. The school facilities are local community centers and sources of pride. They are generally well maintained and use the available funding well. Enrollment statewide decreased 10.9% between October 2005 and October 2011 and a further 2.7% by the 2014-2015 school year. Enrollment in the more populous counties (York and Cumberland) has decreased less, and a couple districts have had gains during this same period. The shrinking student population can be attributed to the state having the nation's oldest median age.[1] Infrastructure funding for public school systems covered by this report, is provided by either local government, at approximately 51%, or the state government, at 49%.

Condition and Adequacy

School facilities have many infrastructure components such as water supply (potable and fire protection), wastewater disposal, parking lots and energy. School infrastructure has a direct impact on students' health, particularly indoor air quality. Common public utilities are often not available to serve rural schools, specifically drinking water and wastewater disposal systems. Many rural districts incur high costs due to transportation costs.

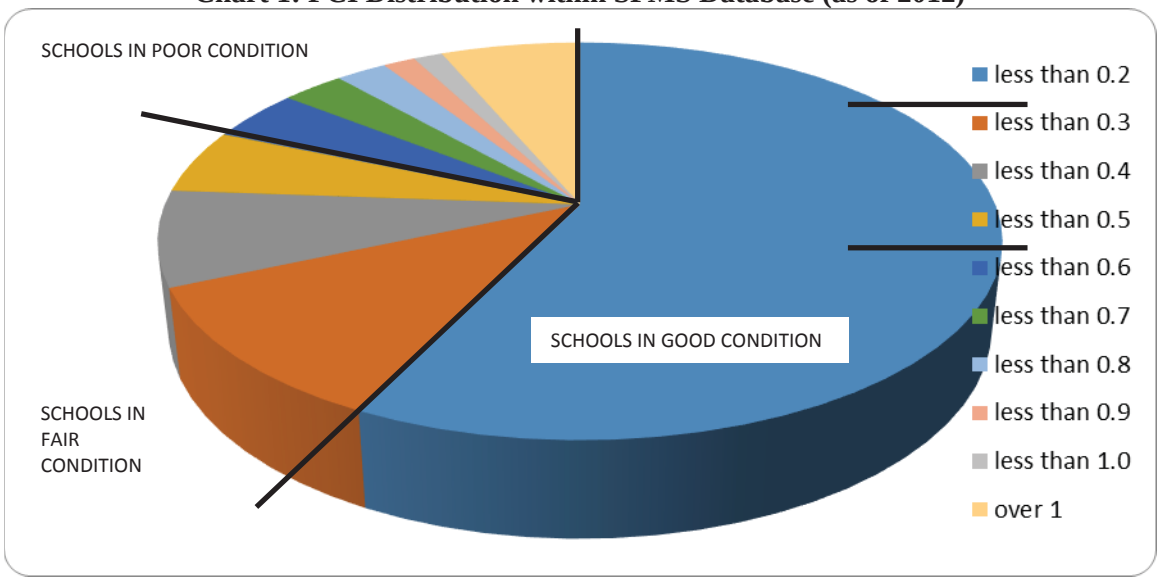
Maine's school facilities have been historically evaluated by various state-appointed Task Forces or academic research institutions, but between 1997 and 2011 the evaluations were done by the Maine Department of Education (DOE), using two databases. Individual analysis of school facilities has been done with a Capital Management Database (CAM) since 1998; in 2009 this was absorbed into a new database, the School Facilities Management System (SFMS), with 66.4% of administrative units using the system in 2011, up from 52% in 2008. The school systems not using this system prior to 2014 could not request capital funding from the Department of Education (DOE). The SFMS database was eliminated from use in 2014 to return more control of education to the local governments. The SFMS was not updated since 2014 and since that time the program is no longer available even to review the data from before 2014.

Up until 2014, the SFMS database used a Facility Condition Index (FCI), which is an industry standard for measurement of the relative condition of assets. The FCI is obtained by dividing the cost to bring an asset into good condition by the current replacement cost of the asset. The higher the FCI ratio is, the poorer the condition of the asset. An FCI of 1.0 or over identifies an asset that has exceeded its useful life and should be replaced.

[1] *http://overflow.solutions/demographic-data/what-is-the-average-age-of-the-each-state/*

Of the school assets in the SFMS database in 2012, 93.6% had an FCI of 1.0 or less, a 3.2% improvement from 2008. The pie chart depicts the FCI distribution within the SFMS database in 2012. As can be seen from the pie chart, 57.3% of the records had an FCI of 0.2 or less, which is considered in "good condition" by the Maine DOE; this value was 45% in 2008 with less schools reporting to the database. Of the total records in the SFMS database (including those with an FCI greater than 1.0), approximately 18.6% of these records had an FCI greater than 0.5, which indicates these facilities needed work. The information used here has not been updated since 2011 but was used as the best available rating information.

Chart 1: FCI Distribution within SFMS Database (as of 2012)



Drinking water is regulated under the Maine Department of Health and Human Services (DHHS). Problems with drinking water are funded for repairs using the DHHS State Revolving Fund (SRF). As of September 16, 2016, there is one public school with a Boil Water Order due to a leaking tank, and one private school with a Do Not Drink Order for high uranium levels[2] and there are 5 schools working on drinking water issues and providing bottled water as needed. Repairs include connecting to municipal supplies, removing boiler cross connections and replacing old plumbing runs.

Capital Program Oversight

The Maine Department of Education (DOE) has added two architects to the program for oversight of major capital projects, for a total of three. Technical oversight of these projects was moved from the Bureau of General Services (BGS) to the DOE. Due to focus on only school construction, we expect oversight to be improved especially in areas that are specific to school construction.

Standardization

Since 2012, the DOE has developed standards for sizes and materials to be used in all new projects, to ensure that all of the approved projects are of high quality, high performing, and affordable, and the design professionals and school boards have a consistent source of information in developing projects. These include the sizes of rooms for a given activity and class size, materials, site and environmental specifications, commissioning, security, life cycle cost evaluations, and also include standards for Career Technical Education (CTE) programs.

[2] Included for informational purposes only as private schools are not rated in this report.

November 28, 2016

Investment Needs – SRRF, Major Capital Projects

In 1998, the School Revolving Renovation Fund (SRRF) was created by the Maine State Legislature to provide funding through loans and grants that would contribute to safe, healthy and adequate school facilities through renovation or capital construction projects. These projects are generally up to $1 million with 30 to 70% of the funding as grants. The SRRF has four major categories:

- **Priority 1**. This category is limited to health and safety projects. Specifically, Priority 1 addresses roofs, Americans with Disabilities Act compliance, air quality, asbestos and other health and safety issues.
- **Priority 2.** This category covers projects that are not health and safety related. These include infrastructure issues, windows, doors, water and septic systems.
- **Priority 3.** This category is limited to energy and water conservation projects. This priority was added in 2011.
- **Priority 4.** This category is limited to the upgrade of learning space. This was "Priority 3" prior to 2011.

Between 1999 and 2015 the SRRF program funded $171.9 million out of $346.3 million of requests; this represents a funding level of slightly over 49% of the requests during that time frame. Some projects have been requested more than once. The last cycle had few requests, with all the Priority 1 requests filled; the DOE is not taking requests for Priority 3 or 4 projects, which are done with local funding. The next funding cycle may include funding for some Priority 2 projects and is expected to provide $8-10 million in project funding for $20 million in requests.

Chart 2: SRRF FUNDING BY PRIORITY

	# Requests 1999-2011	# Requests 2012-2015	# Projects Funded 1999-2011	# Projects Funded 2012-2015	$ Funded 1999-2011 (millions)	$ Funded 2012-2015 (millions)
P1 Health, Safety, Compliance	947	123	432	70	120.8	20.1
P2 Structures, Water, Septic	128	0	56	0	17.6	0
P4 classroom Upgrades, Small Capital	48	0	32	0	13.3	0
Total	**1123**	**123**	**520**	**70**	**151.7**	**20.1**

Maine school districts generally spend 1-2% of their operational budgets on infrastructure maintenance and repairs.

Major capital construction projects generally involve major renovations or new school facility construction. Selection for the Major Capital Projects program is a rigorous needs-based process including strict site selection requirements. The current selection process format has been in place since 1999 and has gone through four rating cycles between 1999 and 2011. Another selection cycle is expected to take two years and is expected to be initiated in 2016. Projects are ranked by the Maine DOE and presented to the Maine State Board of Education for funding approval. During the four funding cycles, approximately $976 million dollars of projects were funded, representing both state and local funding. In the 2004-2005 cycle, the average project cost was approximately $26 million. The last cycle saw 6 construction projects averaging $29.5 million.

The large increases in costs since the first two cycles were due to the increased costs of the facilities for security, computer/technology, and sitework, but also the cost of special teaching facilities for technical school programs. The technical schools are now on an even footing in requesting funding, and two projects that include CTE schools were

committed for funding in the last cycle. A comprehensive high school with CTE currently under construction was just committed for funding at a cost of $90 million in Sanford.

During the past four funding cycles, 301 major capital school construction applications were received and rated. As of 2012, 60 projects had been funded. Since 2012, 14 projects have been committed for funding, are being planned and designed and are expected to be built between 2017 and 2020. The funded projects often include combining the school populations of nearby schools that were requesting funding. As of 2016, there were 31 projects that remain unfunded that are likely to reapply in future cycles. Using the average cost of $29.5 million per project, the potential outstanding needs in 2016 dollars exceeds $914 million. One reason for the substantial decline in outstanding needs from 2012 report ($1.7 billion unmet need estimated in 2012) is that previous school funding requests that applied individually before have now been combined into consolidated school applications. Some additional projects have been locally funded without state subsidy and no information has been collected about these projects by the DOE. Of the listed projects, half of the projects were addressed, mostly with state resources.

In the last four years, at least three major projects were self-funded by communities not meeting the needs-based criteria for state funding. These include a K-5 school in Scarborough, and two high school expansion/renovation projects in Wells and South Portland, that amount to around $100 million in construction costs. These are relatively affluent communities in the southern part of the state.

Nationwide, spending for major projects for schools has slumped, lagging the economic recovery. Maine's major projects under construction have also decreased over the last 8 years, but Maine is ramping up spending as the projects which have been in planning move into the construction cycle. Maine has been funding projects well below the allowable debt ceiling, but by 2018-2020 will have most of the allowable debt in play.

Because of the lower level of construction work on these projects in the past years, the school projects coming up may be limited by the aging construction workforce and a lower number of contractors with experience building schools. With the recession, some CTE programs in the construction trades in Maine have been cut back and fewer qualified people are being encouraged to consider or prepare for construction jobs. Many contractors are experiencing difficulty in hiring construction workers.

Conclusions and Recommendations

The required level of needs identified exceeds what is currently allocated through the two primary means of dealing with school infrastructure: the SRRF and the Major Capital Projects program. Current funding levels show a gap of $914 million in major renovations or new construction between the requested and funded projects. Many substandard and aging facilities have been addressed through consolidating school districts and moving the consolidated schools into new buildings, providing those students with enhanced facilities and programs but longer bus rides. Many temporary classrooms and other substandard facilities are in use. Maine ASCE gives schools (PreK-12) a grade of **C**.

Maine ASCE provides the following recommendations:

- The next selection cycle for Major Capital Projects needs to be initiated;
- Schools are major facility investments and need to use SFMS-type software to have the information to manage their facilities, and suspending reporting of this information limits the support the facility maintenance departments can provide, so some method of reporting the facilities condition needs to be implemented, whether it is reported to the DOE or not;
- Increase the visibility of maintenance funding in the school districts as a vital part of keeping the capital cost of the education infrastructure down;
- Increase debt service and bond cap levels to coincide with cost increases so that infrastructure project funding does not fall behind, especially for SRRF projects; and
- Increase the support for students considering or attending CTE programs, especially in construction.

Sources:

- Maine Department of Education Data Warehouse, website: http://dw.education.maine.gov/DirectoryManager/Web/Maine_report/MaineLanding.aspx
- Interviews with Education Specialists and consultants at the Maine Department of Education
- National Education Spending: http://www.governing.com/gov-data/education-data/state-education-spending-per-pupil-data.html
- Center on Budget and Policy Priorities, http://www.cbpp.org/research/state-budget-and-tax/most-states-have-cut-school-funding-and-some-continue-cutting
- Maine Department of Education Booklet 3, Public School Standards and Construction Guidelines for New School Construction and Major Renovation Projects, http://www.maine.gov/doe/facilities/construction/3%20Standards%20&%20Guidelines.pdf
- Maine DHHS website: http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/sitemap/inspections.shtml
- Interview with Director of Drinking Water Program, Maine DHHS

November 28, 2016

SOLID WASTE

Grade: C-

Overview

In 2014, Mainers collectively disposed of 2.8 million tons of total solid waste, including an average of 1,140 pounds of household waste (or municipal solid waste) per person – lower than most northeastern states. Waste disposal rates have fluctuated over the past ten years with the annual solid waste tonnage in 2014 returning to the disposal rate of 2008. Increasing disposal rates, facility closures, and the creation of no new landfill capacity in recent years lends uncertainty to current analysis that indicates that capacity exists to meet disposal needs over the next two decades. Recent efforts to manage food and yard waste disposal have seen positive results, but at 36% in 2014, MSW recycling remains below the state-established goal of 50%. Continued promotion of recycling and reduction, along with changes in policies, long term planning, and investment, are necessary to ensure that usable disposal capacity remains for the long term.

Background

In the late 1980s, the State of Maine enacted legislation that resulted in significant improvements to the way solid waste was managed. Since that time, solid waste management in Maine has continued to evolve, as the State strives to follow the hierarchy developed for disposal:

1. Reduction of waste generated at the source, including both amount and toxicity of the waste;
2. Reuse of waste;
3. Recycling of waste;
4. Composting of biodegradable waste;
5. Waste processing that reduces the volume of waste needing land disposal, including incineration; and
6. Land disposal of waste.

In the past two decades, the rate of recycling has more than doubled as public recycling services have been made available to nearly all of the state's population; toxic materials have been kept out of the waste stream by requiring recycling and special collection of certain hazardous materials like universal wastes; nearly all of the state's substandard landfills have been capped and closed to reduce their impact on the environment; and new landfills and expansions have been held to siting, design, and monitoring standards that help to protect the environment.

In 2013, the Maine Legislature required that the solid waste hierarchy be incorporated into the Solid Waste Regulations as licensing criteria for all solid waste licensing actions. This incorporation shifted the responsibility of meeting the state goal from the state level to that of the individual solid waste facilities.

In accordance with the original legislation, periodic waste management plans have been developed, first by the Maine Waste Management Agency, then by the Maine State Planning Office (SPO), and now by the Maine Department of Environmental Protection (DEP), Bureau of Remediation and Waste Management. The most recent Waste Materials Management Plan was issued by the Maine DEP in January 2014. The plan provided an assessment of current policies and a review of changes since the previous plan was issued five years prior. The 2014 plan defined the following four focus areas for solid waste in Maine:

1. Encourage development of new infrastructure and technologies;
2. Encourage an increase in beneficial use and recycling;
3. Provide tools and assistance to municipalities and businesses to support waste reduction; and

4. Continue to refine data sources to more accurately assess progress towards waste management goals.

The Maine DEP collects annual solid waste data from waste processors and municipalities, and summarizes this information in state-wide reports issued at the beginning of each year. The most recent report was issued in January 2016, and includes data from 2014. The Maine DEP took over data collection/presentation in 2012, and has been working to improve the accuracy and consistency of the information that is presented. This annual data is used to project capacity and evaluate progress towards the state's waste management goals.

Condition and Adequacy

The condition of Maine's solid waste system is evaluated annually by comparing the state's waste generation rates to the available solid waste management options.

MSW Generation Rates: In 2014, Maine Residents generated and disposed of 2.8 million tons of waste, including MSW, construction demolition debris (CDD), wood waste, land-clearing debris, and special wastes. Considering only the MSW waste, disposal was an average of 1,140 pounds per person, a slight increase from 1,030 pounds per person in 2013. This value is less than the average MSW generation in the Northeast, which was 1,400 pounds per person in 2012.

From 1993 through 2001, waste generation increased by 42%, but from 2003 through 2007 waste generation growth leveled off, with an increase of only 1%. Since 2007, waste generation has fluctuated, decreasing with the economic downturn between 2008 and 2012 and returning to pre-2008 levels by 2014.

Solid Waste Management:

As previously discussed, Maine has a solid waste hierarchy that defines the types of solid waste management that should be utilized in the state. First on the list is reduction at the source, eliminating the need for solid waste management. The following three, reuse, recycling, and composting are often evaluated together under the category of "diversion from disposal". The two final are waste processing for volume reduction (i.e. incineration) and landfill disposal.

Diversion from Disposal: Maine's legislative goal was to achieve a 50% MSW recycling rate by January 1, 2009. In 2014, Mainers recycled 36.24% of MSW, not including construction demolition debris (CDD). Including CDD and land-clearing debris with the MSW, Maine's diversion from disposal rate was 45% in 2014, compared to 47% in 2013. Recycling facilities exist throughout the state, but more recycling options will be necessary to eventually meet the state's recycling goals.

A significant effort has been made to increase the amount of composting in Maine. From 2013 to 2014, the amount of composted materials nearly doubled from 12,700 tons to 23,600 tons. The state continues to emphasize the importance of composting primarily to remove these materials from landfills. Although a recent effort to enact legislation to ban food waste in landfills was unsuccessful, private business is acting on the opportunity to expand efforts in organics diversion and anaerobic conversion to energy. New operations like Garbage to Garden and We Compost It offer curbside residential pickup of organics in Maine and companies like Village Green Ventures and Exeter Agri-Energy are using new technologies to convert organic wastes to energy.

Volume reduction: In 2014, there were three Waste-To-Energy (WTE) facilities in operation in Maine:

- Mid-Maine Waste Action Corporation (MMWAC), Auburn;
- ecomaine (formerly Regional Waste Systems), Portland; and
- Penobscot Energy Recovery Company (PERC), Orrington.

Note that the ecomaine WTE facility is separate from the ecomaine single-sort recycling facility. PERC utilizes refuse derived fuel technologies (whereby the waste is processed prior to incineration), while the ecomaine WTE facility and MMWAC are mass burn technologies, which does not include waste processing prior to incineration. In 2014, 578,000 tons of waste were received at incineration facilities, and of that waste, 369,500 tons were incinerated. The remaining tonnage was disposed of in landfills as bypass waste and ash, and a small amount of metals were recovered and recycled.

Landfills: In 2014, in addition to the three WTE facilities, Maine had seven municipally-owned landfills, two State-owned landfills, and one commercially owned landfill. The number of municipally-owned landfills in Maine is dropping. Running a landfill can be an expensive endeavor for a municipality.

