National Park Service
U.S. Department of the Interior

Northeast Region

DRAFT Long Range Transportation Plan

Compendium of Technical Studies

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New River Gorge Bridge, New River Gorge National River. Photo by VHB.

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Subject Area Memoranda

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NORTHEAST REGION LONG RANGE TRANSPORTATION PLAN

Asset Management Subject Area Memorandum

Prepared for:

National Park Service

WASO Denver

12795 W. Alameda Parkway

P.O. Box 25287

Denver, CO 80225-0287

Prepared By:

Vanasse Hangen Brustlin, Inc.

351 McLaws Circle, Suite 3

Williamsburg, VA 23185-6316

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1.0 INTRODUCTION

The purpose of this memorandum is to present the existing and forecasted conditions of the transportation-related assets in the Northeast Region (NER) and to describe the current asset management strategy of the Northeast Region. This is a companion document to the Financial and Funding subject area memorandum. The Financial and Funding memorandum uses the information presented herein to quantify the gap between projected funding revenues and funding needed to meet all of the Northeast Region's transportation-related needs.

The summary of the existing conditions of the transportation-related assets is based on an analysis of the National Park Service (NPS) facility management software system data and includes the following topics.

- The number of transportation assets and their current replacement value, disaggregated by category of transportation system (on-road, parking, road bridge, non-motorized, water, and transit),
- The deferred maintenance and critical systems deferred maintenance for each category of transportation asset,
- The Facility Condition Index for transportation assets,
- The Asset Priority Index for transportation assets,
- An evaluation of asset inventory, current replacement value, deferred maintenance and facility condition index by optimizer banding, and
- Operations and maintenance costs for the transportation asset inventory.

The discussion of the Northeast Region's asset management strategy provides a summary of implemented strategies by asset silo, the current multiyear program, and projects now under design. This is followed by a discussion on how the current strategy aligns with the overall National Park Service asset management strategy/capital investment strategy.

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2.0 EXISTING CONDITION OF TRANSPORTATION ASSETS

This chapter presents inventory and condition data of the transportation asset inventory for the Northeast Region. The data are from an analysis conducted by Booz Allen Hamilton (BAH) using the NPS Facility Management System Software (FMSS) database. As part of this work, the FMSS data were reviewed and refined to create the inventory of transportation assets discussed in this chapter. A white paper titled "Identifying the Transportation Asset Inventory for the Northeast Region Long Range Transportation Plan" can also be found in the Compendium of Technical Studies. This white paper prepared by Booz Allen Hamilton provides detailed information on how the FMSS database was refined for the purposes of this study.

2.1 Transportation Asset Inventory and Value

As shown in Table 2-1, the Northeast Region has 2,898 NPS-owned active transportation assets with a current replacement value of almost $2.8 billion. Transportation asset inventory makes up about 28% of all region assets and represent approximately 12% of the current replacement value (CRV) of the entire Northeast Region (NER) FMSS asset portfolio.

Table 2-1: Northeast Region Assets

Asset Type	Number of Assets	Percentage of Assets	Current Replacement Value	Percentage of CRV
Transportation Assets	2,898	28.0%	$2,773,472,828	11.9%
Other Assets	7,451	72.0%	$20,484,442,827	88.1%
All Northeast Region Assets	**10,349**	**100.0%**	**$23,211,915,656**	**100.0%**

Source: FMSS database analysis by BAH

A large number of the Northeast Region transportation assets are historic. As shown in Table 2-2, there are 396 miles of roads, 90 bridge assets, 38 miles of trails, and 99 acres of parking that are historic. More detailed information on the historic transportation assets in the Northeast Region is presented in the Resource Stewardship subject area memorandum.

Table 2-2: Northeast Region Transportation Assets by Historic Status

	All Assets	Historic Assets	National Historic Landmarks	Percentage of Historic Assets
Roads (miles)	875	396	16.1	45%
Trails (miles)	156	38	1.2	24%
Parking (acres)	610	99	1.6	16%
Bridges	196	87	5	44%

Source: FMSS database analysis by BAH

Note: For the purpose of this analysis a "Historic Asset" is one that is a National Historic Landmark, National Register Listed, or National Register Eligible.

To further analyze transportation assets and their contributions to current replacement value and deferred maintenance, transportation assets were categorized as one of six transportation asset types.

The six types are as follows. Aviation is not listed as a type of transportation asset because the Northeast Region does not have any aviation assets.

- **On-Road System Assets:** Transportation assets that make up the on-road transportation system include all road system assets that are not specifically defined by other types, including roads, tunnels, lighting, signage, and entry gates. These assets primarily support motorized vehicle transportation.
- **Parking Assets:** Transportation assets that make up parking facilities and infrastructure.
- **Road Bridge Assets:** Transportation assets that make up bridge infrastructure used primarily by motor vehicles.
- **Non-Motorized System Assets:** Transportation assets that make up the non-motorized transportation system including trails, sidewalks, walkways, trail bridges, tunnels, and culverts.
- **Water Transportation System Assets:** Transportation assets that make up waterways, boat transportation, marinas, docks, water maintenance facilities, etc.
- **Transit System Assets[1]:** Transportation assets that make up surface transit networks (e.g., bus, tram, trolley, rail) including vehicles, stops, shelters, and maintenance facilities.

Table 2-3 and Figure 2-1 present the six transportation asset types by number of assets and total current replacement value. Transportation assets supporting motor vehicles (On-Road System Assets, Parking Assets and Road Bridge Assets) make up more than 85% of both the transportation inventory and current replacement value. Parking assets alone account for 44% of the transportation asset inventory and 19% of the total transportation asset current replacement value. Non-Motorized System assets make up 7% of transportation assets. Water transportation assets and Transit System assets together make up about 6% of all transportation assets.

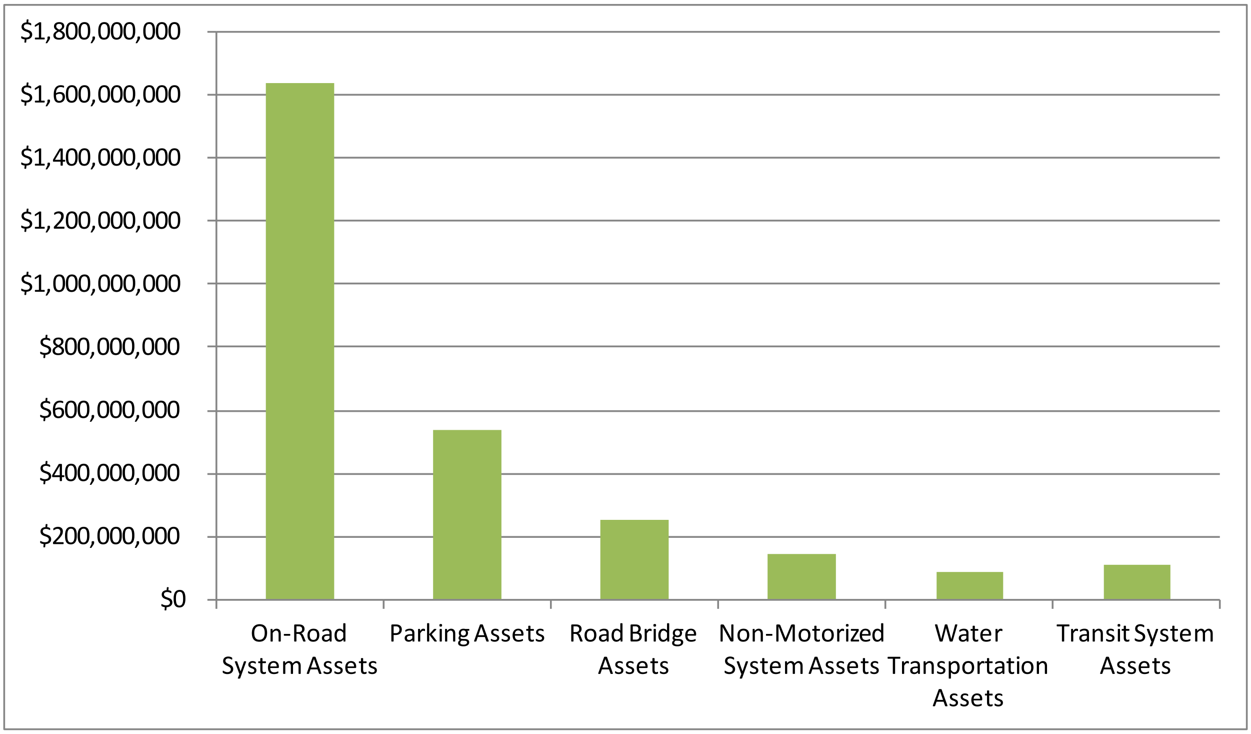
Table 2-3: Northeast Region Transportation Asset Current Replacement Value by Type

Transportation Asset Types	Number of Assets	% of Assets	Current Replacement Value	% of CRV
On-Road System Assets	1,106	38.2%	$1,635,316,276	59.0%
Parking Assets	1,267	43.7%	$537,967,554	19.4%
Road Bridge Assets	156	5.4%	$255,476,174	9.2%
Non-Motorized System Assets	208	7.2%	$146,749,553	5.3%
Water Transportation Assets	65	2.2%	$90,324,896	3.3%
Transit System Assets	96	3.3%	$107,638,375	3.9%
Grand Total	**2,898**	**100.0%**	**$2,773,472,828**	**100.0%**

Source: FMSS database analysis by BAH

[1] Transit System Assets are not well represented in the FMSS database; however, some were added to the inventory through refinement process using the NER Alternative Transportation Management System study inventory of transit assets. It should be noted that for many of the comparative analyses presented herein, transit system assets are more likely than other assets to be missing FMSS data.

Figure 2-1: Northeast Region Transportation Asset Current Replacement Value by Type



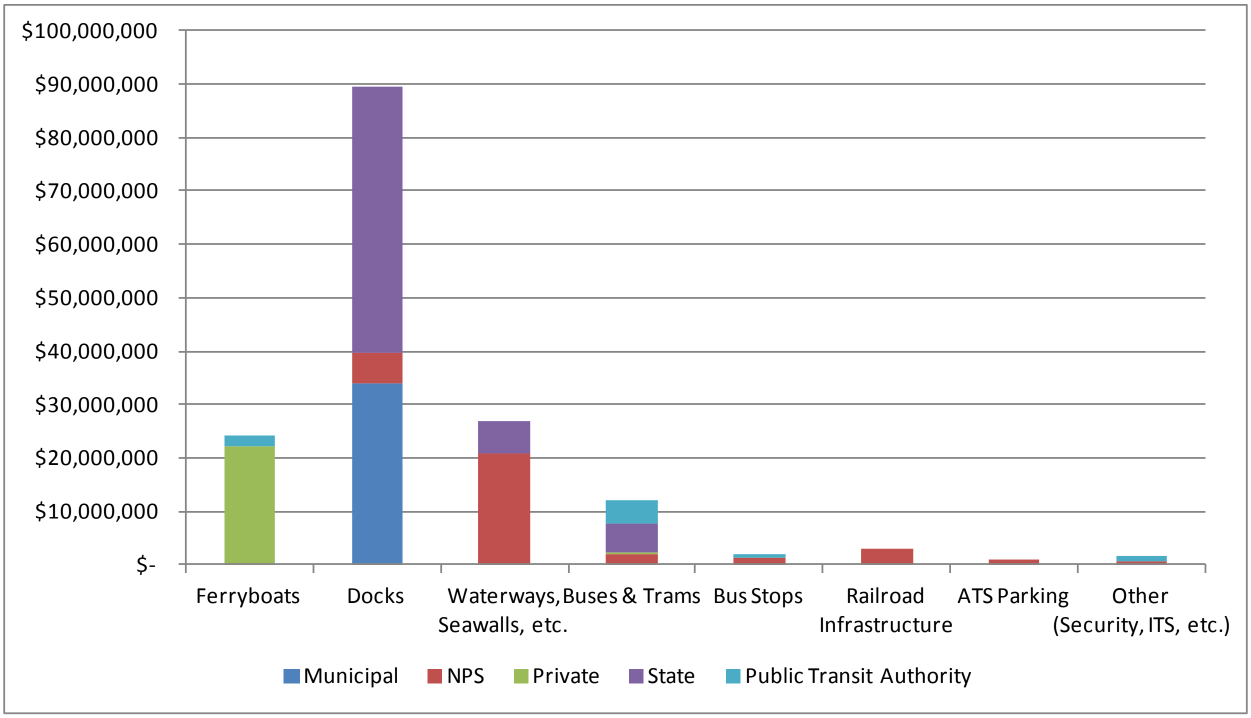
Source: FMSS database analysis by BAH

2.1.1 Alternative Transportation Assets

A recent inventory of ferry and shuttle systems at Northeast Region park units showed that most of the alternative transportation and visitor transportation system assets are not owned by the National Park Service[2]. The Northeast Region has $160 million (CRV) in these ATS assets and owns only 21% of those assets. The finding is illustrated in Figure 2-2 and Table 2-4. These exhibits also show that the value of ATS assets in the Northeast Region is predominately related to ferry services and associated infrastructure.

[2] Tom Crikelair Associates, "Northeast Region of the National Park Service Alternative Transportation Management System Phase 1 Final Report", September 2011. White Paper.

Figure 2-2: Ownership of Alternative Transportation Assets in the Northeast Region



Source: Tom Crikelair Associates, “Northeast Region of the National Park Service Alternative Transportation Management System Phase 1 Final Report”, September 2011. White Paper.

Table 2-4: Ownership of Alternative Transportation Assets in the Northeast Region

	Municipal	NPS	Private	State	Transit	Total
Ferryboats	$ -	$ -	$ 22,099,999	$ -	$ 2,000,000	$ 24,099,999
Docks	$ 34,000,000	$ 5,516,616	$ -	$ 49,855,990	$ -	$ 89,372,606
Waterways, Seawalls, etc.	$ -	$ 20,804,337	$ -	$ 6,000,000	$ -	$ 26,804,337
Buses & Trams	$ -	$ 2,012,414	$ 160,000	$ 5,411,681	$ 4,615,400	$ 12,199,495
Bus Stops	$ 3,300	$ 1,201,251	$ 150,000	$ -	$ 750,000	$ 2,104,551
Railroad Infrastructure	$ -	$ 2,811,519	$ -	$ -	$ -	$ 2,811,519
ATS Parking	$ -	$ 990,062	$ -	$ -	$ -	$ 990,062
Other (Security, ITS, etc.)	$ -	$ 481,000	$ -	$ -	$ 1,120,000	$ 1,601,000
Total	$ 34,003,300	$ 33,817,199	$ 22,409,999	$ 61,267,671	$ 8,485,400	$ 159,983,569

Source: Tom Crikelair Associates, “Northeast Region of the National Park Service Alternative Transportation Management System Phase 1 Final Report”, September 2011. White Paper.

2.2 Deferred Maintenance

Table 2-5 shows that there is approximately $490 million in deferred maintenance (DM) for Northeast Region transportation assets. Although transportation assets represent only 12% of the CRV of all Northeast Region assets, transportation assets account for 25% of the total deferred maintenance for all types of assets. This indicates that, on average, transportation assets tend to be in poorer condition than other assets.

Table 2-5: Summary of Northeast Region Assets, by CRV and DM

Asset Type	Number of Assets	Percentage of Assets	CRV	Percentage of CRV	DM	Percentage of DM
Transportation Assets	2,898	28.0%	$2,773,472,828	11.9%	$490,154,916	24.7%
Other Assets	7,451	72.0%	$20,484,442,827	88.1%	$1,490,715,873	75.3%
All Northeast Region Assets	**10,349**	**100.0%**	**$23,211,915,656**	**100.0%**	**$1,980,870,790**	**100.0%**

Source: FMSS database analysis by BAH

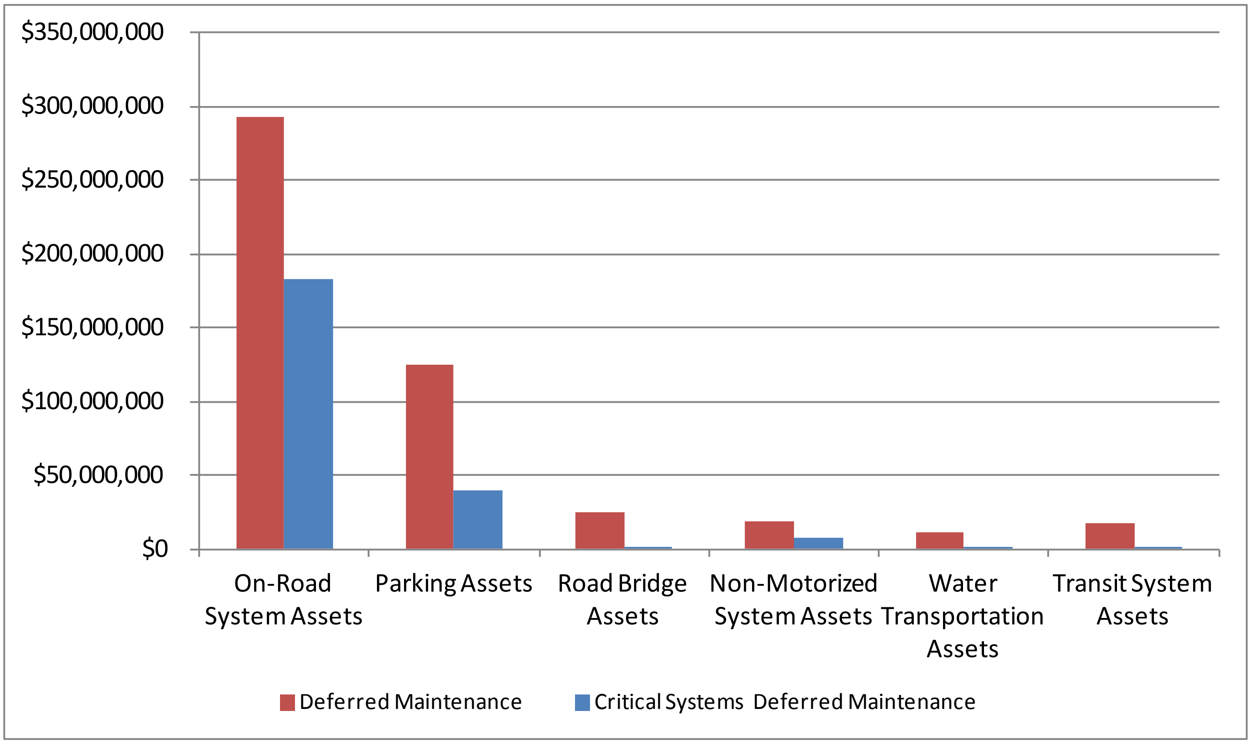
Table 2-6 and Figure 2-3 show deferred maintenance and critical systems deferred maintenance (CSDM) for each category of transportation asset. Roads, parking and bridges make up more than 90% of the deferred maintenance and 96% of the critical systems deferred maintenance. About 26% of deferred maintenance and 17% of CSDM is related to parking. Of note is that road bridges have relatively little critical systems deferred maintenance.

Table 2-6: DM and CSDM of Northeast Region Transportation Assets

Transportation Asset Types	Deferred Maintenance	Percentage of DM	Critical Systems Deferred Maintenance	Percentage of CSDM
On-Road System Assets	$292,169,161	59.6%	$182,814,752	78.6%
Parking Assets	$124,914,006	25.5%	$39,411,590	16.9%
Road Bridge Assets	$25,390,015	5.2%	$807,266	0.3%
Non-Motorized System Assets	$18,584,174	3.8%	$7,341,993	3.2%
Water Transportation Assets	$11,457,656	2.3%	$2,111,094	0.9%
Transit System Assets	$17,639,904	3.6%	$105,012	0.1%
Grand Total	**$490,154,916**	**100.0%**	**$232,591,707**	**100.0%**

Source: FMSS database analysis by BAH.
Note: Transit system asset values are likely underestimated since data are missing for many of those assets.

Figure 2-3: DM and CSDM of Northeast Region Transportation Assets



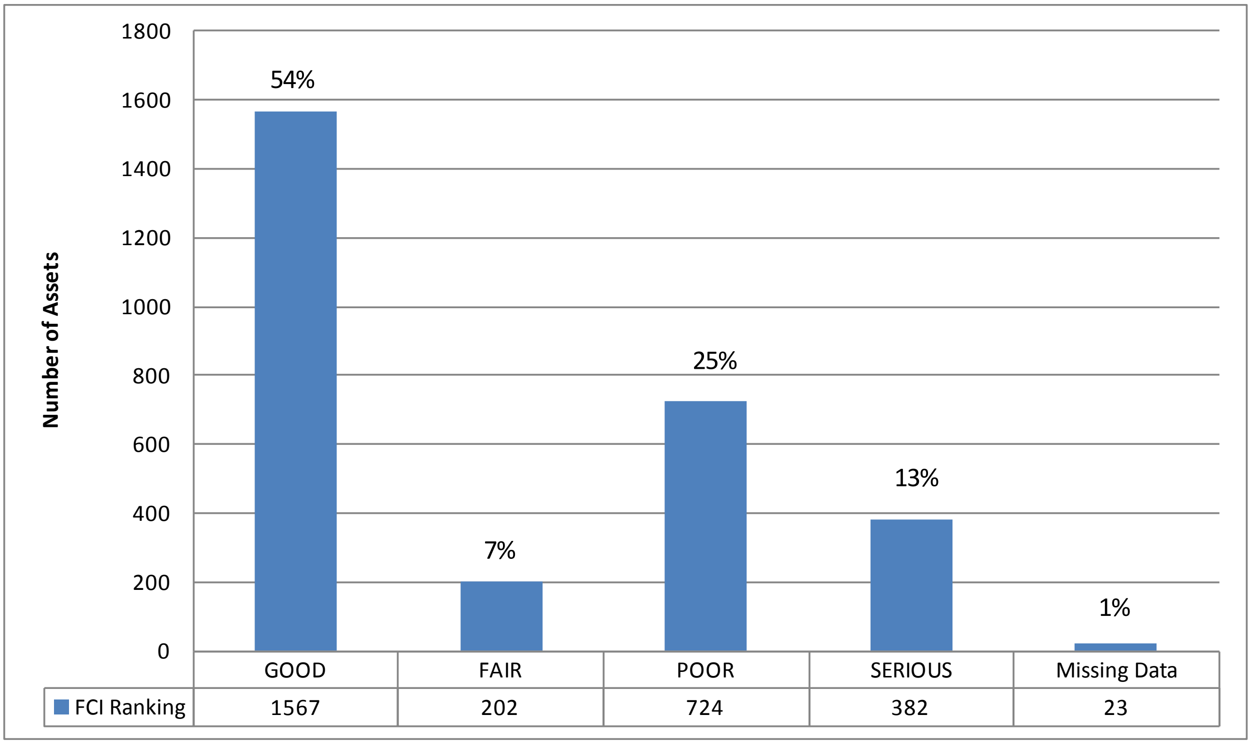
Source: FMSS database analysis by BAH

2.3 Transportation Asset Condition

Figure 2-4 shows the Facility Condition Index (FCI) ranking for transportation assets. The FCI is measured on a scale from 0-1.0 and is determined by dividing the deferred maintenance of an asset by the current replacement value. In cases where deferred maintenance estimates exceed the value of the asset the FCI calculation will produce a value greater than 1.0. Indices between 0.0 and 0.1 denote an asset in "Good" condition. FCIs greater than 0.1 up to 0.15 denote assets in "Fair" condition. FCIs greater than 0.15 up to 0.5 denote assets in "Poor" condition. Lastly, when deferred maintenance makes up more than half the value of the asset (FCIs greater than 0.5) assets are considered to be in "Serious" condition.

More than half (54%) of the Northeast Region's transportation assets are currently assessed as being in "Good" condition. A total of 61% of assets are in acceptable condition with either "Good" or "Fair" ratings. More than 1,100 of the region's transportation assets (38% of the total) are rated as being in either "Poor" (25%) or "Serious" (13%) condition.

Figure 2-4: Condition of Transportation Assets



Source: FMSS database analysis by VHB

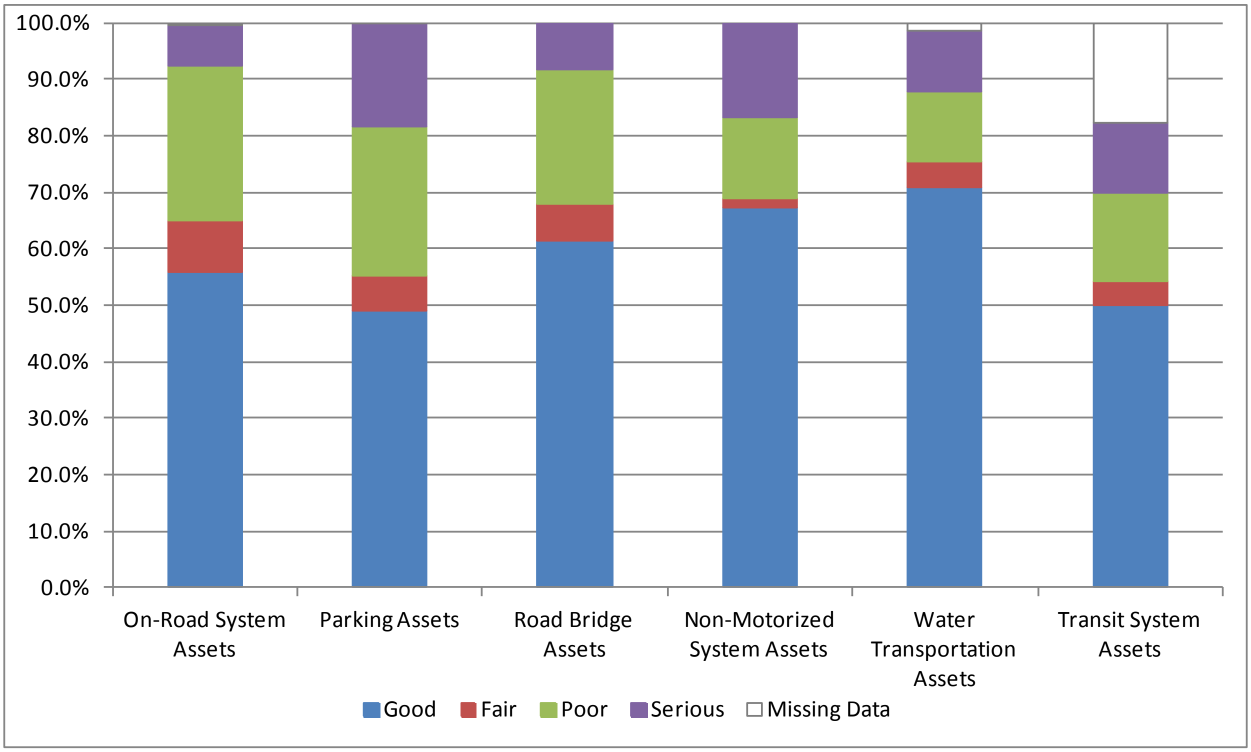
Table 2-7 and Figure 2-5 illustrate the condition of the transportation assets by the category of assets. Comparatively, parking assets are in the worst condition and water transportation assets are in the best condition. The data for transit system assets should be reviewed with caution as 18 of the 97 transit assets are missing FCI data. The transit assets missing data are those added to the FMSS database for the purpose of this study from the inventory work done by Tom Crikelair Associates for the Alternative Transportation Management System study.

Table 2-7: Condition of Transportation Assets

	Good	Fair	Poor	Serious	Missing Data
On-Road System Assets	616	104	300	82	4
Parking Assets	621	78	334	233	1
Road Bridge Assets	96	10	37	13	0
Non-Motorized System Assets	140	3	30	35	0
Water Transportation Assets	46	3	8	7	1
Transit System Assets	48	4	15	12	17
Grand Total	**1,567**	**202**	**724**	**382**	**23**

Source: FMSS database analysis by VHB

Figure 2-5: Condition of Transportation Assets



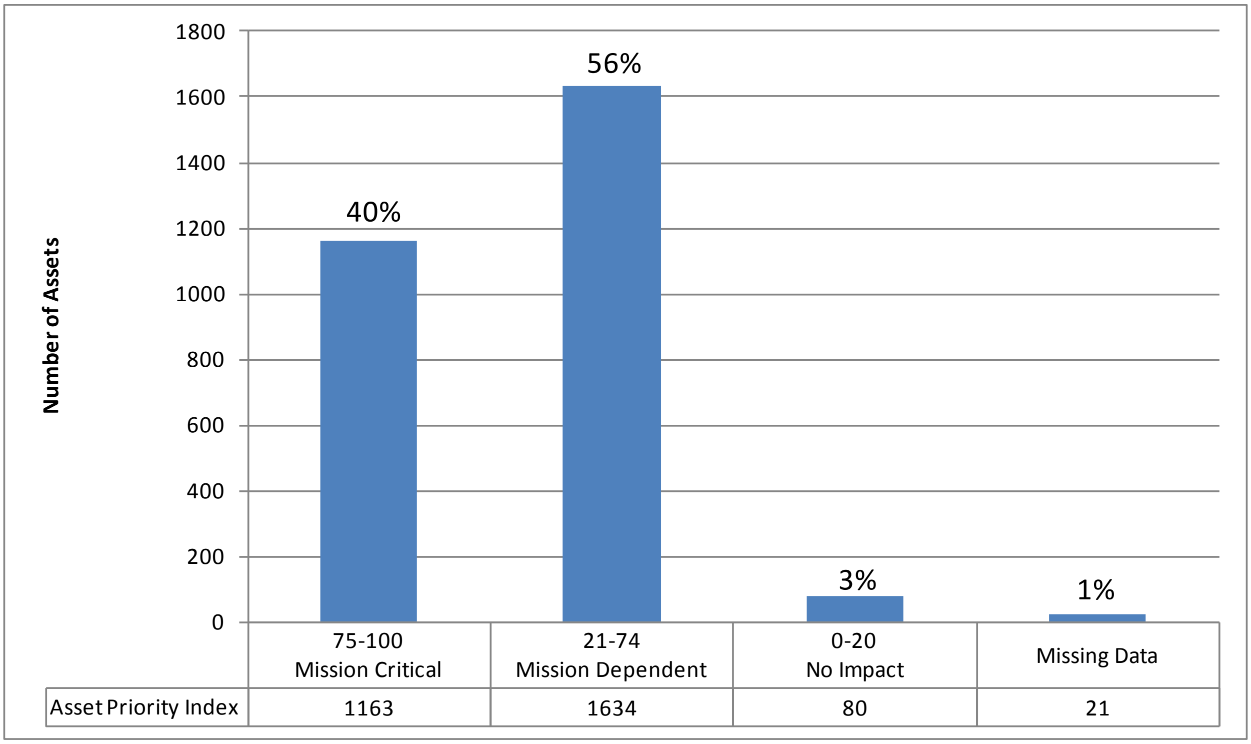
Source: FMSS database analysis by VHB

2.4 Transportation Asset Priority

The Asset Priority Index (API) reflects the importance of an asset to the National Park Service based on how dependent the asset is on the mission of the National Park Service, operations of the National Park Service, and how substitutable the asset is if decommissioned. The API is measured on a scale from zero to 100 with 100 being the score for the most mission critical, irreplaceable assets. Assets scoring between 75 and 100 are considered mission critical. Mission dependent assets score between 21 and 74. Assets scoring 20 and below do not impact the mission.