In 2014, the Maine DEP estimated that approximately 10.5 million tons of landfill capacity remained in Maine. Based on current disposal rates, and assuming no additional licensed capacity added, it is estimated that in 20 years, the remaining landfill capacity will be 1.8 million tons. Nearly all of this remaining capacity will be in two landfills located in Aroostook County.

Based on the current license of the Juniper Ridge Landfill in Old Town, after 2018, the facility will no longer be able to accept municipal solid waste. The State-owned landfill has been accepting waste for the past few years that was previously sent to a waste-to-energy facility that was closed in Biddeford, Maine. In 2015, the State Bureau of General Services, which has assumed ownership of State-owned landfills, submitted an application for expansion of the Juniper Ridge Landfill. This expansion, if approved, would provide 10-12 years of capacity at a waste acceptance rate of 700,000 tons per year. The first phase of the facility is planned for construction in 2017 to be ready to accept waste in 2018, assuming that approval is obtained. This planned capacity is not accounted for in current waste capacity projections

Funding

Though policy decisions are made at the state level, solid waste management is still the responsibility of and funded almost entirely by municipalities. Thus, state policy makers must consider the costs to local tax payers for solid waste management, yet strive to maintain environmental protection, especially as disposal facilities close and disposal options in some areas of the state become more limited.

Innovation

A recent emphasis on the diversion of organic wastes from landfill disposal has resulted in some innovative opportunities in Maine. Exeter Agri-Energy and Village Green Ventures are two new companies that are using innovative technologies to convert waste to energy using anaerobic digestion. These facilities focus on using organic wastes from local sources, but there is an effort to expand the technology into a more widespread use.

The DEP recently permitted the Fiberight waste processing facility with the design capacity of 237,250 tons. This facility is proposed to be built in Hampden and is a combined recycling and processing facility with a conversion and recycling rate of 70%-80% with the remainder of the processed waste to be separated and landfilled. The facility will convert organic waste to biofuel for energy production and sort and recycle the remaining non-organic materials. The facility is expected to be operational in late 2018. The proposed technology has not been used in Maine before at this scale. While an innovative technology to be considered in Maine, if there are any delays in completion of the project, or issues with the facility's process, waste that was destined for the facility will be landfilled.

There is also a level of uncertainty with regards to this new facility and whether it will be able to co-exist with the PERC facility in Orrington. The PERC facility is poised to lose its favorable energy rates in 2018. Many municipalities that have been sending waste to PERC are now planning to send waste to the new Hampden facility when it becomes operational. It is unclear whether Maine's solid waste industry will be able to sustain both facilities. Changes in annual waste capacity due to the new facility or changes to PERC are not currently accounted for in waste capacity projections.

Conclusions and Recommendations

Solid waste management has improved due to 1980s legislation and external influences since that time, resulting in:

- Enhanced protection of public health and the environment through the closure of obsolete facilities, reduction of toxics in the waste stream, and strict regulations governing solid waste facilities;
- Increased public awareness of solid waste issues and infrastructure;
- Development of new technologies, most notably single sort recycling;
- Achievement of reasonable recycling rates that are greater than the national average; and

- Provision of adequate disposal capacity based upon today's generation rates.

Today, the state's solid waste management system is adequate. However, to maintain adequate disposal capacity into the future, a number of issues need to be addressed:

- Solid waste generation rates have returned to pre-2008 economic downturn levels, and continue to increase;
- Recycling goals have not been achieved;
- The loss of disposal facilities has not been offset by expansions or new facilities.
- In 2018, the Juniper Ridge Landfill will lose its ability to accept municipal waste, the PERC waste to energy facility will lose its favorable energy rates and many of its municipal waste contracts, and a facility with a new technology is anticipated to open. This level of uncertainty could have an impact on waste capacity.

Maine ASCE gives solid waste a grade of C-.

Maine ASCE makes the following recommendations:

- Continue state support to municipalities to enhance local solid waste management programs, with emphasis on cost-effective reuse and recycling, and support of household hazardous waste collection;
- Promote waste reduction, recycling, and beneficial reuse of waste products. This should include incentives for solid waste service providers for the development of new technologies, enhanced and new beneficial reuse of waste, and new markets for recyclables;
- Continue to review and update Maine's solid waste policies to reflect technological advances made in the solid waste industry, current or present-day public opinion, and current management policy, as well as Maine's variations in population density, waste generation rates, and type of waste generated;
- Respond to annual updates of the solid waste plan and capacity projections in a timely manner, recognizing the long time necessary for permitting and constructing additional (disposal) capacity; and
- Ensure that changes to solid waste management planning at the state level do not result in lost momentum.

Sources

- Code of Federal Regulations (CFR) Title 40: Protection of the Environment; Part 258 – Criteria for Municipal Solid Waste Landfills;
- Maine Revised Statutes Annotated (MRSA) Title 38; Chapters 13 (Waste Management) and 24 (Solid Waste Management and Recycling);
- Report entitled "Maine Solid Waste Generation and Disposal Capacity Report :Calendar Year 2014," prepared by the Maine Department of Environmental Protection for the Joint Standing Committee on the Environment and Natural Resources of the 127rd Legislature, and dated January 2016;
- Report entitled "Solid Waste Disposal Capacity Report for Calendar Year 2009," prepared by the Maine State Planning Office for the Joint Standing Committee on Natural Resources of the 123rd Legislature, and dated January 2011;
- Report entitled "Waste or Resource? Rethinking Solid Waste Policy – State of Maine Waste Management and Recycling Plan," prepared by the Maine State Planning Office, and dated January 2009.
- Fact Sheet entitled "Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2010," prepared by the United States Environmental Protection Agency, dated December 2011.
- Article entitled "Biddeford council votes to close MERC," by Gillian Graham for the Portland Press Herald, dated July 18, 2012.
- Web site of the Waste Management and Recycling Program of the Maine State Planning Office, http://www.state.me.us/spo/, accessed October, 2012;
- Web site of the Bureau of Remediation and Waste Management, Maine Department of Environmental Protection, http://www.maine.gov/dep/waste/index.html, accessed October 2012;
- Maine DEP "Update on New Duties," email dated June 19, 2012.
- 2010 Maine Census

November 28, 2016

STATE PARKS

Grade: C+

Overview

Maine's 49 state parks and historic sites are a key contributor to tourism – Maine's number one industry – and outdoor recreation generates $382 million in tax revenue and 65,000 jobs. Recent technology initiatives, including the ability to view campsites before booking, have improved the park user's experience. However, there has been little capital investment made in recent years to help reduce a $30 million maintenance backlog, enhance the level of service, and fully realize the economic potential of the state park system. A continued decline in condition is anticipated absent additional investment in the system's infrastructure. If this trend continues visitor experiences will diminish in quality and Maine will ultimately suffer a lost economic opportunity.

Background

Maine's public recreation backbone consists of 49 state parks and historic sites (See Figure 1). These areas (except Baxter State Park) are managed by the Maine Department of Agriculture, Conservation and Forestry (DACF) and its associated divisions. Baxter State Park is managed by the Baxter State Park Authority, a three person authority consisting of the Maine Attorney General, Director of Maine Forest Service, and the Commissioner of Inland Fisheries and Wildlife.[i] Public lands, conservation easements and leases bring the total land area managed to over 2 million acres.[ii] The state also has numerous municipal areas, a national park, a national monument and other recreational activity areas. The 49 State Parks are the focus of this report. Eighty percent of Maine residents have a state park within 15 miles of their home.[iii]

Condition and Adequacy

In 2004, the DACF commissioned a study to assess the condition of state parks' major infrastructure assets and develop a recommended capital improvement program. This study enabled the DACF to establish an updated baseline for prioritizing infrastructure improvements to the system. The assessment covered all state park facilities, including more than 200 buildings and multiple site facilities, with an emphasis on assets that would likely require more than $15,000 each to renovate or replace. A comprehensive team of engineers, planners, landscape architects, surveyors and historical preservation consultants conducted the assessment and worked with the DACF to develop the capital improvements plan which identified $40 million in capital investment needs. There has been no new comprehensive study since 2004.

Maine's economy is heavily dependent on the tourism industry. As described in the 2012 Report Card, according to a study by the Outdoor Industry, estimates indicate that in Maine outdoor recreation generates $5.3 billion in consumer spending, 65,000 direct Maine jobs, $1.5 billion in wages and salaries and $382 million in state and local tax revenue.[iv] Although these figures cover all Maine outdoor recreation, this report is specific to State Parks. The State of Maine's annual report for 2014-2015 reported that capital projects were completed at several state parks in Fiscal Year 2015 including Warren Island State Park, Fort McClary Historical Site, Colonial Pemaquid State Historic Site, Quoddy Head State Park and Sebago Lake State Park.

Attendance at Maine's State Parks has seen significant growth in recent years, serving well over 2.5 million visitors every year.[v] When 2009-2013 is compared to 2004-2008, state parks have increased attendance by 8.4%. This increase in attendance at Maine's State Parks is due to both residents and non-residents alike. A survey was completed as part of the 2014-2019 Maine State Comprehensive Outdoor Recreation Plan which asked non-residents where in Maine they recreated. Over 50% of non-residents reported that they had visited

a Maine State Park in the last two years. In particular, campground reservations at Maine State Parks average nearly 40% non-resident campers. With the demand at Maine State Park's increasing both from resident and non-resident attendance, the need for additional funding to keep up with this demand also increases.

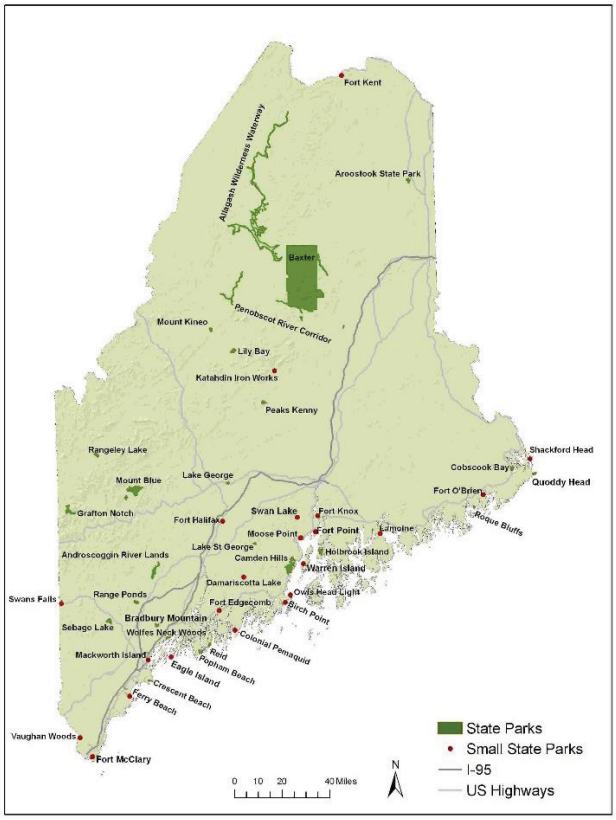


Figure 1: Map of Maine's State Parks[vi]

Table 1.1 List of all Maine State Parks[vii]

1. Allagash Wilderness Waterway
2. Androscoggin Riverlands State Park
3. Aroostook State Park
4. Baxter State Park
5. Birch Point State Park
6. Bradbury Mountain State Park
7. Camden Hills State Park
8. Cobscook Bay State Park
9. Colburn House state Historic Site
10. Colonial Pemaquid State Historic Site
11. Crescent Beach State Park
12. Damariscotta Lake State Park
13. Eagle Island State Historic Site
14. Ferry Beach State Park
15. Fort Baldwin State Historic Site
16. Fort Edgecomb State Historic Site
17. Fort Halifax State Historic Site
18. Fort Kent State Historic Site
19. Fort Knox State Historic Site
20. Fort McClary State Historic Site
21. Fort O'Brien State Historic Site
22. Fort Point State Park
23. Fort Popham State Historic Site
24. Grafton Notch State Park
25. Holbrook Island Sanctuary
26. Katahdin Iron Works
27. Lake St. George State Park
28. Lamoine State Park
29. Lily Bay State Park
30. Mackworth Island State Park Trail
31. Moose Point State Park
32. Mount Blue State Park
33. Mount Kineo State Park
34. Owls Head State Park
35. Peaks-Kenny State Park
36. Penobscot River Corridor
37. Popham Beach State Park
38. Quoddy Head State Park
39. Range Ponds State Park
40. Rangeley Lakes State Park
41. Reid State Park
42. Roque Bluffs State Park
43. Sebago Lake State Park
44. Shackford Head State Park
45. Swan Lake State Park
46. Two Lights State Park
47. Vaughan Woods Memorial State Park
48. Warren Island State Park
49. Wolfe's Neck Woods State Park

Funding and Investment Needs

As reported in the 2008 Report Card, the DACF's Bureau of Parks and Lands (BP&L) contracted more than $5 million in critical need improvements for major sanitary projects to upgrade restroom facilities, as part of a larger $7.5 million bond from 2007. The projects include masonry repairs, sanitary system replacements and shoreline protection. This investment level was a good start and resulted in Maine ASCE giving State Parks a B- in 2008.

According to the 2012 Report Card, after interviewing staff at the BP&L, the only notable additional funding since the 2008 Report Card was $610,000 as part of a state bond issued in 2009. This limited funding was focused on health and safety related improvements, primarily for wastewater improvements at park facilities. These represent the most fundamental needs of the State Park system and did little to reduce the overall backlog of over $30 million for estimated maintenance, reconditioning, rehabilitation and replacement that still exists. As reported in 2008 and 2012, the state's general fund has not provided BP&L with capital money for renovations and new construction for at least a decade.

In 2010, a $9,750,000 bond was passed to invest in land conservation and working waterfront preservation with only $500,000 designated to preserve state parks.

One source of revenue for Maine State Parks is the sale of the Wildlife Loon License Plate. Slightly more than $400,000 per year is generated from this source.[viii] For every $20 spent on a new loon license plate, $8.40 goes to the BPL.[ix] These funds are used for basic maintenance supplies and upkeep items, and other more significant projects, including:

- Construction of a new day-use shelter at Moose Point State Park;
- Replacement of boat slips at Lily Bay State Park;
- Improvements in keeping with the Americans with Disabilities Act at the Lightkeeper's House at Quoddy Head State Park;
- Harvesting about 20,000 board feet of lumber from the Camden Hills woodlot, later used to build picnic tables, signs, Adirondack shelters and a cold storage building, as well as repair many other park structures throughout the park system;
- Repairing trails, roads and parking lots at Moose Point State Park, Camden Hills State Park, Quoddy Head State Park, Damariscotta Lake State Park, Shackford Head State Park and Birch Point Beach State Park.;
- Installation of a new lifeguard stand at Peaks-Kenny State Park; and,
- Purchase of a historically important parcel at Colonial Pemaquid State Historic Site in Bristol, completing the site area.

Money from dedicated license plate sales and water extraction fees has only been sufficient to make minor improvements and to cover a portion of maintenance. Poland Springs was paying royalties to extract water from an aquifer bordering Range Pond State Park between 1999-2006 contributing $4 million to the maintenance of state parks during that time, as example. Upgrades to the facilities—for sanitary systems, shelter, wayfinding and interpretive signage—are necessary to promote the areas, and to preserve the quality and natural existence of the resources. Without the maintenance of the recreational areas, the quality of the experience will be degraded and economic opportunity for the state will be lost.

Some revenue is also generated from the Maine Outdoor Heritage Fund (MOHF) through the sale of instant scratch lottery tickets, which conserves wildlife. The MOHF awards grants twice a year, totaling approximately $700,000 annually.[x] Over the past four years, the following grants have been awarded for State Park projects:

- In May 2016, a $4,870 grant was awarded to the DACF for natural resource inventories for vulnerable coastal state parks, which included Quoddy Head State Park, Roque Bluffs State Park, Scarborough Beach State Park, and Ferry Beach State Park. These inventories will help the BP & L in the long term management of the natural resources within the parks.
- In May 2015, a $12,151 grant was awarded to the DACF for the purchase of twelve wheelchairs specifically designed for beach terrain, which will be distributed among several Maine State Parks.
- In May 2015, a $7,200 grant was awarded to the DACF which will fund the Maine Conservation Corps Field Team to spend three weeks performing trail maintenance at Vaughn Woods State Park to ensure the public will continue to have safe access to the Woods' three miles of walking trails. A similar grant of $4,800 was awarded in May 2014 to the Vaughn Homestead Foundation also for trail maintenance.
- In May 2015, a $14,800 grant was awarded to DACF for the mapping and managing of invasive plants on State Parks and public land.
- In May 2014, a $5,533 grant was awarded to Mount Blue State Park to upgrade and expand educational displays, materials, equipment and supplies at the Park Nature Center.
- In November 2013, a $14,440 grant was awarded to DACF to document and map significant natural features at Maine's coastal state parks as part of a wider scale assessment of coastal park vulnerability.
- In November 2013, a $14,060 grant was awarded to the DACF to survey Maine residents in order to gain valid insight into the pattern of perspectives on, barriers to, and characteristics associated with Mainers' enjoyment of the outdoors.
- In November 2013, a $4,938 grant was awarded to DACF to improve the trail based rescues at Bradbury Mountain State Park with the purchase of new emergency rescue equipment and by providing coordinated rescue training sessions between Bradbury Mountain State Park and Pownal Fire and Rescue. A similar grant of $5,043 was awarded to DACF in May 2013.
- In May 2013, a $5,920 grant was awarded to DACF to inform, educate and inspire potential visitors to the Allagash Wilderness Waterway while also producing video content that can be used to educate canoe and kayak campers across the state.

In 2015 camping reservation fees were increased from $2 to $5, however, the DACF spokesperson, John Bott, stated that "even with the increase, the state still can't cover all of the costs of programs and maintenance of the state parks."[xi] Reservation fees in FY2015 generated almost $980,000. State Parks generated over 40% of their general appropriation though through user fees ($2.7 million in calendar year 2014).[xii]

The Maine BP&L did produce the Maine State Comprehensive Outdoor Recreation Plan (SCORP) for 2014-2019 as required by State Law to be eligible for the federal Land and Water Conservation Fund Program (LWCF). The LWCF provides matching funds to states for statewide outdoor recreation and planning and for acquisition and development of public outdoor recreation areas and facilities.[xiii] The report outlines the demand and supply of outdoor recreation resources and facilities in the state and a program for implementation of the plan. The report gives no clear financial figures specific to state parks but does show the need for improving outdoor recreation in Maine. From 1966 through 2013, just under $40 million of LWCF money has been used for non-federal projects in Maine.

Baxter State Park Authority receives approximately 35% of the cost of park operations from fees and the remainder from trust funds established by Percival Baxter.

Innovation

While the annual report from the DACF's BP&L generally doesn't discuss improvement to the parks themselves, there have been several technology initiatives to improve the park user's experience. One of the projects allows uses to view campsites before booking using google earth, while another has launched a pilot program at nine park locations where users can access park and trail condition information online or through

text. Also using Recreational Trails Program funds the BP&L has continued to develop trail maps which are available online.

Conclusions and Recommendations

There have been no new large scale inspection studies since 2012 updating the details of condition or funding needs. The DACF does release annual reports which show no major increases in funding or major changes in condition over the 2013-2015 time period. As listed in the previous section there have been several bonds and grants that have benefitted the state parks, but with the prior financial backlog and increase in use of the parks, those funds have not allowed for all of the needed improvements.

Based on available information, the status and condition of state parks have not changed significantly since the 2012 Report Card, and without increased investment into the State Park's infrastructure a further decline in condition is expected. The DACF continues to prioritize available funding based on most critical needs and managing any deferred maintenance or capital improvement needs to the extent practicable. While some improvements have been made, the needs continue to outweigh the funding available. Maine ASCE again rates the State Parks a grade of C+.

Maine ASCE makes the following recommendations:

- Update the BP&L database to include recent investments and establish an updated baseline of where the inventory stands;
- Evaluate and leverage fee structures to fund maintenance and improve key assets. User fees can potentially be leveraged further to assist with the funding process, resulting in a more sustainable infrastructure. One potential option would be to increase user fees for non-resident visitors;
- Increase visitation by surveying existing users on what they enjoy the most or what they see are needed for improvements and focus on those areas first; and,
- Use public private partnerships to increase revenues for increased capital maintenance.

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[i] Maine State Government Annual Report 2014-2015 P. 327 Baxter State Park Authority
[ii] http://www.maine.gov/dacf/parks/about/index.shtml
[iii] The State of State Parks in Maine By Li Yu Chan, Gordon Padelford and Theo Papademetriou Colby College 2011
[iv] Outdoor Industry Association. "The Outdoor Recreation Economy-Maine." Outdoor Industry Association Outdoor Recreation Economy Comments. Outdoor Industry Association, 2014. Web. 01 Sept. 2016. <https://outdoorindustry.org/research-tools/outdoor-recreation-economy/>.
[v] Maine State Government Annual Report 2014-2015 P. 34 Bureau of Parks and Lands
[vi] Maine Office of GIS 4/30/2010
[vii] Harris and Townsend 2010; MDOC 2010. Prior to this report, no cumulative up-to-date list of state parks in Maine was publicly accessible.
[viii] The State of State Parks in Maine By Li Yu Chan, Gordon Padelford and Theo Papademetriou Colby College 2011
[ix] "Loon License Plate."*: Get Involved: Bureau of Parks and Lands: Maine DACF*. Department of Agriculture, Conservation and Forestry, n.d. Web. 12 Sept. 2016. <https://www1.maine.gov/dacf/parks/get_involved/loon_plate.shtml>.
[x] "Maine Outdoor Heritage Fund." *Maine Outdoor Heritage Fund*. Department of Inland Fisheries and Wildlife, n.d. Web. 12 Sept. 2016. <http://www.maine.gov/ifw/MOHF.html>.
[xi] Costa, Chris. "Maine State Parks Camping Fees Increase." WCSH. WCSH, 9 Feb. 2016. Web. 01 Sept. 2016. <http://www.wcsh6.com/life/maine-state-parks-camping-fees-increase/38226091>.
[xii] Maine State Government Annual Report 2014-2015 P. 34 Bureau of Parks and Lands
[xiii] Maine Department of Agriculture, Conservation, and Forestry Bureau of Parks and Lands. Maine State Comprehensive Outdoor Recreation Plan, 2014-2019. Rep. July, 2015. Print.

November 28, 2016

AIRPORTS

Grade: C+

Overview

Since 2012, there has been no federal funding or fee increases for Maine's Airports. Concurrently, budget shortfalls in many communities, coupled with a doubling of the local match in 2012 from 2.5% to 5% have left many airport sponsors short of their share of project funding. The recently improving economy and increase in construction costs have exacerbated the situation by eroding the value (dollars allocated) of the federal program in relation to inflation. An additional concern since 2012 is the sharp increase in airspace obstructions precluding safe access to some airports by planes during times of inclement weather and nighttime operations. It should be noted, however, that even in the face of restrictive funding levels, meaningful terminal expansions and facility improvements have taken place at many of our airports throughout the state of Maine.

Introduction and Background

While the state has 188 airports, ranging from private grass strips to seaplane bases, heliports, and public use airports, this report focuses on the 35 public-use airports that are included in the "National Plan of Integrated Airport Systems (NPIAS)." This update narrows the focus exclusively on the Maine airports that are linchpins for economic growth and stability and discounts references to the now outdated "2002 Maine Aviation System Plan (MASP)". As noted in the Recommendations Section, this plan should be updated, as soon as possible.

Of the 35 airports servicing the state, two commercial service facilities constitute many of the state's air passenger traffic; Portland International Jetport and Bangor International Airport. The remaining 33 airports include two additional primary airports (Northern Maine Regional Airport and Knox County Regional Airport) and two non-primary commercial service airports (Augusta State Airport and Hancock County-Bar Harbor Airport), with the remaining facilities classified as general aviation (GA) airports[i].

Since the 2012 report, the FAA replaced the Level I, II, III and IV with five new GA airport categories. **Table 1** lists the airport categories for both commercial service and general aviation.

Maine's Airport Infrastructure

This ASCE Report Card update focuses on airport infrastructure needs using quantifiable data that is measurable today and in the future. Information in this section is provided by the Maine Department of Transportation (MaineDOT) through its comprehensive evaluation of NPIAS airports and FAA Airport Master Records. MaineDOT's ongoing inspection process of runways, taxiways, and parking aprons,

Table 1. NPIAS Airport Classifications and Maine Airport Count

Role	Airports	Description
Commercial Service		
Primary	4	Airports that have more than 10,000 passenger enplanements each year.
Non-Primary	2	Airports that have at least 2,500 and no more than 10,000 passenger enplanements each year.
General Aviation		
National	0	Provides communities with access to national and international markets in multiple states and throughout
Regional[ii]	2	Supports regional economies by connecting communities to statewide and interstate markets.
Local	13	Provides access to primarily intrastate and some interstate markets.
Basic	11	Links the community with the national airport system and supports general aviation activities
Unclassified	3	Provides access to the aviation system.

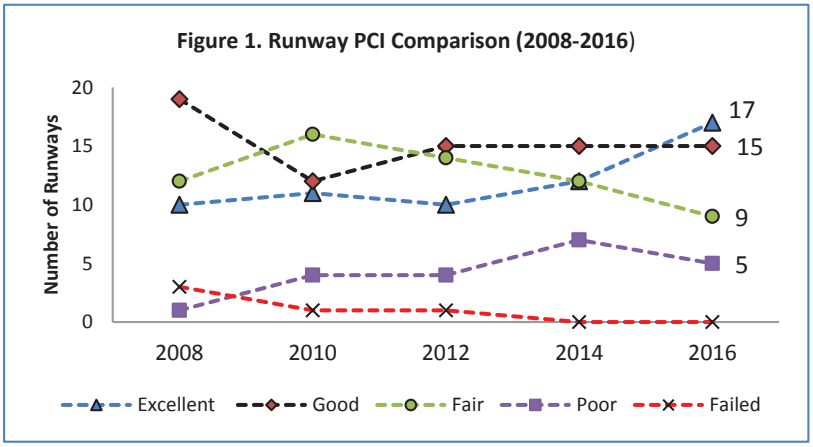
and its observation and assessment of obstructions in protected airspace, runway safety areas, itinerant pilot/passenger and medical access is recognized and noted in this update. Using data from the FAA's Airport Master Records (5010-1), this section also examines the availability of *fuel*, *weather reporting*, *visual navigation systems*, and *instrument approach procedures*.

Public Safety and Operations & Maintenance Considerations

A - Pavement Condition. PCI (Pavement Condition Index) is widely used in civil engineering to indicate the general condition of pavements. The method is based on a visual survey of the number and types of distresses in the pavement and is then generalized into FAA Pavement Condition Ratings. The PCI scale ranges from 0 (failed) to 100 (excellent) with a corresponding rating value of 0 to 5. MaineDOT's objective is to achieve a rating of Fair (3) or better.

- 5 = Excellent or a PCI of 94-100
- 4 = Good or a PCI of 80-93
- 3 = Fair or a PCI of 65-79
- 2 = Poor or a PCI of 45-64
- 1 = Failed or a PCI of 0-44

Runways at the state's NPIAS general aviation (GA) airports were evaluated in 2008, 2010, 2012, 2014, and again in 2016[iii]. **Figure 1** illustrates PCI trends during this eight-year span**.**



An examination of the state's NPIAS runways indicates that 85% are rated fair or better, with the objective of reaching 100%.

Taxiways, aprons, and lighting systems at the same 31 GA airports were also evaluated[iv]. The runways were evaluated using the PCI measurement discussed above, and the taxiways, aprons, and lighting systems were graded based on a scale of 0 (failing condition) to 5 (new condition).

MaineDOT's evaluation indicates that Taxiways are rated at 3.9 (Good – Very Good); Aprons: 3.4 (Fair); and Lighting Systems: 3.3 (Fair), with the objective of having 100% rated fair or better.

B – Obstructions. Twenty-one airports have had night procedures, night landings, or night circling procedures deemed "Not Applicable" by the FAA because of trees and other objects materializing in the airspace adjacent to airports (cell towers, power lines, etc.)[v]. Not applicable indicates the approach is still valid other than during nighttime operations.

These objects are primarily located in or close to the approach and departure surfaces, creating two problems. First, the obstructions are "hazards" to the safe navigation in and around airports, and second, the cancellation of an instrument approach procedure reduces the airport's capability to support the aviation system. Two separate airspace concerns face our airports. The first being obstructions to Part 77[vi] airspace, and the second, the more critical TERPS[vii] Approach Surfaces. The latter is the most important issue because of its direct impact on aircraft operations. The "cleaner" the surface, the better the approach or departure available to pilots.

An examination of the 35 NPIAS airports indicates that 16, or 46%, have close-in obstructions in either the Part 77 or TERPS surface[viii], meaning the 20:1 visual approach surface is compromised[ix]. Objective: 100% unmitigated clear approaches.

C - Runway Safety Areas. The Runway Safety Area (RSA)[x] surrounds a runway and enhances the safety of aircraft which undershoot, overrun, or veer off the runway. It also provides enhanced accessibility for firefighting and rescue equipment during such incidents. Airports meet the RSA dimensional standards according to size and slope. They must be clear and graded, with no ruts or bumps, and no surface variations. They must also be capable under dry conditions of supporting firefighting equipment or snow removal equipment, and they must be free of all objects except objects located there because of function (edge lights, guidance signs, etc.).

An examination of Maine's runways indicates that all commercial service airports (primary and non-primary) and 25 of the remaining 30 airports have fully compliant runway safety areas[xi]. Objective: 100% fully compliant RSAs.

D - Medical Access. Many airports provide access for flights that transport patients in need of specialized medical care. In some parts of the country, airports provide the only means, or in some cases the most efficient means of transportation. Without these airports, particularly in rural areas, residents would be faced with isolation or would have to incur substantial time, money, and risk traveling by other means. The rural nature of the state has implications for a variety of areas, including spending on government services and infrastructure, including aviation. As evidenced by the growth and increased use of air medical transport[xii], Maine's rural landscape places a higher dependence on airports than do urbanized areas[xiii].

Medical access for an airport is highly dependent on several airport infrastructure elements: runway length, runway lighting, weather reporting, fuel availability, and instrument approach procedures.

The air medical transport industry in Maine is in the process of upgrading aircraft to include both helicopters and now fixed wing aircraft. With this growth comes the need for longer runways at many of Maine's airports (with the minimum being around 4,000 feet). Increased access to the air transportation system will require improvements in instrument approach procedures, clear airspace surfaces, and lower minimums which in turn allow increased access to the public in reduced weather conditions.

Medical access is available to all 35 NPIAS airports in one form or another, with the objective of maintaining that level of service and to strive to improve access capability to all weather conditions (see B - Obstructions, E – Weather and F - Fuel in this section).

E - Weather Stations. Historically, about two-thirds of all aviation accidents are weather related[xiv], proving local and accurate weather reporting to be critical. The FAA and the National Weather Service have installed automatic weather systems[xv] at airports around the country, including Maine. A few airports with the financial means have installed privately owned and operated systems. An important element of the weather network is the interface that transmits weather data to the National Weather Service, FAA, the Internet, media and other resources using the National Airspace Data Interchange Network (NADIN). However, because of AIP funding policies, 37% of the currently installed systems do not meet the standards for inclusion in the NADIN, meaning many of Maine's airport weather systems are not integrated with the national systems, but instead only provide data to local users[xvi].

24 (69%) of Maine's NPIAS airports have an automatic weather system installed. Of these 24, only 15 (63%) are tied into NADIN. Objective: 100% of each NPIAS airport weather system should be tied into the NADIN.

F- Fuel Availability. Fuel, whether aviation gas (AvGas) or Jet fuel, increases the number of airports attractive as both a destination and home base. Fuel sales also provide a greatly needed source of revenue for many GA airports.

In Maine, 80% of our NPIAS airports offer fuel service (AvGas or Jet A[xvii])[xviii]. Objective: 100% availability of fuel at each of the 35 airports, with the type (AvGas or Jet A) determined locally based on need.

G - Instrument Approaches and Visual Glideslope Systems. An Instrument Approach Procedure (IAP) provides an electronic navigation process to the airport in inclement weather and periods of darkness. A Visual Glide Slope Indicator (VGSI) system uses lights to assist a pilot in landing an airplane at an airport by defining a vertical approach path during the final approach to a runway[xix].

Of the 35 NPIAS airports, 26 airports (74%) have at least one IAP into the airport, and 22 (63%) have at least one VGSI system[xx]. Objective: 100% IAP capability to each airport and 100% VGSI to at least one runway end.

Innovation and Resiliency

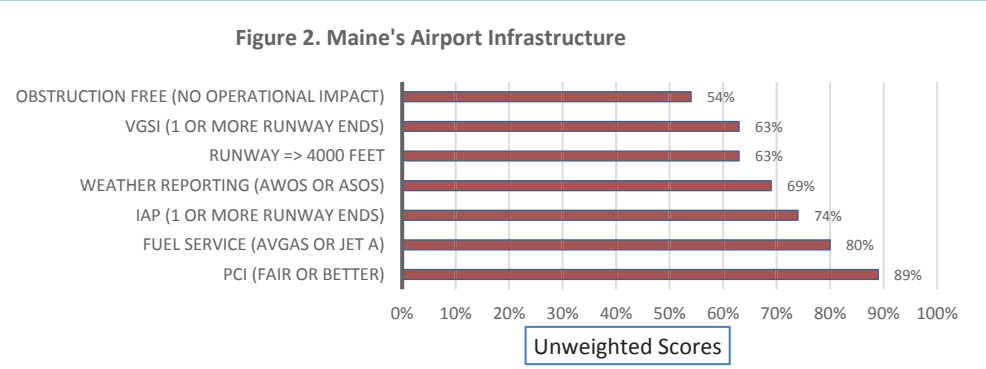
The desire and need to design and construct airport facilities to be more resilient through innovative design has become a priority in recent years. Recycled construction materials, environmentally friendly manufacturing practices, and operational efficiencies for HVAC and electrical systems have provided significant advances at several of Maine's airports in recent years. With that said, FAA regulations and limitations on the use of AIP funds make this challenging, especially in regards to airside enhancements.

Infrastructure Summary

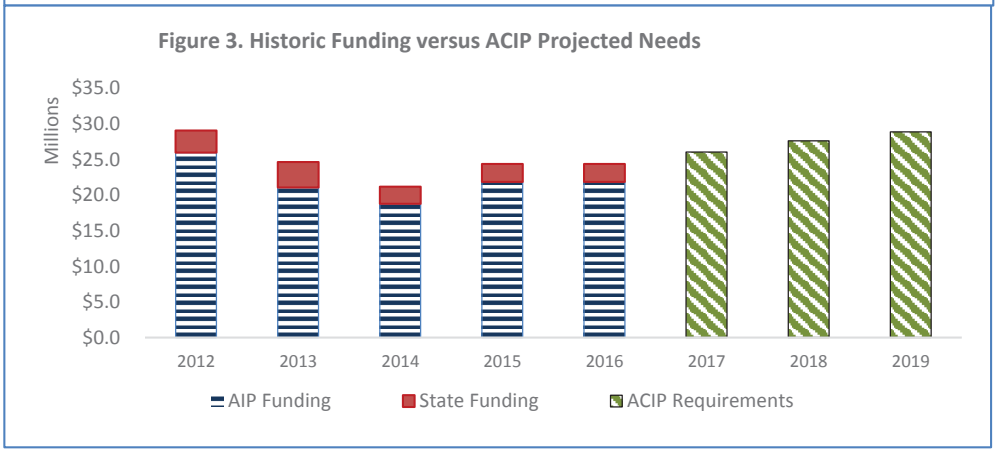
Figure 2 on next page summarizes Maine's airport infrastructure acceptability with the goal of reaching 100% in each of the seven categories listed.

Investment Needs

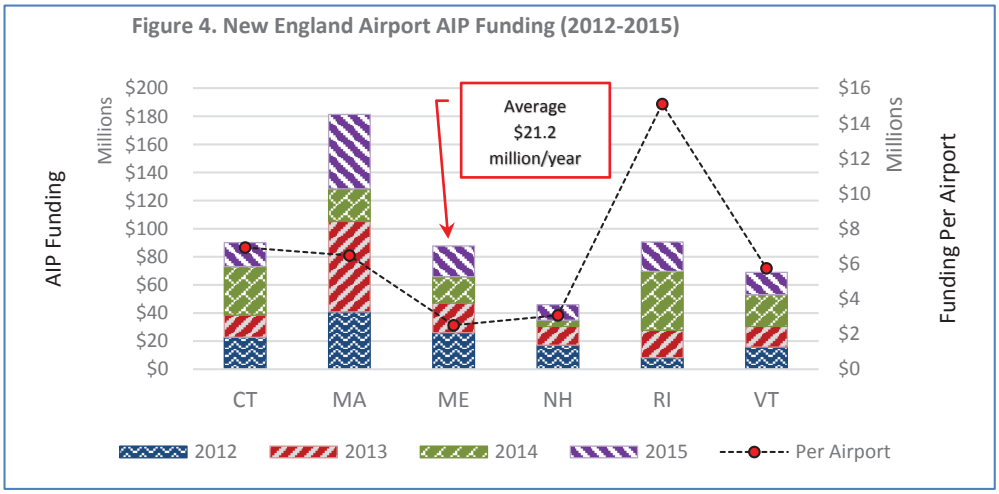
The cost of infrastructure improvements continues to increase annually. However, AIP funding levels have remained flat. Due to inflation, the actual purchasing power of allocated funds has decreased. As in 2012, the respective funding sources for all 35 Maine NPIAS airports comes from four primary sources: federal (primarily FAA), state (MaineDOT), local (the sponsoring municipality), and private investments. Local funding sources also include Passenger Facility Charges (PFC), which are levied and collected by Portland International Jetport, Bangor International Airport, Knox County Regional Airport, and Northern Maine Regional Airport at Presque Isle.