Figure 2-6 shows how transportation assets in the Northeast Region rank in terms of mission dependence. The majority of assets (56%) are mission dependent, though not mission critical. The second largest group of assets (40%) is mission critical assets. The high rankings of the transportation assets reflect not only that many of the transportation assets are historic resources themselves, but also the key role the transportation system plays in the providing access for visitors to a park's cultural and natural resources.

Figure 2-6: Transportation Assets by Asset Priority Index



Source: FMSS database analysis by VHB

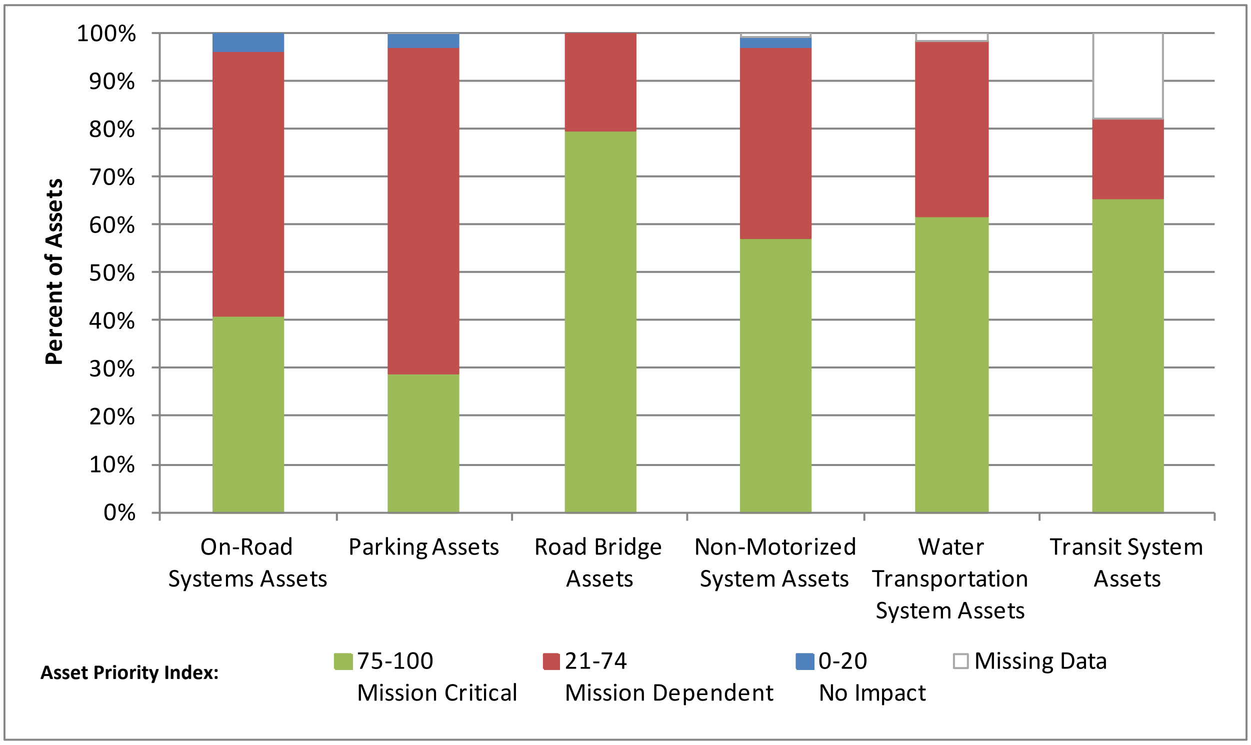
Table 2-8 and Figure 2-7 illustrate APIs of assets for the groups of asset types. Bridges and water transportation assets are entirely mission critical or mission dependent. The relatively few assets with a very low API are among the on-road system assets and the parking assets.

Table 2-8: Transportation Assets, by Mission Dependence and Type

	API 75-100 Mission Critical	**API 21-74 Mission Dependent**	**API 0-20 No Impact**	**Missing Data**
On-Road System Assets	451	613	42	0
Parking Assets	366	866	34	1
Road Bridge Assets	124	32	0	0
Non-Motorized System Assets	119	83	4	2
Water Transportation Assets	40	24	0	1
Transit System Assets	63	16	0	17
Grand Total	**1163**	**1634**	**80**	**21**

Source: FMSS database analysis by VHB

Figure 2-7: Asset Priority Index, by Transportation Asset Type



Source: FMSS database analysis by VHB

2.5 Evaluation of Optimizer Banding of Transportation Assets

Optimizer banding of assets is a method for prioritizing investments in assets. Assets are designated with optimizer band values of 1, 2, 3, 4 or 5. Funding prioritization is highest for low-cost preventive maintenance on highly important assets (optimizer bands 1 and 2). Conversely, the lowest priority funding is provided to assets with little importance to the NPS mission (optimizer bands 4 and 5).

The designation of an optimizer band value for a particular asset is determined using both a quantitative formula and qualitative discretion. As shown by Figure 2-8, the quantitative formula uses Asset Priority Index (API) and Facility Condition Index (FCI) to calculate an optimizer band. Once this initial designation is made the parks review the assets and, if necessary, adjust banding to take into account funding constraints. The result is a prioritized grouping of assets for investment purposes.

Figure 2-8: Optimizer Banding of Assets, Quantitative Analysis

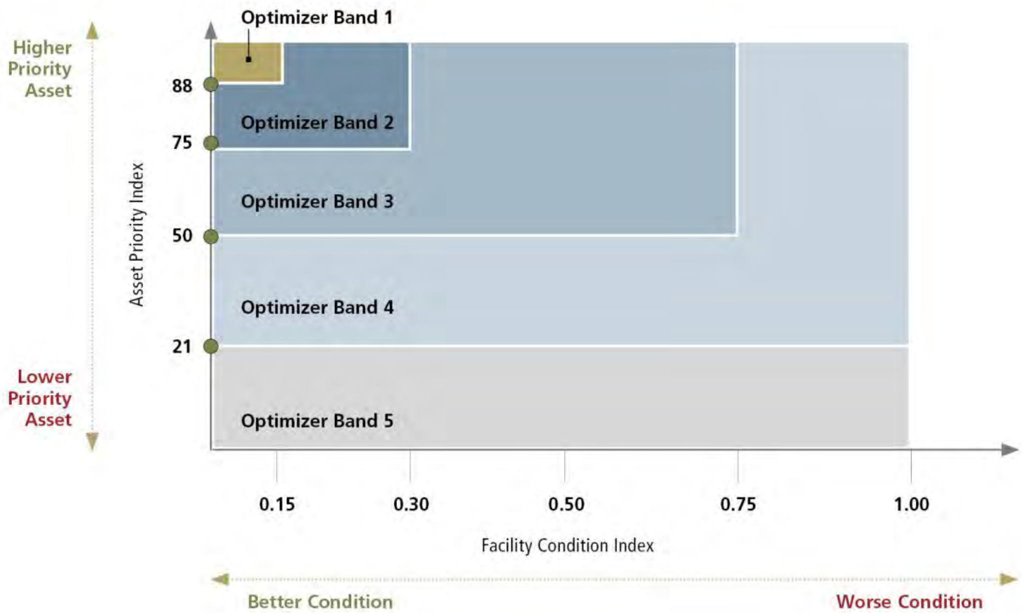
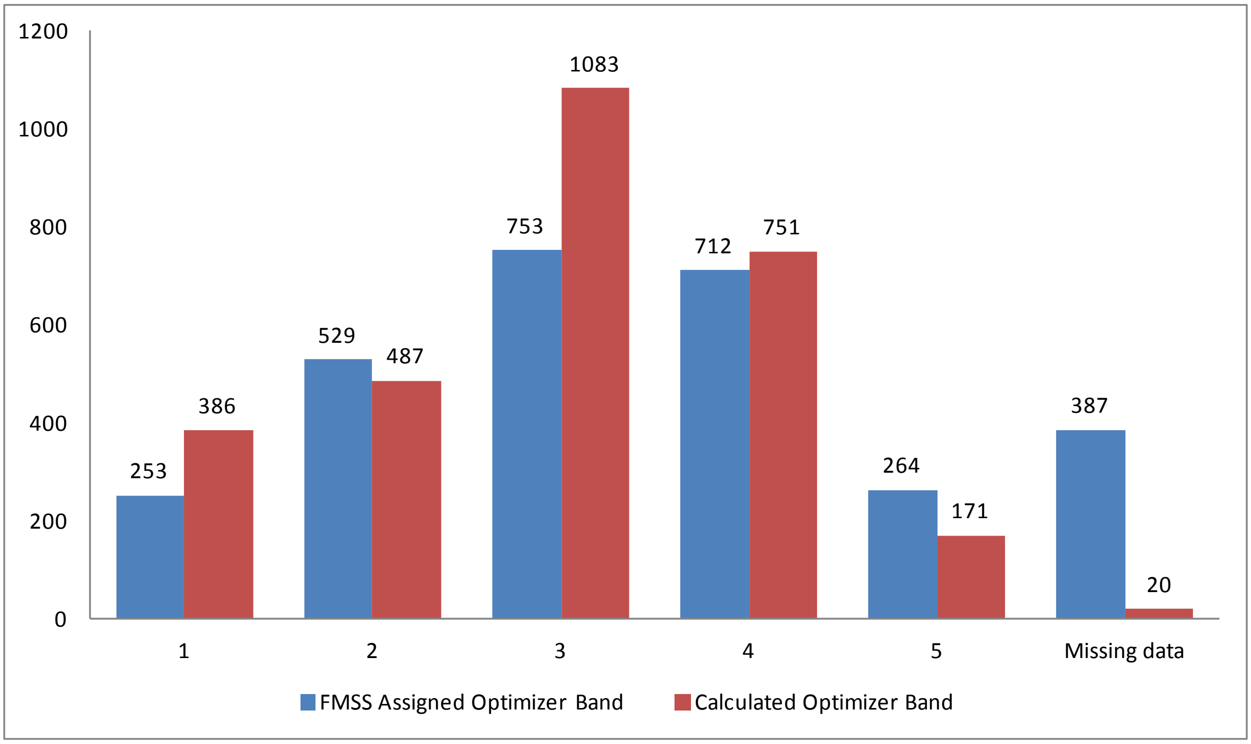


Figure 2-9 shows the current banding of the Northeast Region transportation assets. Two sets of banding values are depicted. The “Calculated Optimizer Band” shows the initial value based on the quantitative API/FCI formula. The “Assigned Optimizer Band” is the final value after the park made adjustments to asset’s designated band. The figure illustrates that there the number of assets qualitatively assigned to optimizer band 1 and 2 is less than the initial quantitative calculation. This is consistent with an investment analysis involving constrained funding.

Figure 2-9: Transportation Assets by Optimizer Band



Source: VHB review of FMSS database (modified by BAH)

Figure 2-9 also illustrates that 387 (13%) of transportation assets are missing assigned optimizer band designations despite there being API and FCI data available to do the initial calculation of the optimizer band. The reason for this is not known but as shown in Table 2-9 most of the assets that do not have an assigned optimizer band value are parking assets. Figure 2-13 (following page) will show that most of the assets that do not have assigned optimizer band values are in "Good" condition.

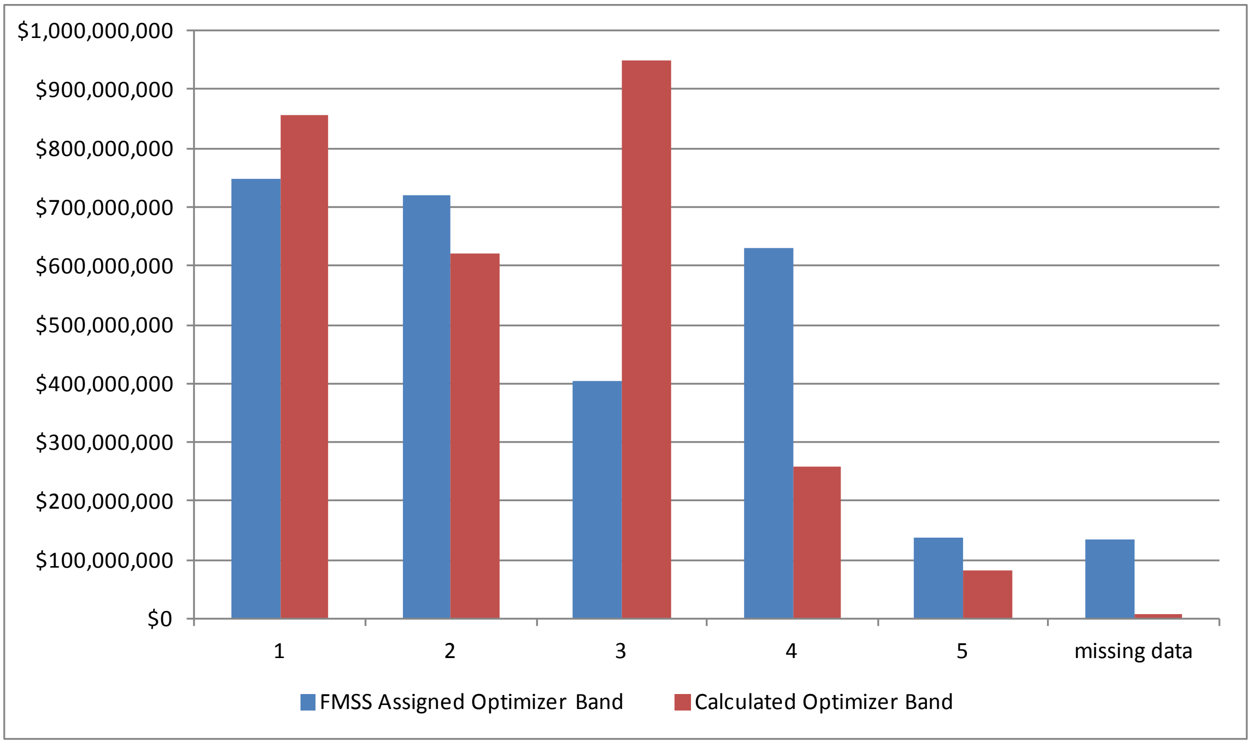
Table 2-9: Assets Missing an Assigned Optimizer Band by Transportation Asset Type

Transportation Types	Number of Assets Missing Optimizer Band Data
On-Road System Assets	54
Parking Assets	263
Road Bridge Assets	5
Non-motorized System Assets	13
Water Transportation Assets	9
Transit System Assets	43
Grand Total	**387**

Source: VHB review of FMSS database (modified by BAH)

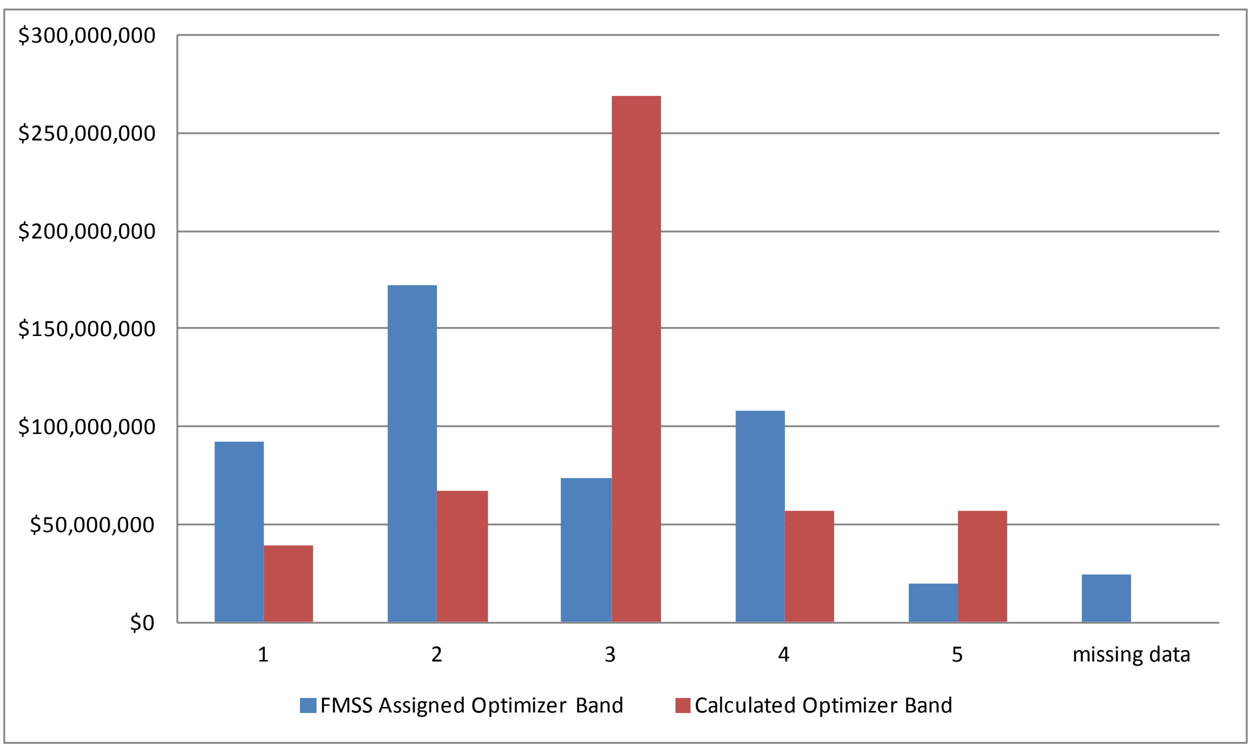
Figure 2-10 and Figure 2-11 show the current replacement value and deferred maintenance associated with assets in each optimizer band. Both figures illustrate a general trend consistent with shifting (calculated) optimizer band 3 assets to a higher investment priority in order to address deferred maintenance.

Figure 2-10: Current Replacement Value by Optimizer Band



Source: VHB review of FMSS database (modified by BAH)

Figure 2-11: Deferred Maintenance by Optimizer Band



Source: VHB review of FMSS database (modified by BAH)

Figure 2-12 and Figure 2-13 show the condition of assets by calculated optimizer band and by assigned optimizer band. As would be expected with the investment strategy behind optimizer banding, the figures illustrate that the qualitative assignment of optimizer band values by parks shifted projects with substantial deferred maintenance into optimizer bands 1 and 2, and moved some projects in good condition out of those bands.

Figure 2-12: Asset Condition by Calculated Optimizer Band

Source: VHB review of FMSS database (modified by BAH)

Figure 2-13: Asset Condition by Assigned Optimizer Band

Source: VHB review of FMSS database (modified by BAH)

2.6 Operations and Maintenance

Proper investment in operations and maintenance activities is a fundamental tenet of a good asset management system. This is highlighted by the National Park Service development of the Capital Investment Strategy. The Capital Investment Strategy aligns capital funding with commitments to O&M (to only invest in facilities that it can afford to operate and maintain). It is particularly important for Northeast Region transportation assets since they make up only 12% of the current replacement value of all Northeast Region assets, but account for 25% of the deferred maintenance.

It appears that there is no easy way to quantify operation and maintenance needs or expenses for transportation assets. Booz Allen Hamilton worked closely with Northeast Region staff to review available sources of data. Their findings are described in two white papers. The methodology for determining needed Operations and Maintenance spending is described in a white paper titled "Estimating Operations & Maintenance Costs for the Northeast Region's Transportation Asset Inventory". The second white paper, titled "Estimating Total Funds Spent for Operations, Maintenance, and Capital Projects on the Northeast Region's Transportation Asset Inventory", describes the method used for determining actual operations and maintenance spending. Copies of both white papers are provided in the Compendium of Technical Studies.

Each methodology and the resulting operations and maintenance figures are described in the sections that follow.

2.6.1 Operations and Maintenance Need

Booz Allen Hamilton developed two methods for estimating required funding to maintain transportation assets. The first method for estimating operations and maintenance requirements is based on available PAMP data and FMSS data. The second method is an aggregate estimate of potential operations and maintenance requirements based on the current replacement value of the asset and the Total Cost of Facility Ownership. Table 2-10 highlights some of the pros and cons of these methods.

Table 2-10: Comparison of Operations and Maintenance Requirement Estimating Methodologies

Approach	Description	Pros	Cons
Park Asset Management Plans (PAMPs)	- Use PAMPs for parks in the region to summarize required O&M spending, Component Renewal, and Capital Investment needs	- Projected data exists for all parks	- PAMPs are dated with some more than 3 years old
Two Percent of Current Replacement Value (CRV)	- Take two percent of each asset's CRV to determine annual O&M requirements	- CRV data exists for all assets at all parks	- NPS-owned assets have high CRVs due to their unique nature and may overstate the O&M need
Total cost of facility ownership (TCFO) models	- Use existing NPS TCFO models to estimate future needs for transportation system component O&M (as well as other life cycle [e.g., non-O&M] costs)	- Existing models - Comprehensive	- Models do not exist for all asset types, especially for transportation related asset types - Structured for use with individual assets, not portfolios

The results of estimating operations and maintenance need are shown in Table 2-11. These results summarize spending on National Park Service owned transportation assets. To give the estimates some perspective, real and proxy data was collected to estimate what one might expect annual operations and maintenance need to be for the Northeast Region. Support for the development of the Real and Proxy Data estimate can be found in the Compendium of Technical Studies.

Table 2-11: Summary of Required Transportation-Related Operations and Maintenance Funding

Transportation O&M Estimates: Methodologies	Operations	Maintenance		Total O&M
	FO	RM	PM	
PAMP Required (Inflated)	$7,491,357	$6,626,082	$3,329,301	$17,446,741
2% CRV	$38,212,805	$19,128,303		$57,384,908
Real and Proxy Data				$14,400,000

Source: Booz Allen Hamilton, "Estimating Operations & Maintenance Costs for the Northeast Region's Transportation Asset Inventory", 2012. White Paper.

For the estimate of needed operations and maintenance spending, the real and proxy data estimate of $14.4 million was cited by the Washington Service Office as a reasonable estimate of spending. Therefore, operations and maintenance needs are estimated at approximately $14 to $17 million annually. The two percent of current replacement value method was discarded through discussion with the Washington Service Office.

2.6.2 Operations and Maintenance Spending

The white paper titled "Estimating Total Funds Spent for Operations, Maintenance, and Capital Projects on the Northeast Region's Transportation Asset Inventory" estimates ONPS, Regular Cyclic, and Transportation Fee Authority fund used for the operation and maintenance of transportation assets in the Northeast Region during fiscal year 2011 (FY 11).

The analysis of ONPS and Regular Cyclic spending on transportation assets was determined using the same methodology. Account spending data for the year 2011 details operations and maintenance spending on all assets in the Northeast Region by the Primary Work Element (PWE). Each PWE has an account code that reflects how funds are being spent. For transportation, the relevant account codes are Roads and Bridges, Trail and Trail Bridges, and Marina/Water Systems. It should be noted that the code Trail and Trail Bridges does not cull out transportation trails or recreation trails so ONPS and Regular Cyclic spending in this category are over estimated.

Transportation Fee Authority spending on an annual basis was estimated using recent Alternative Transportation System (ATS) Financial Analysis studies. The best sources for this data at this time are reports from Acadia National Park and Roosevelt-Vanderbilt national historic sites.

Table 2-12 summarizes the findings of the methodology described.

Table 2-12: Actual Operations and Maintenance Spending on Transportation Assets in the Northeast Region (FY 11)

Funding Category	O&M Funding			
	ONPS (Base)	Regular Cyclic	Transportation Fee Authority	Total O&M
Northeast Region Transportation Assets	$6,534,343	$4,825,294	$781,563	$12,141,201
Roads and Bridges	$3,835,774	$3,496,050		$7,331,824
Trail and Trail Bridges	$1,717,086	$1,326,293		$3,043,378
Marina/Water Systems	$981,484	$2,952		$984,436
All Other Asset Categories	$83,644,783	$18,572,118		$102,216,901
Northeast Region Total Asset Portfolio	$90,179,126	$23,397,412	$781,563	$114,358,102

Source: Booz Allen Hamilton, "Estimating Total Funds Spent for Operations, Maintenance, and Capital Projects on the Northeast Region's Transportation Asset Inventory", 2012. White Paper.

The actual expenditures on transportation assets in FY 11 are estimated to be upwards of $12 million. The comparison between actual operations and maintenance spending of $12 million and required spending of $14 -$17 million shows a budget shortfall of as much as five million dollars annually. This shortfall poses yet another challenge to the Northeast Region when planning for future projects and investments.

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3.0 NORTHEAST REGION ASSET MANAGEMENT STRATEGIES AND CURRENT INVESTMENT PROGRAM

This chapter highlights the current Northeast Region investment strategy towards transportation assets and how the current strategy aligns with the overall National Park Service asset management strategy/capital investment strategy.

3.1 Northeast Region Asset Management Strategies

The overall Northeast Region transportation asset management strategy is currently a data-driven process to develop silo-driven priorities. It is an ongoing process of the Northeast Region to refine and improve the investment strategies. The better use and collection of data continues to be high priority, and the focus of transportation assets continues to be expanded. A few years ago the investment strategies targeted only roadway pavement, bridges, and alternative transportation systems. Now the investment strategies include congestion, safety and parking. Roadway pavement, bridges, alternative transportation systems, congestion, and safety are the silos for which priorities are developed.

3.1.1 Pavement: Roadways and Parking

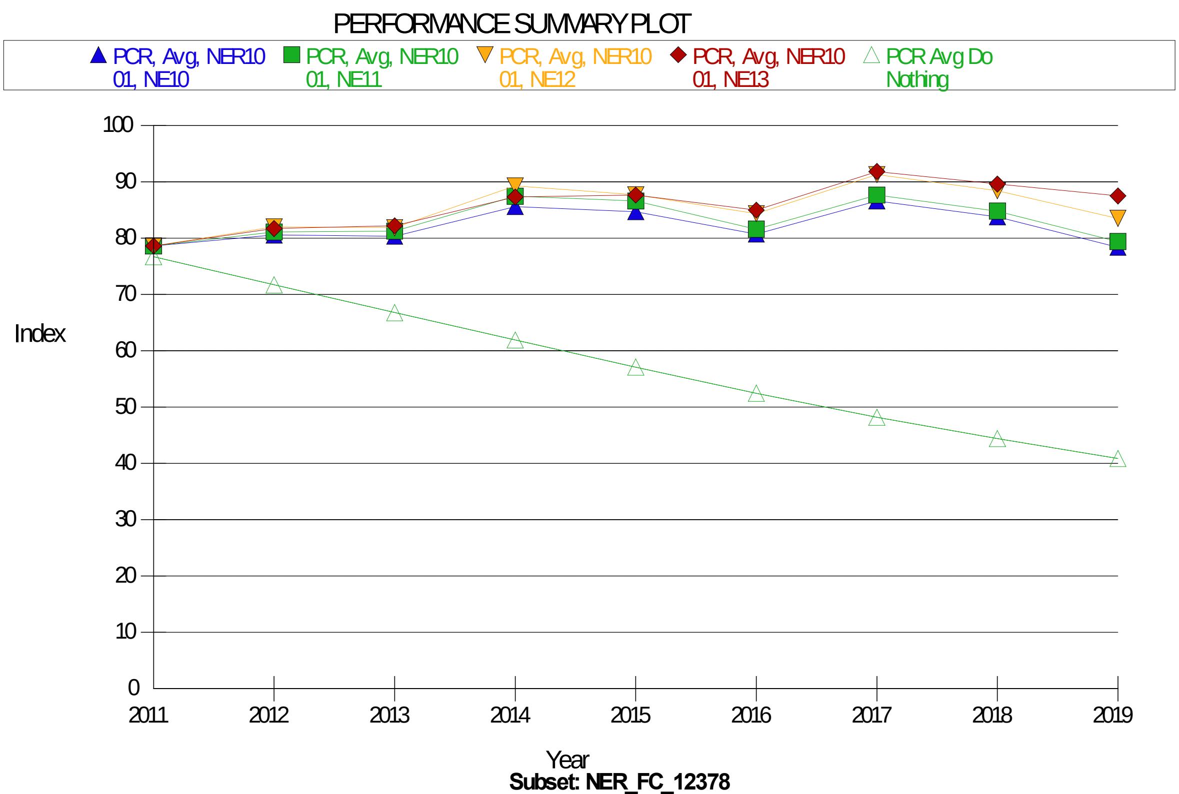
The largest transportation investments in the Northeast Region are roads and parking. They comprise 85% of both the transportation inventory and current replacement value.

The approach to the pavement management strategy is one of extensive data collection, validation, and analysis prior to program formulation. The data collection process and condition modeling is provided by The Federal Highway Administration (FHWA), Federal Lands Highway Program (FLHP) through Eastern Federal Lands Highway Division (EFLHD). Those services include:

- **RIP Data Collection.** The Roadway Inventory Program (RIP) is a cyclic data collection program done by FHWA for all NPS roadways using an Automatic Road Analyzer (ARAN) vehicle. Data are collected every four years for parks with more than 10 miles of roadway and every eight years for remaining parks. Measurements of Surface Condition Rating (SCR) and Roughness Condition Index (RCI) are used to define the Pavement Condition Rating (PCR) for every segment of every NPS road. Pavement conditions for any roadways on which the ARAN vehicle cannot travel, and for all parking lots, are manually rated. Often, a parking area adjacent to a roadway segment is assigned the same PCR as the roadway segment. The PCR is measured on a scale from 0 to 100 where roads rated at 100 are in perfect condition. The Northeast Region has set a goal of maintaining paved roads and parking facilities at a PCR of 85. Currently, roads have an average PCR of 78 while parking has an average PCR of 70.

- **HPMA Modeling.** The Highway Pavement Management Application (HPMA) is a model used to project pavement conditions in future years given different levels of maintenance and rehabilitation. In order to run this model for the entire Northeast Region roadways segments are grouped by similar characteristics including pavement type and current and predicted future pavement condition. The model then uses pavement condition data from the Roadway Inventory Program, data from the roadway construction history, and deterioration models to project future roadway conditions through a comprehensive set of analysis models. Additionally, a set of Maintenance and Rehabilitation (M&R) needs can be applied to improve the condition; each has a level of financial investment associated with it. M&R strategies include: preventive maintenance, Light 3R, Heavy 3R, and 4R. The program is particularly useful for the Northeast Region in that it can assess trends in PCR based on a set of levels of investment. A sample output for road assets is shown in Figure 3-1. The figure shows an example where five (including do nothing) average annual investments were tested.

Figure 3-1: Sample Roadway Asset Performance Summary



The Northeast Region developed the Roadway Objective Score Evaluation Model (ROS), first completed in 2005, to help move from the HPMA modeling to a multiyear list of prioritized pavement projects. Under the ROS process, the Northeast Region supplements condition information received from the Federal Highway Administration pavement management systems with:

- Survey data received from the parks on their top priorities;
- Park comments on the HPMA outputs;
- Traffic demands and vehicle classification data for facility;
- Safety history of facility;
- Drainage conditions; and
- Relationship to other planned projects.

A key element of the ROS process is validation of proposed projects. During the past year, this validation process has been strengthened with a 100 percent field validation of all proposed pavement projects. An important outcome of the field validation was to provide an up-to-date evaluation of pavement condition. Recent projects not captured by the cyclic data used in the HPMA were identified and pavement conditions at parking lots, which the HPMA models less accurately than roadway pavement conditions, were specifically reviewed. The field validation was also used to refine cost estimates to specific park locations (rather than the averages used in HPMA) and to identify projects appropriate to be bundled in a single year rather than having separate but similar projects in a park addressed in different years.

The existing multiyear plan for roadways and parking is fiscally constrained. During the past five years, and excluding one-time monies from ARRA, funding allocated for roadways and parking has averaged about $12 million annually.