An examination of funding from 2010 through 2016 as compared to projected needs through 2019, indicate a potential shortfall if all projects listed in the most current state Airport Capital Improvement Plan (ACIP) are implemented. **Figure 3** illustrates this issue by comparing both Federal and state funding for the past four years against projected needs between now and 2019. The funding mix does not include the local share. If current funding levels remain unchanged, the state will fall short of meeting the infrastructure needs over the next three to four years.



The FAA AIP share reduction from 95% to 90% in 2012 doubled the state and local matching share requirements. The increase in share has had a significant impact on funding potential for future project implementation within the Maine aviation system, especially for the smaller GA airports and municipalities. As shown in **Figure 4**, Maine has received more than $87 million during the four-year period from 2012-2015[xxi] (4th lowest of the six New England states). However, Maine remains the lowest-ranked New England state regarding AIP expenditures per airport since 2012, a trend that continues since the last report[xxii]. This figure also shows the average funding per airport and the wide disparity between Maine and the other five states, in particular, Rhode Island.



Examining Maine's recent funding history indicates that when all federal, state and local sources are considered, annual investments in Maine's commercial and public general aviation airports have been met. The single most important component of long-term funding is

the health and viability of the AIP and a commitment by the state to continue supporting the aviation infrastructure at the same or higher levels.

Airports finance and build critical infrastructure to cope with the expected passenger and cargo traffic demand of the next 20 years. One of the most significant challenges is the current cap on the Passenger Facility Charge (PFC) at $4.50 per passenger[xxiii]. In 1990, the FAA established the PFC Program due to the need for a local funding mechanism. This limit has not kept pace with increasing infrastructure and airline ticket costs and has decreased available funds[xxiv].

Conclusions and Recommendations

Perhaps the largest challenge in maintaining the relative health of the Maine Airport System is the viability of AIP, and ensuring that both state and federal funding programs keep pace with inflation. Future challenges include maintaining the relative health of the airport system, given the funding constraints. In recent years, the FAA and MaineDOT have stepped up their already sound efforts in working with local sponsors in prioritizing various projects based on safety need first, followed by capacity enhancements. Maine ASCE grades Airports a C+.

To continue to maintain existing infrastructure, achieve overall compliance with the FAA standards, and provide improvements to address safety, economic and capacity enhancement needs, Maine ASCE recommends the following:

1. Increase AIP entitlement funding for both primary and non-primary airports and return to 95% federal funding. The current funding levels have not kept pace with inflation and the growing costs of infrastructure work;
2. Increase or eliminate the PFC funding cap of $4.50 per passenger[xxv]. This increase would permit airports to generate more revenue at the local level to help fund projects;
3. Work with the FAA to uncouple design grants and construction grants or establish a state reserve to help offset the funding gap that the FAA rule has created, which forces small communities to pay design costs well in advance of being awarded a grant;
4. Although inspection programs have improved at the state level, there must be a long-term program or budget funding to continue to assess and correct non-runway pavement deficiencies and obstruction hazards to critical airspace segments;
5. Continue to strive for 100% compliance with each of the seven elements addressed in this report card (Pavement Condition, Obstructions, RSAs, Medical Access, Weather Reporting, Fuel Availability and Instrument Procedures and Lighting Systems);
6. Prepare a new Maine State Aviation Systems Plan and Economic Impact Study; and
7. Increase in State (MaineDOT) Share Funding and reinstatement of the state only 50/50 project funding on FAA ineligible projects.

Contributors are as follows:

- M. Allison Rogers, Airport Manager - Sanford Seacoast Regional Airport
- Paul Bradbury, Airport Director - Portland International Jetport
- Jeffrey Northgraves, Airport Manager - Knox County Regional Airport
- Tim LeSiege, Program Manager, Aviation - Maine Department of Transportation
- Shane McDougall, Associate/Caribou Office Manager – Stantec

References

[i] General Aviation Airports are public-use airports that do not have scheduled service or have less than 2,500 annual passenger boardings.
[ii] Augusta State Airport is a commercial service facility; however, it is listed also as a Regional Airport.
[iii] T. LeSiege, MaineDOT, Aviation Program – Bureau of Planning (July 2016).
[iv] While there are 35 NPIAS airports in Maine, only the 31 general aviation airports are evaluated by MaineDOT for pavement structure and condition.
[v] Caribou Municipal, Eastport Municipal, Machias Valley, Oxford County, Princeton Municipal, Biddeford Municipal, Greenville Municipal, Old Town Municipal, Dexter Regional, Eastern Slopes Regional, Lincoln Region, Houlton International, Millinocket Municipal, Waterville Municipal, Wiscasset Municipal, Sanford Seacoast Regional, Augusta State, Brunswick Executive, and Auburn-Lewiston Municipal.
[vi] Title 14, Part 77, Safe, Efficient Use, and Preservation of the Navigable Airspace.
[vii] United States Standard for Terminal Instrument Procedures (TERPS) based on FAA Order 8260.3C.
[viii] FAA Master Record, Form 5010-1.
[ix] The 20:1 visual area surface is described in Section 3.3.2.c of FAA Order 8260.3B, United States Standard for Terminal Instrument Procedures (TERPS). The surface is aligned with and centered on the runway centerline. It has vertical slope of 20:1, beginning from the runway's threshold elevation. The surface begins 200 feet prior to the runway threshold and extends until reaching the decision altitude of the approach procedure it serves.
[x] The Runway Safety Area (RSA) is an FAA design surface as defined in FAA Advisory Circular 5300-13A, Airport Design.
[xi] T. LeSiege, MaineDOT, Aviation Program – Bureau of Planning (July 2016).
[xii] http://www.lifeflightmaine.org/Documents/Statistics/Patients-Per-Year-98-15.aspx
[xiii] Maine was the most rural state in 2010, with 61.3% of its population living in rural areas (U.S. Census Bureau).
[xiv] Risk Factors Associated with Weather-Related General Aviation Accidents, NTSB Safety Study SS-05-01, September 2005.
[xv] Automatic Weather Observation System (AWOS) and Automatic Surface Observation System (ASOS).
[xvi] An AWOS that has been manufactured, installed, and maintained according to the criteria in Advisory Circular 150/5220-16D may constitute a National Weather Service (NWS) approved source for weather information; may be approvable as a
source of weather information that partially satisfies aviation regulations as identified in Title 14 of the Code of Federal Regulations (14 CFR); may be eligible to receive a broadcast frequency assignment or permission to broadcast over a NAVAID; may be eligible (subject to additional criteria) to transmit its weather information, directly or indirectly, to the FAA for subsequent national dissemination and may be eligible for funding under Federal grant programs.
[xvii] Two airports offer Motor Gas (Mogas), Aircraft commonly have engines which consume AvGas (Lycoming / Continental / Franklin and equivalent types) or engines running on Mogas (Rotex, Subaru etc.). Some are capable, or modified to run either fuel; although possibly with operating restrictions or maintenance limitations. Today, Mogas can contain a certain percentage (3 - 5%, going up to 10% or more) of methanol or ethanol (bio-alcohol) and the possible effect of using that fuel in aviation engines must be considered by the pilot
[xviii] FAA Airport Master Records, Form 5010-1.
[xix] The most common VGSI systems are the Visual Approach Slope Indicator (VASI) and Precision Approach Slope Indicator (PAPI)
[xx] FAA Airport Master Record, Form 5010-1.
[xxi] The FAA has not released the 2016 funding totals as of the time this report was prepared.
[xxii] Airport Improvement Program (AIP) Grant Histories (www.faa.gov/Airports/Aip/Grant_Histories.
[xxiii] The Anti-Head Tax Act of 1973 prohibits the collection of fees by airports based on individual enplanements.
[xxiv] PFC is based on the price of the actual airfare and not additional fees, such as baggage.
[xxv] The current rate ceiling of $4.50 has not been adjusted since 2000 with passage of the Wendell H. Ford Aviation Investment and Reform Act for the 21st Century (AIR21) and is not indexed for inflation.

November 28, 2016

BRIDGES

Grade: C-

Overview

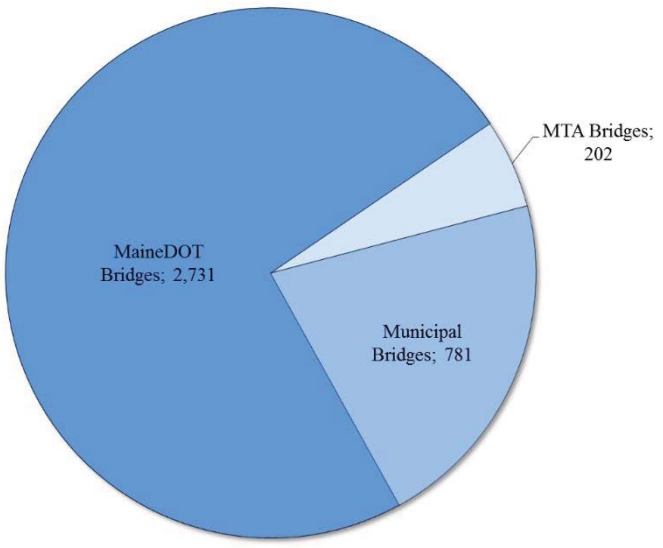
Maine's highway system includes a total of 3,714 bridges, 58% of which are more than 50 years old. Historic funding levels have not been sufficient to replace bridges before they exceed design life and one out of every seven Maine bridges (14.8%) is structurally deficient. Accordingly, MaineDOT's current 3-year work plan includes an increased emphasis on bridge maintenance and preservation projects. The area of structurally deficient bridges in Maine has been declining gradually over the past several years. However, achieving long term, sustained improvements necessitates a comprehensive strategy that identifies potential financing methods and investment requirements to meet the additional $33 million annual funding need projected by MaineDOT.

Background

The highway system is the most important transportation service for Maine's 1.3 million residents and visitors, providing access to homes, employment, shopping, agricultural land and recreation. Improved roads and bridges provide Maine's residents with greater mobility and traffic safety, which in turn improves personal and commercial productivity and boost tourism and economic development statewide.

Maine's highway system includes a total of 3,714 bridges at least 10 feet in length. Of these bridges, 2,431 are greater than 20 feet in length. These structures are owned by MaineDOT, municipalities and the Maine Turnpike Authority (MTA) as shown in Figure 1.

Figure 1: Maine Bridges by Owner



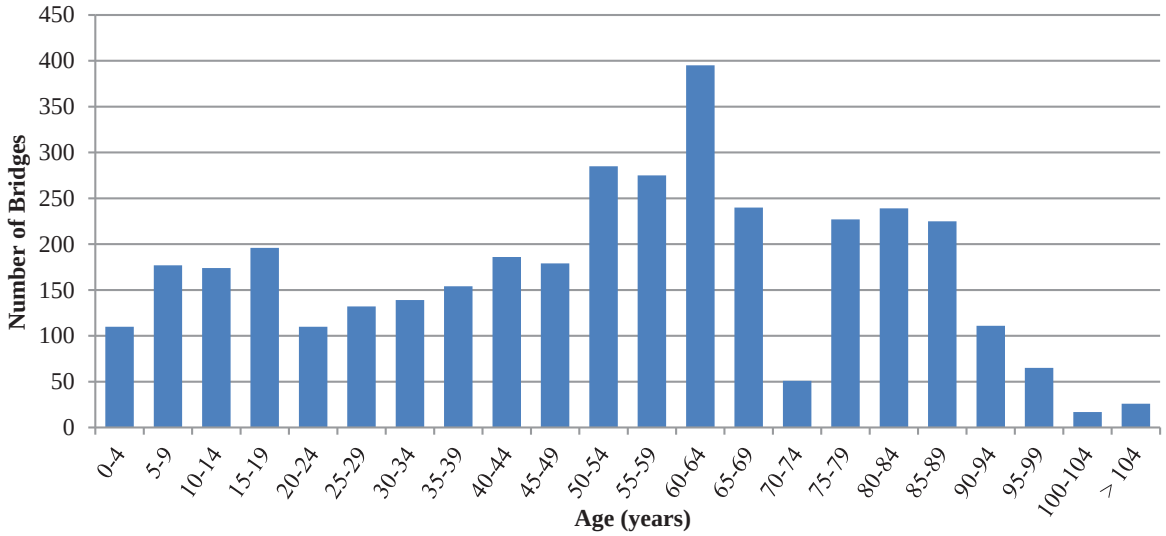
According to MaineDOT data, 58% of Maine's bridges were constructed more than 50 years ago, which is a 5% increase from 2012. In addition, nearly 18% of Maine's bridges are at least 80 years old. Many of these bridges were designed to last 50 years before requiring significant repair or replacement. Historic bridge funding levels have not allowed Maine bridges to be significantly repaired or replaced before reaching the end of their design life. A chart summarizing the age of Maine's bridges is included as Figure 2.

In terms of route importance, Maine's bridge inventory includes 497 bridges within the National Highway System (NHS). The NHS includes the Interstate Highway System, as well as other roads vital to the nation's economy, defense and mobility. While reviewing the condition and ratings of bridges, Maine's NHS bridges will be evaluated separately.

Inspection Frequency and Methods

All Maine bridges are regularly inspected in accordance with the Federal Highway Administration's (FHWA) National Bridge Inspection Standards (NBIS). MaineDOT inspects most state and municipal bridges every two years. Turnpike bridges are inspected annually. This inspection data was used as the basis for evaluating the condition of Maine bridges.

Figure 2 – Age of Maine Bridges Greater than 10' in Length



NBIS Rating System

The NBIS established by FHWA and the American Association of State Highway and Transportation Officials (AASHTO), defines the scope of bridge inspections and provides guidelines for rating and documenting the condition and general attributes of bridges. Standard condition evaluations are documented and functional aspects of the bridge are rated. NBIS provides criteria to define a bridge as either structurally deficient or functionally obsolete.

Structurally Deficient (SD): A bridge is structurally deficient if there is significant deterioration to the bridge deck, superstructure, substructure or other major components. Although bridges classified as structurally deficient are safe for continued use, the bridge may be posted for lower weight limits or closed if conditions warrant such action.

Functionally Obsolete: Bridges that are functionally obsolete no longer meet current highway design standards, often because of narrow lanes, lack of safety shoulders, inadequate clearances or poor alignment. Over 19% of Maine's bridges are classified as functionally obsolete.

This Report Card focuses primarily on bridges that are classified as Structurally Deficient. Additionally, FHWA only compiles condition data for bridges that are 20 feet or more in length. Therefore, where Maine bridge data is compared to regional or national averages, only these longer structures are considered.

Condition and Adequacy

A breakdown of Maine bridges classified as structurally deficient in 2015 is shown in Table 1. Bridge condition data for New England and the nation are included for comparison. The data shows that Maine's bridge inventory includes significantly more structurally deficient bridges compared to the national average.

Approximately one out of every seven Maine bridges is structurally deficient. These bridges show significant deterioration to their decks, girders and other major components and/or have insufficient load carrying capacity. According to The Road Information Program (TRIP), a non-profit transportation research organization, "Deteriorated bridges can have a significant impact on daily life. Restrictions on vehicle weight may cause many vehicles – especially emergency vehicles, commercial trucks, school buses and farm equipment – to use alternate routes to avoid posted bridges. Redirected trips also lengthen travel time, waste fuel and reduce the efficiency of the local economy".[4]

Figures 3a and 3b compare trends in the condition of Maine bridges to the regional and national averages. Maine continues to have larger percentages of structurally deficient bridges when compared to the nation. In Maine a notable

reduction in the area of structurally deficient bridges has been made through a focus on large structurally deficient bridges. However, only modest improvements in the number of structurally deficient bridges have been realized.

Table 1 – Condition of Maine Bridges in 2015

Bridges (Spans ≥ 20 feet)

Owner	Bridges by Count		Bridges by Deck Area	
	Bridge Count (Ea.)	Structurally Deficient	Bridge Area (Sq. Ft.)	Structurally Deficient
Maine	2,431	361 (14.8%)	1,201,978	105,671 (8.8%)
New England	17,808	1,859 (10.4%)	11,295,595	1,503,427 (13.3%)
United States	611,845	58,791(9.6%)	369,109,088	24,766,427 (6.7%)

Figure 3a – Historical Number of Maine Structurally Deficient Bridges compared the Region and the Nation

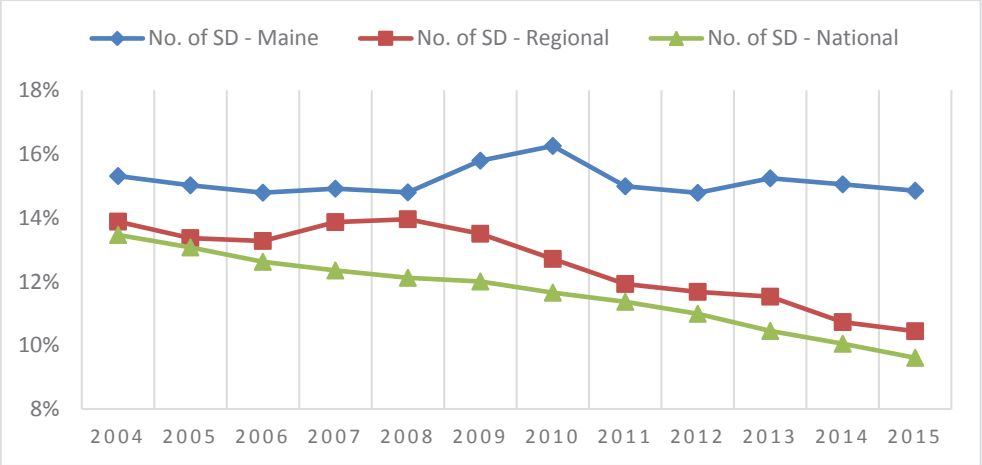
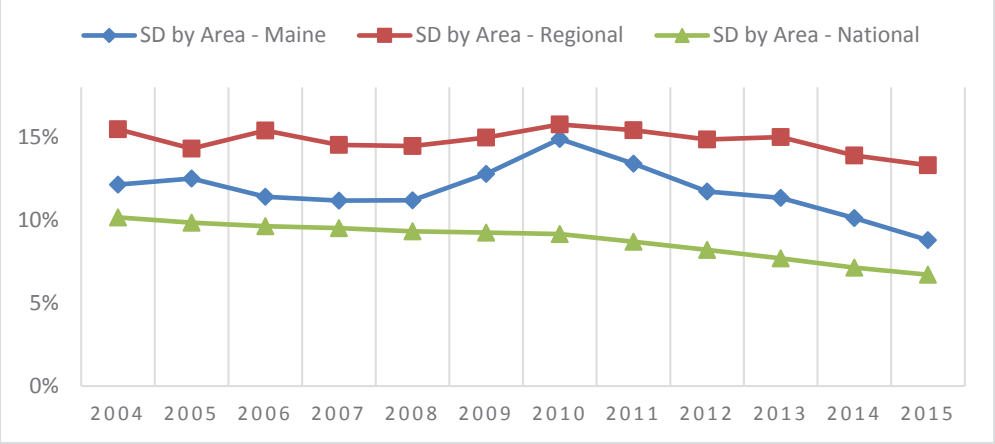


Figure 3a – Historical Deck Area of Maine Structurally Deficient Bridges compared the Region and the Nation



When Maine's National Highway System (NHS) bridges are considered separately the percentage of structurally deficient bridges, in terms of deck area, drops from 8.8% to 4.5%. This smaller percentage of deficient bridges on Maine's NHS roadways indicate these vital structures are generally in better condition than the average Maine bridge.