Because of the constrained funding, multiyear plans for pavement projects in the Northeast Region have been guided by several principles to help make the most effective use of the available monies. These include:

- **Minimize design and supervision costs.** One means of making the best use of the project funds is to be as effective as possible in how much is spent on construction supervision and design rather than construction. Every year since 2005, the Northeast Region has spent less than other NPS regions on construction supervision as a percentage of net construction costs. In 2010 the Northeast Region spent 6.9% compared to the 12.9% average for other NPS regions. Between 2005 and 2007 the Northeast Region spent more than other regions on construction design, but since then the construction design costs have been lowered. In 2010, design costs in the Northeast Region amounted to 11.4% of net construction costs, compared to an average of 13.7% for other NPS regions.

- **Focus on primary roads.** The Northeast Region roadway investments have in past years been focused on those roads most used by visitors. Roads that are used by at least 80% of park visitors are typically given the highest priority for pavement investments, while other roads may be allowed to deteriorate to a lower PCR. This policy has also excluded most work on parking lots. As described later, the current investment strategy now includes some parking projects.

- **Stay between the white lines.** The Northeast Region's expenditures on roadway projects are limited to the roadway surface itself, and do not routinely include other work such as revegetation.

- **Decommission assets.** When practical to do so, the Northeast Region decommissions duplicative or non-performing roadway and parking assets. In the past five year the Northeast Region has eliminated more than 1,200 parking spaces. These 1,200 eliminated parking spaces represent about 10 acres of parking, or 1.5% of parking assets.

One policy of the constrained funding environment that the Northeast Region is modifying is the past decision to **minimize investment in parking lots**. Roadways were always prioritized ahead of parking lots, but the current multiyear plan includes some investments in parking lots. Each park was asked to recommend their highest-priority parking lot projects and that work was included in the multiyear plan. Doing so in a cost-effective manner was facilitated by the field verification of the parking lot conditions. The parking projects recommended by the parks were not always those parking lots most important to visitors, but rather were more oriented towards a “worst-first” evaluation. The Northeast Region is currently investigating means of standardizing the prioritization of parking lots so that future investments in parking lots can move away from the worst-first strategy, just as has been done with roadways. The region is also evaluating the implications of using a lower target PCR for parking lots than for roadways.

The investment strategy for the latest multiyear roadway and parking project list also elevated the importance of two strategies. The first was to **bundle projects** when appropriate. The field validation results allowed for a better understanding of when to advance projects to an earlier year. For example, small parking lot jobs originally anticipated for FY 15 might be advanced to FY 13 in conjunction with a similar pavement project on a roadway. The other key principal was to **protect prior investments** through industry-proven pavement preservation strategies. During the past few years extensive roadway investments have been made in the Northeast Region through the ARRA program and among the Northeast Region’s highest priorities is to ensure that those investments are protected. Among the later years of the multiyear plan are several pavement preservation projects for those roadways.

3.1.2 Bridges

The Northeast Region’s asset management approach and strategies for bridge assets is similar to that for roadways with the notable exceptions that (1) more of the process is undertaken by FHWA through its Federal Lands Highway Bridge Office (FLHBO) and (2) safety is a more prominent factor in prioritizing the work.

All National Park Service road bridges are inventoried through the Bridge Inspection Program (BIP) established by the Federal Highway Administration. The FHWA developed the Pontis software system as part of an overall bridge management system that provides a systematic process for collecting and analyzing bridge data to make forecasts and recommendations for bridge maintenance, rehabilitation, and replacement programs and policies. As with the HPMA system for pavements, the Pontis software can be used to evaluate funding scenarios.

The success of the FHWA bridge management system relies in part on the Pontis software program and its ability to be used for forecasting and budgeting. However, at the core of the bridge management system are FLHBO bridge inspectors and bridge designers. Not only does the FLHBO conduct a two to four year cyclic inspection program of all NPS vehicular bridges, the FLHBO is directly involved in design, rehabilitation, construction support, routine safety inspections, and other technical assistance for the National Park Service. The FLHBO also provides the National Park Service with routine maintenance work recommendations that are included in the Inspection reports and which can be used directly by parks. The FLHBO bridge management system provides bridge-level and network-level recommendations to the National Park Service for consideration.

The Pontis software uses a Health Index to rate bridges as “good”, “fair” and “poor”; “good” is the goal condition for bridge maintenance. A health index of 92% is the lower limit of “good” and is effectively the same as an FCI of 0.08. Similar to the Northeast Region’s use of field validations of the HPMA pavement recommendations, the FLHBO’s bridge management system performs significant post-processing of inspector work recommendations, particularly those of a non-routine nature.

The ongoing investment strategy for bridges follows the recommendations of FHLBO for rehabilitation and replacement, as well as preventive maintenance. Consistent with current NPS servicewide standards, approximately 25% of annual bridge funding is targeted to preventive maintenance on structures which are assessed as being in good condition. The remaining funding is prioritized based on the Bridge Condition Index (BCI) assessment. BCI ranks the priority of improvement based on three factors – the structural condition of critical bridge systems, scour, and the rate of deterioration. BCI ranks bridges in categories A to D. Critical (A) is a bridge in poor condition and will soon be closed. Serious (B) is a bridge in serious condition, is structurally deficient, and major actions are required to prevent closure within 10 years. Moderate (C) is a bridge in fair condition or with a moderate safety issue, and which needs some repairs or rehabilitation. Minor (D) is a bridge in fair or good condition that needs only preventive maintenance. About two-thirds of bridges in the Northeast Region are of a Minor priority of improvement and the rest are of a Moderate priority of improvement.

3.1.3 Alternative Transportation Systems (ATS)

Over the past decade the National Park Service has been promoting the use of alternative transportation systems (including walking, bicycling, transit and water modes) and management strategies including travel information and other intelligent transportation systems (ITS) to better manage visitor access to the parks. The Northeast Region currently has 27 ATS transit services or other type of multi-passenger visitor transportation system. Table 3-1 lists the systems. This table also illustrates who the service operator. Services operated by entities outside of the National Park Service are much lower cost to the region than NPS operated services.

Table 3-1: Existing Northeast Region Alternative Transportation Systems

Park	State	ATS	Operator
Acadia NP	ME	Island Explorer	Regional Transit
Adams NHP	MA	Adams Trolley	NPS Contractor
Allegheny Portage Railroad NHS	PA	Van Tours	NPS
Boston Harbor Islands NRA	MA	Island Ferries	Private
Boston NHP	MA	Charlestown Water Shuttle	Regional Transit
Cape Cod NS	MA	Coast Guard Beach Trams	NPS
Cape Cod NS	MA	Provincetown Shuttle	Regional Transit
Cape Cod NS	MA	FLEX Existing	Regional Transit
Colonial NHP	VA	Historic Triangle Shuttle	Regional Transit
Eisenhower NHS	PA	Eisenhower Shuttle	NPS Contractor
Home of Eleanor Roosevelt NHS	NY	Val-Kill Tram	NPS Contractor
Fire Island NS	NY	Island Ferries	Private
Fort McHenry NM & HS	MD	Charm City Circulator	Regional Transit
Gateway NRA	NY	Sandy Hook Ferry	Private
Gateway NRA	NY	Riis Park Ferry	Private
Gettysburg NMP	PA	Freedom Shuttle	Regional Transit
Governor's Island NM	NY	Island Ferry	State
Home of FDR NHS	NY	Roosevelt Ride	NPS Contractor
Home of FDR NHS	NY	FDR Tram	NPS Contractor
Johnstown Flood NM	PA	Lakebed Tours	NPS
Johnstown Flood NM	PA	Path of Flood Tours	NPS
Lowell NHP	MA	Electric Trolley	NPS
Marsh Billings Roosevelt NHP	VT	Full Circle Trolley	Regional Transit
Shenandoah NP	VA	Camp Rapidan Tour	NPS
Steamtown NHS	PA	Live Steam	NPS
Statue of Liberty NM	NY	Liberty Ferries	NPS Contractor
Valley Forge NHP	PA	Revolutionary Shuttle	NPS Contractor

Source: Tom Crikelair Associates, Northeast Region of the National Park Service Alternative Transportation Management System Phase 1 Final Report, September 2011. White Paper.

The general approach for the ATS management strategy has always been a competitive application process and screening, supplemented by an aggressive pursuit of partnership support. The Northeast Region petitions its member parks to propose ATS initiatives for funding consideration. The parks provide a description of the proposed project, its intent, and the potential for support by partners beyond the federal government. These initial candidates are screened by committee and shortlisted. Proponents of shortlisted candidate projects are then asked to submit more details on their project including projected use and cost information. These proposals are reviewed and ranked by committee and designated for Category III funding from the Northeast Region allocation or designated for submittal to the Paul S. Sarbanes Transit in the Parks program (TRIP). Many of those submitted to the TRIP program are partnership projects for which the Northeast Region provides assistance to those partners in developing their grant application.

The asset management strategies for expanded or new transit projects has recently been strengthened by the inventory and total cost of facility ownership study conducted by Tom Crikelair Associates for the Northeast Region. The work included the development of an evaluation matrix and performance metrics to use in determining effective transit investments. The system can be used to compare options for modifying an existing service as well as evaluate proposed services. The evaluation matrix scores existing and proposed transit services based on the following nine factors.

- Critical access
- Resource Protection
- Safety
- Visitor Experience
- Visitor diversity & car-free travel
- Regional economy & partnerships
- Recreation & education
- Ridership & productivity
- Cost effectiveness

The ATS study also provided the Northeast Region with a better understanding of the cost and role of each of the systems, and this information provides the principal guidance for the Northeast Region's investment strategy in transit systems. The most important systems are those such as at Boston Harbor Islands NRA, Statue of Liberty NM, and Eisenhower NHS that provide the only visitor access to the park. There are also some systems that provide the only access to a site within a park, usually to manage the carrying capacity of that site. There are also systems that provide interpretive experiences for visitors, many of which are operated at a low cost to the National Park Service.

It is important to note that the ATS study work done to date focuses on shuttle bus and ferry systems and does not address the other non-motorized asset systems such as transportation-related trails. It continues to be a goal of the Northeast Region to develop data-driven metrics and evaluation criteria for those assets as well.

3.1.4 Congestion Management System

Until recently the Northeast Region had no management system in place to address congestion issues in the parks. The few projects implemented that helped mitigate congestion were generally done ad hoc as result of a roadway or ATS project. The Northeast Region conducted a study in 2010 to identify potential congestion projects and develop a method for evaluating those projects[3].

The initial list of candidate congestion projects came from the 25 parks in the Northeast Region. The 25 parks evaluated account for some 90% of NER visitation, and include all parks which noted some congestion issues in response to a region-wide survey. Prioritization of potential congestion projects is based on (1) how serious the congestion issue is that the candidate project seeks to address and (2) how

[3] Vanasse Hangen Brustlin, Inc., *Northeast Region of the National Park Service Long-Range Transportation Planning: Congestion Management System Study Final Report*, March 2011. White Paper.

effectively does a candidate project mitigates the specific congestion issue. Projects are scored based on a set of 20 criteria for "need" and "effectiveness". The scoring criteria for project need include: the magnitude and frequency of impacts to resources, and visitor experience and gateway communities. The scoring criteria for project effectiveness include: the extent to which the congestion issue is mitigated, benefits to resources, visitor experience and gateway communities, and partnership opportunities.

After potential projects are scored they are compared to estimated project costs. The target projects are those that provide good benefits at a relatively low cost. In this evaluation some high-benefit, high-cost projects are identified as opportunities for possible revision to reduce costs. There were more than 100 projects evaluated and the estimated cost for all projects exceeded $70 million.

The congestion management system is an ongoing process, but the Northeast Region is committed to moving forward with transportation investments to address congestion. The multiyear plan includes approximately $500,000 per year for congestion projects. Most of the initial projects are small projects, such as wayfinding, or "enabling" projects. One of the lessons learned in the congestion study is that there is often not sufficient data available regarding the magnitude and frequency of a congestion issue to definitively justify large investments and the enabling projects are data collection systems to gather the required information.

3.1.5 Safety Management System

As with congestion, until recently the Northeast Region had no management system in place to consistently address safety issues in the parks. Safety projects were done in response to specific park requests and primarily in an ad hoc and opportunistic manner as part of roadway projects.

The Safety Management System was developed from an analysis of crash data at 10 parks[4]. Within those parks the roadways with the most crashes were studied. The study included roadways that accounted for 58% of all crashes in the Northeast Region. The Northeast Region has a goal of reducing vehicle crashes by 20% and the study focused on the following emphasis areas.

- Keeping vehicles on the roadway and minimizing the consequences of leaving the road
- Improving the design and operation of highway intersections
- Reducing head-on and across-median crashes
- Reducing driveway access crashes
- Reducing parking lot crashes
- Reducing animal crashes
- Reducing crashes resulting from human factors (for example, aggressive driving, impaired driving, and inattentive driving)

The evaluation of potential safety projects was done using a benefit-cost economic appraisal that quantified societal benefits against the implementation cost. Crash reduction benefits were calculated

[4] CH2MHill, "Northeast Region Transportation Safety Management System Study- Summary Report", January 2012.

using national standard crash reduction factors for implementation of various countermeasures. Societal benefits were calculated using national standards for monetizing the cost of injuries, fatalities and vehicle damage. The evaluation involved substantial participation by park staff to identify preferred countermeasures and locations.

The recommended projects included both reactive and proactive countermeasures. Reactive strategies address an identified safety issue based on crash data. Proactive strategies have the potential to prevent crashes at sites with no reported crashes or reduce crashes at sites where crashes may be underreported, and were developed for locations identified by the project team and park staff.

3.2 Northeast Region Transportation Asset Need

The asset management strategies utilized in the Northeast Region are focused on addressing asset need in the most effective method possible. For this reason, the asset management strategies and needs are closely tied to one another. The following sections will describe the current level of financial need within each silo of transportation assets.

3.2.1 Pavement: Roadways and Parking

As described in section 3.1.1, Highway Pavement Management Application (HPMA) models are used to establish the current and potential future condition of paved roadways and parking areas in the Northeast Region of the National Park Service. With a goal Pavement Condition Rating (PCR) of 85, the necessary level of annual investment can be determined. Figures 3-2 and 3-3 show the results of HPMA modeling of NER roadways and parking areas, respectively, for the current 20 year planning horizon.

Figure 3-2: Roadway Asset Performance Summary over 20-year Horizon

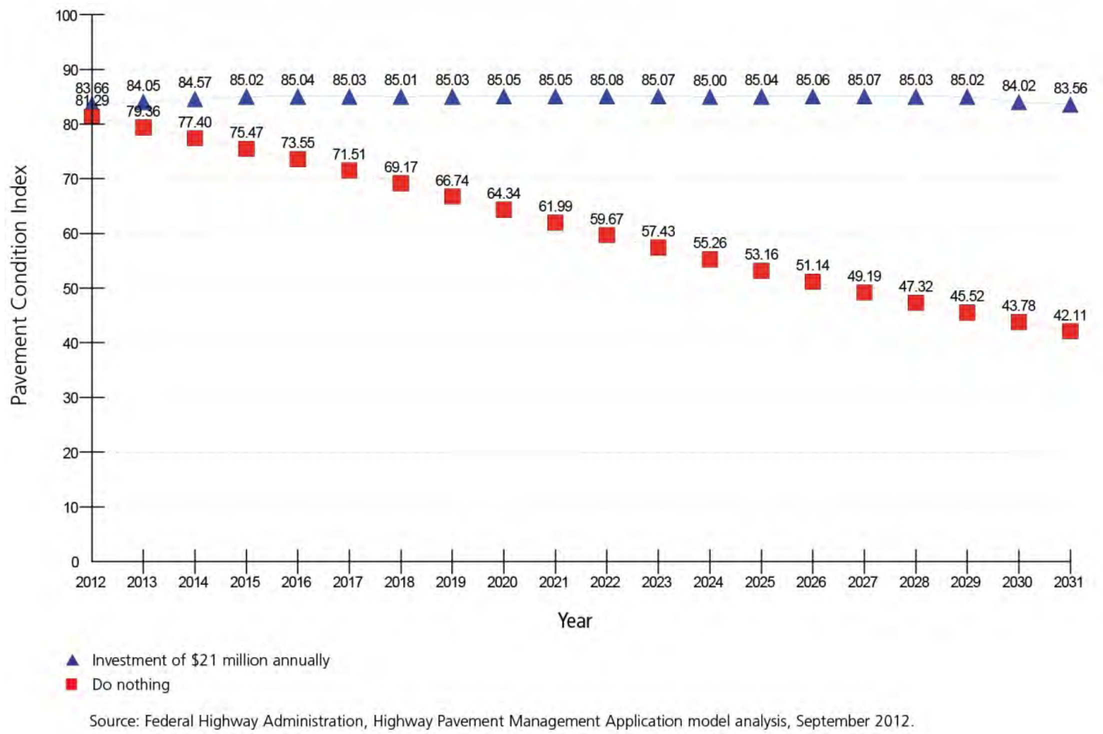
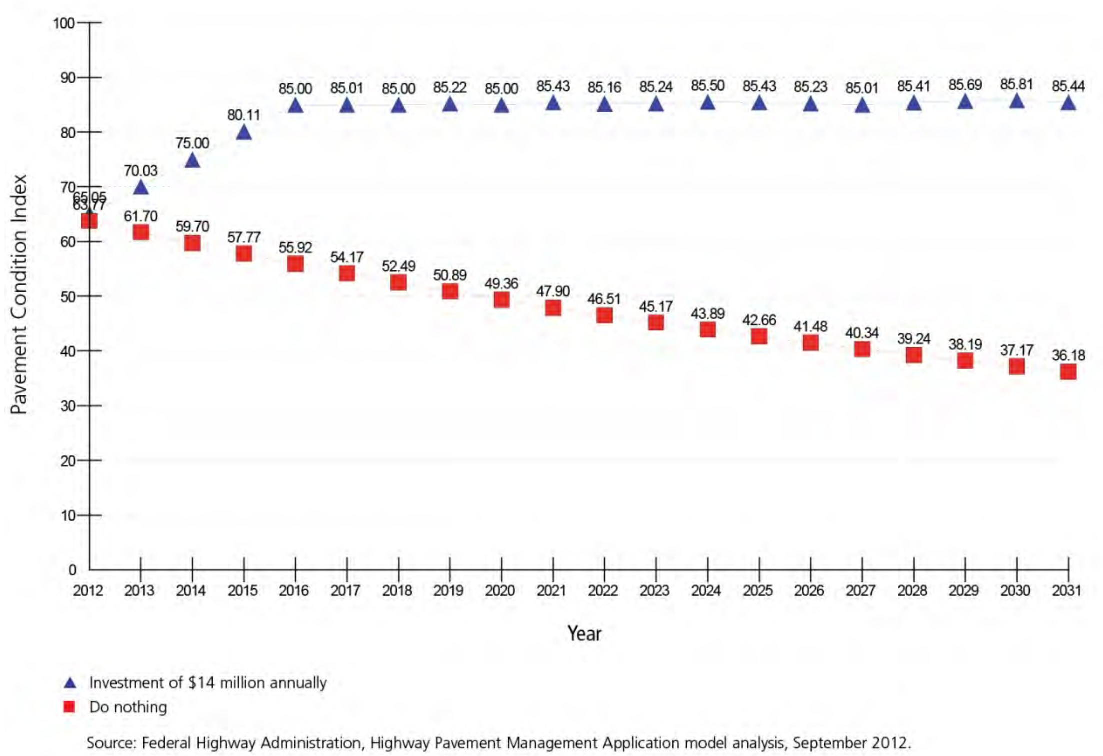


Figure 3-3: Parking Asset Performance Summary over 20-year Horizon



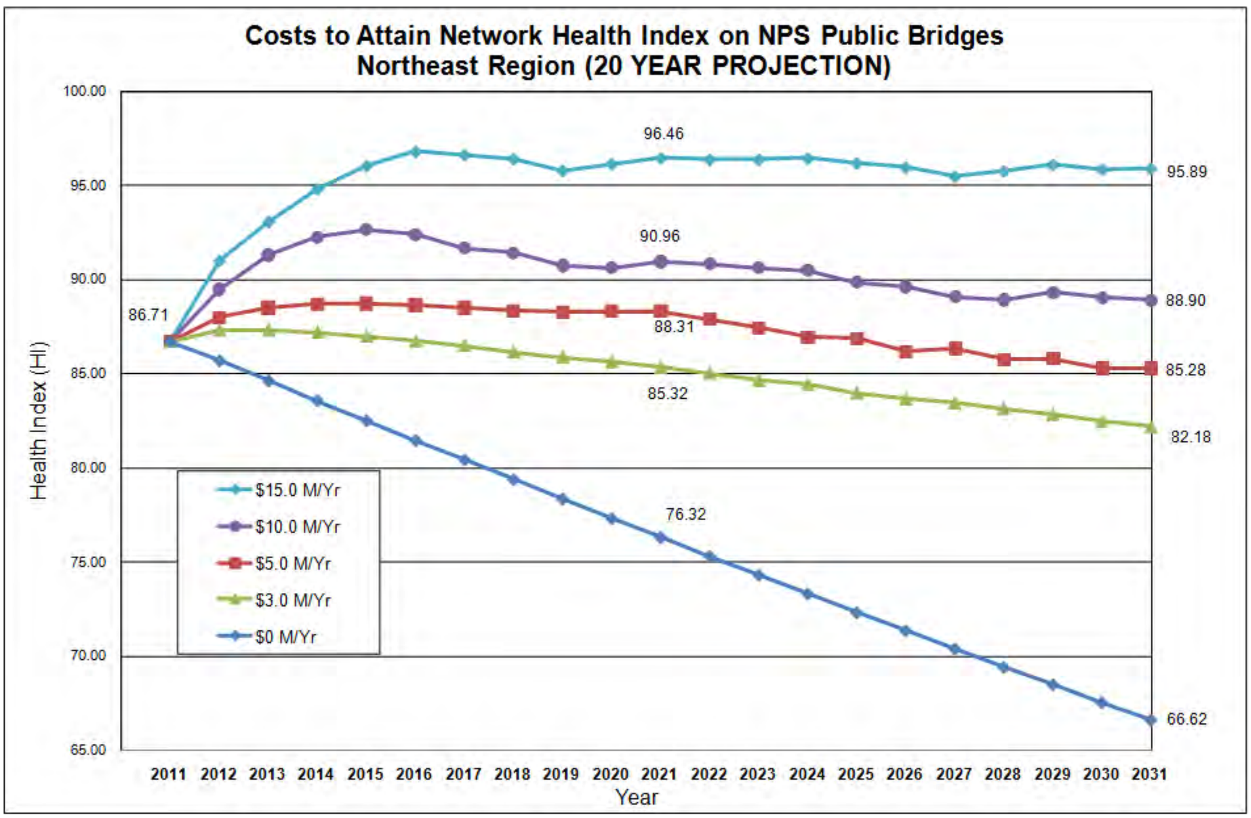
The HPMA analyses estimates that approximately $21 million is needed annually to maintain the roadway system in order to achieve the goal of an 85 PCR. An additional $14 million annually would be required to maintain the region's parking facilities at a PCR of 85. The historical expenditure level of $12 million annually represents only about one-third of the estimated annual total of $35 million required to achieve the region's 85 PCR goal.

3.2.2 Bridges

As described in section 3.1.2, funding in transportation bridge assets is based on Pontis modeling describing current and potential future conditions. The goal of the modeling effort is to determine the appropriate level of funding necessary to maintain bridges at a Health Index of 92 or higher. The results of the current modeling effort are shown in Figure 3-4.

Figure 3-4 shows the costs required to obtain a range of health index scores.

Figure 3-4: Annual Funding Required to Achieve Acceptable Health Indices



The impacts of funding constraints for bridges are similar to those for roadways. During the past five years bridge funding has averaged roughly $3 million per year and thus investments have been focused on only the highest priority bridges. In general, this means focusing on those bridges in poor condition. In 2009 the Northeast Region had five of its 108 bridges rated as poor condition. All five have since been rehabilitated or reconstructed and are now in good condition.

The Northeast Region bridge management target is to have all bridges in good condition (health index of 92%/FCI of 0.08). The Pontis analysis shows that In order to achieve that goal an investment of approximately $10 million is needed annually.

The current multiyear plan includes about $1.1 million annually for capital bridge projects.

3.2.3 Alternative Transportation Systems (ATS)

Alternative transportation systems and other intelligent transportation systems (ITS) do not have a specific performance metric or model available to determine an exact level of need. The Transit Evaluation Matrix described previously (Section 3.1.3) does provide a method for evaluating whether or not an individual system may be in need. Through use of this evaluation matrix the current multiyear plan was developed. The value of the Northeast Region's current multiyear plan for ATS projects is shown in Table 3-2. The annual cost for the vetted ATS projects is about $15 million.

Table 3-2
Planned Capital Investment in Northeast Region ATS to Maintain and Enhance Existing Systems

	Category III	TRIP	Total
FY 12	$2,194,552	$11,035,100	$13,229,652
FY 13	$3,534,331	$8,794,943	$12,329,274
FY 14	$7,806,706	$4,978,547	$12,785,274
FY 15	$4,244,110	$15,771,773	$20,015,885
FY 16	$4,430,498	$12,137,272	$16,567,770
FY 17	$3,275,777	$10,848,373	$14,124,150
FY 18	$5,296,812	$11,120,124	$16,416,936
Total FY 12-FY 18	**$30,782,786**	**$74,686,132**	**$105,468,918**

The current multiyear plan addresses all alternative transportation system needs. However, it should be noted that funding has yet to be secured for all projects in the current program, particularly with the transition to the MAP-21 transportation bill.

3.2.4 Congestion

The strategy presented for managing congestion in the Northeast Region is focused on the development of the Congestion Management System (section 3.1.4). For the current planning horizon, the need for congestion funding is based on the identified projects that were identified as part of the Congestion Management System. After eliminating low-benefit, high-cost projects, and accounting for overlaps with programmed safety and ATS projects, there is approximately $20 million of projects that appear to be worthwhile. Further validation of those projects with parks is underway by the Northeast Region. The goal is to accomplish these projects in the next ten years. If the approximate life of an investment is ten years then it is assumed that a program of similar value would be implemented to address congestion issues in the following ten years. Ultimately, there is a need for two million dollars in congestion investment funding annually.

3.2.5 Safety

Similar to the Congestion Management System, the Safety Management System was developed to inventory safety needs and identify solutions. In all about 350 safety countermeasures were proposed, at a total cost of $11.1 million. Total societal cost savings were estimated to exceed $46 million. Implementation of the countermeasures is expected to reduce 600 crashes over 10 years at the 10 parks studied. This equates to an 11% crash reduction on the roadways studied. This also indicates that the Northeast Region goal of reducing vehicle crashes by 20% can be achieved through expanding the safety study region-wide, and reductions in vehicle-wildlife collisions due to deer management programs.

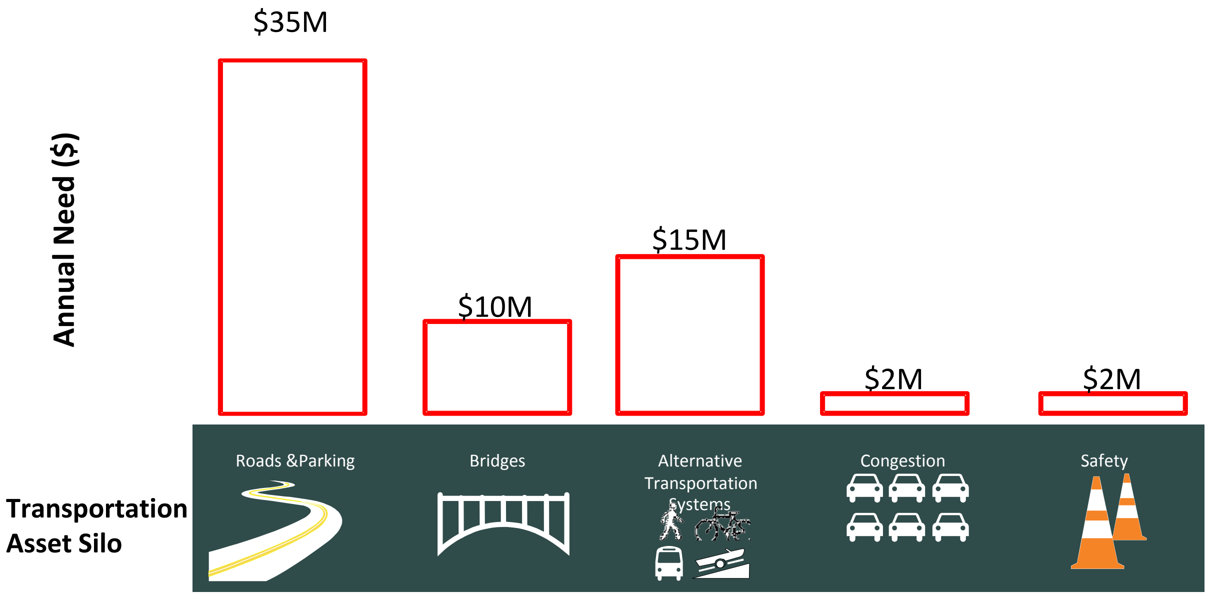
The total need for safety investments in the Northeast Region is currently estimated at $18.9 million. There is the $11.1 million for the parks studied and a projected $4.5 million for parks not included in the initial study. There is also a need for a total expenditure across the region of about $3.3 million to implement FHWA mandated signage retroreflectivity compliance efforts. Similar to the Congestion Management System program of projects, the assumption is that these projects would be implemented in a ten year period and that the lifetime of these infrastructure investments is about ten years. The annual needed investment in safety is about two million dollars annually. The second ten year period in the 20 year planning horizon would involve renewed investment in the projects identified and investment in parks that have yet to be inventoried.

As part of its multiyear plan the Northeast Region dedicated approximately $1.5 million annually to address safety projects. This includes about $1.0 million to implement the recommended reactive and proactive safety countermeasures, with the remainder for signage retroreflectivity compliance efforts.

3.2.6 Transportation Asset Need

After a review of the Northeast Region transportation asset management strategies and identified needs a total investment need of $64 million annually has been determined. Figure 3-5 illustrates how $64 million in transportation asset needs is distributed over the various asset types discussed.

Figure 3-5: Summary of Transportation Asset Need (2012 dollars)



The Funding and Financial Subject Area Memorandum discusses the availability of funds over various sources and makes recommendations on how available funds can be invested to achieve asset management goals regionwide.

3.3 Northeast Region Asset Management Strategies and National Strategies

Significant research and effort have been directed toward improvements in asset management by the National Park Service since the late 1980s, stemming from the 1986 National Park Service Maintenance Management System. This management philosophy was further codified in the policies and requirements outlined in Director's Order 80: *Real Property Asset Management*, in November, 2006. The NPS Management Policies 2006 states:

> *In protecting the park resources and values, the Service will demonstrate environmental leadership and a commitment to the principles of sustainability and asset management in all facility developments and operations.*

The vision for asset management within the National Park Service is to sustain all high priority, mission critical transportation assets at acceptable conditions today and for future generations.

Since the NPS Asset Management Plan was first published in February 2006, the National Park Service has made significant progress addressing its inventory of transportation assets, assessing their condition, and formalizing and communicating the decision-making framework, business practices, and data to ensure that region and park-level staff are using these tools to manage their transportation investment decisions.