Resilience & Innovation

Maine bridge owners have been using innovative strategies and technologies to minimize project impacts on the public and the environment, and to maximize the return on their infrastructure investments. FHWA's Strategic Highway Research Program, and their Every Day Counts initiative, have been coordinating and supporting many of these state-based efforts to shorten the project completion process and increase use of proven, innovative practices.

Accelerated Bridge Construction (ABC) methods are being used on projects throughout Maine to reduce construction duration and traffic disruptions. Other innovations, such as the use of fiber-reinforced plastic composites and geosynthetic reinforced soil-integrated bridge systems, have been used to deliver low-cost durable bridge solutions that can be built quickly and cost effectively. These innovations, and numerous others, benefit the travelling public and the state's infrastructure. Maine ASCE encourages bridge owners to continue this strategic approach to sustainability and innovation.

Investment Needs

MaineDOT's "Keeping our Bridges Safe 2014 Report," found that an annual bridge investment of $140 million was needed to eliminate 90% of the structurally deficient bridges located on Maine's highest priority roadways. An annual investment of $217 million in the state's bridges would be needed to maintain the entire bridge system and substantially meet service, condition and safety goals.

In the spring of 2012, the state legislature passed LD 1753B, which required MaineDOT to prioritize and set performance goals for Maine's transportation corridors. This new system represents a more sophisticated approach to managing Maine's roadway and bridge infrastructure by setting Customer Service Levels (CSL) for all bridges. These new CSL goals vary the acceptable condition and load capacity of bridges based on the relative importance of the roadway corridor they carry. Based on these performance goals MaineDOT reports the projected annual bridge funding need is $140 million compared to current funding levels of $107 million. In essence, MaineDOT receives only 2 out every 3 dollars needed to maintain the state's bridge inventory in good condition.

Historically, funding for Maine's bridges has been $70 million per year. In 2008, the Maine Legislature approved an additional $160 million over four years, increasing the state's annual bridge investment to $110 million for the 2008 through 2012 period. Even with this funding increase the condition of bridges here in Maine continue to be below desirable standards and worse than the national average. Achieving long term and sustained improvements requires funding levels exceeding $140 million per year.

Traditionally, Maine has used bonds to fund a significant portion of its transportation budget. In November 2015 Maine voters approved an $85 million bond referendum for transportation infrastructure improvements. The November 2015 bond measure passed by an overwhelming 3:1 margin, demonstrating the value Maine voters place on transportation infrastructure. While the issuance of bonds is a valuable tool, Maine ASCE is concerned that it does not provide a steady, predictable and sustainable source of transportation funding around which major improvements in transportation can be achieved. Additionally, no significant increases in federal funding levels are anticipated. Unless action is taken to secure additional financing, the overall condition of Maine's bridges will worsen.

MaineDOT's current three-year work plan includes an increased emphasis on bridge maintenance and preservation projects. These investments extend the service life of a bridge while also delaying the need for more significant repair or rehabilitation work in the future. Allocating funding for preservation projects reduces overall lifecycle costs and represents a strategic investment of transportation dollars.

Similar to MaineDOT, the MTA has recently focused a significant portion of its capital improvement program on bridge preservation and rehabilitation. This initiative facilitated a 90% reduction in the number of structurally deficient MTA bridges over the past four years. In 2015 approximately 3% of MTA bridges were classified as structurally deficient. In spite of these significant improvements, funding for bridges in the MTA's 4-year capital improvement program will grow from approximately $16.5 million per year in the 2012-2016 time period to an average of approximately $19 million per year in 2017-2020. This critical bridge funding will allow the Turnpike to maintain their bridge inventory in a state of good repair. Current tolling levels are sufficient to fully fund the MTA's capital bridge program.

Conclusions and Recommendations

The total deck area of structurally deficient bridges in Maine has been declining gradually over the past several years. However, the ongoing bridge funding shortfall has limited MaineDOT's ability to make significant and sustainable progress toward meeting the customer service level goals set by the State Legislature. Additionally, Maine continues to have a higher percentage of structurally deficient bridges compared to the national average. Unless the bridge funding shortfall is addressed the condition of our State's bridges will continue to fall short of these important benchmarks.

At a minimum, the state should focus on meeting the newly-established CSL goals within the next decade. Doing so will require cooperation between federal, state and local governments to increase the annual investment in MaineDOT bridges from $107 million to at least $140 million. More of our state's bridges will become structurally deficient if this existing funding gap is not closed.

Based on current bridge conditions in Maine, existing funding shortfalls, and failure to keep pace with bridge improvements being realized across the nation, Maine's bridge inventory is assigned a letter grade of **C-**. Funding for our bridges is currently well below projected needs. Unless MaineDOT's bridge maintenance and capital improvement program is fully funded bridge conditions across the state will worsen.

Successfully and efficiently improving Maine's bridge infrastructure will require a long-term, comprehensive strategy, including identifying potential financing methods and investment requirements. Reliance on the gas tax has become insufficient because adjustments have not kept pace with inflation. Insufficient funding will ultimately shorten the service life of our bridges and result in higher life-cycle costs. Increasing investment levels now will significantly reduce future funding needs.

For the continued safety of our bridges, Maine ASCE recommends:

- Increase bridge funding for MaineDOT to at least $140 million annually, the minimum funding level necessary to achieve bridge performance measures established by Maine statute in 2012;
- Maximize existing sources of funding, such as fuel tax revenues, state general fund bonds, tolls and car registration and title fees;
- Secure additional funding including fuel tax increases, vehicle miles traveled (VMT) mechanisms, and General Fund sources, as current MaineDOT funding levels will not suffice over time;
- Implement systematic approach to bonding, allowing MaineDOT to fund a 3-year work plan with more predictable bonds;
- Fully fund MaineDOT's bridge maintenance and capital improvement programs to meet established Customer Service Level goals;
- Establish a state funding mechanism for municipal bridges and encourage municipalities to establish capital reserve funds for the repair of important municipally-owned bridges. MaineDOT should help municipal bridge owners understand and plan for the investment needs of these structures;
- Maintain a healthy blend of maintenance, preservation and capital improvement work; and
- Continue to invest in design and construction innovations that will allow MaineDOT to deliver projects more cost-effectively and to extend bridge service life.

Sources

Information for this report was obtained from a number of sources including the MaineDOT, Federal Highway Administration (FHWA), the Maine Turnpike Authority, the Maine Better Transportation Association, and TRIP.

1. "FHWA website, Bridge Technology Section, National Bridge Inventory, highway bridges by owner, 2015 inspection data
2. "MaineDOT Work Plan, Calendar Years 2016-2017-2018", MaineDOT, January 2016
3. "Keeping Our Bridges Safe, 2014 Report", MaineDOT, 2014
4. "4 year capital improvement plan, Updated 2016" Maine Turnpike Authority, 2016
5. "Preserving Maine's Bridges: The Condition and Funding Needs of Maine's Bridge System", TRIP, October 2015

November 28, 2016

PASSENGER TRANSPORTATION

Grade: D+

Overview

In 2015, more than 7.4 million passengers used Maine's transit systems, an increase of 9.2% since 2012. Maine has 21 rural and small urban transportation systems that fall into three categories: regional transportation, fixed route transit, and tourist industry transit. Only 38% of the 414 transit vehicles MaineDOT is responsible for are in good condition and according to the MaineDOT's *Connecting Maine* report, passenger transportation will be competing with funding shortfalls for the next 10 years. Simultaneously, Maine's aging population will increase demand on the public transit system. Maine must therefore identify new and sustainable funding sources to meet needs and provide residents with an adequate transportation system.

Background

Passenger transportation includes traditional mass transit, passenger rail, car-pool and van-pool programs, and bicycle and pedestrian-focused projects. The Maine State Ferry Service is also included due to its importance to the overall Maine transportation system. However, the four private intercity bus services are not included as they receive limited or no public funding. These bus services are currently one of the primary modes of connectivity within this rural state as well as nationally and internationally and a vital part of Maine's transportation system.

Transit, for the purposes of this report, is limited to the 21 rural and small urban transportation systems that are divided into eight geographical regions and are supported by the Maine Department of Transportation (MaineDOT) through funds mostly provided by the Federal Transit Administration (FTA). These services rely on other transportation infrastructure (roads, bridges, ports and railroads) to operate efficiently and effectively.

In 2012, the Center for Medical Services (CMS) raised concerns across the U.S. about a potential conflict of interest for transit providers providing Medicaid rides for non-emergency transportation utilizing mass transit vehicles rather than other vehicles that were believed to the least expensive alternative. This led to the State of Maine competitively advertising for brokers to manage this process. Contracts were awarded in 2012, canceled after numerous start-up issues were encountered and then re-advertised again in 2014. From that process, two primary brokers were contracted with one covering Regions 1, 2, 6, 7 and 8 and another covering Regions 3 and 4. The Region 8 provider has declined to provide MaineCare trips and the Region 5 provider has terminated transportation services entirely. The Governor's Interagency Transportation Coordinating Committee was dissolved and a new Public Advisory Committee was created.

Maine's 21 transit systems fall into one of three categories:

- **Regional transportation systems.** There are eight regional transit systems (down from nine) receiving MaineDOT funding support and one that is not funded. These systems serve rural areas of the state known as Regional Transportation Providers, providing low cost public transportation as well as working with the brokers to provide non-emergency transportation.
- **Fixed route transit systems.** There are 13 systems that offer year-round fixed route service. They operate according to a fixed schedule and a fare system and are broken down further into urban and rural systems, inter-city systems and ferry systems. These can vary from providing service to just one community or connecting several communities within a county or region. There are also several private ferry services that are currently seeking or have been provided some limited assistance from both state and federal funding sources to better serve the island communities and connect/coordinate with mainland transportation systems.

- **Transit systems supporting the tourist industry.** Five of the fixed route transit systems also offer specific routes, both year-round and seasonally, that help support tourism related industries and are designated as "Explorer" services. They are the Island, Mountain, Sugarloaf, Shoreline, Brunswick and Kennebec. Brunswick and Kennebec offer year-round service while the others support a more seasonal operation.

Passenger rail service includes Amtrak's Downeaster from Brunswick to Boston, which is operated by Amtrak under a 20-year agreement with the Northern New England Passenger Rail Authority (NNEPRA). The 145-mile corridor is owned mainly by Pan Am Railways and the Massachusetts Bay Transportation Authority. The segment from Brunswick to Portland was placed in service in 2012 with a stop in Freeport.

Other transportation systems include GO MAINE Commuter Connections rideshare program operated and managed by the Maine Turnpike Authority (MTA) in collaboration with MaineDOT; ZOOM Turnpike Express which provides a commuter bus service between Biddeford, Saco and Portland; 55 Park & Ride lots with over 3,192 parking spaces, funded and maintained by MaineDOT (45 lots, 2,558 spaces) and MTA (10 lots, 752 spaces); and the Maine State Ferry Service (MSFS), which is the primary mode for access to the mainland from six of Maine's year-round island communities.

To increase both bicycle and pedestrian mobility, MaineDOT instituted a policy to construct paved shoulders, bike lanes, and/or sidewalks. MaineDOT has also adopted a "Complete Streets" policy which focuses on multiple transportation modes sharing transportation corridors whenever feasible. Maine has seen development and construction of numerous multi-use paths including parts of the Eastern and Mountain Division trail systems. Additional trails of statewide significance are currently under development.

Condition and Adequacy

Ridership

In 2015 more than 7.4 million passengers used the transit systems provided by 21 regional providers on 425 vehicles servicing at least 47 communities at least 3 days per week. Ridership has seen a modest increase over the last 4 years in spite of changes in how rides are provided and generally lower gas prices. Bus transit ridership had reached a high in 2013, only to be followed by a 5% drop in 2014, but rebounded by 8.6% in 2015 and is up 9.2% overall since 2012. According to the Maine Strategic Transit Plan 2025, Maine has the oldest population by median age nationally and that data indicates that the population will "age out" of their vehicles because they are no longer willing or able to drive. This could result in increased demands on an aging transit system.

Transit Vehicle/Ferry Vessel

MaineDOT is responsible for 414 of the transit vehicles (mainly buses and vans) in Maine and only 38% of them (156 vehicles) have more than 50% of their useful life remaining (good condition). The remaining 62% (258 vehicles) have 50% or less of their remaining life and of those, 123 vehicles (30% of total) have reached the end of their useful life. Another 58 vehicles (14% of total) are beyond 75% of their useful life. This puts 156 vehicles in good condition, 135 in fair condition and 123 in poor condition. MaineDOT is in the process of replacing 25 vehicles for 2016 which helps, but still leaves more than 57% of the fleet in fair or poor condition.

Of the five active vessels used by the Casco Bay Island Transit District to provide over 1,099,000 passenger trips per year and nearly 36,000 vehicle trips, the oldest is 31 years old and the average age of the fleet is 19 years old. Three vessels have less than 22 years of service (with two less than 12 years of service) which would place them in good condition. The remaining vessels would fall into a fair or poor condition category.

The Maine State Ferry Service provides service to nearly a half a million passengers and more than 180,000 vehicles per year with seven ferries. With their newest vessel coming on line in 2012, the age range for the fleet is from 4 years to 56 years old. Even with a new vessel, the average age of the fleet is 30 years old and the two spare vessels used to replace an active vessel when there are break downs or annual maintenance/inspections performed are both over 48 years old. This places one vessel in excellent condition and the remaining in fair or poor condition.

Amtrak Downeaster

The Downeaster's ridership had seen continued to growth until 2015 when it experienced a decline of 18%, which appears to be in part due to an "On Time Performance" (OTP) of 30% for the year which is significantly below previous years. In 2012 OTP was 85%. During 2015 there were major track improvements between Plaistow, NH and Portland, ME to improve line conditions and improve speed for the service. Expansion of the service to Brunswick with a stop in Freeport has had a positive effect on ridership and the new layover facility being constructed in Brunswick is expected to be open in September 2016 which will allow for a third round trip from Brunswick to Boston. Improvements are also planned for a 4 mile siding in Cumberland (Royal Siding) for 2018, which will allow for an increase to 5 round trips daily between Brunswick and Boston. Amtrak's Downeaster cars and locomotives range in age from 18 years to more than 43 years old. The three train sets have a typical seating capacity of 306. Even with poor OTP, the Downeaster continues to receive high customer service ratings, obtaining an 80 out of a 100 for 2015.

Bicycle/Pedestrian

Due to the increased focus in recent years on safety and bicycle/pedestrian access, MaineDOT continues to dedicate funding for capital investments in sidewalks, bike lanes and paved shoulders. Maine's efforts to improve conditions for bicyclists and pedestrians have resulted in consistently high ratings by the League of American Bicyclists. While Maine has slipped from 9th in 2012 to 15th in 2015, it continues to score well in most categories evaluated by the League. Changes in rank can be attributed to several factors such as more states becoming more bicycle friendly with changes to programs and the adoption of national policies as well as changes to the evaluation criteria as more people become educated and aware of the benefits these facilities bring to a transportation system.

Investment Needs

Financial support from the FTA is distributed by MaineDOT to 21 rural and small urban transportation systems. FTA typically allocates these funds by formula and identifies annual funding levels for five years. The majority of these funds are used for operating support. Federal and state funds can cover 90% of the capital costs or 95% if that agency is using clean fuel vehicles like Compressed Natural Gas (CNG) or bio-fuels. In 2012 MAP 21 created some changes and flexibility to how funding could be used which has provided funding increases, especially for the Greater Portland area.

While federal funding has seen modest increases, state funding has remained flat, making it more difficult for the transit operators to generate the local match necessary to use federal funds. With the new MaineCare brokerage system, vehicle trips are now for the exclusive use of the MaineCare rider unless equivalent funding is provided for the non-MaineCare riders. This change has hampered the use of coordinated trips due to varying rates of reimbursement by various sources, inhibiting transit operators operating and business strategies and placing them into a new paradigm, where they are uncertain of cost recovery and service delivery schemes. While changes in FTA funding has helped, transit operators may still need to find additional revenues or make cuts in service while trying to serve the existing and growing ridership associated with our economic times and aging population.

Maine's 21 transit systems operate 414 vehicles ranging in size from minivans to full size transit buses. With 62% of these vehicles in poor to fair condition, the state is falling behind on the needed replacement schedule. Even with 25 new vehicles expected in 2016, more than 50% of the vehicles will remain in fair or poor condition. According to the Maine Strategic Transit Plan 2025 that was prepared for MaineDOT in 2015, Maine needs to spend $9.5 million each year to properly replace transit vehicles beyond their useful life. This requires more extensive maintenance efforts to keep the same reliable service level needed for current and future ridership.

MaineDOT, working with regional and local transit systems, has just completed a new Transportation Center in downtown Auburn that provides a hub connection for the local bus service as well as a location for a regional bus stop. MaineDOT has also begun construction of a second Transportation Center in Auburn at Exit 75 off the Maine Turnpike that will provide a similar arrangement and is combined with an existing Park & Ride lot.

Casco Bay Island Transit District (CBITD) placed a new vessel in service in 2013 and they currently have funding approval from PACTs for $10 million to construct a replacement vessel for the car ferry, Machigonne II. $6.3 million in funding is also in place to complete the 2nd phase of the terminal renovation at the mainland location in Portland, which will improve structural issues as well as enhance access and mobility. CBITD also has $8.25 million in their long range capital plan for the design and construction of a new passenger ferry, with $1.2 million already approved by PACTS and FTA.

The Maine State Ferry Service also has plans to construct a new ferry vessel to replace the Captain Henry Lee and rehabilitate the Margaret Chase Smith. These efforts should be completed by 2020/2021. Even with these successes, the average age of the MSFS fleet will be approximately 22 years. Along with the vessel improvements, MaineDOT rebuilt portions of the pier facilities at Frenchboro and Matinicus and are currently in the process of rehabilitating all nine of the transfer bridge lifting assemblies. Both the MSFS and CBITD should continue to evaluate and pursue funding for the planning, design and construction of replacement vessels to ensure that reliable service is maintained to all the island communities served by them. Maintenance of an aging fleet will remain high and funding subsidies will remain necessary for operating and maintenance budgets.