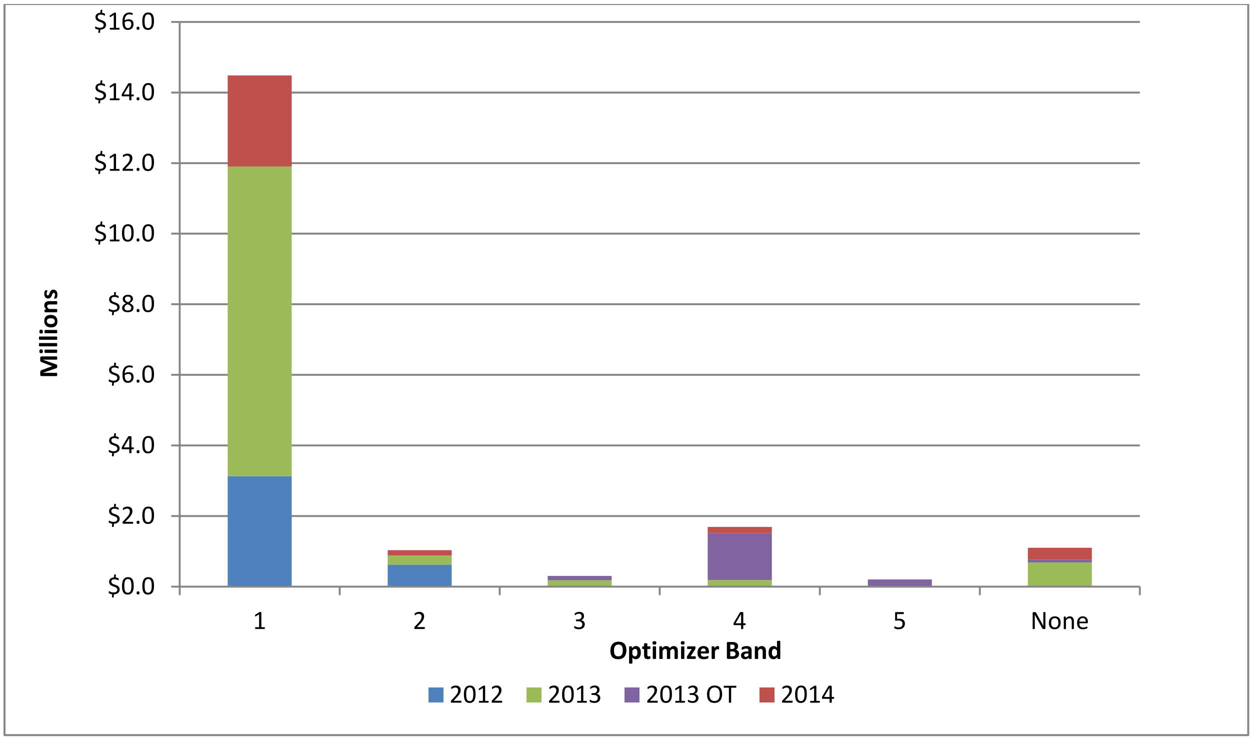
The National Park Service continues to refine and enhance its asset management strategies. The National Park Service is in the process of developing and piloting a Capital Investment Strategy to help prioritize investments and ensure that the greatest impact can be made with available capital funds. At this time, the Capital Investment Strategy is still in draft form. The Capital Investment Strategy uses a scoring strategy to evaluate projects on a number of different criteria. The scores prioritize project investments in four categories: Financial Sustainability, Visitor Experience, Resource Protection, and Health & Safety. The four categories are then weighted to provide an overall scoring and prioritization.

The current draft of the Capital Investment Strategy scoring supports an asset management approach that emphasizes maintaining key assets and reducing deferred maintenance. The scoring for Financial Sustainability is weighted the highest, accounting for half of the potential maximum score. Some of the key objectives in the financial sustainability strategy are to build only what can be maintained, right-size the asset portfolio, reduce liabilities, and eliminate non-essential development in parks in order to emphasize the natural and cultural experience.

The Northeast Region transportation asset management strategies are well aligned with the servicewide asset management policies in regards to assessing needs and making effective investments. The Northeast Region's has consistently prioritized its funding towards sustaining high priority, mission critical transportation assets at acceptable conditions. Right-sizing the asset portfolio has been a strategy and using a data-driven process to ensure wise investments is at the core of the Northeast Region's strategy.

The prioritization of investments in optimizer band 1 and 2 assets is illustrated by Figure 3-6 which shows the construction costs of roadway projects in the first year of the multiyear plan. About 85% of the investments are in optimizer band 1 and 2 projects, and the other projects are generally bundled projects for which it is more cost-effective to do them along with the other work rather than postpone them until later years.

Figure 3-6: Summary of Construction Costs for Roadway Projects Under Design, by Optimizer Band



Note: OT designates over target projects

3.3.1 SWOT Analysis

The Northeast Region transportation asset management strategies have been strengthened by recent initiatives such as the safety management program and the region continues to strive to improve its transportation asset management strategies. The following SWOT analysis provides a summary evaluation of the current strategy and identifies opportunities for future enhancements.

SWOT analysis is a tool used to evaluate the **S**trengths, **W**eakness, **O**pportunities and **T**hreats facing a project or program. The purpose of SWOT analysis is to identify the key factors that are important to achieving the objective. SWOT analysis categorizes these factors based on whether they are internal or external to the program and whether they are beneficial or harmful to achieving the objectives.

Table 3-3: SWOT Analysis of Northeast Region Transportation Asset Management Strategies

	Beneficial	**Harmful**
Internal	**Strengths** ▪ Data driven ▪ Field validations ▪ Bridge safety ▪ Vehicular safety ▪ Primary visitor roads ▪ ATS ▪ Congestion	**Weaknesses** ▪ Growing inventory ▪ Deferred Maintenance backlog ▪ Trails ▪ Parking prioritization ▪ Congestion data ▪ Cyclic data
External	**Opportunities** ▪ NPS initiatives (A Call to Action, the Green Parks Plan, Sustainability, etc) ▪ Partnerships ▪ Technology	**Threats** ▪ Climate change ▪ Visitation trends ▪ Funding availability ▪ Funding silos and policy standards ▪ Limited park staffing resources ▪ Funding pressures on FHWA support

The strengths in the SWOT analysis highlight the Northeast Region's data-driven process and field validations to prioritize investments; the importance of safety; the focus on visitors in roadway and ATS investments; the ATS inventory data and strong history of investment in ATS, and the development of a congestion management system.

Among the weaknesses of the Northeast Regions transportation asset strategy is the considerable backlog of deferred maintenance and the growing inventory of transportation assets to be maintained. The growing inventory is in part due to external directives of newly established parks, but it is also due to permanent commitments to maintain new and expanded transit and trail systems. The lack of data for the trail system, the magnitude and frequency of congestion, and the utilization of parking hinder the ability to make wise investments. For roads and bridges, the four to eight year data collection cycle can also hurt the ability to make effective investments.

There are a variety of opportunities for the Northeast Region to enhance its asset management strategies. Recent NPS initiatives such as *Call to Action* can help align the asset management strategy towards servicewide visitor experience and resource protection objectives. Partnerships continue to provide opportunities, and more park participation in regional planning efforts and the Congestion

Management and Air Quality (CMAQ) program is one of them. Technology advances, including though the use of smart data apps, are rapidly occurring. If the Northeast Region can capitalize on this growing ability to communicate with a larger audience and readily share data there are opportunities to reach new visitors and existing visitors in new ways.

The threats to the Northeast Region asset management strategy are the same as for all NPS regions. Adapting to climate change and to changes in visitation characteristics is a significant challenge. The available funding does not meet current needs and funding availability can be limited further by restrictions among individual funding programs. At times, policy standards can hinder effective strategies. For example, ERFO policies require restoration of conditions and do not have flexibility for adjustments, and standardized project funding formulas tend not to prioritize the decommissioning of assets. Lastly, a severe threat is the funding pressures on FHWA support programs and limited NPS park staff resources. The FHWA provides critical assistance to the Northeast Region with programs such as the roads and bridge programs. Park staff is relied on to perform preventive maintenance and provide assistance in developing the details of proposed project is necessary to ensure cost-effective investments.

NORTHEAST REGION LONG RANGE TRANSPORTATION PLAN

Existing and Forecasted Funding and Financial Subject Area Memorandum

Prepared for:

National Park Service
WASO Denver
12795 W. Alameda Parkway
P.O. Box 25287
Denver, CO 80225-0287

Prepared By:

Vanasse Hangen Brustlin, Inc.
351 McLaws Circle, Suite 3
Williamsburg, VA 23185-6316

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FUNDING AND FINANCIAL SUBJECT AREA

1.0 INTRODUCTION

This document presents funding forecasts and investment scenarios related to the Northeast Region (NER) Long Range Transportation Plan (LRTP). The memorandum consists of the following sections.

- **Funding Assumptions and Forecasts.** This chapter identifies existing funding sources for National Park Service Northeast Region transportation facilities and describes assumptions regarding future funding.[1] This chapter also presents the three funding forecasts – Low, Medium, and High – that were developed for the LRTP.

- **Gap Identification.** This chapter describes the difference between presently anticipated funding levels and the estimated level of funding that would be required to meet all of the NER's currently defined transportation-related needs.

- **Investment scenarios.** Four scenarios of different investment levels and investment strategies are discussed in this chapter. The first three are based on the NPS-defined "Medium" funding forecast. The first scenario invests in just "the essentials" – defined as the most important roads, critical transit access systems, and safety-related signage. The second of these scenarios reflects a continuation of the present NER investment allocation across the various transportation program categories based on defined need. The third prioritizes some of the funding towards projects to advance the broader goals and objectives of this LRTP. The fourth investment scenario is based on the NPS-defined "High" funding forecast and supplements current investment practices with additional financial resources to advance the LRTP goals and objectives.

- **Strategy evaluation.** This chapter provides a qualitative and quantitative assessment of each investment scenario and a draft recommendation on an investment strategy moving forward for consideration in the LRTP.

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1 Although the financial forecasts used herein were developed prior to the enactment of legislation to extend SAFETEA-LU through FY2012 and establish the Moving Ahead for Progress in the 21st Century (MAP-21) transportation program for FY 2013 and FY2014 (which calls for changes in some of the specific funding programs), it is believed that the total funding for transportation programs contained in this analysis remains appropriate for the purposes of establishing and evaluating investment scenarios for the Long Range Transportation Plan.

2.0 FUNDING ASSUMPTIONS AND FORECASTS

This chapter presents the approach and assumptions for developing a range of funding forecasts. The first section of this chapter describes the funding sources available to the Northeast Region today for transportation facilities and trends in funding over the past few years to inform the forecasts. The second section of this chapter describes the data used and assumptions made regarding future funding. The resultant funding forecasts are presented in the final section of this chapter.

2.1 Sources of Funding

Funding sources for investment in transportation projects in the Northeast Region include funds for capital, planning, and operations and maintenance. The operations and maintenance funding programs, and fee-based capital funding programs are administered by the National Park Service (NPS) and the Department of the Interior. The Federal Lands Highway Program (FLHP) represents the largest capital funding program and is jointly administered by the Federal Highway Administration (FHWA) and the National Park Service (NPS). The Transit in Parks Program is administered by the Federal Transit Administration (FTA). Partnership funding supports both capital and operations and maintenance projects.

Capital Investment Funds

- Federal Lands Highway Program[2]
- Paul S. Sarbanes Transit in Parks Program (TRIP)
- Title 23 / 49 funding
- National Scenic Byways Program
- Partnership Funding[3]
- Transportation Fees[3]
- Recreation Fee Program, Federal Lands Recreation Enhancement Act (FLREA)[3]

Operations and Maintenance Funding

- Regular Cyclic Maintenance Program
- Repair and Rehabilitation Program
- Annual Operating and Maintenance Funds/Park Base
- Partnership funding

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2 Federal Lands Highway Program funds are used to fund pavement management, which can include Recurring Maintenance. Using this interpretation, FLHP is being used to fund both capital operations and maintenance needs.
3 Transportation Fees, Recreation Fees, and Partnership funding can be used to fund transit system maintenance in order to keep systems running. Using this interpretation, these fund sources are being used to fund both capital and operations and maintenance needs.

2.1.1 Federal Lands Highway Program

The Federal Lands Highway Program provides funding for the repair, rehabilitation, and reconstruction of National Park Service roads, parkways, and bridges. The program is funded annually through the Federal Highway Trust Fund, which is supported by the federal motor vehicle gas tax and a portion of the excise taxes. Funds are transferred from the FHWA to the National Park Service and then distributed to the regions.

FLHP funds may only be used on roads and transportation facilities open to the public, and not on administrative roads or recreational trails. In addition, FHLP funds may not be used for routine maintenance activities, such as snow plowing, patching, and restriping. Additional information can be found at www.flh.fhwa.dot.gov/programs/prp.

There are three categories of FLHP funding, described below. The descriptions of policy and Service-wide expenditures are taken from P*ark Roads and Parkways Program Handbook, Guidelines for Program Implementation (*National Park Service, 2008).

Category I – Road Rehabilitation (3R) and Road Reconstruction/Realignment (4R)

Category I funds are for the rehabilitation and reconstruction of the primary road system. Between 1999 and 2007, approximately 80 percent of the total available Service-wide FLHP funds went to Category I projects, which are intended to preserve the infrastructure condition of the existing park roads and parkways. The funds support the repair, resurfacing, rehabilitation and reconstruction of roadways and are intended to help:

- Ensure that major roads and bridges are in “acceptable” condition;
- Improve safety by using current design standards; and
- Apply sound asset management strategies to protect and reduce lifecycle costs.

Category I funds are distributed to the regions based on a formula that incorporates the following data:

- Percentage of combined transportation asset inventory in region;
- Percentage of deficient lane miles in region;
- Percentage of average daily traffic on park roads in region; and
- Percentage of traffic accidents in the region.

Historically, approximately 80 percent of all Service-wide Category I funding is allocated toward 3R (an acronym for resurfacing, rehabilitation, and restoration) projects to extend the service life of roads and enhance safety. 3R projects involve work only within the existing alignment of the roadway and its shoulders. The remaining 20 percent of Category I funds is used for 4R (reconstruction/realignment) projects. A 4R project could include horizontal or vertical realignment, roadway widening, or roadway relocation.[4]

Table 2-1 presents the annual FLHP Category I funding for the Northeast Region from FY 05 to FY 11. Funding has averaged about $15 million each of the last three years.

Table 2-1 FLHP Category 1 Funding for the Northeast Region (FY 05 to FY 11)

2005	2006	2007	2008	2009	2010	2011	Average
$14,316,606	$21,102,772	$24,909,150	$17,806,354	$15,170,000	$14,678,000	$15,206,000	$17,598,412

Source: NERO - Boston

Category II – Congressionally Mandated Parkways

Category II FLHP funds are distributed by NPS Washington Support Office (WASO) and are used to build the six congressionally mandated parkways. Parkways that have been completed under this category include:

- Baltimore-Washington Parkway;
- Cumberland Gap Tunnel Project;
- Chickamauga-Chattanooga National Military Park Bypass; and;
- George Washington Memorial Parkway (in Maryland, it is the Clara Barton Parkway).

The remaining two parkway projects are an uncompleted segment of the Foothills Parkway's in the Great Smokey Mountains National Park and a safety-related multiuse trail at a congested location along the Natchez Trace Parkway. None of the parkways are located in the Northeast Region; as such, Category II FLHP funding does not apply to the Northeast Region.

Category III – Transportation Management Program

Category III funding provides support for multimodal transportation systems other than those specifically related to private automobile travel. Such transportation systems include transit systems (bus, shuttle, rail, etc.), water ferries, trails, bicycle and pedestrian facilities, and multimodal transportation technologies. Additionally, Category III also provides funding to ensure multiyear continuity for investments made through the Paul S. Sarbanes Transit in Parks Program (TRIP), which is described below.

4 More recently, the NPS has been focusing 95% of available Category I funds on 3R (or lighter) and is expected to continue to do so for the foreseeable future.

Category III projects are selected to:

- Relieve traffic congestion and parking shortages;
- Enhance visitor mobility and accessibility;
- Preserve sensitive natural, cultural, and historic resources;
- Provide improved interpretation, education, and visitor information services;
- Reduce pollution; and
- Improve economic development opportunities for gateway communities.

Table 2-2 presents the annual FLHP Category III funding for the Northeast Region from FY 05 to FY 11. Due to a change in the formula allocating funding among all NPS regions, the FY 11 funding level for the Northeast Region has decreased by over $2 million over the prior years. The primary factors in the current funding allocation formula are miles of trail inventory (including backcountry trails) in a region, regional visitation, deferred maintenance of transportation assets (excluding trails) as a percentage of all deferred maintenance in a region, and the percentage of past category funding received by a region.

Table 2-2 FLHP Category 3 Funding for the Northeast Region (FY 05 to FY 11)

2005	2006	2007	2008	2009	2010	2011	Average
$4,989,739	$896,357	$852,491	$4,855,740	$4,806,000	$6,012,000	$2,733,000	$3,592,190

Source: NERO - Boston

2.1.2 Paul S. Sarbanes Transit in Parks Program (TRIP)[5]

Established in 2005, TRIP is jointly administered by the Department of the Interior and the Federal Transit Administration. It is formerly known as Alternative Transportation in the Parks and Public Lands program. The program funds capital and planning expenses for alternative transportation systems in national parks and other public lands and is intended to address problems such as traffic congestion and limited parking in environmentally sensitive areas. Alternative transportation includes transportation by bus, rail, or any other public means of transportation and sightseeing services. It also includes non-motorized transportation systems such as pedestrian and bicycle trails. Additional information can be found at www.fta.dot.gov/grants/13094_6106.html.

Projects funded through TRIP include:

- Bus and tram replacement;
- Leasing of transit vehicles;
- Shuttle bus transfer area rebuilding;

5 This program has been eliminated under MAP 21, although a final round of grant applications for FY 12 funding is currently underway.

- Ferry dock rehabilitation;
- Planning and feasibility studies; and
- Technical-assistance and research funding at the program level.

TRIP funded projects must meet certain criteria. TRIP does not support program development and administration, system level planning, unforeseeable cost changes, emergencies, or strategic initiatives. TRIP funds can only be used to fund one phase of a project and funding at an early stage of a project does not guarantee further funding. Lastly, TRIP funds do not cover ongoing transit system operations.

TRIP is a highly competitive, nationwide grant program which is open to all federal land management agencies, tribal governments, and state and local government agencies and transit operators working in concert with FLMAs. As shown in Table 2-3, the Northeast Region has been very successful in obtaining TRIP funding grants, averaging approximately $4.6 million per year between FY 07 and FY 11.

Table 2-3 Transit in Parks Program Funding for Northeast Region (FY 07 to FY 11)

2007	2008	2009	2010	2011	Average
$2,929,500	$6,187,803	$4,930,100	$3,214,011	$5,679,307	$4,588,144

Source: NERO - Boston

2.1.3 Title 23 / 49 Funding

For the purposes of this analysis, “Title 23 and Title 49 funding” is used as a catch-all for “earmarked” and other one-time funding allocations that may be made towards Northeast Region transportation projects. In the past this would have included not only project-specific earmarks made as part of a reauthorization of highway (Title 23 - Public Lands Highway) or transit (Title 49 - Federal Transit Administration) laws or annual appropriations, but also funding obtained from discretionary funding programs such as the Ferry Boat Discretionary program, the Transit Enhancements program, or the Public Lands Highway Discretionary program.[6] These funds have been highly variable and under The Safe, Accountable, Flexible, Efficient Transportation Equity Act (SAFETEA-LU) have ranged from $2.4 to $11.8 million per year. The amount for FY 11 is approximately $9.1 million.

2.1.4 National Scenic Byways Program[6]

The Federal Highway Administration has lead responsibility for the National Scenic Byways Program (NSBP), which was established to help recognize, preserve and enhance selected roads throughout the United States. Nominated roadways are selected based on its historic, cultural, recreational, natural,

6 These programs have been modified and consolidated under MAP-21.

scenic, or archaeological qualities. Nominations come from the local communities, through a state-designated Scenic Byways Coordinator, to the FHWA for designation. Federal Land Management Agencies may submit applications directly to FHWA for designation. Additional information can be found at www.bywaysonline.org.

There are four national scenic byways within Northeast Region parks. These are the Colonial Parkway in Colonial NHP, Skyline Drive in Shenandoah NP, the Schoodic Scenic Byway in Acadia NP, and the 180-mile Journey Through Hallowed Grounds Scenic Byway that travels through Gettysburg NMP.

The NSBP provided grants to state and nationally designated byways through a competitive grant process. A 20 percent match was required to submit the application for consideration as part of this process. Grant funds used by the National Park Service, in partnership with the local byways communities, enhanced and promoted individual byways and the NPS resources associated with it.

The Northeast Region received an average of about $225,000 in grants through this program from FY 05 through FY 12. This includes large grants in FY 08 and FY 11 for trail projects at Colonial NHP and Gettysburg NMP, respectively.

Table 2-4 Scenic Byways Grant Funding for the Northeast Region (FY 05 to FY 12)

2005	2006	2007	2008	2009	2010	2011	2012	Average
$100,000	$14,400	$0	$647,955	$0	$0	$977,600	$45,940	$223,237

Source: *National Scenic Byways Grants by State for 1992-2012*. National Scenic Byways Program, www.bywaysonline.org

2.1.5 Partnership Funding

Some park units in the NPS system have a long history of funding partnerships with other public agencies, private organizations, and park friends groups to support transportation investments.

One example of a successful transportation partnership in the Northeast Region is the Island Explorer bus service at Acadia National Park. The Island Explorer has been funded through a number of different partnerships over the years that have included federal transit funding, state funding from the Maine Department of Transportation, the Friends of Acadia, and L.L.Bean who has donated over $3 million to the Island Explorer to date. Parks are authorized to accept and use donated funds to meet the purposes of the NPS. Use of these funds is strictly controlled, must be consistent with legislative authority, and must meet with the approval of the grantor. Individual park accounts are established for specific-purpose donations, and a general donation account, not specific-purpose in nature, is also available. This type of funding is not limited to capital investments, and may be used to help fund operations and maintenance within the same guidelines described.

In FY 11 the Northeast Region received about $680,000 in funding from private partnerships to support transportation services.[7] About $110,000 was for capital items and $570,000 was for operations. Almost all of the private partnership funding was at two parks – Acadia National Park and Boston Harbor Islands National Recreation Area. The partnership funding at Acadia NP came from L.L.Bean and local businesses to support the Island Explorer transit system. The partnership funding at Boston Harbor Islands NRA came from the Boston Harbor Alliance to support the inter-island ferries and from the Thompson Island Outward Bound organization to support the Thompson Island ferry service.

2.1.6 Transportation Fees

The National Parks Omnibus Management Act of 1998 (P.L. 105-391) as amended by P.L. 109-31 (December 2005) authorizes the collection of transportation fees from the public for the use of transportation services provided either by the National Park Service or an entity under a service contract, cooperative agreement, or other contractual arrangement with the National Park Service. Transportation fees are collected specifically for a public transportation service and are additional to other fees collected by the park. Transportation fees must be “reasonable and appropriate” and all the transportation fees collected must be spent (as operating, maintaining or capital expenses) on the park’s transportation system where the transportation fee was collected. Parks must receive approval from the Associate Directors, Park Facilities, and Lands and Business Services before establishing a transportation fee.

The Northeast Region currently has three parks that are approved to collect a transportation fee: Acadia National Park, Cape Cod National Seashore[8], and the Home of Franklin D. Roosevelt National Historic Site. As shown in Table 2-5, NER transportation fee revenues have averaged about $950,000 annually. The majority of fees are generated at Acadia National Park.

Table 2-5 Transportation Fees Collected in the Northeast Region (FY 05 to FY 12)

2005	2006	2007	2008	2009	2010	2011	2012	Average
$810,660	$1,081,886	$1,035,413	$913,548	$840,133	$1,066,733	$996,510	$863,124	$951,001

Source: NERO - Boston

2.1.7 Recreation Fee Program, Federal Lands Recreation Enhancement Act (FLREA)

The FLREA Program (formerly the Fee-Demonstration Program) allows park units to charge fees for access to specific areas and attractions. The parks use these funds for various purposes within the park

7 Information from analysis of Northeast Region alternative transportation systems by Tom Crikelair Associates.
8 Cape Cod National Seashore has collected fees in the past but has suspended that practice.

specific to visitor use issues; such issues sometimes include investment in transportation. The majority of fee revenues collected are retained at the site of collection and used to enhance visitor services, including repair, maintenance, and enhancement of facilities. Typical uses of fee revenues include maintaining campgrounds, habitat restoration directly related to wildlife-dependent recreation, fixing boat launches, offering interpretive displays and tours, and improving amenities for visitors (e.g., bathrooms, parking, trash cans).

Projects to be funded with park fee revenue are identified on a Recreation Fee Comprehensive Five-year Plan, and revenues for projects in a park's Comprehensive Plan are approved based on program eligibility criteria and emphasis factors. Fee collecting sites that collect $500,000 or more in revenue retain 80 percent of the revenues generated, with the remaining 20 percent distributed Service-wide. Fee collecting sites that collect $500,000 or less retain 100 percent of the revenue. More information can be found at www.nps.gov/policy/DOrders/DO-22.pdf.

About 30 park units in the Northeast Region currently charge entrance fees. Typically, a per-person fee for admission for tours of the park's main resource is collected, but use of the grounds is free to the public. Precise annual figures are not available, but the Northeast Region Boston Office estimates that roughly $1 million of FLREA fees are spent annually by NER parks on transportation assets. The amount of fee revenue is not expected to change significantly in the future. As shown in Table 2-6, recreation fees (Service-wide) have remained fairly constant during the past few years.

Table 2-6 Service-wide Recreation Fee Program Revenues (FY 08 to FY 12)

2008	2009	2010	2011	2012	Average
$170,851,000	$169,303,000	$167,542,000	$170,796,000	$170,313,000*	$169.761,000

Source: The U.S. Department of the Interior, Budget Justifications and Performance Information, FY 2012.
* Estimated.

2.1.8 Repair and Rehabilitation Program

Funding for minor repairs to roads and bridges is occasionally provided through the Repair and Rehabilitation Program. This program's funds are appropriated annually through the NPS operating budget and are intended to support a combination of deferred maintenance and capital improvement needs. These funds may not be used for new construction without the approval of WASO.

The maximum funding threshold for Repair and Rehabilitation projects is $1 million (gross). The program is coordinated by regional offices with WASO oversight and is administered by the Team Leader for Park Improvement Programs, Park Facility Management Division, Washington Office.

An analysis of FY 11 expenditures in the Northeast Region[9] estimated that approximately $1.5 million in Repair and Rehabilitation monies was used for transportation projects. As shown in the Table 2-7, Service-wide funding for the Repair and Rehabilitation Program has been relatively flat over the past few years and that trend is not expected to change in the near future.

Table 2-7 Service-wide Repair and Rehabilitation Program Funding (FY 08 to FY 12)

2008	2009	2010	2011	2012	Average
$79,727,000	$99,289,000	$97,157,000	$96,011,000	$96,351,000	$93,707,000

Source: The U.S. Department of the Interior, Budget Justifications and Performance Information, FY 2012.

2.1.9 Regular Cyclic Maintenance Funds

Regular Cyclic Maintenance Funds are used to maintain park roads, trails, building, utility systems, and other facilities. The Cyclic Maintenance Program incorporates a number of regularly scheduled preventive maintenance procedures and preservation techniques into a comprehensive program that helps to ensure that assets can meet their intended design life. According to NPS directives, Cyclic Maintenance funding is most optimally applied to facilities in “good” or “fair” condition. Projects undertaken in this program are performed as often as every two years or as infrequently as every 10 to 20 years.[10]

Budget submissions for the cyclic maintenance program are extracted from a park’s ten-year cyclic maintenance program. Funding from the cyclic maintenance program may not be used for new construction unless approved by NERO and WASO.

An analysis of FY 11 expenditures in the Northeast Region[11] estimated that approximately $4.8 million in Regular Cyclic Funds were used to operate and maintain transportation facilities in the region. Table 2-8 presents Service-wide funding for the Regular Cyclic Program, which has not changed significantly during the past few years and decreased slightly in FY 12.

Table 2-8 Service-wide Regular Cyclic Maintenance Funds (FY 08 to FY 12)

2008	2009	2010	2011	2012	Average
$77,403,000	$77,403,000	$79,828,000	$76,576,000	$71,040,000	$76,450,000

Source: The U.S. Department of the Interior, Budget Justifications and Performance Information, FY 2012.

9 Completed in support of this technical study by Booz Allen Hamilton.
10 Five-year Deferred Maintenance and Capital Improvement Plan (Attachment G)
11 Completed in support of this technical study by Booz Allen Hamilton.

2.1.10 Annual Operating Funds or Park Base (ONPS)

Annual Operating Funds or Park Base funds are the primary source of operational funding for the parks. These recurring funds are used for the management, interpretation, visitor services, maintenance, and resource protection of NPS areas. The ONPS section of the budget is divided into five operational areas: Resource Stewardship; Visitor Services; Park Protection; Facility Maintenance & Operations; Park Support; and External Administrative Costs. These congressionally allocated funds are provided to WASO and then distributed to the regions. The region keeps a portion of these funds, and distributes the remainder to the park units.[12]

An analysis of ONPS expenditures in the Northeast Region for FY 11 indicates that about $6.5 million went towards operating and maintaining the transportation system.[13] Table 2-9 summarizes the Service-wide funding for park management which has remained relatively level over recent years and this trend is expected to continue.

Table 2-9 Service-wide Operating Funds for Parks (FY 08 to FY 12)

2008	2009	2010	2011	2012	Average
$1,831,200,000	$1,983,700,000	$2,106,029,000	$2,092,000,000	$2,055,000,000*	$2,003,232,250

Source: The U.S. Department of the Interior, Budget Justifications and Performance Information, FY 2012.
* Estimated.

2.2 Funding Forecast Approach

Forecasted funding is based on an analysis of historical data and trends, and discussions with National Park Service representation from the Washington Office and the Northeast Region on future funding projections. Three funding forecasts have been developed: the “Low Forecast” assumes very modest growth in some funding sources and funding decreases among other sources, the “Medium Forecast” essentially assumes current growth trends and baseline funding extended, and the “High Forecast” assumes higher baseline funding and moderate growth rates across several funding programs. Forecasts were made for a twenty year horizon beginning in FY 12 and ending in FY 31. The funding forecasts are presented in Table 2-10.

12 Description information from The U.S. Department of the Interior, Budget Justifications and Performance Information, FY 2012.
13 Completed in support of this technical study by Booz Allen Hamilton. The valuable, but difficult to quantify, contributions of trail maintenance and similar transportation-related work by volunteers in parks is not included in the analysis.

Table 2-10 Northeast Region Funding Forecasts (FY 12-FY 21)

Funding Forecast LOW

	Year 1 FY12	Year 2 FY13	Year 3 FY14	Year 4 FY15	Year 5 FY16	Year 6 FY17	Year 7 FY18	Year 8 FY19	Year 9 FY20	Year 10 FY21
Capital										
FLHP Cat I	$15,206,000	$14,600,000	$14,600,000	$14,600,000	$14,600,000	$14,600,000	$14,600,000	$14,906,600	$15,219,639	$15,539,251
FLHP Cat III	$2,733,000	$2,624,083	$2,624,083	$2,624,083	$2,624,083	$2,624,083	$2,624,083	$2,679,188	$2,735,451	$2,792,896
FTA TRIP	$4,600,000	$0	$0	$0	$0	$0	$0	$0	$0	$0
Transp. Fee	$950,000	$950,000	$950,000	$950,000	$950,000	$950,000	$950,000	$950,000	$950,000	$950,000
Title 23 / 49	$9,100,000	$0	$0	$0	$0	$0	$0	$0	$0	$0
Partnership Funding Capital	$110,000	$110,000	$110,000	$110,000	$110,000	$110,000	$110,000	$110,000	$110,000	$110,000
Visitation & Recreation Fees	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000
Capital TOTAL	$33,699,000	$19,284,083	$19,284,083	$19,284,083	$19,284,083	$19,284,083	$19,284,083	$19,645,788	$20,015,090	$20,392,147
O&M										
Cyclic	$4,800,000	$4,776,000	$4,752,120	$4,728,359	$4,704,718	$4,681,194	$4,657,788	$4,634,499	$4,611,327	$4,588,270
Rehab/Repair	$1,500,000	$1,492,500	$1,485,038	$1,477,612	$1,470,224	$1,462,873	$1,455,559	$1,448,281	$1,441,040	$1,433,834
Partnership Funding O&M	$570,000	$570,000	$570,000	$570,000	$570,000	$570,000	$570,000	$570,000	$570,000	$570,000
ONPS Maintenance	$6,500,000	$6,467,500	$6,435,163	$6,402,987	$6,370,972	$6,339,117	$6,307,421	$6,275,884	$6,244,505	$6,213,282
O&M TOTAL	$13,370,000	$13,306,000	$13,242,320	$13,178,958	$13,115,914	$13,053,184	$12,990,768	$12,928,664	$12,866,871	$12,805,387

Funding Forecast MEDIUM

	Year 1 FY12	Year 2 FY13	Year 3 FY14	Year 4 FY15	Year 5 FY16	Year 6 FY17	Year 7 FY18	Year 8 FY19	Year 9 FY20	Year 10 FY21
Capital										
FLHP Cat I	$15,206,000	$16,100,000	$16,100,000	$16,100,000	$16,100,000	$16,100,000	$16,100,000	$16,438,100	$16,783,300	$17,135,749
FLHP Cat III	$2,733,000	$2,893,680	$2,893,680	$2,893,680	$2,893,680	$2,893,680	$2,893,680	$2,954,447	$3,016,491	$3,079,837
FTA Trip	$4,600,000	$2,500,000	$2,500,000	$2,500,000	$2,500,000	$2,500,000	$2,500,000	$2,552,500	$2,606,103	$2,660,831
Transp. Fee	$950,000	$952,375	$954,756	$957,143	$959,536	$961,935	$964,339	$966,750	$969,167	$971,590
Title 23 / 49	$9,100,000	$3,500,000	$3,500,000	$3,500,000	$3,500,000	$3,500,000	$3,500,000	$3,573,500	$3,648,544	$3,725,163
Partnership Funding Capital	$110,000	$111,100	$112,211	$113,333	$114,466	$115,611	$116,767	$117,935	$119,114	$120,305
Visitation & Recreation Fees	$1,000,000	$1,010,000	$1,020,100	$1,030,301	$1,040,604	$1,051,010	$1,061,520	$1,072,135	$1,082,857	$1,093,685
Capital TOTAL	$33,699,000	$27,067,155	$27,080,747	$27,094,457	$27,108,286	$27,122,236	$27,136,307	$27,675,368	$28,225,575	$28,787,161
O&M										
Cyclic	$4,800,000	$4,800,000	$4,800,000	$4,800,000	$4,800,000	$4,800,000	$4,800,000	$4,800,000	$4,800,000	$4,800,000
Rehab/Repair	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000
Partnership Funding O&M	$570,000	$575,700	$581,457	$587,272	$593,144	$599,076	$605,066	$611,117	$617,228	$623,401
ONPS Maintenance	$6,500,000	$6,500,000	$6,500,000	$6,500,000	$6,500,000	$6,500,000	$6,500,000	$6,500,000	$6,500,000	$6,500,000
O&M TOTAL	$13,370,000	$13,375,700	$13,381,457	$13,387,272	$13,393,144	$13,399,076	$13,405,066	$13,411,117	$13,417,228	$13,423,401

Funding Forecast HIGH

	Year 1 FY12	Year 2 FY13	Year 3 FY14	Year 4 FY15	Year 5 FY16	Year 6 FY17	Year 7 FY18	Year 8 FY19	Year 9 FY20	Year 10 FY21
Capital										
FLHP Cat I	$15,206,000	$18,685,000	$18,685,000	$18,685,000	$18,685,000	$18,685,000	$18,685,000	$19,077,385	$19,478,010	$19,887,048
FLHP Cat III	$2,733,000	$3,358,287	$3,358,287	$3,358,287	$3,358,287	$3,358,287	$3,358,287	$3,428,811	$3,500,816	$3,574,333
FTA Trip	$4,600,000	$5,000,000	$5,000,000	$5,000,000	$5,000,000	$5,000,000	$5,000,000	$5,105,000	$5,212,205	$5,321,661
Transp. Fee	$950,000	$954,750	$959,524	$964,321	$969,143	$973,989	$978,859	$983,753	$988,672	$993,615
Title 23 / 49	$9,100,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,126,000	$6,254,646	$6,385,994
Partnership Funding Capital	$110,000	$112,200	$114,444	$116,733	$119,068	$121,449	$123,878	$126,355	$128,883	$131,460
Visitation & Recreation Fees	$1,000,000	$1,020,000	$1,040,400	$1,061,208	$1,082,432	$1,104,081	$1,126,162	$1,148,686	$1,171,659	$1,195,093
Capital TOTAL	$33,699,000	$35,130,237	$35,157,654	$35,185,549	$35,213,929	$35,242,805	$35,272,185	$35,995,990	$36,734,890	$37,489,204
O&M										
Cyclic	$4,800,000	$4,848,000	$4,896,480	$4,945,445	$4,994,899	$5,044,848	$5,095,297	$5,146,250	$5,197,712	$5,249,689
Rehab/Repair	$1,500,000	$1,515,000	$1,530,150	$1,545,452	$1,560,906	$1,576,515	$1,592,280	$1,608,203	$1,624,285	$1,640,528
Partnership Funding O&M	$570,000	$581,400	$593,028	$604,889	$616,986	$629,326	$641,913	$654,751	$667,846	$681,203
ONPS Maintenance	$6,500,000	$6,565,000	$6,630,650	$6,696,957	$6,763,926	$6,831,565	$6,899,881	$6,968,880	$7,038,569	$7,108,954
O&M TOTAL	$13,370,000	$13,509,400	$13,650,308	$13,792,741	$13,936,718	$14,082,255	$14,229,371	$14,378,083	$14,528,412	$14,680,374

Table 2-10 (continued) Northeast Region Funding Forecasts (FY 22-FY 31)

Funding Forecast LOW

	Year 11 FY 22	Year 12 FY 23	Year 13 FY 24	Year 14 FY 25	Year 15 FY 26	Year 16 FY 27	Year 17 FY 28	Year 18 FY 29	Year 19 FY 30	Year 20 FY 31
Capital										
FLHP Cat I	$15,865,575	$16,198,752	$16,538,926	$16,886,244	$17,240,855	$17,602,913	$17,972,574	$18,349,998	$18,735,348	$19,128,790
FLHP Cat III	$2,851,547	$2,911,429	$2,972,569	$3,034,993	$3,098,728	$3,163,801	$3,230,241	$3,298,076	$3,367,336	$3,438,050
FTA TRIP	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Transp. Fee	$950,000	$950,000	$950,000	$950,000	$950,000	$950,000	$950,000	$950,000	$950,000	$950,000
Title 23 / 49	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Partnership Funding Capital	$110,000	$110,000	$110,000	$110,000	$110,000	$110,000	$110,000	$110,000	$110,000	$110,000
Visitation & Recreation Fees	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000
Capital TOTAL	$20,777,122	$21,170,181	$21,571,495	$21,981,237	$22,399,583	$22,826,714	$23,262,815	$23,708,074	$24,162,683	$24,626,840
O&M										
Cyclic	$4,565,329	$4,542,502	$4,519,789	$4,497,191	$4,474,705	$4,452,331	$4,430,069	$4,407,919	$4,385,879	$4,363,950
Rehab/Repair	$1,426,665	$1,419,532	$1,412,434	$1,405,372	$1,398,345	$1,391,353	$1,384,397	$1,377,475	$1,370,587	$1,363,734
Partnership Funding O&M	$570,000	$570,000	$570,000	$570,000	$570,000	$570,000	$570,000	$570,000	$570,000	$570,000
ONPS Maintenance	$6,182,216	$6,151,305	$6,120,548	$6,089,946	$6,059,496	$6,029,198	$5,999,052	$5,969,057	$5,939,212	$5,909,516
O&M TOTAL	$12,744,210	$12,683,339	$12,622,772	$12,562,508	$12,502,546	$12,442,883	$12,383,518	$12,324,451	$12,265,679	$12,207,200

Funding Forecast MEDIUM

	Year 11 FY 22	Year 12 FY 23	Year 13 FY 24	Year 14 FY 25	Year 15 FY 26	Year 16 FY 27	Year 17 FY 28	Year 18 FY 29	Year 19 FY 30	Year 20 FY 31
Capital										
FLHP Cat I	$17,495,600	$17,863,008	$18,238,131	$18,621,132	$19,012,175	$19,411,431	$19,819,071	$20,235,272	$20,660,212	$21,094,077
FLHP Cat III	$3,144,514	$3,210,548	$3,277,970	$3,346,807	$3,417,090	$3,488,849	$3,562,115	$3,636,919	$3,713,295	$3,791,274
FTA Trip	$2,716,708	$2,773,759	$2,832,008	$2,891,480	$2,952,201	$3,014,197	$3,077,496	$3,142,123	$3,208,108	$3,275,478
Transp. Fee	$974,019	$976,454	$978,895	$981,342	$983,796	$986,255	$988,721	$991,193	$993,671	$996,155
Title 23 / 49	$3,803,391	$3,883,263	$3,964,811	$4,048,072	$4,133,082	$4,219,876	$4,308,494	$4,398,972	$4,491,351	$4,585,669
Partnership Funding Capital	$121,508	$122,724	$123,951	$125,190	$126,442	$127,707	$128,984	$130,273	$131,576	$132,892
Visitation & Recreation Fees	$1,104,622	$1,115,668	$1,126,825	$1,138,093	$1,149,474	$1,160,969	$1,172,579	$1,184,304	$1,196,147	$1,208,109
Capital TOTAL	$29,360,363	$29,945,424	$30,542,591	$31,152,117	$31,774,261	$32,409,285	$33,057,459	$33,719,057	$34,394,360	$35,083,653
O&M										
Cyclic	$4,800,000	$4,800,000	$4,800,000	$4,800,000	$4,800,000	$4,800,000	$4,800,000	$4,800,000	$4,800,000	$4,800,000
Rehab/Repair	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000
Partnership Funding O&M	$629,635	$635,931	$642,290	$648,713	$655,200	$661,752	$668,370	$675,054	$681,804	$688,622
ONPS Maintenance	$6,500,000	$6,500,000	$6,500,000	$6,500,000	$6,500,000	$6,500,000	$6,500,000	$6,500,000	$6,500,000	$6,500,000
O&M TOTAL	$13,429,635	$13,435,931	$13,442,290	$13,448,713	$13,455,200	$13,461,752	$13,468,370	$13,475,054	$13,481,804	$13,488,622

Funding Forecast HIGH

	Year 11 FY 22	Year 12 FY 23	Year 13 FY 24	Year 14 FY 25	Year 15 FY 26	Year 16 FY 27	Year 17 FY 28	Year 18 FY 29	Year 19 FY 30	Year 20 FY 31
Capital										
FLHP Cat I	$20,304,676	$20,731,075	$21,166,427	$21,610,922	$22,064,751	$22,528,111	$23,001,202	$23,484,227	$23,977,396	$24,480,921
FLHP Cat III	$3,649,394	$3,726,031	$3,804,278	$3,884,167	$3,965,735	$4,049,015	$4,134,045	$4,220,860	$4,309,498	$4,399,997
FTA Trip	$5,433,416	$5,547,518	$5,664,016	$5,782,960	$5,904,402	$6,028,395	$6,154,991	$6,284,246	$6,416,215	$6,550,956
Transp. Fee	$998,583	$1,003,576	$1,008,594	$1,013,637	$1,018,705	$1,023,799	$1,028,918	$1,034,062	$1,039,232	$1,044,429
Title 23 / 49	$6,520,099	$6,657,022	$6,796,819	$6,939,552	$7,085,283	$7,234,074	$7,385,989	$7,541,095	$7,699,458	$7,861,147
Partnership Funding Capital	$134,089	$136,771	$139,507	$142,297	$145,143	$148,046	$151,006	$154,027	$157,107	$160,249
Visitation & Recreation Fees	$1,218,994	$1,243,374	$1,268,242	$1,293,607	$1,319,479	$1,345,868	$1,372,786	$1,400,241	$1,428,246	$1,456,811
Capital TOTAL	$38,259,253	$39,045,366	$39,847,882	$40,667,142	$41,503,498	$42,357,307	$43,228,936	$44,118,757	$45,027,152	$45,954,509
O&M										
Cyclic	$5,302,186	$5,355,208	$5,408,760	$5,462,848	$5,517,476	$5,572,651	$5,628,377	$5,684,661	$5,741,508	$5,798,923
Rehab/Repair	$1,656,933	$1,673,503	$1,690,238	$1,707,140	$1,724,211	$1,741,453	$1,758,868	$1,776,457	$1,794,221	$1,812,163
Partnership Funding O&M	$694,827	$708,723	$722,898	$737,356	$752,103	$767,145	$782,488	$798,138	$814,100	$830,382
ONPS Maintenance	$7,180,044	$7,251,844	$7,324,363	$7,397,606	$7,471,582	$7,546,298	$7,621,761	$7,697,979	$7,774,959	$7,852,708
O&M TOTAL	$14,833,990	$14,989,278	$15,146,258	$15,304,950	$15,465,373	$15,627,548	$15,791,495	$15,957,234	$16,124,788	$16,294,177

Fiscal year 2011 funding was used to establish a baseline for all three of the funding forecasts. Year 1 (FY 12) assumptions show no growth over FY 11 in any of the funding sources. Beyond FY 12 assumptions were made for each revenue source to project potential future funding levels.[14] Those assumptions are described below.

2.2.1 Funding Forecast Approach - Federal Lands Highway Program

The forecasts of near-term FHLP funding are based on current year allocations, assumptions about the future year funding levels in the anticipated federal transportation reauthorization bill, and funding level targets used for the Service-wide Comprehensive Call (SCC) multiyear project submittals earlier this year. Long-term funding increases are based on a fixed annual increase to match inflation projections.

Funding in the first year (FY 12) is the same for all three forecast scenarios. Funding for FY 13 to FY 18 varies for each scenario and for each scenario is an annualized amount based on analysis of the (then) proposed House and Senate transportation bills and guidance for the multiyear SCC. Funding in Year 8 (FY 19) and beyond is increased by an annual compounded rate of 2.1 percent. This is equivalent to the inflation rate assumed in current U.S. Office of Management and Budget forecasting. Thus, long-term FLHP funding is effectively a level-service scenario, whereby the general level of increased funding has been assumed to increase each year in pace with projected inflation.

Category I Funding Forecasts

Category I funding forecasts through FY 18 range from $14,600,000 (low forecast) to $16,100,000 (medium forecast) to $18,685,000 (high forecast) annually. Table 2-11 summarizes the FLHP funding forecasts for the region.

Table 2-11 FLHP Category Funding Forecasts for the Northeast Region

	Low Forecast	Medium Forecast	High Forecast
Baseline FY 12	$15,206,000	$15,206,000	$15,206,000
FY 13 – FY 18	$14,600,000	$16,100,000	$18,685,000
FY 19 – FY 31	+ 2.1% annually	+ 2.1% annually	+ 2.1% annually

14 Although the financial forecasts used herein were developed prior to the enactment of legislation to extend SAFETEA-LU through FY 2012 and establish the Moving Ahead for Progress in the 21st Century (MAP-21) transportation program for FY 2013 and FY 2014 (which calls for changes in some of the specific funding programs), it is believed that the total funding for transportation programs contained in this analysis remains appropriate for the purposes of establishing and evaluating investment scenarios for the Long Range Transportation Plan.

Category II Funding Forecasts

The Northeast Region does not have any of the congressionally-defined parkways for which this funding category is dedicated. Consequently, no Category II funds are assumed in the forecasts.

Category III Funding Forecasts

Category III funds to the Northeast Region represented approximately 18 percent of Category I funding in FY 11. To estimate Category III funds for each forecast, this 18 percent ratio of Category I funding for FY 13 to FY 18 is assumed for the low, medium and high Category III forecast scenarios. Beyond FY 18 a uniform 2.1 percent per year increase in funding is forecasted.

Table 2-12 FLHP Category III Funding Forecasts for the Northeast Region

	Low Forecast	Medium Forecast	High Forecast
Baseline FY 12	$2,733,000	$2,733,000	$2,733,000
FY 13 – FY 18	$2,624,083	$2,893,680	$3,358,287
FY 19 – FY 31	+ 2.1% annually	+ 2.1% annually	+ 2.1% annually

2.2.2 Funding Forecast Approach - Paul S. Sarbanes Transit in Parks Program (TRIP)

The TRIP program has been funded through the national transportation bill and would be considered discretionary spending. The low forecast assumes the elimination of TRIP funding after FY 12, as proposed in MAP 21. The medium forecast of $2,500,000 starting in FY 13 assumes that some replacement funds will be available and the high forecast of $5,000,000 is an approximation of past annual funding received over the past five years (FY 06 – FY 11). The future-year values were agreed upon through discussions with WASO and NER. Table 2-13 highlights the forecast assumptions for TRIP funding. For the medium and high forecasts a 2.1 percent annual growth rate is assumed beyond FY 18 through FY 31.

Table 2-13 TRIP (or Equivalent) Funding Forecasts for the Northeast Region

	Low Forecast	Medium Forecast	High Forecast
Baseline FY 12	$4,600,000	$4,600,000	$4,600,000
FY 13 – FY 18	None	$2,500,000	$5,000,000
FY 19 – FY 31	None	+ 2.1% annually	+ 2.1% annually

2.2.3 Funding Forecast Approach - Transportation Fees

The Northeast Region has collected an average of about $950,000 transportation fee funding in each fiscal year since 2005. A base year amount of $950,000 is assumed in the forecasts.

The forecast in transportation fee funding was determined by WASO and NER staff, as follows:

- Low Forecast: level funding
- Medium Forecast: 0.25% annual increase
- High Forecast: 0.5% annual increase

2.2.4 Funding Forecast Approach - Title 23/49 Funding

The Title 23/49 funding category represents discretionary funding that the Northeast Region may be able to secure to help complete its program of projects. In past years, Title 23/49 funding could include funds such as SAFETEA-LU or American Recovery and Reinvestment Act. The baseline FY 12 funding amount of $9,100,000 is consistent with what NER received in FY 11. No discretionary funding in future years is assumed for the low forecast. As shown in Table 2-14, the medium funding forecast assumes discretionary funds of $3,500,000 are available in FY 13 to FY 18 and the high funding forecast projects $6,000,000 annually over the same period. In the medium and high funding forecasts, the funds are assumed to grow by 2.1 percent annually, similar to the FHLP funding assumptions, beyond FY 18.

Table 2-14 Other Title 23/49 Funding Sources for the Northeast Region

	Low Forecast	Medium Forecast	High Forecast
Baseline FY 12	$9,100,000	$9,100,000	$9,100,000
FY 13 – FY 18	None	$3,500,000	$6,000,000
FY 19 – FY 31	None	+ 2.1% annually	+ 2.1% annually

2.2.5 Funding Forecast Approach - Scenic Byways

Scenic Byways funding has historically been an occasional and small source of funding in the overall Northeast Region budget for transportation. Under MAP-21 the program was consolidated with other discretionary programs. Accordingly, the funding forecasts do not include separate line item assumptions for the program. This type of dedicated funding would be included among the assumptions of discretionary Title 23/49 funding.

2.2.6 Funding Forecast Approach - Partnership Funding

The Northeast Region has been working on better understanding the funding required to support alternative transportation in the parks and most partnership funding in the region is utilized for such transportation options. Based on the work conducted to date by Tom Crikelair Associates, some $110,000 was used in FY 11 through private partners to support capital investment in park units and about $570,000 was used for operations and maintenance.[15] The annual growth rate assumptions for Partnership Capital and Operations and Maintenance funding were determined by WASO and NER staff to be 0% growth rate (low scenario), 1% growth rate (medium scenario), and 2% growth rate (high scenario).

2.2.7 Funding Forecast Approach - Recreation Fees

Based on consensus among NER and WASO representatives, all three scenarios assume a base year funding of $1 million in recreation fee revenues used for transportation projects. Annual growth rates vary for each forecast. They are based on guidance from WASO and include 0% growth for the low scenario, 1% annual growth for the medium scenario, and 2% annual growth for the high scenario.

2.2.8 Funding Forecast Approach - Regular Cyclic Maintenance Funds

An analysis of FY 11 expenditures in the Northeast Region estimated that approximately $4.8 million in Regular Cyclic Funds were used to operate and maintain transportation facilities in the region. This amount is assumed for the baseline of all three funding scenarios. Annual growth rates for the three forecasts have been determined by WASO and NER staff as shown in Table 2-15.

Table 2-15 Regular Cyclic Maintenance Funding Forecasts for the Northeast Region

	Low Forecast	Medium Forecast	High Forecast
FY 12	$4,800,000	$4,800,000	$4,800,000
FY 13 – FY 31	0.5% annual reduction	Level Funding, 0% growth	1% annual growth

[15] Crikelair, Thomas. Total Cost of Facility Ownership (spreadsheet), TCFO pivot_5.xlsx, March 30, 2012.

2.2.9 Funding Forecast Approach - Repair and Rehabilitation

It is estimated that in 2011 approximately $1.5 million of Repair and Rehabilitation monies were used for transportation. This amount is assumed for the baseline of all three funding scenarios. The annual growth rates for the three forecasts were determined by WASO and NER staff and are the same as assumed for Regular Cyclic Maintenance funds.

Table 2-16 Repair and Rehabilitation Funding Forecasts for the Northeast Region

	Low Forecast	Medium Forecast	High Forecast
FY 12	$1,500,000	$1,500,000	$1,500,000
FY 13 – FY 31	0.5% annual reduction	Level Funding, 0% growth	1% annual growth

2.2.10 Funding Forecast Approach - Operations for National Park Services (ONPS)

ONPS is essentially the park budget to cover the salaries of the NPS employees, fixed costs, and utilities. Specifically, it represents every program the park superintendent manages, and includes administration, law enforcement, natural resources, and other categories of expenditures.

An analysis of ONPS expenditures in the Northeast Region for FY 11 indicates that about $6.5 million went towards operating and maintaining the transportation system.[16] This amount is assumed for the baseline of all three funding scenarios. Annual growth rates for ONPS funding in the NER associated with the three forecasts have been determined by WASO and NER staff as shown below. They are consistent with the forecasts for Regular Cyclic Maintenance funds and Repair and Rehabilitation funds.

Table 2-17 ONPS Funding Forecasts for the Northeast Region

	Low Forecast	Medium Forecast	High Forecast
FY 12	$6,500,000	$6,500,000	$6,500,000
FY 13 – FY 31	0.5% annual reduction	Level Funding, 0% growth	1% annual growth

16 Completed in support of this technical study by Booz Allen Hamilton

2.3 Summary of Funding Forecasts

The three forecasts for funding are summarized below. The forecasts are presented in both current dollars and constant (2012) dollars. The adjustment from current dollars to constant dollars is made using an assumption of a 2.1 percent inflation rate.

2.3.1 Capital Funding Forecasts

As shown in Table 2-18, the capital funding forecast for the medium funding scenario is level funded compared to the base year, while the low forecast represents an annual loss of funding of about 1.6 percent and the high forecast provides an increase in funding of about 1.6 percent.

When the current dollar amounts are discounted for inflation (Table 2-19), all three forecasts result in a decrease in funding compared to the base level. The low forecast is shown to represent a decrease in 2012 dollars averaging about $900,000 (3.7%) each year. The medium forecast is a decrease of about $530,000 annually (1.8%) and the high forecast is a decrease of about $140,000 annually (0.4%).

Table 2-18 Total Northeast Region Capital Funding Forecasts – Current Dollars

	Base Year	Year 5	Year 10	Year 15	Year 20	Avg. Annual Change	Annual Percentage Change
Low Forecast	$33.70	$19.28	$20.39	$22.40	$24.63	($0.48)	(1.6%)
Medium Forecast	$33.70	$27.11	$28.79	$31.77	$35.08	$0.07	0.2%
High Forecast	$33.70	$35.21	$37.49	$41.50	$45.95	$0.64	1.6%

NOTE: Amounts shown are in millions ($000,000) of dollars

Table 2-19 Total Northeast Region Capital Funding Forecasts – Constant (2012) Dollars

	Base Year	Year 5	Year 10	Year 15	Year 20	Avg. Annual Change	Annual Percentage Change
Low Forecast	$33.70	$17.75	$16.91	$16.74	$16.59	($0.90)	(3.7%)
Medium Forecast	$33.70	$24.95	$23.88	$23.75	$23.64	($0.53)	(1.8%)
High Forecast	$33.70	$32.40	$31.09	$31.02	$30.96	($0.14)	(0.4%)

NOTE: Amounts shown are in millions ($000,000) of dollars

2.3.2 Operations and Maintenance (O&M) Funding Forecasts

The O&M funding forecasts show little if any increases over the base year amounts. In current dollars (Table 2-20), the low forecast shows a slight decline, the medium forecast has essentially level funding, and the high forecast provides an average annual increase of about $150,000 (1.0%). In constant dollars (Table 2-21) all three forecasts show decreases in anticipated funding. The decreases range from an average of $130,000 (1.0%) per year to $270,000 (2.5%) per year.

Table 2-20 Total Northeast Region O&M Funding Forecasts – Current Dollars

	Base Year	Year 5	Year 10	Year 15	Year 20	Avg. Annual Change	Avg. Annual Percentage Change
Low Forecast	$13.37	$13.12	$12.81	$12.50	$12.21	($0.06)	(0.5%)
Medium Forecast	$13.37	$13.39	$13.42	$13.46	$13.49	$0.01	0.0%
High Forecast	$13.37	$13.94	$14.68	$15.47	$16.29	$0.15	1.0%

NOTE: Amounts shown are in millions ($000,000) of dollars

Table 2-21 O&M Funding Forecasts – Constant (2012) Dollars

	Base Year	Year 5	Year 10	Year 15	Year 20	Avg. Annual Change	Avg. Annual Percentage Change
Low Forecast	$13.37	$12.07	$10.62	$9.34	$8.22	($0.27)	(2.5%)
Medium Forecast	$13.37	$12.32	$11.13	$10.06	$9.01	($0.23)	(2.1%)
High Forecast	$13.37	$12.83	$12.18	$11.56	$10.98	($0.13)	(1.0%)

NOTE: Amounts shown are in millions ($000,000) of dollars

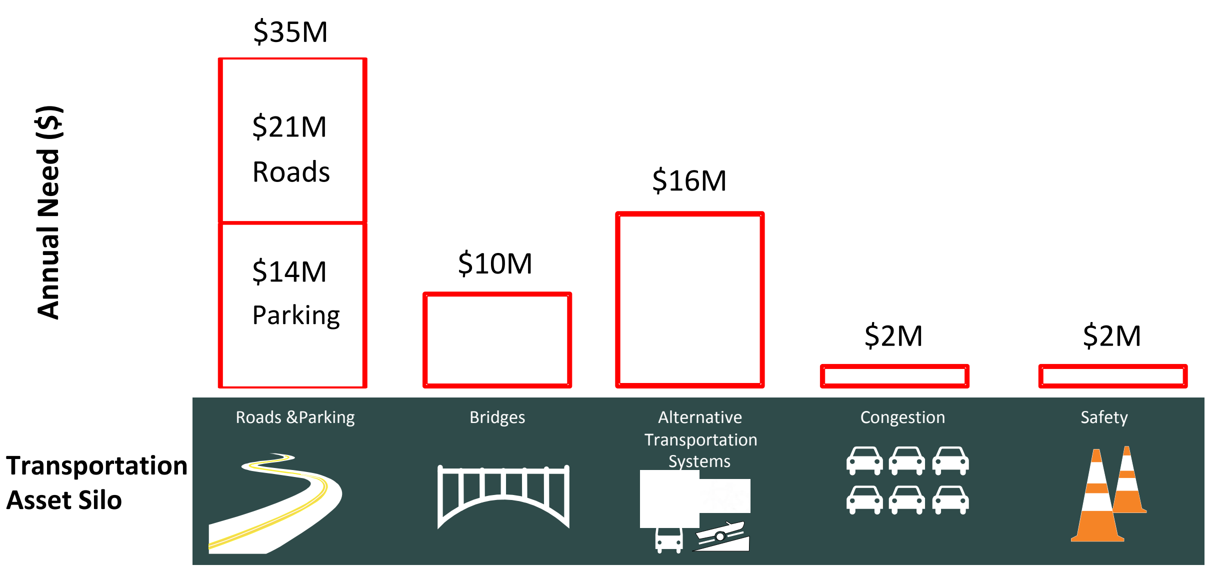
3.0 GAP IDENTIFICATION

This chapter presents a summary of the gap between the annual needs for investments in transportation assets and the funding forecasted to be available. The annual need for investments in Northeast Region transportation assets is described in the Asset Management subject area memorandum.

3.1 Capital Funding Gap

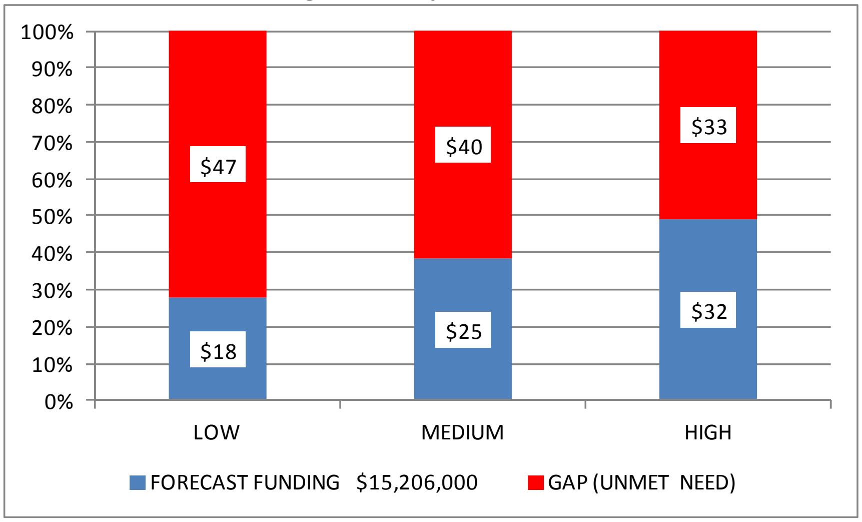
As illustrated by Figure 3-1. The annual need (2012 dollars) for all NER transportation assets is estimated to be about $65 million. The majority of this need is related to on-road systems (including: roads, parking, and road bridges).

Figure 3-1 Annual Capital Funding Need for Northeast Region Transportation Assets



The funding forecasts from Chapter 2 were annualized to base year 2012 dollars to be consistent with the annualized estimate of $65 million of annual needs. An assumption of a 2.1 percent inflation rate was used. The annualized value of the three funding forecasts are $18 million, $25 million, and $32 million. They provide 28 percent, 38 percent and 49 percent, respectively, of the anticipated need. As shown in Figure 3-2, the annual funding gap for the three forecasts range from $33 million to $47 million.