The Downeaster line's 2015 operating budget was $18.1 million. Of the total budget, $9.1 million came from revenues; $1.8 million from MaineDOT and the remaining $7.2 million was provided by funds from FTA. Several improvements along the rail corridor have been completed since the 2012 report card including the construction of the layover facility in Brunswick, replacement of 30,000 ties from Plaistow to Portland and improvements at several crossings. Additional improvements are planned, including a new 4 mile siding in Cumberland; replacement of 15,000 ties from Wells to Portland and continued work on additional rail crossings in multiple locations. NNEPRA continues to seek a solution for long term funding, both operationally and from a capital perspective. New Hampshire and Massachusetts still do not contribute operating funding, even though 43% of the ridership is from those two states.

MaineDOT continues to provide funding for the Go Maine Program which is now administered by the Maine Turnpike Authority and it continues to promote commuter services with education, outreach and programs like emergency ride home. In 2015, the Go Maine program contracted with a new vendor (NuRide) for the Program's online ride-matching service. In 2016, the program also invested $45,000 for awareness and outreach that included updating the GoMaine Logo; development, production, and radio airtime for promotional spots and bus backs in Maine's three largest metro areas.

The van pool service that had been run by the state through Go Maine was privatized and expanded to address the need in high-demand areas. For the last 3 years, MaineDOT has committed $60,000 for capital and $40,000 for maintenance in its triennial Work Plans for Park & Ride lot improvements. MaineDOT currently has four Park & Ride lot improvement projects planned for the 2017- 2019 Work Plan with new facilities being developed in Skowhegan, Boothbay, Wiscasset, and Brewer. The facility in Pittsfield is being relocated because of commercial development at the current location. MTA will continue to maintain the Park & Ride lots that it owns.

The current work plan allocates about $2.3 million each year for a variety of Bike-Ped and Safe Routes to School Program (SRTS) projects that will improve access and safety for users. The most recently published Work Plan indicates that MaineDOT has programmed over 26 Bicycle and Pedestrian Capital Projects with an estimated cost of over $7.2 million over the next 3 years. This year, over 30 communities have requested funding in excess of the $2.3 million available.

Conclusions and Recommendations

Most areas in Maine do not have the population density to support typical transit services, but many Maine citizens and visitors need transportation options. Choices are made based on convenience, schedule, costs and the environment. As Maine's population continues to age, transportation options will become increasingly important. Regional Transportation Providers provide on-demand, door-to-door non-emergency medical transportation to thousands of Maine residents in rural communities. In order to fulfill the needs of the communities, these services have been

expanding beyond health care to include transportation to work and school. There is a concern that these agencies are already under resourced.

Fixed-route transit providers' limited funds restrict their ability to continue meeting growing demand. Rising operating costs burden local providers and jeopardize service to an expanding customer base. Finding a long term sustainable funding source to supplement the fare box remains a challenge for passenger rail. With minimal funding for ferries, there is greater potential for future decreases in service. Ferries are the only viable transportation mode to the islands communities and identifying long-term and cost-effective ways to maintain and replace them is vital.

According to MaineDOT's *Connecting Maine* report, these modes of passenger transportation will be competing with funding shortfalls for the next 10 years and beyond in the comprehensive transportation system. Each mode is an important part of the overall transportation system and demand is growing in all geographic areas of the state. Maine faces some big challenges and must identify new and sustainable funding sources in order to meet those needs and provide residents with an adequate transportation system. Maine ASCE gives passenger transportation in Maine a Grade of D+.

Maine ASCE's recommendations for passenger transportation include:

- Promote and implement statewide land use strategies and demand management measures (e.g., discourage use of cars by increasing parking fees in urban areas). This could slow traffic growth in urbanized areas and promote transit use or car/van pooling;
- Provide additional financial support for Regional Transportation Providers;
- Based on funding complexities associated with public transit systems, the state should continue to work with and challenge federal, state and local entities to maximize the use of all funds without diminishing current levels of service or adding layers of administration;
- Consider additional state funding for fixed route transit providers where population densities merit, as well as for ferry services, though fare box revenues should be increased proportionately for both modes as well;
- Continue to promote the use of Park & Ride lots as well as rideshare and other commuting options as provided through Go Maine and ZOOM;
- Continue to provide passenger rail with funding from state's general fund as recommended by the "2007 Task Force on Passenger Rail Funding," as well as expanding support to the Multimodal Account; and
- Persuade NH and MA to provide equitable support of Amtrak's Downeaster service.

Sources:

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November 28, 2016

PORTS & WATERWAYS

Grade: B-

Overview

Maine's seaports are in good condition with more than $80 million in State and Federal funds invested over the last eight years. Projected growth will require an additional $120 million for necessary investments in areas of industrial infrastructure, intermodal connections, cruise ship terminals, and municipal fishing and recreational facilities. The Federal Maritime Commission projects an annual rate of growth around 5% for containerized shipments to East Coast ports; the marine route from Portland, ME to NY/NJ was included in America's Marine Highway Program; and cruise ship calls increased 6% in 2016. Accordingly, Maine should update its Three-Port Strategy originally developed in the early 1980s to reflect recent changes to its industrial terminals and the emergence of new and developing markets.

Background

Maine has over 3,500 miles of coastline with 12 significant ports and harbors as shown in Figure 1. Five of these ports: Portland, Searsport, Eastport, Bucksport, and Bangor are well-suited to handle the requirement of most modern cargo vessels. The remaining ports serve local commercial fisherman and recreational activities.

Industrial

Since 1970, industrial development has been generally concentrated in three port areas: Portland Harbor, Penobscot Bay and River (Searsport, Bangor and Bucksport), and Eastport/Quoddy Bay. This follows a Three-Port Strategy policy adopted in the early 1980's to maximize the effectiveness of the limited funds available for port development. Each area offers deep water, quality pilotage and services necessary for ocean-going vessels. Utilization of industrial ports in Maine varies depending on the terminals, time of year, and market conditions. In 1980, only a limited amount of dry cargo was handled at the ports of Portland and Searsport, and none in Eastport. Today, the three ports collectively handle more than 1.6 million tons of dry cargo per year. Furthermore, Portland and Searsport also handle petroleum products; however, volumes have been down in recent years from the 100 million barrels (about 12.6 million tons) per year in 2012.

Figure 1: Ports and Harbors of Maine

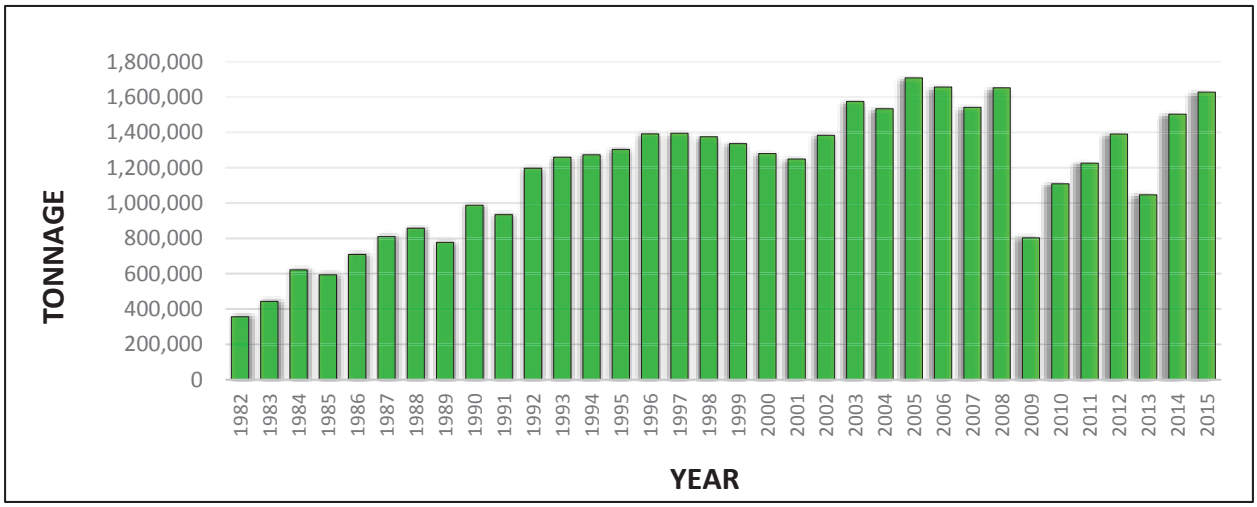
Maine Ports and Harbors

1. Kennebunkport
2. Portland
3. Freeport
4. Bath
5. Boothbay Harbor
6. Rockland
7. Camden
8. Belfast & Searsport
9. Bucksport
10. Bangor
11. Bar Harbor
12. Eastport

Annual dry cargo tonnage since 1982 is depicted in Figure 2.[i] With the recession in 2009, the volume of dry cargo dropped sharply, reaching a 20-year low of 800,000 tons in 2009. Marked increases in dry cargo tonnage since 2009 have resulted in over 1.6 million tons in 2015, near all-time highs from 2005. Improvements in the port facilities, as well as the economy over time and particularly in Portland have resulted in an upswing in shipments and overall volume. With the arrival of the Icelandic shipping company, Eimskip, in 2013 container shipments through Portland have increased significantly since 2012, with 2015 recording a 24% increase alone. Continued increases on the order

of 20% year-over-year are anticipated as ship frequencies are expected to increase from one ship every ten days to one ship per week by 2020. In 2012, only 227 containers shipped through the Port of Portland. Now as recently as 2015, over 7,000 containers shipped through the terminal, and 8,500 containers are anticipated in 2016. An additional 3,500 containers are also transported through the site via truck. The Federal Maritime Commission projects a surge in international cargo traffic through U.S. ports over the next 10 to 15 years, and predicts an annual rate of growth around 5% for East Coast ports, which is consistent with trends since 2009 yet still lower than historical growth rates.[ii] East Coast ports including Portland will need to double their capacity to handle the increased demand from containerized cargo.

Figure 2: Annual Dry Cargo Tonnage Through Maine Ports (1982-2015)



Intermodal Connections

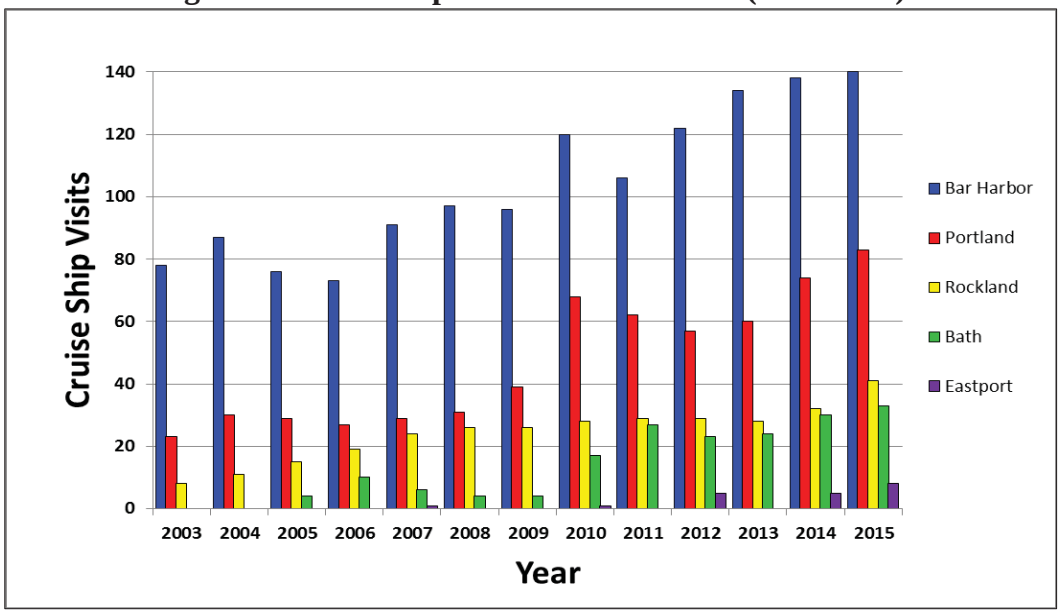
Intermodal connectivity is critical to the long-term success of shipping and handling cargo through Maine's ports. The two most critical modal connectors, highways and rail, provide avenues for moving freight to and from port terminals. The Maritime Administration has been exploring the development of a Short Sea shipping system to aid in reducing the growing amount of freight congestion on our nation's rail and highway systems. In 2010, USDOT Secretary Ray LaHood designated a Marine Highway route from Portland to NY/NJ as one of eight such Marine Highway projects in the country. The Maine Port Authority (MPA) intends to utilize this route using a tug-and-tow operation as early as 2017. In addition, the MPA has designed an ATB (Articulated Tug Barge vessel); however, its in-service date has been delayed until 2018 due to lack of construction funds.

With completion of the intermodal connection in 2014 at the Portland International Marine Terminal (IMT), the site now offers a fulltime chassis storage area where trucking companies can access the terminal and pick up containers. The expanded site also offers a 750-ft track and a concrete loading slab capable of loading ten rail cars. Maine ports have also positioned themselves to better support the handling of both on-shore and off-shore wind components. All three ports have handled wind components over the last six years with Searsport and Eastport leading the way in this market. Currently, MaineDOT is partnered with the Aqua Ventus I team and is in the early stages of designing port facilities to facilitate the construction of off-shore wind infrastructure at the Mack Point Marine Terminal in Searsport.

Cruise Ship Industry

Cruise ship frequency in Maine has increased since 2003 (Figures 3)[iii] and remains a home port for American Cruise Line, Blount Small Ship Adventures and a variety of Clipper coastal cruise operations. Portland and Bar Harbor are deep-draft ports that regularly host vessels of all sizes and all lines. Regular calls are made by Royal Caribbean, Norwegian Cruise Line, Carnival Cruise Line, Holland America, Line and Azamara Club Cruises. Rockland, which has been a port of call for military ships, is beginning to attract deep-draft cruise passenger vessels, as well. Bath, Eastport, and Camden continue to flourish as popular boutique ports of call.

Figure 3: Cruise Ship Calls at Maine Ports (2003-2015)



Commercial Fishing and Recreation

In 2014, Maine's fishing industry accounted for 48% of the total fishing tonnage of New England. While the overall tonnage in Maine has dropped 15% over the last 3 years, the value of the product has increased by 16%, to $495.4 million in 2015. In Maine the American Lobster harvest accounts for 80% of the value of the fishing tonnage. In the last few years, management programs have continued to reduce the harvest quantities of Maine's fishing industry affecting the amount of cod, shrimp, and scallops caught on an annual basis.

Condition, Capacity, and Adequacy

Industrial

In Portland, the IMT has undergone major renovations since 2012 and is in relatively good condition. Renovations include a new 3,400 sq. ft office building, a 10,000 sq. ft pier addition, upgrades and improvements to lighting, security, and the installation of 150 power outlets for refrigerated containers, all of which courted the arrival of Eimskip in 2013. Subsequent expansions doubled the size of container storage to include a chassis drop-and-pick yard and a railhead complete with a concrete loading slab and a 750-ft track for loading containers. Half of the fender panels along the existing pier have been replaced, and the remaining fenders will be replaced by 2017. The recent grant award, coupled with the State's 50% matching share, will enable the following upgrades at the IMT: expansion of the existing pier, rail improvements such as sidings and crossings, and equipment purchases such as a mobile harbor crane and rail packer.

Overall, the Portland IMT is in relatively good condition, having been originally constructed in 1988 with concrete-filled steel pipe piles and a concrete deck. The steel pipe piles are protected with both an epoxy coating and cathodic protection. The concrete deck is protected with a penetrating sealer. Steel bollards and steel fender panels provide mooring devices along the pier head. The pier contains areas of industrial-strength load-carrying capacity of 1,000 psf; however, areas remain of 450 psf capacity and should be addressed with future improvements. The upland container storage grounds have been strengthened with screened gravels and a bituminous pavement. Recent improvements to the terminal increased container storage and provided a new rail siding with a concrete loading ramp. ***Final design grade elevations were raised 2 ft throughout the terminal to compensate for high storm waters and the potential for future flooding of the Fore River.*** Future improvements to the terminal beyond 2020 should not be overlooked. Additional improvements and upgrades include: modifications to the Cassidy Point Bridge, rail components to serve the cold storage building, improvements to the existing pier, and port security features such as lighting, fencing, and access equipment.

Dredging throughout the Fore River in Portland's federal navigational channel is necessary on a periodic basis. In 2014/2015, the U.S. Army Corps of Engineers (USACE) removed most of the 750,000 cubic yards, originally programed for removal in order to achieve the required 35-ft channel depths; however, the side slopes and 2-ft over-dredge were not completed. To compensate, private waterfront owners are considering dredging the immediate shoreline along their wharves to maintain usability. This private investment would require the State's assistance to develop a CAD (Confined Aquatic Disposal) cell, which is currently being analyzed for siting. Since the most recent dredge project was not completed in its entirety, additional dredging by the ACOE will likely be required by 2024.

In Searsport, improvements since 2012 included a new Liebherr mobile harbor crane that is used to move bulk materials including salt, petcoke, kaolin, and wind turbine components. Maintenance dredging has also been performed at the liquid cargo pier and future dredging is anticipated. Plans are also under development for additional pier structures that would support the construction of off-shore wind turbines. Searsport is only hampered by the dredging needs of the approach channel. Approximately 900,000 cubic yards of material are scheduled to be removed in the near future, but local disagreement over the amount of materials and the disposal site have delayed dredging. The dry cargo pier is constructed of steel pipe piles and a concrete deck, both of which are in relatively good condition. The liquid cargo pier is constructed of timber piles and a concrete deck and will require additional maintenance beyond that required of the dry cargo pier due to the timber elements. Plans have been developed for new structures, and permits, along with funding, are currently being pursued. Both piers should receive annual maintenance.

Eastport maintains two waterfront structures that serve eastern Maine: Estes Head terminal and the Breakwater Pier. The Estes Head marine facility has seen improvements and expansions with the installation of a conveyor system to move bulk goods such as salt, aggregate, and forest products. The wharf lies in naturally deep waters and is constructed of steel pipe piles and a concrete deck with bollards and fender panels all in relatively good condition. In recent years, the capacity of the site has increased with the construction of leveled areas and outdoor pads where bulk materials can be stored. Other markets have the potential to develop such as bio mass, wood pellets, and wind turbines. The downtown Breakwater Pier on the other side of Eastport is currently under construction after years of postponed maintenance and repairs. Prior to the start of construction, the pier experienced a major collapse. Fortunately, construction activities have been accelerated and the new facility should be completed soon. For Eastport to remain competitive and viable in Maine's three-port system, improvements to the rail and highway system as well as ancillary facilities within the region are needed. The waterfront structures should receive annual maintenance.