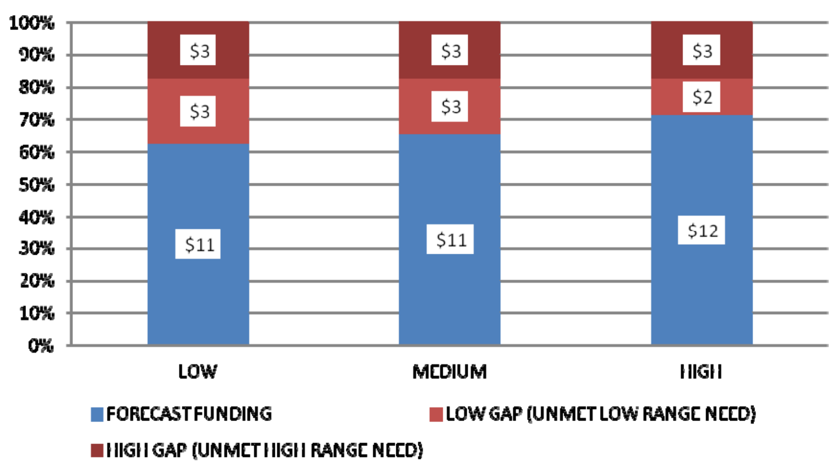
Figure 3-2 Funding Gap Analysis of Annual Capital Needs: Northeast Region Transportation Assets



3.2 Operations and Maintenance Funding Gap

As described in the Asset Management subject area memorandum, the annual transportation-related need for operations and maintenance in the Northeast Region is estimated to be $14 to $17 million. The annualized amount of the three funding forecasts for operations and maintenance are $10.6 million, $11.1 million, and $12.1 million. The operations and maintenance funding gap is projected to be between $2 million and $6 million annually.

Figure 3-3 Funding Gap Analysis of Annual O&M Needs: Northeast Region Transportation Assets



4.0 ASSESSMENT OF INVESTMENT SCENARIOS

This chapter presents the assessment of four investment scenarios. Each focuses a different amount of funding on the various transportation assets and policies. The findings from the evaluation are used to provide a recommendation for consideration in the LRTP on an investment strategy moving forward.

The medium and high funding forecasts are used for the investment scenarios. The medium funding forecast provides $25 million annually and the high funding forecast provides $32 million. The medium forecast is meant to be a realistic outlook for the Northeast Region while the high funding forecast is used to illustrate the potential impacts of additional funding.

The four investment scenarios are as follows:

1. *The Essentials*

   This investment scenario assumes medium level funding of $25 million. The funding in this scenario is geared towards meeting the basic transportation operating needs of the Northeast Region. This program funds the minimum ATS needs to continue providing existing services including transit features, and funds bridges at the level necessary to maintain current conditions. This program then funds on-road system projects to attempt to bring roads and parking up to a pavement condition rating of averaging 85 or better.

2. *Current Trends Extended*

   The *Current Trends Extended* Investment scenario utilizes the existing priorities and initiatives of the Northeast Region to program future years of projects. The medium funding forecast of $25 million is assumed for this scenario. Current trends focus on 'between the white lines' roadway system investments, maintaining and improving upon the existing Alternative Transportation System, and beginning to address safety and congestion related projects as identified by the safety and congestion management systems.

3. *Broadening Goals & Objectives*

   This investment scenario considers how the medium funding forecast of $25 million can be utilized differently to address Long Range Transportation Plan goals and objectives. This scenario focuses on how moving funds from existing initiatives and trends to new initiatives would change outcomes across the various transportation needs.

4. *Advancing the LRTP*

   The *Advancing the LRTP* investment scenario assumes the high funding forecast of $32 million annually. This scenario shows the benefits of investing additional funds into the Northeast Region's transportation system to be able to achieve LRTP goals and objectives through investment in new initiatives and greater ability to invest in maintaining the current transportation system.

4.1 Allocation of Funding by Transportation System Category

Table 4.1 shows the assumed funding allocations for the four investment scenarios for each of five transportation system categories. The five system categories are: On-Road System, which includes roads, parking and bridges; Alternative Transportation System, including land and water transit, as well as trails; Safety initiatives; Congestion initiatives; and "New Policy-Directed Initiatives". The new initiatives reflect investments to specifically address recent priorities and policy directives, including decommissioning assets.

Certain assumptions apply to all investment scenarios and these are illustrated by the amounts assigned to the investment categories in *The Essentials* scenario.

- All scenarios include $0.3 million for safety-related sign work. This reflects the approximately $3 million of mandatory sign upgrades to meet retroreflectivity standards and continuation of a similar level of investment in future years to maintain the compliance of traffic signs in parks.

- All scenarios include $3.0 million for bridges. Modeling and historic funding show that this level of investment will continue to maintain NER bridges in current conditions (typically fair) and avoid any structurally deficient bridges.

- The funding amounts assumed for roads and parking systems is determined once allocations to all other categories are made. These funds are split with 80 percent of funding allocated to roads and 20 percent allocated to parking. The 80/20 split is based on the current ratio of total deferred maintenance for roadways versus that for parking facilities.

The funding allocation assumptions for each scenario are summarized as follows.

1. The funding allocation for *The Essentials* scenario assumes the medium funding forecast and covers the mandated sign reflectively program, sustaining existing critical ATS, and maintaining all bridges in acceptable condition. The remaining funds are allocated to roads ($14.4 million) and parking ($3.6 million). It should be noted that the funds available for roads and parking are considerably less than the identified needs ($21 million and $14 million, respectively) for those assets.

2. The funding allocation for the *Current Trends Extended* scenario assumes the medium funding forecast and generally reflects the current NER efforts, as presented in its current multiyear SCC (FY 12-FY 18) program, to increase investments in safety, congestion, and parking. The allocation approximates the proportion that each category represents of the overall NER transportation needs, with roadway systems receiving about 73 percent of the funding, ATS receiving about 18 percent, safety and congestion receiving a combined five percent of the funding, and four percent of the funding going towards policy-directed initiatives. The policy-directed funding might, for example, provide for non-motorized system projects consistent with the *A Call to Action* urban connections objective.

   With the exception of ATS, the amount of funding for each category is consistent with the spending assumed for the current multiyear plan. The $4.5 million for ATS is the amount planned for investments in all current ATS but it does not provide any funding for system expansions, new trails, or transit service pilots.

3. The *Broadening Goals & Objectives* scenario assumes the medium funding forecast and reallocates roadway and parking investment monies to other categories. The amount for safety and congestion projects is increased to about eight percent of available funding. A similar amount is allocated to new initiatives. This scenario also provides some funding ($0.5 million) to begin to address disposal/decommissioning of low priority assets, and adds another $1.0 million for other policy-directed initiatives.

4. The *Advancing the LRTP* scenario assumes the high funding forecast ($32 million). The extra funding allows safety and congestion needs to be fully funded, increases the amount available for roads and parking (although still well below full needs), provides funding to decommission all low priority assets, and provides $1.5 million more (than the previous scenario) to address policy-directed initiatives.

Table 4-1: Northeast Region Transportation System Investment Scenarios Funding

	On-Road System (Roads, Parking, Bridges)	Alternative Transportation System	Safety	Congestion	New Policy-Directed Initiatives
I. The Essentials Medium Funding $25 million	**On-Road System: $21.0M** Roads: $14.4M Parking: $3.6M Bridges: $3.0M	ATS: $3.7M	Signage: $0.3M		
II. Current Trends Extended Medium Funding $25 million	**On-Road System: $18.3M** Roads: $12.2M Parking: $3.1M Bridges: $3.0M	ATS: $4.5M	Signage: $0.3M Other Safety Needs: $0.4M	Congestion Needs: $0.5M	New Initiatives: $1.0M
III. Broadening Goals & Objectives Medium Funding $25 million	**On-Road System: $16.4M** Roads: $10.7M Parking: $2.7M Bridges: $3.0M	ATS: $4.5M	Signage: $0.3M Other Safety Needs: $0.8M	Congestion Needs: $1.0M	New Initiatives: $1.5M Decommission Assets: $0.5M
IV. Advancing the LRTP High Funding $32 million	**On-Road System: $20.0M** Roads: $13.6M Parking: $3.4M Bridges: $3.0M	ATS: $4.5M	Signage: $0.3M Other Safety Needs: $1.6M	Congestion Needs: $1.5M	New Initiatives: $2.5M Decommission Assets: $1.6M

4.2 Investment Outcomes

The following describes comparative outcome metrics of the various elements of the investment scenarios. Some outcome metrics, such as a pavement condition rating and bridge health index, have long been used as part of the NPS and NER asset management system. Other metrics, such as those applicable to transit systems, have only recently been implemented by the Northeast Region, as an outcome of its recent regionwide inventory and evaluation of alternative transportation systems. Some metrics, such as delay and vehicle hours traveled, used for congestion projects, lack the data necessary to effectively assess outcomes. Accordingly, the following discussion of the outcomes of the various investment scenarios supplements available quantitative metrics with some qualitative insights.

4.2.1 On-road System Investment Outcomes

The on-road system covers assets related to roads, bridges along those roads, and parking areas. The outcomes for the on-road system for the four investment scenarios are described below.

Investment Outcomes - Roads

One of the goals for roads is to maintain an average pavement condition rating (PCR) of 85 among the Northeast Region roadway system. Do in large part to substantial American Recovery and Reinvestment Act and other recent investments in roadways, the PCR for all NER roads is currently at 85.

HPMA modeling has determined that maintaining the 85 PCR would require an annual investment of about $21 million. None of the investment scenarios provides sufficient funding to meet this goal. As shown in Table 4-2, *Advancing the LRTP*, which assumes the high funding forecast, results in a PCR of 76. This is a decline of about 0.6 percent per year. Among the other scenarios, which assume the medium funding forecast, the PCR outcome ranges from 70 to 78. The best-case of those three scenarios (*The Essentials*) results in a PCR of 78, a decline in pavement condition of about 0.5 percent per year.

Table 4-2 also notes the percentage of road miles that would be in good or poor condition. All scenarios show a large decrease in the percentage in good condition and large increase in the percentage in poor condition.

Table 4-3 shows the outcome of the investment scenarios on deferred maintenance and Facility Condition Index (FCI). All scenarios result in an increase of deferred maintenance and a decline in FCI. The increases in deferred maintenance range from 45 percent to 80 percent over the existing backlog.

Table 4-2 Investment Outcome for Roads (FLHP Eligible), PCR and Condition

Funding Scenario	Outcomes (FY 31)			
	Annual Funding	Average PCR	Percentage in Good Condition	Percentage in Poor Condition
Current Need	$21M*	85	70%	7%
The Essentials	$14.4M	78	41%	18%
Current Trends Extended	$12.2M	73	36%	29%
Broadening Goals & Objectives	$10.7M	70	32%	37%
Advancing the LRTP	$13.6M	76	39%	22%

Source: HPMA modeling, September 2012.
* Amount required to maintain current condition. Typical investments have been roughly $15 million annually, but recent investments using non-reoccurring funding such as ARRA have enabled the roadway PCR to be improved to the current level.

Table 4-3 Investment Outcome for Roads (FLHP Eligible), Deferred Maintenance and Facility Condition Index

Funding Scenario	Annual Funding	Deferred Maintenance			Facility Condition Index		
		FY 12	FY 31	Change	FY 12	FY 31	Change
Current Need	$21M*	$292M			0.18		
The Essentials	$14.4M		$422M	$130M		0.26	0.08
Current Trends Extended	$12.2M		$487M	$195M		0.30	0.12
Broadening Goals & Objectives	$10.7M		$527M	$235M		0.33	0.15
Advancing the LRTP	$13.6M		$452M	$160M		0.28	0.10

Source: Analysis by BAH of 2011 FMSS data.
* Amount required to maintain current condition. Typical investments have been roughly $15 million annually, but recent investments using non-reoccurring funding such as ARRA have enabled large scale roadway maintenance and improvements improving the roadway to the current level.

<u>Investment Outcomes - Parking</u>

The PCR goal for parking is the same 85 PCR as for roads, but unlike for roads, (which currently are at an 85 PCR) the condition of parking assets must first be improved from their current condition (a PCR of 68) and then maintained at an 85 PCR. HPMA modeling has determined that an average annual investment of $15 million is required to achieve the goal.

None of the investment scenarios provide sufficient funding to meet the PCR goal for parking. The funding scenarios provide only between 14 percent and 21 percent of the annual need. The outcome as measured by PCR is shown in Table 4-4. The largest investment occurs with *The Essentials* scenario. It results in a PCR of 56, an annual decline of about 0.9 percent.

Table 4-4 Investment Outcome for Parking, PCR and Condition

Funding Scenario	Outcomes (FY 31)			
	Annual Funding	Average PCR	Percentage in Good Condition	Percentage in Poor Condition
Current Need	$15M*	68	15%	24%
The Essentials	$3.6M	56	14%	58%
Current Trends Extended	$3.1M	53	12%	64%
Broadening Goals & Objectives	$2.7M	51	11%	67%
Advancing the LRTP	$3.4M	55	13%	60%

Source: HPMA modeling, September 2012.
* Amount required to achieve 85 PCR. Amount required to maintain current conditions is $7.5M. Typical investments have been less than $2 million annually.

Table 4-5 shows the outcome for deferred maintenance and FCI. As with roads, the deferred maintenance increases and the FCI worsens for all scenarios. The relative change is considerably larger for parking than for roads. The increase of deferred maintenance ranges from 128 percent to 150 percent. In all cases, the FCI falls from an average of “poor” to “serious”.

Table 4-5 Investment Outcome for Parking, Deferred Maintenance and FCI

Funding Scenario	Annual Funding	Deferred Maintenance			Facility Condition Index		
		FY 12	FY 31	Change	FY 12	FY 31	Change
Current Need	$15M*	$126M			0.23		
The Essentials	$3.6M		$287M	$161M		0.53	0.30
Current Trends Extended	$3.1M		$305M	$179M		0.56	0.33
Broadening Goals & Objectives	$2.7M		$315M	$189M		0.58	0.35
Advancing the LRTP	$3.4M		$295M	$169M		0.55	0.32

Source: Analysis by BAH of 2011 FMSS data.
* Amount required to achieve 85 PCR. Amount required to maintain current conditions is $7.5M. Typical investments have been less than $2 million annually.
FCI < 0.10 = “Good” condition. FCI > 0.10 and ≤ 0.15 = “Fair” condition. FCI > 0.15 and ≤ 0.50 = “Poor” condition.
FCI > 0.50 = “Serious” condition.

Investment Outcomes - Bridges

The goal for the bridge assets is a Health Index (HI) of 0.92 and all bridges in good condition. The funding requirement to achieve these goals is estimated to be $10 million annually. At the present time the bridges have an HI of 0.86, and the only bridge in serious condition is currently programmed for improvements and is under design.

Each of the four investment scenarios includes an investment in bridges averaging $3 million annually. This amount is expected to slightly degrade the current health index to 0.82, but will be sufficient to prevent any bridges from becoming structurally deficient.

4.2.2 Alternative Transportation Systems Investment Outcomes

As shown in Table 4-6, the Northeast Region currently has 27 ATS transit services or other types of multipassenger visitor transportation systems; provided by a variety of service operators. Based on an analysis of the current multiyear program, the annual capital cost to sustain these existing ATS services is $3.7 million. Another $7.2 million annually is programmed to enhance and expand existing transit systems and trails, with $0.9 million of that for bus and ferry systems that provide the only access to a site.

The Essentials scenario has funding ($3.7 million) for ATS sufficient to maintain existing ATS services. The other scenarios include the additional $0.9 to enhance the critical-access ATS. The outcome of the other three scenarios is that all existing services are sustained. Of course, the Northeast Region would committee to monitor the services over time to make sure they are operating effectively and it is reasonable to expect some modifications to routes and schedules in the future. None of the scenarios provide funding for expansion of existing alternative transportation systems or funding for new systems.

Table 4-6: Existing Northeast Region Alternative Transportation Systems

Park	ATS	Operator	Service Type
Acadia NP	Island Explorer	Public Transit Agency	Public Transit
Adams NHP	Adams Trolley	NPS Contractor	Shuttle Service
Allegheny Portage Railroad NHS	Van Tours	NPS	Interpretive Tour
Boston Harbor Islands NRA	Island Ferries	Public Transit Agency	Commercial Passenger Ferry
Boston NHP	Charlestown Water Shuttle	Public Transit Agency	Public Passenger Ferry
Cape Cod NS	Coast Guard Beach Trams	NPS	Shuttle Service for Restricted Access Area
Cape Cod NS	Provincetown Shuttle	Public Transit Agency	Public Transit
Cape Cod NS	FLEX	Public Transit Agency	Public Transit
Colonial NHP	Historic Triangle Shuttle	Public Transit Agency	Shuttle Service
Eisenhower NHS	Eisenhower Shuttle	NPS Contractor	Shuttle Service for Restricted Access Area
Home of Eleanor Roosevelt NHS	Val-Kill Tram	NPS Contractor	Mobility Service
Fire Island NS	Island Ferries	Private	Commercial Passenger Ferry
Fort McHenry NM & HS	Charm City Circulator	Regional Transit	Public Transit
Gateway NRA	Sandy Hook Ferry	Private	Commercial Passenger Ferry
Gateway NRA	Riis Park Ferry	Private	Commercial Passenger Ferry
Gettysburg NMP	Freedom Shuttle	Regional Transit	Public Transit
Governor's Island NM	Island Ferry	State	Public Passenger Ferry
Home of FDR NHS	Roosevelt Ride	NPS Contractor	Shuttle Service
Home of FDR NHS	FDR Tram	NPS Contractor	Mobility Service
Johnstown Flood NM	Lakebed Tours	NPS	Interpretive Tour
Johnstown Flood NM	Path of Flood Tours	NPS	Tour
Lowell NHP	Electric Trolley	NPS	Feature Related to the Park Mission
Marsh Billings Roosevelt NHP	Full Circle Trolley	Regional Transit	Public Transit
Shenandoah NP	Camp Rapidan Tour	NPS	Shuttle Service for Restricted Access Area
Steamtown NHS	Live Steam	NPS	Feature Related to the Park Mission
Statue of Liberty NM	Liberty Ferries	NPS Concession	Commercial Passenger Ferry
Valley Forge NHP	Revolutionary Shuttle	NPS Contractor	Shuttle Service

Source: Tom Crikelair Associates, “Northeast Region of the National Park Service Alternative Transportation Management Systems Phase 1 Final Report”, September 2011.

4.2.3 Safety System Investment Outcomes

Until recently the Northeast Region had no management system in place to consistently address safety issues in the parks. Safety projects were done in response to specific park requests and primarily in an ad hoc and opportunistic manner as part of roadway projects. The Northeast Region now uses a Safety Management System (SMS) developed during the past couple of years.[17] That work identified scores of countermeasure projects to address traffic safety both proactively and reactively. Countermeasures are geared towards the 4 E's of transportation safety: Engineering, Enforcement, Education, and Emergency Response. Reactive strategies address an identified safety issue based on crash data. Proactive strategies have the potential to prevent or reduce crashes at sites, even though the location is not (yet) identified as a high crash site.

The cost for the countermeasure projects is estimated to average $1.6 million annually. At this rate all identified regionwide safety needs can be met within the first ten years of investing. This would allow for reinvestments to be made in the following ten years that would prevent assets from aging beyond their useful life, therefore continuing to ensure the safety of visitors, employees, and other users. In addition, there is a mandate to invest about $3 million to replace signs to meet new reflectivity standards. Taking into account the cyclical replacement of the signs results in an annualized estimate of $0.3 million for traffic signs.

Table 4-7 shows the outcomes of making these various investments in safety. Outcomes are shown for 10 years of investments because of the assumption that the same investments will be made in the following 10 years to maintain crash benefits or address new safety needs as the SMS gets updates. No additional crash reductions have been factored in to the outcomes beyond the first 10 years, but sustaining these investments is necessary to prevent a later increase in crashes.

All four scenarios address the mandate for upgrading signs to current reflectivity standards. *The Essentials* scenario addresses the signage needs only. The other three scenarios also enable countermeasure projects to be implemented.

The *Current Trends Extended* scenario provides $0.4 million annually towards reactive and proactive projects. The investments would be in the highest priority crash hotspots identified among the 16 routes in the CH2MHILL SMS study. All projects that address locations where there were fatalities would be implemented. Other projects would be expected to reduce severe crashes by about one-third and address about one-quarter of other crashes. The societal benefit, calculated using national standards for

17 SMS prepared by CH2MHILL for the Northeast Region. The initial focus on road crashes is being expanded to include trail and transit systems.

the type of accident prevented, would be $7.1 million. The benefit cost ratio of the $0.4 million investment over the 10 years is 1.8.

The *Broadening Goals and Objectives* scenario funding of $0.8 million allows all of the safety projects identified for the 16 routes with the highest number of crashes to be implemented and some projects in other parks. The societal benefit of investing $0.8 million over 10 years is $10.9 million, for a benefit cost ratio of 1.4.

The *Advancing the LRTP* funding of $1.5 million annually would address the entire safety program for the Northeast Region. The benefit cost ratio for the $16 million investment is 1.2.

Table 4-7: Investment Outcome for Safety

	Sign Reflectivity	Additional Annual Investment	Severe Crashes Reduced	PDO Crashes Reduced	Societal Benefits	Benefit Cost Ratio
The Essentials	Yes	$0				
Current Trends Extended	Yes	$0.4M	43	82	$7.1M	1.8
Broadening Goals & Objectives	Yes	$0.8M	73	155	$10.9M	1.4
Advancing the LRTP	Yes	$1.6M	128	296	$18.4M	1.2

NOTES: The number of Severe Crashes Reduced and Property Damage Only (PDO) Crashes Reduced are cumulative numbers over 10 years.

The societal benefit data in Table 4-7 show that there is a declining rate of return for later projects. This is because it is assumed that the initial projects funded would be those of the highest value, that is, those that reduce the most crashes for the least investment. In fact, the benefit cost ratio for the additional $1.1 million in the *Advancing the LRTP* versus *The Essentials* scenario provides a benefit cost ratio of only 1:1. Nonetheless, it is important to understand that that calculation is for reactive projects only and that additional, but unquantified, benefits related to visitor experience and resource protection could be realized through the implementation of proactive projects.

4.2.4 Congestion System Investment Outcomes

The Northeast Region developed a Congestion Management System (CMS) in 2010 to identify potential congestion projects to mitigate hot spots and develop a method for evaluating those projects. The study looked at 25 parks in the Northeast Region. The 25 parks evaluated account for some 90 percent of NER visitation, and include all parks which noted some congestion issues in response to a regionwide survey.

The findings from the study identified a variety of congestion mitigation project needs, averaging about $1.5 million annually. Many are small projects involving wayfinding, signage, and minor traffic control management. Other potential large projects were identified but many could not be definitively justified due to a lack of supporting data. Accordingly, a primary CMS need is for “enabling” projects to implement data systems at some parking areas, entrance stations, and trails. These projects would also enable monitoring of outcomes of a project. Similar to the enabling projects, a general need for preliminary studies was identified. These studies might be safety audits of pedestrian crossing locations or charettes to better define initial ideas about more in-depth congestion mitigation projects.

Until data monitoring systems and practices are implemented, it is not possible to quantify many of the typical congestion metrics, most of which are related to delay. The investment scenario outcomes summarized in Table 4-8 instead are based simply on the number and type of project — or congestion hot spot — that the various funding allocations would address.

Table 4-8: Investment Outcome for Congestion

	Annual Investment	Enabling Projects	Mitigation Projects (Small)	Mitigation Projects (Large)	Studies
The Essentials	$0	0	0	0	0
Current Trends Extended	$0.5M	15	25	2	25
Broadening Goals & Objectives	$1.0M	15	44	5	35
Advancing the LRTP	$1.5M	15	71	10	45

NOTE: Average project costs assumed to be $75,000 for enabling projects, $250,000 for small mitigation projects, $1,000,000 for large mitigation projects, and $25,000 for studies.

The *Advancing the LRTP* scenario funding of $1.5 million annually addresses the entirety of the anticipated congestion project needs. It covers 15 enabling projects to install data systems at entrances stations, parking areas and trails; 71 small projects such as turn lanes, traffic signal upgrades, minor parking expansions, and 10 large projects such as new trails or transit services. In addition, 45 preliminary study efforts would be funded. The number of projects, including studies, averages about three per year.

The *Broadening Goals and Objectives* scenario funding of $1.0 million annually addresses all of the enabling projects, half of the large projects and about 60 percent of the small projects.

The *Current Trends Extended* scenario funding of $0.4 million annually addresses all of the enabling projects, 35 percent of the small projects, and only two large projects.

4.2.5 Policy-Directed Initiatives Investment Outcomes

The Northeast Region's current transportation investment strategies include such things as a data-driven prioritization of roadway, bridge, and parking projects; prioritization of investments in historic assets; implementation of initial safety and congestion projects; decommissioning parking assets; and substantial support for trail and transit projects. These strategies are consistent with many aspects of current policies such as those put forth in *A Call to Action* and the *Capital Investment Strategy*.

Three of the investment scenarios include funding for projects specifically related to new policy initiatives. The funding amounts, ranging from $1.0 million to $4.1 million would advance these new initiatives.

<u>Investment Outcomes: Decommissioning</u>

The *Capital Investment Strategy* highlights decommissioning of low priority assets as an important strategy in response to the gap between needs and funding available for roads and parking. The *Broadening Goals and Objectives* scenario provides $0.5 million annually for decommissioning and the *Advancing the LRTP* scenario provides $1.6 million annually.

The Northeast Region has more than 250 acres of roads and parking that are in Optimizer Band 5.[18] The cost of decommissioning a road or parking asset can vary considerably depending on the level of restoration of the land. On one hand, the cost may be negligible if it is possible to simply stop maintaining a roadway and, say, allow it to be used only by hikers. On the other hand, the cost can be extraordinarily high if, for example, it is desired to restore a historic trace presently covered by a roadway. A realistic planning estimate is $125,000 to $275,000 per acre to decommission roads and parking. The lower range reflects a standard restoration that would restore the facility by removing six inches of pavement and replacing it with top soil and native vegetation and plants. The upper range reflects an enhanced restoration that would restore the facility by removing 12 inches of pavement and replacing it with top soil and native vegetation including plants and trees. Based on those assumptions, the annualized need for decommissioning transportation assets ranges from approximately $1.6 million to $3.5 million.

For the purposes of this assessment, a unit cost of $125,000 per acre is assumed. With this assumption the $1.6 million in funding provided by the *Advancing the LRTP* scenario would cover the decommissioning of all Optimizer Band 5 roadway and parking assets.

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18 Based on 2011 FMSS data analysis by BAH and VHB. Optimizer banding of assets is a method for prioritizing investments in assets. Assets are designated with optimizer band values of 1, 2, 3, 4 or 5 based on their FCI and the importance of the asset to the park. Optimizer Band 1 represents the highest priority assets while Optimizer Band 5 represents the lowest.

The financial benefits of decommissioning include the savings in capital investments and annual operations and maintenance. The HPMA modeling of funds necessary to sustain road and parking assets at an overall PCR of 85 includes about $2 million annually invested in Optimizer Band 5 road and parking assets. The savings in operations and maintenance costs are more difficult to quantify on a regional level since presumably current O&M expenditures on Optimizer Band 5 assets are proportionally less than on other assets. For the purposes of the assessment of decommissioning assets a conservatively low savings of $1,000 per acre in O&M is assumed. This equates to less than $10 per parking space annually and less than $1 per linear foot of road miles.

Table 4-9 shows that decommissioning has a positive financial benefit/cost return. An additional outcome would be a decrease in the deferred maintenance since Optimizer Band 5 road and parking assets account for about five percent of the deferred maintenance total for those assets.

Table 4-9 Investment Outcome for Decommissioning

Investment Scenario	Funding (20 Years)	Acres of Road/Parking Removed (20 Years)	Avoided Capital Investment (20 years)	Minimum Annual O&M Savings
The Essentials	$0	0	$0	$0
Current Trends Extended	$0	0	$0	$0
Broadening Goals & Objectives	$10M	80	$13M	$80,000
Advancing the LRTP	$32M	250	$42M	$250,000

Investment Outcomes: Other Policy-Directed Initiatives

The investment scenarios (other than *The Essentials*) provide annual funding of $1.0 million to $2.5 million for projects that advance new public policy initiatives. This funding could be used in a variety of ways. It might be used to construct new trails to connect to urban communities, provide new or expanded transit access and mobility, or be used to adapt a roadway or parking asset to anticipated climate change impacts.

Because the monies could be invested in many ways there are no precise outcome metrics applicable the additional funding for policy-directed initiatives. Among the simplest comparisons are looking at potential multimodal projects and this comparison is summarized as follows:

- The *Current Trends Extended* scenario provides an annual average of $1.0 million. Based on the current CRV and trail inventory data, this investment over 20 years could provide about 25 miles of new trail connections. There are currently about 156 miles of inventoried transportation trails in the Northeast Region. Alternatively, the $1.0 million is about 27 percent of the $3.7 million need to sustain current ATS services in the Northeast Region and could be used to expand current systems or pilot and implement new systems.

- The *Broadening Goals and Objectives* scenario provides an annual average of $1.5 million. This investment over 20 years could be used to construct about 35 miles of trails. Alternatively, $1.5 million represents an increase of about 40 percent over the $3.7 million need to sustain current ATS services available for expanded or enhanced ATS.

- The *Advancing the LRTP* scenario provides an annual average of $2.5 million which equates to about 60 miles of trails or an increase of about 68 percent over current funding needs for ATS in the Northeast Region.

4.3 Overall Findings of Investment Scenario Analyses

The funding outlook — when compared to regionwide needs — underscores the importance of investing every dollar wisely and ensuring that investment decisions are supported by good data and sound planning. There is a significant gap between the annual needs for capital investment in transportation and the funding forecasted to be available.

The annual need for capital investments in Northeast Region transportation assets is estimated to be about $65 million (2012 dollars) for all NER transportation assets. These needs are related to on-road systems (69%), followed by transit and water systems (25%) and safety and congestion needs (3% each). This does not factor any additional, direct costs associated with visitor experience enhancements, climate change implications, sustainability initiatives, resource restoration needs, or decommissioning of assets.

The forecasts of potential transportation funding to the region identified low ($18 million), medium ($25 million), and high ($32 million) funding scenarios. They provide 28 percent, 38 percent and 49 percent, respectively, of the identified need. The annual funding gap for the three forecasts range from $32 million to $45 million.

There is also a gap of approximately $4 million between the annual needs for operations and maintenance (O&M) and spending. The O&M funding shortfall undermines the effectiveness of an asset management plan and poses yet another challenge to the Northeast Region when planning for future projects and investments.

Table 4-10 summarizes the outcomes of the four investment scenarios tested. Under the medium (most likely) funding scenario none of the performance metrics established for roads, bridges, and parking assets are achieved. In fact, if the monies are allocated proportionately across transportation asset needs, the condition of the portfolio across all asset types would deteriorate. Even if the entirety of the funding were focused on on-road systems at the expense of everything else, while the funding identified could achieve the performance goal for roads, it could only maintain bridges at their current condition and parking would continue to deteriorate.

The general outcomes under the medium (most likely) funding scenario are as follows.

- Forecasted funding is needed exclusively toward the goals of asset management within the *Capital Investment Strategy* and limit the region's ability to advance other goals and objectives, in particular in the areas of:
    - Mitigating safety and congestion issues
    - Decommissioning non-essential assets
    - Enhancing visitor information systems and multimodal options, and
    - Resource protection/restoration

Table 4-10 Summary of Investment Scenario Outcomes

	Road Systems (Roads, Parking, Bridges)	Alternative Transportation Systems	Safety	Congestion	New Policy-Directed Initiatives
I. The Essentials Medium Funding $25 million	**On-Road System** Roads: PCR 78, 18% Poor Parking: PCR 56, 58% Poor Bridges: HI 0.82, None Structurally Deficient	Maintain Existing ATS	Reflectivity Program No countermeasure projects		
II. Current Trends Extended Medium Funding $25 million	**On-Road System** Roads: PCR 73, 29% Poor Parking: PCR 53, 64% Poor Bridges: HI 0.82, None Structurally Deficient	Maintain Existing ATS Enhance Existing Critical Access ATS	Reflectivity Program 4% fewer severe crashes 1.8 B/C ratio	27 Mitigation projects 15 Enabling projects 25 Studies	**New Initiatives** $1.0M annually
III. Broadening Goals & Objectives Medium Funding $25 million	**On-Road System** Roads: PCR 70, 37% Poor Parking: PCR 51, 67% Poor Bridges: HI 0.82, None Structurally Deficient	Maintain Existing ATS Enhance Existing Critical Access ATS	Reflectivity Program 6% fewer severe crashes 1.4 B/C ratio	49 Mitigation projects 15 Enabling projects 35 Studies	**Decommissioning** Remove 80 acres, >$3M savings **New Initiatives** $1.5M annually
IV. Advancing the LRTP High Funding $32 million	**On-Road System** Roads: PCR 76, 22% Poor Parking: PCR 55, 60% Poor Bridges: HI 0.82, None Structurally Deficient	Maintain Existing ATS Enhance Existing Critical Access ATS	Reflectivity Program 8% fewer severe crashes 1.2 B/C ratio	81 Mitigation projects 15 Enabling projects 45 Studies	**Decommissioning** Remove 250 acres (all), >$12M savings **New Initiatives** $2.5M annually

- Forecasted funding severely limit the region's ability to advance the policy initiatives of the *A Call to Action*, in particular in the areas of:
    - Broadening non-motorized access options
    - Improving connections to urban parks and under-represented populations
    - Enhancing visitor information systems and the use of technology
    - Resource protection/restoration, and
    - "Greening" of park operations.
- It follows that this same forecasted funding severely limits the region's ability in meeting national policy initiatives and advancing the goals and objectives of the *Long Range Transportation Plan*, especially in the areas of:
    - Broadening non-motorized access options
    - Enhancing visitor information systems
    - Resource protection/restoration, and
    - "Greening" of park operations.
- Advancing the goals and objectives of this Long Range Transportation Plan, consistent with the *Capital Investment Strategy* and *A Call to Action*, will require a significant infusion of new revenue over the life of this LRTP. This Plan articulates how the Northeast Region would use more funding should it become available.

4.3.1 Strategies with Medium Funding

In general the investment scenario analysis suggests that the Northeast Region:

- Continue a strong focus of available funds on roads and parking, and integrate tiered performance metrics to classes of roads/parking
- Maintain bridges in current condition
- Fund high priority safety improvement projects
- Maintain mission critical and mission priority transit systems
- Accelerate decommissioning of non-performing assets
- Be opportunistic about all else

If the Northeast Region is likely to receive only $25 million in annual funding to support its transportation assets, these guidelines point to the funding being allocated generally as follows.

- $3.7 million for alternative transportation systems
- $1 million for safety and congestion projects
- $0.5 million for decommissioning
- The remainder ($19.8) million for on-road systems

Alternative Transportation Systems

The $3.7 million for alternative transportation systems would be sufficient to maintain the existing systems. Expansion of existing trail and transit systems and implementation of new systems would be done on an opportunistic basis as partnership opportunities arise or as one-time NPS funding became available. The prioritization of any expansions or new projects would be guided by the current policy initiatives such as *A Call to Action* and chosen projects would undergo a thorough validation of their likely benefits before any investment is made.

Safety and Congestion

Most of the $1 million for safety and congestion projects would go towards safety projects. The reflectivity signage project would be funded and safety hotspots would be addressed. Even though the full need of $1.5 million for safety projects would not be achievable, an investment of about one-third of that could achieve most of the benefits if focused on the highest crash locations. Some congestion enabling projects would be implemented, along with a few small projects. As with the safety projects, and all investments, the selected congestion projects would need to be carefully evaluated to ensure the most effective investment.

Decommissioning

The funding of $0.5 million for decommissioning roads and parking would be sufficient to decommission at least one-third of the Optimizer Band 5 road and parking assets. Perhaps more so than for other assets, validation of potential assets to decommission would ensure a high return on the investments. It should be relatively simple to identify low-cost opportunities for decommissioning and those OB5 assets requiring significant investments to keep them functional and safe. It should be noted that capital investment and O&M savings would be maximized if decommissioning projects were completed sooner rather than later.

On-Road Systems

The $19.8 million for road systems includes $3 million for bridges to maintain them at current conditions and to avoid any from becoming structurally deficient. The remaining funds would be allocated among roads and parking. The funding is not sufficient to maintain current conditions, but degradation is minimized by the compromises of allocating a higher percentage of the available funding to roadway systems and less to the other LRTP objectives. In addition, decommissioning of assets will reduce the total investment need and, by eliminating the assets in the poorest condition, help improve the overall pavement condition rating.

Because roadway systems will continue to require the majority of transportation funding, and because there appears to be little chance for the availability of sufficient funding to meet the goal metrics, consideration should be given to adjusting the metrics. For example, a goal of an 85 PCR for parking requires an investment of $14 million annually while a goal of a 70 PCR requires $8 million. Nevertheless, there does not appear to be funding sufficient to meet the lower overall target metric and thus potential roadway and parking projects will need to be prioritized based on their levels of use by visitors and by their importance to the mission of the park. This is consistent with the ongoing practice of the Northeast Region.

4.3.2 Opportunities with Additional Funding

Given the medium funding forecast of $25 million it is recommended that about 80 percent of the monies be allocated to on-road systems; that the existing ATS services be maintained and no new ATS projects pursued; and that modest amounts of money be dedicated to safety, congestion and decommissioning projects.

If additional funding were realized, the focus of the additional funding would shift towards projects other than on-road systems. Even with tiered performance metrics for various types of parking areas, some money should still be prioritized for parking projects to avoid an unsustainable increase in deferred maintenance and an extremely low service quality for visitors. However, the vast majority of additional funding could be used to implement safety projects and projects supporting new initiatives.

Decommissioning as many of the Optimizer Band 5 assets as possible would be a cost-effective means of using some additional funding, particularly one-time funding opportunities. Other opportunities include adapting transportation assets at risk of adverse climate change impacts and broadening opportunities to provide more transportation options and better connectivity with parks to current and potential visitors. Those mobility opportunities will likely involve many trail and other ATS projects, something that the Northeast Region has been able to pursue vigorously in the past but which is not practical in the future without funding above that assumed for the medium funding forecast.

4.4 Recommendations for Moving Forward

The assessment of the investment scenarios shows that as (constant dollar) funding for transportation declines from the base year amount of $35 million to the average of $25 million for the medium forecast there will need to be careful decisions made in allocating the reduced funding in the most effective manner. Not all objectives of the LRTP can be achieved to the extent desired. In some cases target metrics might have to be reduced. In other cases compromises may need to be made in prioritizing objectives. In all cases there needs to be a strong project validation effort to ensure maximum effectiveness of each investment.

The following ongoing and *future effort* recommendations are made for Northeast Region Long Range Transportation Plan. The recommendations are organized by the NER LRTP goals.

Manage Assets Wisely: Roads

- Accomplish goals of asset management
  - Continue to focus on high priority assets -- in particular primary roads that are used by at least 80% of park visitors.
  - Stay between the white lines – limit roadway project expenditures to the roadway surface itself, unless other work such as signage, roadside treatments, limited widening, or resource restoration are linked to a documented safety, visitor, or resource needs.
  - Incorporate safety, historic resource status, and congestion into project prioritization
  - Continue to validate HPMA modeled output to verify need and recommended treatment prior to programming projects.
  - Minimize design and supervision costs.
  - Assess risk and options to relocate, adapt, or decommission before investing in assets that have been identified as being vulnerable to the effects of climate change (severe weather, storm surges, erosion, and sea level changes, etc.).
  - Define and implement a data collection program to ensure that adequate data exists to prioritize road investments.

- Right-size Portfolio: Accelerate the decommissioning of duplicative or non-performing roadway assets.
  - Develop a transportation asset decommissioning/disposition plan for each park in the region for road assets and pilot plan at individual park(s).
  - Update HPMA model and FMSS databases to reflect this plan and ongoing re-optimization efforts.

- Establish new (lower) pavement performance metrics for lower classification and non-FLHP eligible roads.
  - Re-run and recalibrate pavement needs assessment, as required.

Manage Assets Wisely: Parking

- Accomplish goals of asset management
  - Continue to focus on high priority assets -- in particular visitor center parking lots and other mission critical parking areas.
  - Incorporate safety, historic resource status, and congestion into project prioritization
  - Continue to validate HPMA modeled output to verify need and recommended treatment prior to programming projects.

  - Minimize design and supervision costs.
  - Assess risk and options to relocate, adapt, or decommission before investing in assets that have been identified as being vulnerable to the effects of climate change (severe weather, storm surges, erosion, and sea level changes, etc.).
  - Define and implement a data collection program to ensure that adequate data exists to prioritize parking investments.

- Right-size Portfolio: Accelerate the decommissioning of duplicative or non-performing parking assets.
  - Develop a transportation asset decommissioning/disposition or right-sizing plan for parking facilities in each park in the region and pilot plan at individual park(s).
  - Update HPMA model and FMSS data bases to reflect this plan and ongoing re-optimization efforts.

- Establish new (lower) pavement performance metrics for parking lots (suggest an average PCR of 80 for high priority, mission critical facilities and no more than 70 for all the rest).
  - Complete and formally adopt a reclassification/stratification of parking assets within portfolio and re-optimize assets within the category
  - Re-run and recalibrate pavement needs assessment, as required.

Manage Assets Wisely: Road Bridges

- Seek to maintain bridges at current conditions / ensure that all structures provide safe access.
  - Continue to focus on high priority assets -- in particular focus on bridges on primary roads.
  - Incorporate safety, historic resource status, and congestion into project prioritization.
  - Minimize design and supervision costs.
  - Work with FHWA to validate appropriateness/update use of BHI performance metric.
  - Assess risk and options to relocate, adapt, or decommission before investing in assets that have been identified as being vulnerable to the effects of climate change (severe weather, storm surges, erosion, and sea level changes, etc.).

- Continue to validate the bridge management system recommendations prior to programming projects.
  - Work with FHWA to formulate a plan to train park staff on bridge maintenance needs and tracking activities.

- Right-size Portfolio: Accelerate the decommissioning of duplicative or non-performing bridge assets.

Manage Assets Wisely: Transit and Water Transportation

- Sustain critical access alternative transportation systems in good condition.
- Replace, restructure or decommission underperforming ATS.
- Continue focused investments in alternative transportation system enhancements that provide needed access options, advance connection to urban communities, reduce greenhouse gas emissions, or help achieve the Green Parks Plan -- where and when additional funding or sustainable partnerships have been identified.
- Use caution with respect to investing in pilot projects without a long-term financial plan.
- Define and implement a data collection and performance monitoring program to ensure that systems remain effective and viable.
- Engage is regional planning activities to leverage transit services and connections to parks by others (see below Ensure Safety, Access & Mobility)

Manage Assets Wisely: Non-Motorized Transportation

- Continue to focus on maintaining high priority transportation trail (including blueways) assets in good condition with priority based on visitor use and investments that address documented safety or visitor experiential needs.
- Minimize design and supervision costs.
- Improve non-motorized asset inventory and definition of priorities, especially as they relate to safety needs.
- Define and implement a data collection program to ensure that adequate data exists to prioritize trail investments and track performance.
- Engage is regional planning activities to leverage regional trail connections to parks by others (see below Ensure Safety, Access & Mobility)

Ensure Safety, Access & Mobility

- Fund high priority roadway safety improvements at those locations that are experiencing the highest occurrence of serious crashes.
  - Complete pilot safety assessments for trails and ATS facilities and incorporate recommendations into programming
  - Undertake appropriate pro-active safety investment strategies
  - Continue to work cooperatively with parks and partners to advance safety E’s: Engineering, Enforcement, Education, and Emergency Response

  - Define data needs and performance monitoring program to ensure that systems remain effective and viable.
- Carefully invest in proven technologies to improve operations.
- Exploit low cost opportunities to modernize wayfinding signage and other visitor information systems through ongoing investments in roads, parking, and alternative transportation systems.
- Consider the accessibility needs of all users with every transportation investment.
- Incorporate safety, historic resource status, and congestion into project prioritization.
- Incorporate urban demographics and accessibility goals into project prioritization.
- Advance strategies to ensure safety, improve access, and mitigate congestion in the parks and gateway communities through local (park leadership) engagement in regional planning activities, including:
  - Become active with the appropriate Metropolitan Planning Organization (MPO) or regional planning agencies.
  - Pursue Transportation Alternatives, Congestion Mitigation and Air Quality (CMAQ) Program other discretionary funding to improve safety, mitigate congestion, and/ or address gaps in non-motorized connections and between modes.

Enhance Visitor Experiences

- Deliver on the goals of Managing Assets Wisely and Ensure Safety, Access & Mobility to provide transportation facilities and services in a state of good repair to the broadest level of visitors.
- Carefully invest in proven technologies to provide travel information and improve visitor experiences and engagement within the park. In particular, exploit low cost opportunities to modernize wayfinding signage and other visitor information systems/amenities through ongoing investments in roads, parking, and alternative transportation systems.
- Encourage public/private partnerships in the deployment of mobile applications and interactive travel planning tools.
- Incorporate the protection of cultural and natural resources from adverse impacts from automobiles into project prioritization.
- Consider the accessibility needs of all users with every transportation investment.
- Define and implement a data collection program to ensure that adequate data exists to understand and assess visitor satisfaction/response to the transportation system and services through the routine schedule of visitor surveys or other means.

Protect Resources

- Maintain historic and culturally significant transportation assets in good condition (see Goal 1).
- Pursue Congestion Mitigation and Air Quality (CMAQ) Program funding to mitigate congestion or address gaps in non-motorized connections (see Managing Assets Wisely and Ensure Safety, Access & Mobility goals, above) to improve air quality and reduce greenhouse gas emissions.
- Assess risk and options to relocate, adapt, or decommission assets that have been identified as being vulnerable to the effects of climate change (severe weather, storm surges, erosion, and sea level changes, etc.) prior to investing in asset. Consider transportation asset's role in protecting adjacent cultural or historic resources as part of this assessment.
- Identify and catalog at the park level, critical concerns regarding wildlife crossings.
    - Identify and promote operational and/or low cost strategies to address these areas.
- Develop regional sustainability guidebook to provide leadership, educate and promote sustainable transportation and operations, incorporating such strategies as right-sizing portfolio, green road initiatives, wildlife operational strategies, etc.

Ensure Sustainable Operations

- Set programming priorities consistent with the Capital Investment Strategy and the goals and objectives of this LRTP.
- Establish performance metrics; define and implement a data collection program to ensure that adequate data exists to prioritize trail investments.
- Work with national and regional leadership to strengthen programming and accounting of operations & maintenance activities.
- Maintain and broaden partnerships and cooperative planning to fully integrate park service access needs at the community and regional levels.
- Provide the professional staff capacity at the regional level to effectively plan, execute, and monitor the overall transportation program.
- Track and report progress on regional goals and objectives through periodic updates of this Long Range Transportation Plan.

NORTHEAST REGION LONG RANGE TRANSPORTATION PLAN

Climate Change Subject Area Memorandum

Prepared for:

National Park Service

WASO Denver

12795 W. Alameda Parkway

P.O. Box 25287

Denver, CO 80225-0287

Prepared By:

Vanasse Hangen Brustlin, Inc.

351 McLaws Circle, Suite 3

Williamsburg, VA 23185-6316

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Table of Contents

1.0 INTRODUCTION

In order to develop a comprehensive long-range transportation plan the effects of climate change on national parks and their transportation systems must be considered. Climate change is associated with extreme changes in temperature and precipitation magnitude and duration, sea level rise and storm surge, and other extreme weather events. With the growing body of research surrounding climate change it is becoming more apparent that specific measures must be taken in order to prepare assets and resources for potential extreme climatic events.

There are two general approaches to addressing the issue of climate change: adaptation and mitigation. In order to adapt to climate change agencies should be investing in infrastructure that is designed to sustain the impacts of extreme weather events. Examples of such infrastructure may be longer and taller retaining walls, relocating infrastructure where possible, or using building materials that have greater tolerance for extreme weather such as flooding, storm surge, and heat. Mitigating climate change has to do with addressing the source of the problem. It is widely believed that greenhouse gas emissions are a major source of climate change. By taking measures to mitigate greenhouse gas production the impacts of climate change may be slowed. Transportation is a dominant source of greenhouse gas emissions[1]. Recent documents such as Executive Order 13514, the Department of the Interior's *Strategic Sustainability Performance Plan,* the National Park Service *Green Parks Plan,* the National Park Service *Climate Change Responses Strategy,* and the National Park Service *A Call to Action: Preparing for a Second Century of Stewardship and Engagement* contain goals and targets related to reducing GHG emissions from transportation.

This memorandum presents a sampling of policies, plans, and programs related to climate change mitigation and adaptation that should be considered in developing the Northeast Region Long Range Transportation Plan. It includes a discussion of some methods to assess vulnerability and risk to climate change and identifies Northeast Region transportation infrastructure which is vulnerable and at risk to projected sea level rise and storm surge.

[1] Environmental Protection Agency. "Sources of Greenhouse Gas Emissions." June 8 2012. Web. <http://www.epa.gov/climatechange/ghgemissions/sources.html>.

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2.0 SUMMARY OF GUIDANCE DOCUMENTS

The following summary provides an overview of current policies, plans, and frameworks under which the Northeast Region is addressing climate change in the Northeast Region (NER) Long Range Transportation Plan (LRTP). The recent increase in guidance directives emphasizes the acknowledgment of climate change and the need to address it through planning efforts.

Department of the Interior (DOI) Secretarial Order 3289 Addressing the Impacts of Climate Change on America's Water, Land, and Other Natural and Cultural Resources, September 2009

Secretarial Order 3289 established the Climate Change Response Council to increase the Department's scientific knowledge of climate change impacts and develop a response to the issue of climate change. It states *"The realities of climate change require us to change how we manage the land, water, fish and wildlife, and cultural resources and tribal lands and resources we oversee."* The order requires that all bureaus and offices consider climate change in long-range planning activities and mandates the establishment of Landscape Conservation Cooperatives (LCCs) to help provide direction and guidance to the Department of the Interior.

Executive Order 13514 Federal Leadership in Environmental, Energy, and Economic Performance, October 2009

Executive Order 13514 builds upon energy and environmental performance requirements outlined in Executive Order 13423 for federal agencies. Under Executive Order 13514, all federal agencies must: develop GHG emissions reduction targets for fiscal year 2020 (FY 20) relative to FY 08 baseline levels; submit a Strategic Sustainability Performance Plan that includes an evaluation of climate change vulnerabilities and risks to the agencies' operations; establish targets for low greenhouse gas (GHG) emitting vehicles, alternative fuel vehicles, and optimizing the number of vehicles in agency fleets; reduce vehicle fleet petroleum consumption by two percent annually through FY 20, using FY 05 as a baseline; and ensure 95 percent of contracts use environmentally friendly products and services as defined in the Executive Order.

DOI Strategic Sustainability Performance Plan, Released June 2011 with Annual Updates

Executive Order 13514 requires all Federal agencies to annually submit to the White House Council on Environmental Quality and the Office of Management and Budget a Strategic Sustainability Performance Plan that prioritizes actions based on a lifecycle return on investment strategy.

The DOI Strategic Sustainability Performance Plan outlines the Department's goals, strategies, and achievements in reducing GHG emissions and integrating sustainability into agency operations and decision making processes.

The DOI Strategic Sustainability Performance Plan (2011) identifies department goals related to (1) Greenhouse Gas Reduction, (2) Greenhouse Gas Inventories, (3) High-Performance Sustainable

Design/Green Buildings and Regional and Local Planning, (4) Water Use Efficiency and Management, (5) Pollution Prevention/Waste Reduction, (6) Sustainable Acquisition, (7) Electronic Stewardship and Data Centers, and (8) Agency Innovation.

The Plan also outlines Department policy for identifying the return on investment for (1) Economic Lifecycle Cost; (2) Social Costs and Benefits; (3) Environmental Costs and Benefits; (4) Mission-Specific Costs and Benefits, including Asset Priority Index; (5) Operations and Maintenance and Deferred Investments; and (6) Climate Change Risk and Vulnerability.

National Park Service Climate Change Response Strategy, September 2010

As part of its response to DOI Secretarial Order 3289, the National Park Service formally recognized climate change and called for action to address impacts in accordance with its mission to preserve natural and cultural resources for generations to come. The documentation is presented in four sections: science, adaptation, mitigation, and communication. Each section contains goals and objectives and emphasizes collaboration in both action and monitoring change. The National Park Service also plans to leverage its exposure to millions of visitors each year to educate the public on the potential impacts of climate change and how they can help mitigate these effects. The document acknowledges the uncertainty and lack of data in some areas, calling for further information gathering and analyses.

A Call to Action Preparing for a Second Century of Stewardship and Engagement, August 2011

This plan contains themes, goals, and actions for the National Park Service to achieve by 2016, the 100 year anniversary of the National Park Service. Goals and actions contained within *A Call to Action* are organized around four thematic areas: connecting people to parks, advancing the National Park Service education mission, preserving America’s special places, and enhancing professional and organizational excellence. Under the preserving America’s special places theme, *A Call to Action* has an action item to “Go Green” by reducing the NPS carbon footprint and doubling the amount of renewable energy produced by the National Park Service relative to 2009 levels.

- MANAGE the natural and cultural resources of the National Park System to increase resilience in the face of climate change and other stressors.
    - 23. GO GREEN- Reduce the NPS carbon footprint and showcase the value of renewable energy to the public by doubling, over 2009 levels, the amount of renewable energy generated within parks and used by park facilities.

Capital Investment Strategy

The National Park Service is in the process of developing and piloting a Capital Investment Strategy to help prioritize investments and ensure that the greatest impact can be made with available capital funds. The Capital Investment Strategy scores proposed project investments in four categories: Financial Sustainability, Visitor Experience, Resource Protection, and Health & Safety.

The current draft of the Capital Investment Strategy (CIS) scoring generally supports an approach to investments that is applicable to climate change related vulnerability of assets. The scoring for Financial Sustainability is weighted the highest, accounting for half of the potential maximum score. Some of the key objectives in the Financial Sustainability strategy are to build only what can be maintained, right-size the asset portfolio, reduce liabilities, and eliminate non-essential development in parks in order to emphasize the essential natural and cultural experience. This should lead to a careful review of assets that have been impacted by climate change events before they are restored, and a thoughtful evaluation of whether to allocate constrained capital funds to assets that are at high risk of adverse climate change impacts.

The current Capital Investment Strategy scoring formula is still in draft stage. Some elements of the scoring formula relate well to climate change considerations. For example, one of the most significant point factors in the Financial Sustainability scoring category is the optimizer band of the asset. The optimizer band values range from 1 to 5 with the band values of 1 or 2 indicating a high-priority asset for which there is a commitment by the park to maintain and thus protect any capital investment in that asset. Assets that are impacted by climate change, particularly when it results in decreased service life and increased operation and maintenance costs, would be less likely to be assigned high optimizer band values by parks. At the same time, there are some considerations related to climate change that are not strongly represented in the current CIS formulas. Notably, a project to decommission an asset would likely not score competitively until it had become a life/safety issue. In addition, there is an underlying issue with the fact that the CIS formula is used for assigning capital funding from annual allocations. Emergency Relief for Federally Owned Roads (ERFO) funding is typically used to reconstruct transportation assets after a storm event and the history of those expenditures is not directly tied into the CIS formulas.

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3.0 FORECASTED CLIMATE CONDITIONS AND IMPACTS ON TRANSPORTATION IN THE NORTHEAST

As explained by the National Park Service Director Jonathan Jarvis, "*The management implications for protecting species, biological communities, and physical resources within finite land management boundaries in a rapidly changing climate are complex and without precedent"*[2]*.* Projected changes in temperature, precipitation patterns, and sea level rise may affect park visitation and threaten the structural integrity of current transportation infrastructure.

Projected changes in climate may affect future park visitation rates by impacting transportation infrastructure and natural and cultural resources. The means by which visitors enter and exit the park are usually on designated transportation corridors. The transportation system is often used to view and experience the park recreationally and to provide access to cultural and natural resources. If these transportation corridors become inundated by sea level rise or storm surge, or are frequently damaged by storm events, the visitor experience is negatively impacted and park visitation may decline as a result.

Changes to the natural and cultural resources that attract millions of visitors each year may influence travel patterns within a park. Example effects of climate change on the cultural and natural resources within a park include range shifts of native species to higher altitudes, changes in water availability, loss of coastal resources, damage to historic cultural resources, and inundation of resources. For example, the anticipated submersion of a resource could increase visitation prior to the flooding if the event was a predicted occurrence. Alternatively, visitation could decrease in areas where natural resources are damaged or historic resources are destroyed. If these places of interest change as species and ecosystems begin to migrate or coastal resources become submerged, the transportation system will need to be updated accordingly. This shift may occur within and between parks in a region, as well as between regions.

It is important that the National Park Service account for these projected changes in the NER LRTP so that present day infrastructure investments are suitable for potential future climatic conditions. The climate projections presented below are largely from the United States Global Climate Change Resource Program's 2009 Report, *Global Climate Change Impacts in the US* as summarized by the Federal Highway Administration (FHWA)[3].

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[2] National Park Service, "NPS Response to Climate Change*"*. April 22, 2012. <http://www.nature.nps.gov/climatechange/response.cfm>.

[3] Federal Highway Administration, "Global Climate Change Impacts in the U.S.".
<www.fhwa.dot.gov/hep/climate/climate_effects/effects03.cfm>.

3.1 Temperature

It is predicted that throughout the Northeast Region average temperatures will increase over time and that this change will occur at a greater rate than previously experienced. Higher average temperatures are likely to result in a change in the duration of seasons and an increase in the number of extreme heat days. This warming trend could also result in a reduction in the duration and thickness of ice on water bodies and cause more precipitation to fall as rain instead of snow. The winter season is expected to be shorter, potentially up to half the current duration in the upper northeast states and reduced to only a few weeks in the southern portion of the Northeast Region. Potential implications of rising temperatures on Northeast Region transportation infrastructure include:

- Faster deterioration of some types of infrastructure including pavement and rail;
- Thermal expansion of bridge joints;
- Potential limitation of work times and length due to more high heat days. However, a later freeze date and earlier thaw date could result in a longer construction season;
- Need for increased refrigeration and cooling at transportation facilities;
- Reduction in the amount of salt and chemicals used on roads and bridges during the winter season for ice control.

Table 3-1 summarizes the annual and seasonal projections for the average temperature in the Northeast Region states over the rest of the 21st century. This table illustrates the historical baseline average temperatures, the “Near Term” projections, the “Mid-Century” projections, and the “End-of-Century” projections.

Table 3-1: Annual and Seasonal Projections for Temperature in the Northeastern U.S.

Northeast	Baseline Condition (°F)		Δ Temperature 2010-2029 Near-Term (°F)	2040-2059 Mid-century (°F)	2080-2098 End-of-century(°F)
Annual	47	Mean	2.5	3.8 - 4.8	5.4 – 9.0
		Likely	1.9 – 3.2	2.8 – 5.8	4.2 – 10.8
		Very Likely	1.3 – 3.8	1.9 – 6.8	3.0 – 12.5
Winter	24	Mean	2.8 – 3.0	4.0 – 5.4	5.9 – 9.3
		Likely	1.8 – 3.8	2.9 – 6.6	4.7 – 11.0
		Very Likely	0.9 – 4.7	1.8 – 7.9	3.5 – 12.8
Spring	45	Mean	2.0 – 2.2	3.5 – 4.1	5.0 – 8.1
		Likely	1.2 – 3.0	2.2 – 5.5	3.6 – 10.0
		Very Likely	0.4 – 3.8	0.9 – 6.8	2.3 – 11.9
Summer	67	Mean	2.3 – 2.5	3.7 – 4.8	5.2 – 9.4
		Likely	1.8 – 3.1	2.8 – 5.8	3.9 – 11.8
		Very Likely	1.3 – 3.7	1.8 – 6.9	2.7 – 14.1
Fall	50	Mean	2.5 – 2.7	3.9 – 4.8	5.3 – 9.1
		Likely	1.9 – 3.3	2.8 – 5.6	3.9 – 10.8
		Very Likely	1.2 – 3.9	1.8 – 6.5	2.5 – 12.8

Source: Federal Highway Administration, "Regional Climate Change Effects: Useful Information for Transportation Agencies," 2010. Tables 3-2 and 3-4.

Note: Changes in temperatures all measured relative to the baseline condition (1961-1979). Value ranges determined by the low and the high emissions scenarios. Likelihood is a reflection of the number of standard deviations that the value range encompasses.

3.2 Precipitation Change

Forecasts indicate an increase in the amount of precipitation in the form of rain or snow over the next century in the areas of the Northeast Region[4]. This means wetter winter months with a shift in precipitation from snow to rain and a shrinking winter season. The precipitation patterns are also likely to change in intensity, duration, and frequency with more rain falling in intense, brief events. The result is likely to be an increase in the number and severity of flooding events, scour, erosion, and concern for emergency evacuation in low lying areas. Monitoring during the years 1993 through 2008 show that annual mean precipitation has already risen by approximately seven percent in comparison to the values observed over the baseline timeframe of 1961-1979.

[4] Federal Highway Administration, "Regional Climate Change Effects: Useful Information for Transportation Agencies," 2010.

The risks and reactions being faced in transportation from increased precipitation include:

- Disruption of traffic due to prolonged rainfall events and subsequent flooding
- Increased number of crashes for all modes as a result of more frequent driving on wet pavement conditions
- Fog and reduced visibility endangering drivers, cyclists, pedestrians, and water transit, among others
- Flooding of low lying areas exacerbated by higher sea level
- Bridge scouring of waterway channels, pier foundation areas, abutment and embankments.
- Potential changes in drainage needs including sizing of culverts, the amount of crowning on roadways, and the elevation of bridges
- Increased debris on infrastructure, necessitating maintenance
- Reconsideration of design standards to withstand higher frequency and intensity events
- Need for redundancy in emergency evacuation routes
- Potential for increased wind damage and reconsideration of related structure design standards.
- Landslides and slope failure due to water soaked soils could increase, resulting in additional maintenance needs to clear impacted transportation facilities
- Change in maintenance needs as more precipitation falls as rain

Table 3-2 provides the seasonal precipitation changes projected for the Northeast Region states over the rest of the 21st century. This table illustrates the historical baseline average precipitation, the “Near Term” projections, the “Mid-Century” projections, and the “End-of-Century” projections.

Table 3-2: Projected Seasonal Precipitation Changes in the Northeastern U.S.