Intermodal Connections

In Portland, the waterfront connector and the new improvements to Veteran's Memorial Bridge enhance the connections from the marine terminals in both Portland and South Portland to the interstate highway system and to the rail system owned and operated by Pan Am Railways. In Searsport, direct rail access is available to the terminal at Mack Point via the Central Maine & Quebec Railroad (CMQ, formerly Montreal Maine and Atlantic). The CMQ offers double-stack rail clearance from Searsport to Montreal and then Class 1 connections to the Midwest. These intermodal connections provide a valuable link for effectively moving freight and help to keep this traffic from traveling on the interstate highway system. Rail connectivity between the Port of Eastport and the surrounding areas of Ayer's Jct., Woodland Jct., and St. Croix Jct. requires upgrades and could be stifling growth in the eastern part of the state. All three ports would benefit from improved rail connections and trans-load capacity.

Cruise Ship Industry

Waterfront facilities supporting Maine's cruise industry are adequate for the current market but need upgrades and expansion to keep up with the increasing demand for port calls. Over 377 vessels bringing more than 283,000 passengers will visit Maine in 2016, a 6% increase over 2015.[iv] With cruise ships becoming larger and carrying more passengers, the ability to effectively handle these vessels is essential for continued growth in this market.

Portland has made improvements to the Ocean Gateway Terminal positioning it to better handle the increasing number and size of vessels, and a third berth is under consideration to keep up with the demands of the cruise ship industry. Site development would require careful planning in light of shallow water depths. Dredging in 2014/2015 achieved water depths of 35-ft within the navigational channel adjacent to Ocean Gateway; however, without additional dredging within the immediate ship berth itself, silt accumulation could jeopardize the growth of this facility.

In Bar Harbor, the MPA has been working closely with two entities: Canadian National and Bay Ferries. The MPA seeks to acquire the 4-acre waterfront ferry parcel along Eden Street and develop this site into a cruise ship terminal. While the existing pier is not currently in the lease arrangement (due to its poor condition), the MPA is pursuing the construction of a replacement pier to accommodate two cruise ships at one time. According to Cruise Lines International Association, passenger ridership has grown nearly 4% each year between 2009 and 2014.[v]

Commercial Fishing & Recreation

Maine has a strong history of commercial fishing within many of its small harbors. Whereas local municipalities own and operate many of the waterfront facilities, the condition of these aging timber structures is inconsistent across the state and is dependent upon local economies. Municipalities rely heavily on funding from the State's grant programs. MaineDOT provided $1 million for 20 projects in 2012, and another $1.3 million for 19 projects in 2014. Matched with local contributions, these funds are vital to Maine's commercial fishing industry.

Investment Needs

Within the last four years, $54 million was invested from federal, state, and local funds. The breakdown of recent investments includes: $13 million for Eastport breakwater (2013), $25 million for Portland IMT first expansion (2013-2015); and $16 million for Portland IMT second expansion (2016).

Future investment of approximately $120 million is needed from federal, state, and private sectors for the following:

- $25 million for future phases of expansion at the Portland International Marine Terminal.
- $13 million for dredging in Searsport to deepen the main channel.
- $40 million for purchase and upgrade of the Bar Harbor cruise ship terminal (estimated value).
- $10 million for construction of an Articulated Tow Barge.
- $20 million for cold storage building at the Portland International Marine Terminal (via private investments).
- $5 million for construction of a CAD cell in Portland Harbor.
- $5 million for dredging the side slopes and over-dredge depth of the Fore River.
- $2 million for Small Harbor Improvement Program (SHIP) and Boating Infrastructure Grants (BIG)

Conclusions and Recommendations

Maine's industrial ports are in good physical condition, and while the State has made significant investments over the last eight years, continued improvements are needed to accommodate the forecasted demands of the shipping and cruise ship industries. Maine ASCE gives Ports and Waterways a grade of B-.

Maine ASCE makes the following recommendations:

- Continue to invest in Maine's industrial ports with emphasis on waterfront infrastructure, intermodal connections, rail connectivity, upland storage facilities, and short sea shipping;
- Invest in maintenance activities at Maine's industrial ports;
- Invest in ATB's and the development of a marine highway connection between Portland and east coast ports;
- Increase investments in cruise ship industry infrastructure to capitalize on economic benefits of this industry;
- Increase investments in fishing and recreational infrastructure via the SHIP and BIG programs;
- Purchase and upgrade the cruise ship docking facility in Bar Harbor and develop public/private partnerships;
- Promote maintenance dredging and channel improvement projects in Maine's navigable waterways;
- Promote the handling of wind components at Maine's industrial ports; and
- Update Maine's Three-Port Strategy to develop clear objectives for future uses and investments at each terminal.

Sources:
Information from MaineDOT Office of Freight Transportation, Maine Port Authority, and Cruise Maine USA

[i] Maine Port Authority
[ii] FMC, "*U.S. Container Port Congestion & Related International Supply Chain Issues*," July 2015.
[iii] Cruise Maine and the Town of Bar Harbor, Bangor Daily News, May 1, 2015.
[iv] Bangor Daily News, May 2, 2015.
[v] Cruise Line Int'l. Assoc., "*The Contribution of the International Cruise Industry to the U.S. Economy in 2014*," Sept. 2014.

November 28, 2016

RAILROADS

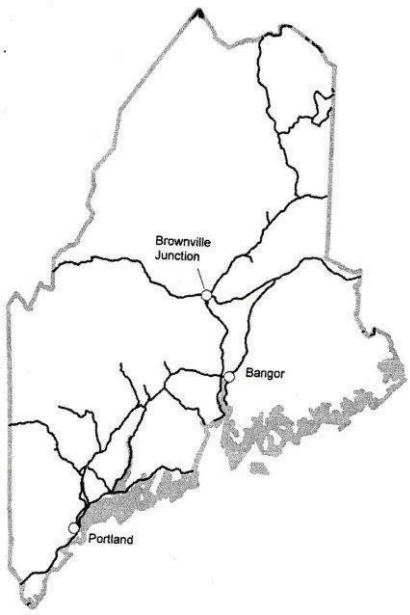
Grade: C

Overview

Maine has 1,119 miles of active railroad, and recent capital projects, most of which are joint initiatives with private railroads, include track repairs, customer rail sidings, and interchange improvements. The largest rail customers in Maine are the pulp and paper and lumber industries. A full time rail inspector has been added since the 2013 Lac Megantic, Quebec, accident. Although railroads in Maine are not capacity-constrained by volume, sections of active track will not support 286,000-pound rail cars, the standard with Class I railroads. Improvement projects are underway, including a federal TIGER grant, which will help increase system usage and ensure the Maine railroad network remains an efficient and effective means of passenger and freight transportation.

Background

Rail service is an important component of the transportation mix in Maine and is particularly cost-effective and energy-efficient when moving high-volume, low-value commodities over long distances as it minimizes heavy truck traffic on roads. In 2015, Maine had nearly 4.7 million tons of freight moved annually by rail. The first railroad company in Maine was chartered in 1832. The peak mileage for track in service for freight and passenger rail was in the 1920s with over 2,300 miles. Since the 1920s, as lines became less competitive track has been abandoned and eventually removed. In 2015, Maine had 1,119 miles of active railroad, a reduction of 35 miles since the 2012 report. Almost 293 miles were owned by the State (25%), which is a decrease from 2012 when 350 miles of active track were owned by the State (30%).[1] The State owns an additional 279 miles of inactive rail right-of-way as well, which is an increase of 102 miles from 2012. Maine has 384 miles of rail converted to trails in 30 trails across the state.



Maine is serviced by seven private railroads; five of which form the core of the regional rail network: St. Lawrence & Atlantic Railroad (SLA), Pan Am Railways (PAR, formerly Guilford Rail), Central Maine and Quebec Railway (CMQ), Eastern Maine Railway (EMR) and Maine Northern Railroad (MNR). The State leases some of its track to two private freight railroads, CMQ and MNR and also to two seasonal passenger excursion railroads, the Belfast and Moosehead Lake Railroad and Downeast Scenic Railroad. Freight railroads are classified by the Federal Rail Administration (FRA) based on annual operating revenues as follows:

- Class I – annual revenues greater than $359.6 million;
- Class II- annual revenues between $40 million and $359.6 million; and
- Class III- annual revenues under $40 million.

CMQ, EMR, MNR and SLA are all Class III railroads and PAR is a Class II railroad.

Central Maine and Quebec Railway (CMQ) purchased approximately 207 miles of track of the former Montreal, Maine and Atlantic Railway (MMA), following MMA's bankruptcy in 2013 after the tragedy in Lac Megantic, Quebec. CMQ now owns 207 miles of track in western and central Maine with a line from Millinocket to Searsport and a line from Brownville Junction to the international boundary west of Jackman and on into Canada. CMQ connects

[1] A Complete Maine Rail map is available at http://maine.gov/mdot/maps/docs/RailSystem_2016.pdf .

with two Class I railroads outside of Maine and connects to PAR at the Northern Maine Junction outside of Bangor, with Canadian National (CN) at St. Leonard, New Brunswick, and EMR at Brownville Junction, Maine. CMQ began a ten year lease of the State – owned Rockland Branch in January 2016.

Pan Am Railways (PAR) rail lines in Maine were originally operated as the Maine Central Railroad and later as the Guilford Rail System (GRS). Based in Waterville, PAR's main freight line runs from South Berwick to Mattawamkeag with branches to most of the major paper mills. A critical link for PAR is not just their southern mainline, but also their connection to the Canadian provinces through the EMR. PAR owns a total of 372 miles of rail in Maine and connects to many Class I railroads, as well (CSX, Norfolk Southern and others). PAR also connects to the St. Lawrence & Atlantic Railroad (SLA) at Danville Junction.

St. Lawrence & Atlantic Railroad (SLA) runs from Portland to Montreal, Canada and interchanges with the Canadian National Railroad (CN). SLA has 85 miles of track in Maine. SLA sold the track from Portland to the Auburn town line to the State, retaining freight rights. SLA operates the 35-acre intermodal terminal facility in Auburn.

Maine Northern Railroad (MNR) is owned by the JD Irving Company. They lease rail lines serving Caribou, Presque Isle, Easton and Houlton from the State totaling 233 miles of track. The Aroostook lines were upgraded with a federal Transportation Investment Generating Economic Recovery grant (TIGER) of $10.5 million to FRA Class II, tripling the traffic on that line segment. MNR connects with the CMQ in Millinocket and its sister railroad the EMR in Madawaska.

Eastern Maine Railway (EMR) operates 100 miles of track between Brownville Junction and Vanceboro Maine. EMR connects to CMQ at Brownville and a sister railroad, New Brunswick Southern, at the Maine/New Brunswick border in Vanceboro. In addition, the EMR operates the 26 mile Van Buren subdivision between Madawaska making a connection with the MNR and Van Buren where it connects at the border with the CN.

Turners Island LLC operates 2 miles of track from the South Portland Marine Rail Cargo Terminal connecting to PAR in South Portland.

Northern New England Passenger Rail Authority (NNEPRA) operates the Amtrak Downeaster passenger service from Boston to Brunswick with 6 stops in Maine. Daily runs from Portland to Brunswick and a new stop in Freeport were added in 2012. A stop in Kennebunk is being developed and is planned to open in 2018. NNEPRA will complete a layover and maintenance facility in Brunswick in 2016, and has $1.15 million in funding for a new rail siding in Cumberland. The new siding will increase the allowable Downeaster trips on this segment from 3 to 5 round-trips per day. From FY11 to FY15, operating revenues totaled between $8-10 million, and between 49-55% of annual operating expenditures. Federal Transit Administration (FTA) funding provided between 36-41% of the remaining expenses, and 9-10% is Multi-Modal Account (MMA, state) funds. 2.6% of the expenses are for maintenance, and projects were 31.3%, or $38.5 million from FY11 to FY15. After increasing ridership from 2011 to 2014, ridership decreased in 2015 due to delays caused by track maintenance replacing railroad ties between Boston and Portland. Some additional tie replacement is scheduled for the next two years. However, ridership is expected to continue to rise as the service becomes more reliable and more trips are added.

Condition and Adequacy

Maine has a State Rail Plan, developed in 2014, as required by the FRA. This has overall planning for rail needs in the State and ties into the Federal Rail Plan. The State Rail Plan ties into the 2014 Maine Integrated Freight Strategy Report. Most rail facilities in Maine are privately owned or are leased. The bulk of the maintenance and the payments for upgrades, as well as the impetus for improvements, is on the rail owners and generally private, and based on business decisions about their customers and profits.

No railroad track in Maine is currently capacity-constrained by volume.

Currently, sections of Maine's active track will not support the 286,000-pound rail cars that are becoming the standard with the Class I railroads. In four years, SLA expects to upgrade bridges in Maine, New Hampshire and Vermont to allow Class I rail cars between Auburn and Montreal. The ability to use consistent car types with Class I railroads would reduce handling costs and make systems more efficient.

Issues related to upgrading for greater railcar capacity include the track (rail, ties, ballast, and substructure) and the load ratings of many of the railroad bridges. Currently, most of Maine's railroad bridges are rated for 263,000 pounds and are not built to accommodate double-stack containers. For bridges on track connecting with Class I corridors out of state, upgrading to accommodate the larger freight rail cars will require significant investment by both the railroads and state/private partnerships, primarily in the cost of inspection and engineering for each bridge. The bridges are generally older, over-built originally, then have been maintained and patched over the years. The bridges need to be kept in service and cannot be taken out of service for the time required to replace a bridge using standard construction methods. Increasing clearances on a rail bridge will occur only if a specific need in a certain corridor is identified or when the bridge is due for major rehabilitation or replacement.

SLA is fully cleared for double-stacked containers from Auburn to Montreal, Canada and beyond to the Port of Vancouver, Canada. From points in Canada, double-stacks can continue down to Chicago and points in the mid-western states. This bodes well for long-term rail freight growth in Auburn. CMQ also has clearance for double-stack containers from Searsport to Montreal, Canada and then via Class I connections to points in the U.S. Midwest and Canada as well. Searsport's port facility requires upgrades in capacity to maximize opportunities of a growing containerized cargo market.

SLA, in conjunction with MaineDOT and Lewiston Auburn Railroad, has re-connected the old Rangeley Branch Line to the Lewiston Auburn Railroad and the St. Lawrence & Atlantic Railroad. Their $3 million infrastructure investment adds a switching track capacity and provides service to MB Bark in Auburn, ME. This project will allow for future industrial development opportunities on 320 acres of land served by rail.

PAR plans to improve their main line to reach Class III standards, rating bridges and repairing them as needed to attain 286,000 pound capacity, and have a 3 - year yard rehab program throughout the State. PAR track between Portland and Brunswick has been upgraded and signal work completed for providing Downeaster passenger service to Brunswick since 2012. PAR has installed continuously welded rail on the track between Waterville and Portland. The Danville Junction Interchange Project, completed in 2012, has upgraded service with $6 million in funding from PAR, SLA, MaineDOT and federal funding. The track from Bangor to Portland has been raised to Class II standards. IRAP funds were used for a siding for Turner Egg Farms in 2012.

PAR is partnered with Norfolk Southern to improve the "Patriot Corridor" between Albany, New York and Boston, Massachusetts for double-stack service. This partnership will provide a direct benefit to freight rail in Maine, even though double-stack clearance on PAR's rail line into Maine is not yet available. Federal funding has been received for improvements in Massachusetts.

Minimizing at-grade crossings would provide for faster train travel and safer travel for pedestrians and vehicles, as well as reducing costs for maintenance. There are now 830 active at-grade crossings. There are 430 crossings with active protection that include lights and gates or lights only. The cost to maintain the crossings is shared between the railroad owner and the state. The remaining 400 crossings are passively protected with signage only. There have been a total of 11 accidents/incidents in the last four years (2012-2015) with no fatalities, compared to 14 accidents/incidents with 1 fatality between 2008-2011; two incidents were due to trespassing, and this does not include the Lac Megantic accident. The 2013 Lac Megantic train derailment accident has caused revisions in both owners and operating practices that will increase safety both on that line and throughout the state.

The MaineDOT provided condition assessments for 478 miles that it owns (of which 293 miles are in active use). MaineDOT owns an additional 94 miles of right of way with no tracks. Of the segments assessed, conditions were classified into three categories: 70 miles or 14.6% were good, 200 miles or 41.8% were fair, and 208 miles or 43.6%

were poor. Track maintenance standards are those acceptable to the Federal Rail Administration (FRA) and the MaineDOT and depend on the planned track usage. Previous to the Lac Megantic accident investigation, MaineDOT had one half-time inspector. An additional 1500+ miles were evaluated following the hiring of a new full-time inspector in 2015. The inspector reports directly to the FRA and the owners of the track, and the information is not provided to the MaineDOT.

Investment Needs

MaineDOT developed its third Maine Integrated Freight Strategy Report in 2014. The plan full fills one of the requirements of federal legislation (MAP-21) which requires each State to "set performance targets in relation to the freight measures, integrate these targets within their planning processes, and report periodically on their progress in relation to these targets." This plan is coordinated with Maine's four Metropolitan Planning Organization (MPO) planning efforts and other MaineDOT planning efforts including the State Rail Plan, in order to provide the most efficient transportation system possible. The plan identifies bottlenecks so that freight can move in a more seamless way.

There are four federal funding sources for rail improvements, three state sources, plus private funding from the private railroads. The federal sources are the Transportation Investment Generating Economic Recovery (TIGER) grants, with $500 million in funding available for over $9 billion in project applications nationwide, FASTLANE, with $800 million in funding available for over $9.8 billion in project applications nationwide, the Federal Transportation Authority (FTA), and Congestion Mitigation and Air Quality Improvement (CMAQ) program (significantly used for intersections). MaineDOT's funding sources include the Industrial Rail Access Program (IRAP), the Multimodal Account (for passenger rail), and specific bonds could be used. In recent years, there has been a major effort to create partnerships for investing and improving rail infrastructure in Maine. MaineDOT and private railroads are working jointly where both have interests on several capital projects around the state.

A TIGER grant for $20 million, with state funding and private funding from the four operators (CMQ, EMR, MNR, PAR), will fund the $37.5 million Maine Regional Railways Project to improve 384 miles of track, providing increased speeds of 25-40 mph and eliminating bottlenecks at switching yards and crossings. Completion is expected in 2017. This will bring new customers using rail freight to this route.

The Industrial Rail Access Program (IRAP) is funding through MaineDOT for Maine businesses to encourage economic development and increased use of rail transportation for new rail users. Shippers can apply for funding to support infrastructure improvements to provide access or more efficient access to freight rail transportation. IRAP will provide up to a fifty-percent match and the user provides the rest. There is $1.2 million in state funding, matched with $1.2 million in private funding annually programmed in the 3-year MaineDOT work plan for this popular program. The IRAP goals are to get heavy freight off the road systems, to encourage jobs growth and retention, and to keep Maine businesses competitive. One example of the IRAP was the 2013 extension of rail for Casco Bay Steel to move steel plate between their fabrication facility and the rail system without loading and reloading trucks.

Maintenance of active state-owned track is included in the responsibilities of the rail companies leasing the track. Needed improvements are funded by the operator, MaineDOT, and federal funding as available.

MaineDOT's three year work plan budgets $1.2 million annually in FHWA crossing safety funds for improving safety at highway-rail crossings. The FHWA allocation is intended to fund 4 to5 crossing improvement projects annually.

Innovations

Innovations in rail include adding ground-mounted infrared cameras ("trackside detectors") to inspect the cars as they pass, looking for hot spots and identifying them by axle location, then transmitting the information to the engineer and to a database which initiates maintenance requests. In Maine, these are in place approximately every 100 miles of track.

The rail industry is also working on Positive Train Control (PTC) to monitor and control train movements automatically; this is not in use in Maine yet but will be required. Inspection by drones and vehicle-mounted lifts will allow enhanced bridge inspections. Track can be inspected with ultrasound and ground penetrating radar.

Funding was provided for designing a trespass detection system for high-risk areas for NNEPRA.

Conclusions and Recommendations

A comprehensive system-wide grade is difficult to determine because much of the system is privately owned and actual condition ratings are not available from the owners. Compared to the 2012 report, the State-owned railroad track's conditions rated good or fair remained at 56.4%. Most of Maine's railroads are privately funded and future investment to improve the system is directly tied to demand for service increases. Joint initiatives with private railroads are important to assuring the system remains efficient and effective. The rail system is moving less pulp and paper as mills close. Targeted improvements in allowable speed and improvements to sidings and crossings, along with increased marketing by rail owners and operators should increase usage of the system which will in turn provide additional funding for maintenance and improvements by the rail owners and operators. Maine ASCE gives Maine's railroads a grade of **C** in 2016.

Maine ASCE makes the following recommendations:

- Continue to fund and promote the IRAP program so businesses can plan on using freight rail;
- Continue to work with railroad owners on interchange projects to assure the system's smooth performance;
- Continue to invest in at-grade crossing improvements and advocate for project funding;
- Conduct reviews with municipalities for redundant crossing locations and alternative traffic pattern opportunities to improve efficiency of the rail systems;
- Develop policies to increase and improve intermodal freight transportation, including improving data collection;
- Review all agency policies on raising bridges that pass over rail lines. By raising bridges to a 22' height over the long term, double-stack trains will be accommodated, increasing the efficiency and cost effectiveness of the system; and
- Upgrade appropriate sections of track for 286,000 pound capacity.

Sources:

Federal Railroad Administration Office of Safety Analysis www.fra.dot.gov

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Maine DOT Annual Report FY 2015, http://maine.gov/mdot/docs/2016/mainedot-annualreport2015-web.pdf

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MaineDOT, 2016/2018 Triennial Capital Work Plan: http://maine.gov/mdot/projects/workplan/docs/2016/MaineDOTWorkPlan2016_2017_2018.pdf

MaineDOT 2015 Rail Plan: http://www.maine.gov/mdot/ofbs/docs/Rail_Plan_7-9-2015.pdf
http://legislature.maine.gov/uploads/originals/final-nnepra-project-direction-recommendation-statement-.pdf

http://maine.gov/mdot/tigergrants/docs/tiger2015/regionalrailways/Maine%20DOT%20TIGER%20VII%20Application%20Narrative.pdf

Maine Rail-to-Trail: http://www.traillink.com/trailsearch.aspx?state=ME

2014 Maine State Rail Plan http://maine.gov/mdot/ofbs/docs/Rail_Plan_7-9-2015.pdf

2014 Maine Integrated Freight Strategy http://maine.gov/mdot/ofbs/docs/FreightStrat.pdf

November 28, 2016

ROADS

Grade: D

Overview

Maine roads are the most used mode of transportation in the state, but Maine has the lowest funding per mile of the six New England states and a projected $68 million annual funding gap. This evaluation shows that due to the funding shortfall, combined with deteriorating roadway conditions and increasing traffic volumes, Maine's roads are not meeting the customer service level goals set forth by the state legislature. Consequently, Maine motorists spend an extra $1 billion per year in vehicle operating costs, congestion delays, and crashes. To address these deficiencies, Maine must continue to maximize existing revenue streams as well as find additional funding sources.

Background

Maine's highway system is the most critical transportation service for the state's 1.3 million residents and 32.9 million annual visitors.[i] Improved roads provide Maine's residents with greater mobility and traffic safety, which in turn improve personal and commercial productivity and boost tourism and economic development statewide.

Maine is a predominantly rural state with a current roadway system of just under 23,000 miles managed by several different jurisdictions – local, county, state and federal. There are over 13,700 miles of municipal roads.[ii] The state's transportation agency, the Maine Department of Transportation (MaineDOT) is responsible for approximately 8,500 miles[1], or about 37% of that total mileage.

Table 1: New England's Roadway Systems in 2014[iii]

State	Total System Mileage	State Controlled Mileage (A)	Percent State Controlled	Federal apportionment in millions (B) FY2015[iv]	Federal $ mill/Mile (B/A)	Expenditure per lane-mile compared to peer states[v]
MA	36,384	3,011	8	$586	$0.19	
ME	**22,916**	**8,366**	**37**	**$178**	**$0.02**	**$37,637**
CT	21,508	3,721	17	$485	$0.13	
NH	16,132	3,903	24	$159	$0.04	$78,091
VT	14,238	2,606	18	$196	$0.08	$56,334
RI	6,027	1,090	18	$211	$0.19	

Table 1 shows that the extent of Maine's roadway system is only surpassed in New England by Massachusetts. MaineDOT controls more than twice the mileage of any other New England DOT.

MaineDOT categorizes Maine highway assets into six levels of priorities called Highway Corridor Priorities (HCP). This is shown in Table 2 with corresponding length of roadways in each class and the approximate Vehicle Miles Traveled (VMT) percentage of the total VMT. Each highway priority level is associated with goals that match the priority level of that road system to funding.[vi] MaineDOT measures Priority 1-5 roads in three areas called Customer Service Levels (CSLs). The CSLs are (1) Condition, (2) Safety and (3) Service. With each measure MaineDOT has applied an A to F grading: A is Excellent; B is Good; C is Fair, D is Poor and F is Unacceptable. Approximately 95% of priority 1-5 roads are rated and included in tables 3, 4 & 5.

[1] An approximate value is used since value changes slightly each year. FHWA website shows 8,366 miles under state control in Maine in 2014 (shown in Table 1) while MaineDOT included customer service levels for approximately 8,700 miles of roadway in 2014.

Table 2 Maine Roads broken up by Highway Corridor Priority Measures[vii]:

Priority	Description	Miles	Approx. VMT % of total
1	Interstate, Turnpike, key principle arterials such as Rt. 1, 2, 9, & 302	1,751	42%
2	Non-interstate, high value arterials	965	12%
3	Remaining arterials & most significant major collectors	1,884	16%
4	Remainder of Major collectors including much of State aid roads	2,077	9%
5	Minor Collectors, almost all State aid	2,385	8%
6	Local Roads & Streets	14,451	13%

(1) Condition

MaineDOT looks at four measures when producing an overall condition rating: ride quality, pavement condition, roadway strength, and bridge condition.[2] The ranges for ride quality and pavement condition vary according to the priority of the road, e.g. an International Roughness Index (IRI) of 150 inches/mile would be a "D" on a Priority 1 road, but on a Priority 3 road the same IRI would be a "B" (since driver expectations are lower for a "3" road than for a "1" road).[viii] The graph to right shows Maine's average ride quality, as measured by IRI, is slightly worse than the National average.

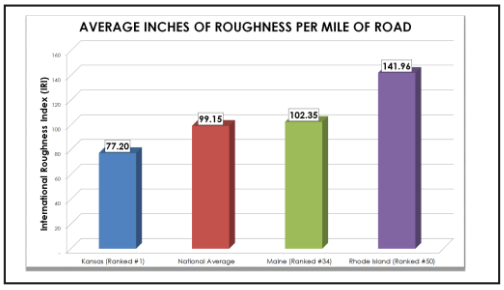

Table 3 shows that 3,459 miles out of 8,645 miles that were rated[3], or 40%, are fair to unacceptable condition (same percentage as 2012 Report Card). 2,640 miles of Priority 1 through 4 roads **42%** of Maine's major roads) have fair to unacceptable conditions (an increase from 38% reported in 2012 Report Card).

Table 3 State Highway Miles broken out by customer service level: Condition[ix]

Priority	*Excellent*	*Good*	*Fair*	*Poor*	*Unacceptable*
1	297	477	386	144	77
2	153	318	268	143	73
3	324	598	464	342	235
4	901	540	344	138	26
5	928	650	467	251	101
Total	**2,603(30%)**	**2,583(30%)**	**1,929(22%)**	**1,018(12%)**	**512(6%)**

(2) Safety

MaineDOT uses four measures to rate safety: crash history, pavement rutting, paved roadway width, and bridge reliability. Pavement rutting is the process of pavement becoming depressed in wheel paths, which can result in water ponding, hydroplaning, and icing in winter. As shown in Table 4 below, 69% of Priority 1 roads that were rated are providing fair to excellent safety conditions (a drop from 82% in reported in 2012 report card), leaving 31% that continue to have issues (poor or unacceptable). Overall, 27% of all Priority 1-5 roads continue to show poor or unacceptable safety issues (approximately the same as reported in 2012 report card).

In May 2011, MaineDOT reported that crashes and fatalities on Maine's roads had dropped significantly from 2001 to 2010, though were still slightly higher than the national average.[x] In 2014 & 2015, Maine's crash rate grew to rates not seen since 2007, or 222.2 and 221.4 per 100 million vehicle miles travelled respectively. The fatality rate in 2015

[2] Though bridges are reviewed under a different Report Card area, some of their information is included in MaineDOT data under roads and will be utilized as part of the road grades as well.

[3] This mileage differs slightly from the mileage reported on Table 1. Table 1 was derived from FHWA website and used for comparison purposes to other states. The mileage reported for condition is the actual mileage rated by MaineDOT in 2014 and will vary slightly each year.

was 1.05 per 100 million vehicle miles travelled, both an approximate 10% increase from 2011. There were 136 highway fatalities in 2011, the lowest since 1959. In 2014, that record was broken again with a low of 131 fatalities and while 2015 had an increase to 156, the overall trend continues to be better than 20 years ago and the 5-year average for the fatality rate has dropped from 1.15 in 2010 to 1.01 in 2015. Among the New England states, Maine generally has the highest fatality rate, though the rate in New England states typically have been some of the lowest fatality rates in the nation.

Table 4 State Highway Miles broken out by customer service level: Safety[xi]

Priority	*Excellent*	*Good*	*Fair*	*Poor*	*Unacceptable*
1	235	379	358	322	105
2	242	335	180	97	108
3	465	528	458	304	222
4	343	546	519	360	190
5	326	736	691	446	205
Total	**1,611(19%)**	**2,524(29%)**	**2,206(25%)**	**1,529(18%)**	**830(9%)**

(3) Service (Capacity)

Service consists of three measures: posted roads, posted bridges and congestion. The condition of the roadway can provide inefficiencies each spring, when approximately **32%** of state highways are eligible for posting (restricted for loads over 23,000 pounds) and in spring 2015 18% were actually posted even with a light winter.[xii] In a 2000 MaineDOT report, 8.9% of Maine's arterials experienced moderately high or higher congestion. According to MaineDOT in 2011, that number had dropped to 6.4%, but with recent traffic growth has risen again to 8.5%.[xiii] A larger concern is that in 2015 28% of Maine's urban arterials are experiencing moderately high or higher congestion. Vehicle miles travelled in Maine was nearly 14.6 billion miles in 2008 as compared to only 14.3 billion miles in 2014, nearly 2% less. As is evident in table 5, a majority of Maine roads provide fair to excellent service and do not have congestion. Good and excellent, ratings reduced from 69% in the 2012 Report Card, to 65% as traffic volumes continue to increase.

In 2011, total statewide vehicle miles travelled dropped back to levels similar to the year 2000. While growth from 2011 to 2014 was slow, 2015 & 2016 growth occurred at a much higher rate. Maine has experienced a 4% growth in VMT in first 6 months of 2016 compared to 2015.[xiv] The Maine Turnpike (MTA), a 109 miles of tolled Interstate in southern Maine, experienced 5.22% growth in transactions from 2014 to 2015 with highest traffic volumes in their 68-year history. Growth on MTA for the first 5 months of 2016 was 7.4%.[xv] A recent safety & capacity needs assessment shows several segments of the MTA decreasing in level of service in the next 5 to 10 years especially in the Portland area.[xvi] The majority of current and future delays will occur on the state's urban arterials, where capacity is limited, volumes are high and land use access is generally uncontrolled. Growth in development along these corridors has resulted in more driveway entrances and left turning movements adding to the congestion.

Table 5 State Highway Miles broken out by customer service level: Service[xvii]

Priority	*Excellent*	*Good*	*Fair*	*Poor*	*Unacceptable*
1	841	382	155	13	7
2	814	96	32	3	17
3	1510	188	53	219	8
4	997	81	876	2	2
5	741	73	1585	4	2
	4,903(56%)	**820(9%)**	**2,701(31%)**	**241(3%)**	**36(<1%)**

Innovation & Resilience

MaineDOT has implemented several innovations in the past few years, including Road Diets on Rt. 202 in Manchester and Smart Work Zones in Ogunquit.[xviii] Road Diets involve reducing four lane roadways to one lane in each direction and then keeping a middle shared lane for turning movements to improve safety. They have developed successful

Planning Partnership initiatives with local communities to share in costs and get more community involvement.[xix] In addition, to address the issue of material loss in pavements, the MaineDOT introduced programmatic durability testing of aggregates, and collaborated with Worcester Polytechnic Institute to test asphalts.[xx] Design standard changes in recent years includes culvert sizing for 100-year storms to increase the likelihood of new culverts handling future run-off without washing out or over-topping the roadway.[xxi] Continued inspection and mitigation of potential problem areas needs to occur to limit the need for emergency closures. Issues related to the on-going natural shift of river channels and severe storm river and stream flows pose a challenge, as does the natural loosening of rock in rock cuts with freeze-thaw cycles. MaineDOT is instituting programs to "inventory" these items, though the task is daunting.

Funding & Investment Needs

Comparing information in Table 1 to previous reports, in FY2010, Maine received $221 million in federal payments for highways, or almost 24% more than the apportionment in 2015 ($178 million). The 2009 to 2011 federal allocations to MaineDOT were temporarily elevated with ARRA funds (The American Recovery and Reinvestment Act of 2009) primarily boosting the paving program. As stated in Table 1, Maine spends considerably less per lane mile than neighboring states New Hampshire and Vermont.

Cost to Maine Drivers: According to The Road Information Program (TRIP) in 2016 *Maine's road conditions are currently costing each Maine motorist an average of $485 per year in extra vehicle operating costs (accelerated depreciation, additional repair costs, increased fuel consumption, and increased tire wear), which amounts to over $494 million statewide annually. Road conditions, congestion delays and crashes cost Maine motorists $1 billion annually.*

In 1976, state investments in highway transportation represented 26% of all state spending. Currently that figure is less than 10%.[xxii] When resources are limited, maintenance is often deferred, thus costing the agency more and deferring costs into future years. Maine is in the middle of this situation today. **The Maine Economic Growth Council April 2016 report "Measures of Growth"**[xxiii] gave the indicator "Transportation" a "red flag," indicating "Significant investment needed to meet roadway improvement goals."

Capital Goals set by Maine Legislature

Per the Maine State Law, 23 MRSA section 73(7) which was passed into law in Spring 2012 (LD 1753), the "Right-Sized" goals are[xxiv]:

Priority 1 and 2 highways: Eliminate all CSL "D"s and "F"s by 2022.
Priority 3 highways: Eliminate all "D"s and "F"s by 2027
Priority 4 highways: Implement a program to maintain "Ride Quality" at a "C" or better by 2017
Priority 5 highways: Continue annual 600 miles of light capital paving, returning every 7 years.

The 2016-2018 MaineDOT work plan reports an annual funding need of $388 million, but there is only $320 million available (assuming current federal funds grow with inflation and proposed bonds proceed). Of the $68 million annual shortfall, half of the shortfall is expected to come from the pavement preservation budget[xxv]. Traditionally, Maine has utilized bonds to fund a significant portion of its transportation budget. In November 2015 the Maine voters overwhelmingly approved a bond referendum for transportation of $85 million of which $68 million was for highways and bridges. In November 2016, Maine voters passed a $100 million bond referendum, of which $80 million is for highways and bridges.[xxvi] The 2016-2018 MaineDOT work plan assumes these bond funds as well as another $100 million in calendar year 2018 is made available. MaineASCE is concerned that without additional funding, beyond these bonds, the State cannot meet the goals set out in 23 MRSA section 73(7).

The MTA collects 100% of its revenues from toll and concessions and does not receive any state or federal funds. With a toll increase in 2012, solid traffic growth and a solid 30-year financial plan, the MTA should be able to self-fund its capital and maintenance projects from cash with no new bond sales projected or toll increases in near future.

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Conclusions and Recommendations

Current investment levels by the state are not sufficient to address the growing needs of the system. Over the next ten years, MaineDOT will not meet goals for roads and bridges set out by the Legislature in 2012, unless a $68 million per year funding gap is resolved. Maine must restore investment in its highway infrastructure as a funding priority for the safety and economic well-being of the state's residents and businesses. Maine ASCE grades Maine roads as a **D**.

> Under-investing in our road system for many years has created a growing backlog of unmet needs that is severely burdening Maine today. Without appropriate levels of sustainable funding unacceptable conditions on roadways will continue to increase.

Maine ASCE makes the following recommendations:

- Maximize existing sources of funding, such as fuel tax revenues, state general fund bonds, tolls and car registration and title fees;
- Secure additional funding including fuel tax increases, vehicle miles traveled (VMT) mechanisms, and General Fund sources, as current MaineDOT funding levels will not suffice over time;
- Implement systematic approach to bonding, allowing MaineDOT to fund a 3-year work plan with more predictable bonds;
- To meet the goals as set out by statute in 2012, fully fund the Pavement Preservation Program; the Light Capital Paving Program; and the other necessary highway reconstruction, safety improvement and paving programs; and
- MaineDOT and its partners should continue simple operational techniques for congestion mitigation, such as intersection improvements and land use policies and also continue to design and construct bypasses and capacity enhancements where required.

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