Northeast	Baseline Condition (inches)	Δ Precipitation			
			2010-2029 Near-Term (%)	2040-2059 Mid-Century (%)	2080-2098 End-of-Century (%)
Winter	9	Mean	6	8 - 11	11 - 17
		Likely	2 - 11	2 - 18	4 - 27
		Very Likely	(2) – 15	(4) - 26	(4) - 36
Spring	10	Mean	3	5 - 6	9 - 11
		Likely	(2) - 7	0 - 12	1 - 21
		Very Likely	(7) - 12	(5) - 17	(9) - 31
Summer	11	Mean	2	1 - 2	(1) -2
		Likely	(1) - 6	(6) - 7	(12) - 11
		Very Likely	(5) - 10	(12) - 14	(24) - 23
Fall	10	Mean	1 - 2	3	3 - 4
		Likely	(4) - 6	(3) - 9	(5) -13
		Very Likely	(10) - 11	(9) - 16	(15) - 23

Source: Federal Highway Administration, "Regional Climate Change Effects: Useful Information for Transportation Agencies," 2010. Tables 3-3 and 3-5.

Note: Changes in precipitation are all measured relative to the baseline condition (1961-1979). Value ranges determined by the low and the high emissions scenarios. Likelihood is a reflection of the number of standard deviations that the value range encompasses.

3.3 Sea Level Rise and Storm Surge

Sea level rise predictions on a regional scale contain a higher level of uncertainty as there are numerous factors that can influence the rate and amount of rise. Some of the influencing factors are interrelated and dependent on other natural courses of action such as erosion and sedimentation rates, ocean circulation and density of the water, and subsidence or uplift of either the ocean floor or adjacent land areas. The interaction of these factors and their effect on sea level rise at the local level has not been assessed. Overall, the average ocean surface elevations are expected to rise due to a combination of thermal expansion and melting polar ice. The Northeast Region is likely to experience a sea level rise six to eight inches higher than the global average of seven to 23 inches that is projected to be experienced by the Intergovernmental Panel on Climate Change (IPCC) for the end of the century[5]. However, recent studies predict a much higher increase in global sea level rise with projections ranging from 20 to 79 inches by 2100[6]. The rise will be accompanied by stronger storm surges at greater frequency, increased

[5] Federal Highway Administration, "Regional Climate Change Effects: Useful Information for Transportation Agencies," 2010.
[6] Ibid.

potential for flooding, and salt water intrusion in low lying areas[7]. Sea level rise may also jeopardize infrastructure at low elevations. The implications of sea level rise on park assets are further complicated by a lack of available elevation data for the multimodal transportation system.

Implications of a rising sea level include:

- Submersion of transportation infrastructure located in proximity to coastal shorelines
- Need to move docks and ancillary facilities
- Change in access and connectivity resulting in disruption to the overall transportation network
- Need for redundancy in emergency evacuation routes

[7] Federal Highway Administration, "Regional Climate Change Effects: Useful Information for Transportation Agencies," 2010.

4.0 SEA LEVEL RISE VULNERABILITY ASSESSMENT

The National Park Service Vulnerability Assessment Tool was developed by ICF International to analyze the vulnerability of all assets in coastal national parks to the threats posed by sea level rise. This Vulnerability Assessment Tool integrates data from the FMSS database with the United States Geological Survey (USGS) Coastal Vulnerability Index (CVI) methodology. CVIs have been calculated by the USGS for all coastal areas of the United States. The USGS provides the following description of the Vulnerability Index in a September 2002 project fact sheet (FS-095-02):

> *The USGS rating system classifies the data variables according to risk. A mathematical formula allows scientists to relate different types of data and to calculate an index value. This coastal vulnerability index (CVI) values yields a relative ranking of the possibility that physical change will occur along the shoreline as sea level rises.*

Coastal vulnerability index values are stated as 1, 2, 3, and 4, with an index of 1 representing low exposure to sea level change and an index of 4 representing a high level of exposure. As illustrated in Figure 4-1, the Vulnerability Assessment Tool relates the CVI exposure value to Sensitivity and Adaptive Capacity factors in order to determine whether assets are at Severe, High, Medium or Low risk.

- Sensitivity is determined by the condition ranking of the asset. Assets are evaluated and assigned a facility condition index value. These values are ultimately tied to a condition ranking. The ranks are Serious, Poor, Fair, or Good. Assets that are in a lower condition ranking are deemed more sensitive to the impacts of sea level rise.
- Adaptive Capacity is represented by the current replacement value (CRV) of the asset. Assets with high current replacement values are considered to be most challenging to adapt to sea level rise. Assets with lower CRVs are considered easier to adapt.

Figure 4-1: Vulnerability to Sea level Rise Categories for National Parks

Exposure = 1

Adaptive Capacity \ Sensitivity	1	2	3	4
1	M	M	M	H
2	L	M	M	M
3	L	L	M	M
4	L	L	L	M

Exposure = 2

Adaptive Capacity \ Sensitivity	1	2	3	4
1	M	H	H	S
2	M	M	H	H
3	L	M	M	H
4	L	L	M	M

Exposure = 3

Adaptive Capacity \ Sensitivity	1	2	3	4
1	H	H	S	S
2	M	H	H	S
3	M	M	H	H
4	L	M	M	H

Exposure = 4

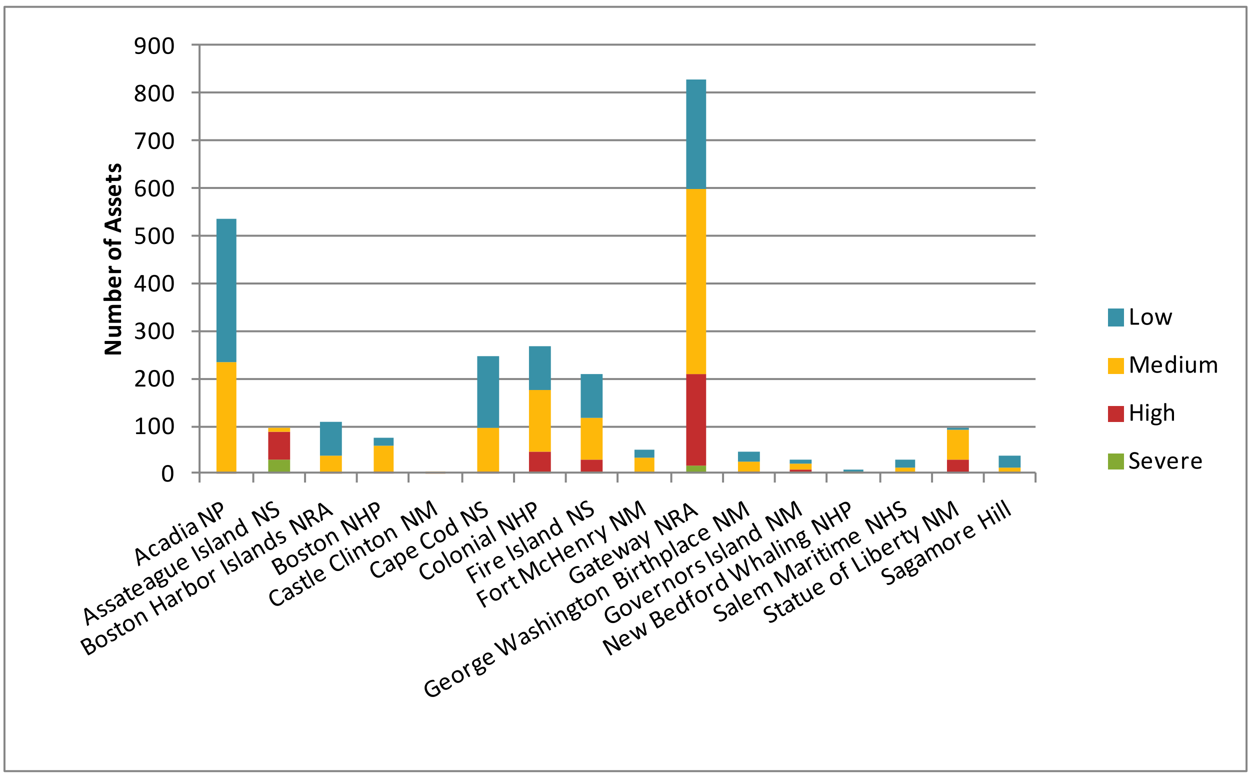
Adaptive Capacity \ Sensitivity	1	2	3	4
1	H	S	S	S
2	H	H	S	S
3	H	H	H	S
4	M	H	H	H

Source: ICF International, NPS Vulnerability Assessment Tool, 2011.

The initial National Park Service Vulnerability Assessment Tool evaluations included all assets in 30 parks in the Northeast Region (see appendix for complete list). Currently, the Vulnerability Assessment Tool is being refined as a pilot project at a sample of national parks in the Pacific West Region and the Southeast Region. The ultimate goal is to be able to use this tool and its results for planning in future long-range transportation plans. In order to do this, transportation specific assets would have to be culled out to provide an accurate representation of the vulnerable assets that can be aided by transportation funding.

The results of a review of the findings for the designated sample of climate change focus parks in the Northeast Region are presented in Figures 4-2 through 4-4 and Table 4-1. Figure 4-2 shows the number of assets with an API over 50 that are vulnerable to sea level rise based on the vulnerability assessment. There are approximately 420 such assets that were determined to be of high or severe vulnerability. Table 4-1 shows that there are some $2.6 billion of assets with a high or severe vulnerability. Figures 4-3 and 4-4 show for each park the current replacement value (CRV) of assets by vulnerability to sea level rise. Since the CRV related to Gateway NRA is several times that of the next highest park, Gateway NRA is excluded from Figure 4-4 to better illustrate impacts at the remaining parks.

Figure 4-2: Northeast Region Assets by Vulnerability to Sea Level Rise



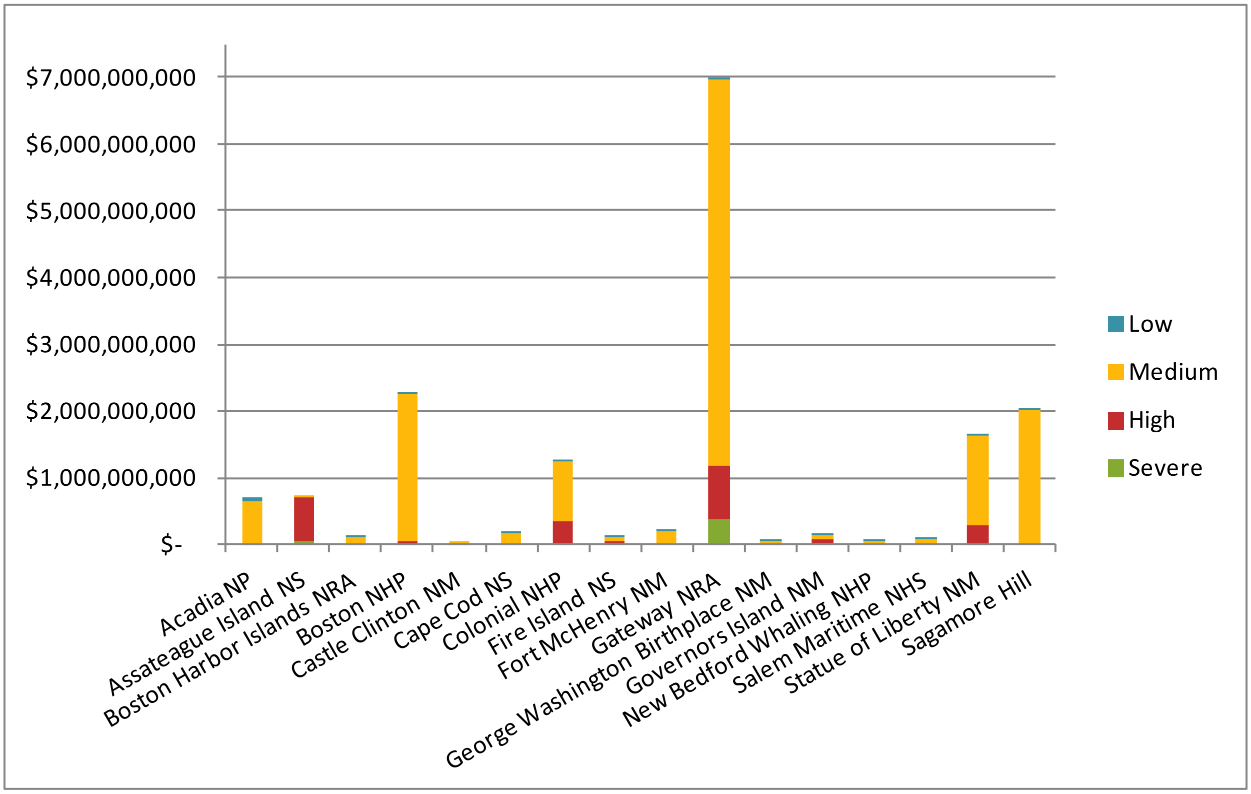
Source: ICF International, NPS Vulnerability Assessment Tool, 2011.

Table 4-1: Current Replacement Value by Vulnerability

	Number of Assets	Current Replacement Value
Low Vulnerability	1,047	$226,558,078
Medium Vulnerability	1,196	$13,641,607,823
High Vulnerability	366	$2,210,265,811
Severe Vulnerability	54	$453,409,302

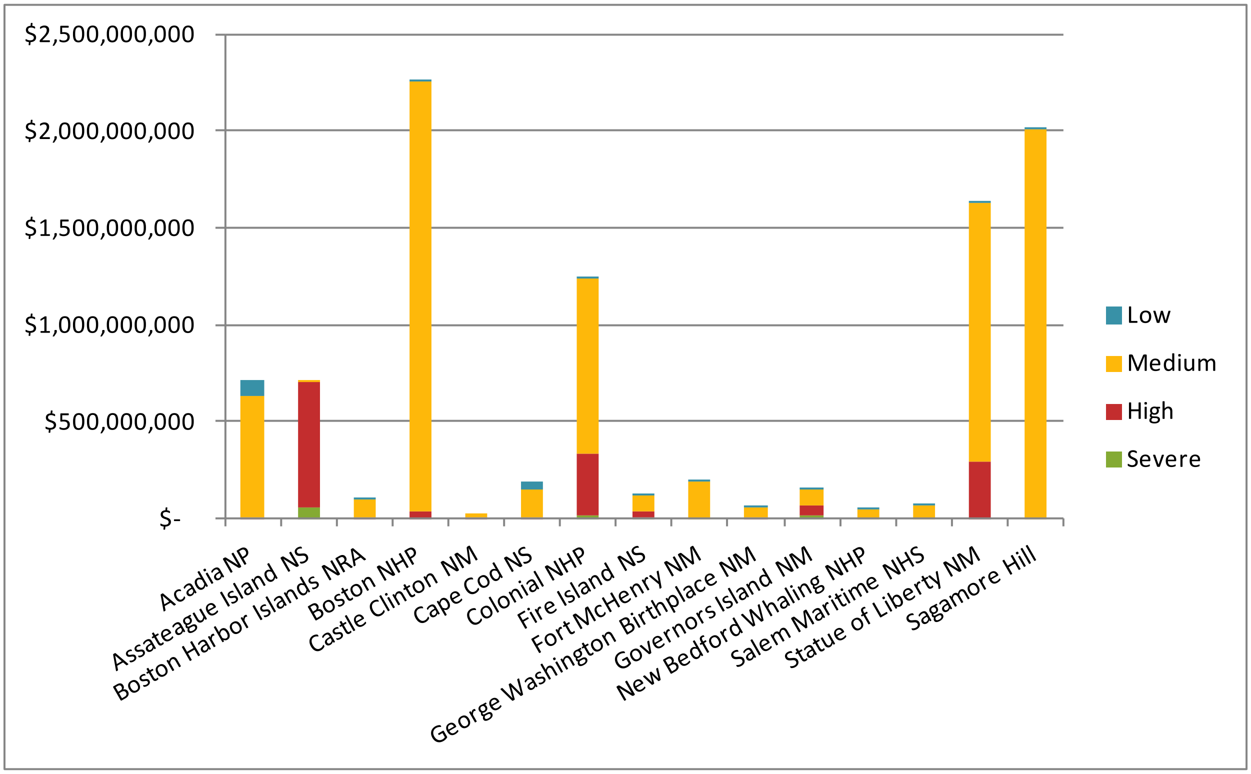
Source: ICF International, NPS Vulnerability Assessment Tool, 2011.

Figure 4-3: Northeast Region Assets by Current Replacement Value and Vulnerability to Sea Level Rise



Source: ICF International, NPS Vulnerability Assessment Tool, 2011.

Figure 4-4: Northeast Region Assets by Current Replacement Value and Vulnerability to Sea Level Rise, excluding Gateway NRA



Source: ICF International, NPS Vulnerability Assessment Tool, 2011.

5.0 SEA LEVEL RISE AND STORM SURGE RISK ASSESSMENT

The National Park Service manages a diverse system of assets which could be impacted by climate change. This section presents the results of a risk assessment using GIS mapping analysis by HDR of two potential climate impacts facing parks in the Northeast: sea level rise and storm surge. The GIS mapping illustrates the magnitude and probability of impacts due to sea level rise and storm surge. The magnitude of impacts can be observed in the land areas impacted and the reporting on the number of assets impacted. Probability can be observed in the elevation at which lands become inundated by the sea. Lower elevation lands are at a much higher probability of flooding. A detailed description of the methodology used to determine asset risk to sea level rise and storm surge can be found in the appendix.

Elevation data are based on one foot intervals, so two sea level rise scenarios were modeled: a one foot rise and a two foot rise. As discussed in the Sea Level Rise and Storm Surge subsection of this report, these scenarios are conservative estimates of sea level rise. Projected global sea level rise for the year 2100 could be as high as 79 inches (6.6 feet) and the Northeast Region is expected to experience an additional six to eight inch sea level rise (about 0.5 to 0.67 feet) over the global average[8]. An elevation change of 15 feet above current sea levels was used to model storm surge that might be associated with a Category 3 hurricane making landfall along the eastern seaboard based on online NOAA modeling[9].

This analysis did not take into account damage that may occur to asset foundations or roadway sub grades or bridges based on changes in tidal levels, which may further exacerbate damage from rising sea levels. It also did not account for potential damage to docks and air facilities since these data items were not available in a format appropriate for GIS analysis. The same sample of 15 coastal parks in the Northeast Region selected by the National Park Service was used for the risk analysis.

Of these parks, nine[10] have transportation assets that would be impacted by at least one of the sea level rise or storm surge scenarios. A total of 40 assets designated as 'Access Roads', 'Routes', and 'Parking Facilities' are very vulnerable to damage from a one foot sea level change. An additional 134 of these types of transportation assets fall within the one to two feet of the existing sea level and are identified as vulnerable. In addition, 54 building assets were identified as very vulnerable, and 135 were identified as vulnerable based on the potential one to two foot increases in sea level. For storm surges between 2 and 15 feet, a total of 541 transportation assets in the parks assessed are affected including 79 access roads, 172 routes, and 290 parking assets. Additionally, 215 buildings are impact by storm surge between 2 and 15 feet. Table 5-1 summarizes the results of the GIS Risk Analysis.

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[8] Federal Highway Administration, "Regional Climate Change Effects: Useful Information for Transportation Agencies," 2010.

[9] NOAA/National Weather Service, "Storm Surge Interactive Risk Maps," 2012. <http://www.nhc.noaa.gov/ssurge/risk/>

[10] No transportation asset data were available for New Bedford Whaling NHP, Governors Island NM, or Boston Harbor NRA. GIS data coverage was incomplete. Therefore, there may be additional facilities within these 15 parks that are vulnerable to changes in sea level that were not identified here.

Table 5-1: Northeast Region Transportation Asset Risk Assessment Results

	Transportation Assets				**Buildings**	**Grand Total**
	Access Roads	Routes	Parking	Total		
Assets at Risk to Sea Level Rise	**29**	**54**	**91**	**174**	**189**	**363**
0-1 feet	4	17	19	40	54	94
1-2 feet	25	37	72	134	135	269
Assets at Risk to Storm Surge						
2-15 feet	79	172	290	541	701	1242

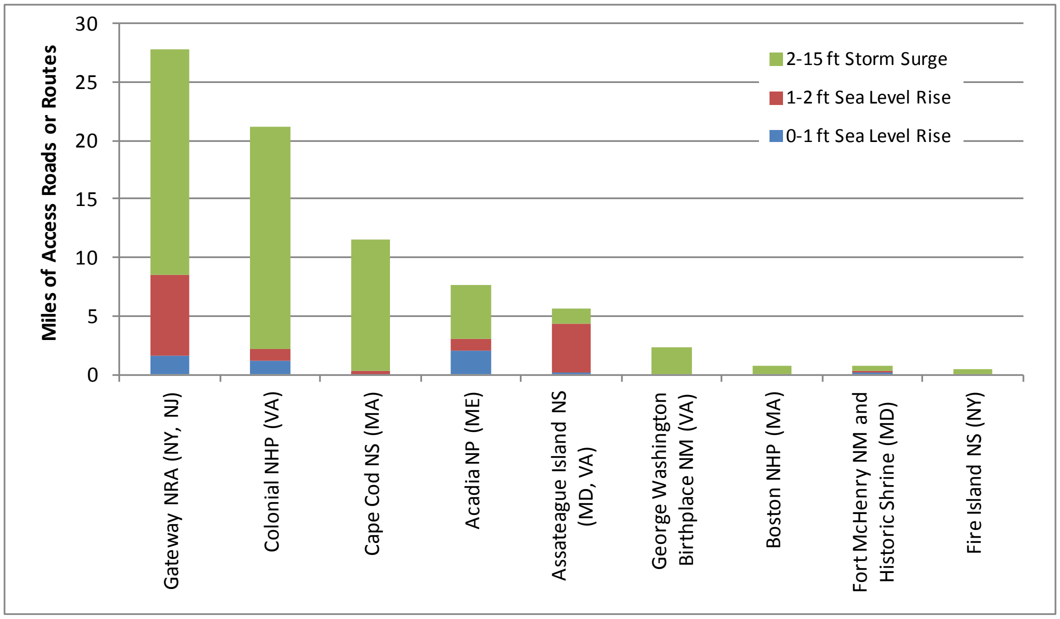
Note: The ranges of height shown for sea level rise and storm surge represent feet above current sea level.
Source: Sea Level Rise and Storm Surge Asset Mapping and Risk Assessment by HDR

Across all of the Northeast Region parks examined, Gateway National Recreation Area, Colonial National Historical Park, and Cape Cod National Seashore had the most miles of access roads and routes at risk from sea level rise and/or storm surge. Gateway National Recreation Area and Colonial National Historical Park also have the highest number of parking areas projected to be affected by sea level rise and storm surge along with Assateague Island National Seashore. Figures 5-1 and 5-2 illustrate the miles of access roads, routes, and parking areas vulnerable to sea level rise and storm surge by park. A detailed list of vulnerable transportation assets by park and maps showing the different sea level rise and storm surge scenarios in each park, are located in the appendix.

Assateague Island National Seashore, Fire Island National Seashore, Salem Maritime National Historic Site, and Gateway National Recreation Area are all primarily coastal wetland areas today. Based on the GIS analysis, these areas will be almost completely inundated with a one foot change in sea level. Over the coming years, if sea levels rise as predicted, the National Park Service may have to make some difficult decisions about the feasibility of maintaining any assets in these areas, or the need to abandon them. The potential for climate change in general, and sea level rise in particular, to have a significant impact in these parks should be carefully considered in all future investment decisions.

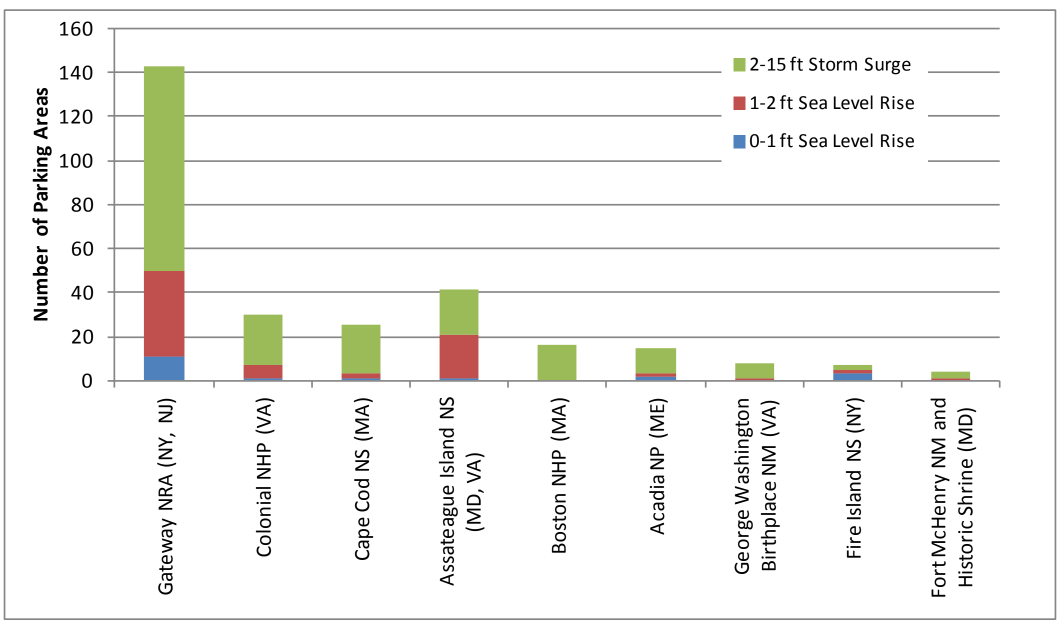
This analysis did not identify vulnerable transportation assets at the Statue of Liberty National Monument or Castle Clinton National Monument because data were not available on dock and marina facilities. Both of these park units would be impacted by a one foot sea level rise, and both would be partially inundated by a two foot sea level change. Because the Statue of Liberty National Monument is accessed by ferry, dock facilities and any future major repairs and or upgrades to these monuments should carefully consider the potential for future sea level rise and how to mitigate or adapt to future conditions.

Figure 5-1: Miles of Access Roads or Routes Vulnerable to Sea Level Rise and Storm Surge, by Park



Source: Sea Level Rise and Storm Surge Asset Mapping and Risk Assessment by HDR

Figure 5-2: Parking Areas Vulnerable to Sea Level Rise and Storm Surge, by Park



Source: Sea Level Rise and Storm Surge Asset Mapping and Risk Assessment by HDR

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6.0 CLIMATE ADAPTATION INITIATIVES, GOALS, AND STRATEGIES

The *Green Parks Plan* and the *Climate Change Response Strategy* both contain adaptation goals and objectives relevant to transportation. By identifying assets at risk, planners can make informed decisions on how best to address climate impacts through a number of different adaptation strategies.

6.1 Adaptation Initiatives

National Park Service is currently working with the U.S Fish & Wildlife service and the Office of Federal Lands Highway to develop a transportation management tool. This tool will help identify transportation infrastructure vulnerable to climate change and develop adaptation strategies to address those vulnerabilities. The National Park Service is also refining a climate change risk assessment tool through a pilot project at a number of national parks, and the NPS Inventory and Monitoring Program collects climate and natural resource data that can help identify and confirm climate trends. These data can then be incorporated into management plans. More information on each initiative is provided below.

NPS Integration of Federal Lands Management Agency Transportation Data, Planning and Practices with Climate Change Scenarios to Develop a Transportation Management Tool

The purpose of this effort is to develop a detailed tool to manage anticipated climate change impacts to the U.S. Fish & Wildlife Service and National Park Service transportation infrastructure in the Southeast Region. This is an ongoing study that will include identification, testing, and evaluation of current best practices for assessing climate change impacts to multimodal transportation infrastructure. This study will serve as a "test bed" for emerging approaches to identify vulnerable infrastructure and develop adaptation strategies. It will focus on transportation infrastructure in the Southeast Region, but its results can be applied nationally. The project will have a unique focus of studying the intersection of the impacts on environmental resources and transportation infrastructure. To date, National Park Service has identified over 65,000 assets nationally with a significant transportation component.

National Park Service Northeast Region Inventory & Monitoring[11]

There are four inventory and monitoring networks within the Northeast Region (Eastern River and Mountain Network, Mid-Atlantic Network, Northeast Coastal and Barrier Network, Northeast Temperate Network). Each network identifies concerns related to changes in temperature, precipitation, and sea level at limited geographic areas. In addition, inventories of wildlife and vegetation as well as water, air, land, and visitation are maintained as the "vital signs" of a park. Data collected helps identify the magnitude and rate of change of climate indicators in the Northeast Region.

[11] National Park Service, "Inventory & Monitoring in Parks (I&M), 2012. URL: http://science.nature.nps.gov/im/index.cfm

6.2 Climate Adaptation Goals and Objectives

The *Green Parks Plan* and the *Climate Change Response Strategy* both contain climate adaptation goals and objectives relevant to transportation. The Northeast Region LRTP should incorporate these goals and objectives into its framework. Tables 6-1 and 6-2 list relevant items from both plans.

Table 6-1: Green Parks Plan: Adaptation Goals Related to Transportation

Goal	Objective
Green Parks Plan	
Goal: Be Climate Ready and Climate Friendly The NPS will reduce GHG emissions and adapt facilities at risk from climate change.	Objective: The NPS will develop and implement guidance on adapting the location, structure, or function of park facilities in anticipation of climate change, including severe weather impacts.
Goal: Adopt Best Practices The NPS will adopt sustainable best practices in all facility operations	Objective: The NPS will use Environmental Management Systems as an implementation tool for the *GPP* and will integrate sustainability into all planning initiatives.
	Objective: The NPS will include applicable sustainability requirements in all new contracts where possible.
	Objective: The NPS will reduce storm water runoff from existing facilities and employ storm water best management practices in the design and construction of new facilities and major renovations.

Source: National Park Service, “Green Parks Plan”, 2012. URL: www.nps.gov/greenparksplan/downloads/NPS_2012_Green_Parks_Plan.pdf

Table 6-2: Climate Change Response Strategy: Adaptation Goals Related to Transportation

Goal	Objective
Climate Change Response Strategy	
Goal 2 Collaborate with partners to develop, test, and appropriately apply climate change models to NPS activities.	Objective 2.1: Identify and characterize the climate attributes and variables that are most important to park resources, infrastructure, and visitor experience.
	Objective 2.2: Characterize the locations and severity of change expected for key climate attributes.
Goal 3: Inventory and monitor key attributes of the natural systems, cultural resources, and visitor experiences likely to be affected by climate change.	Objective 3.2: Monitor, evaluate, and report the status and trends of park resources to facilitate adaptation planning.
	Objective 3.3: Develop criteria with other federal, state, and local partners and programs to measure and evaluate core concepts that may be used to direct adaptation strategies.
Goal 5: Incorporate climate change considerations and responses in all levels of NPS planning.	Objective 5.1: Complete guidance for anticipating, evaluating, and addressing climate change in planning products and identify resources needed to fully implement new planning guidelines.
	Objective 5.2: Incorporate the DOI adaptive management framework into routine planning to facilitate flexible responses to climate change as new information arises.
	Objective 5.4: Conduct scenario planning to explore the range of potential conditions that parks may experience and the possible consequences associated with particular actions.
Goal 6: Implement adaptation strategies that promote ecosystem resilience and enhance restoration, conservation, and preservation of park resources.	Objective 6.2: Develop methods to prioritize resources that are threatened by climate change using scientific assessments, policy, management capacity, and information from stakeholders.
	Objective 6.3: Collaborate to develop cross-jurisdictional conservation plans to protect and restore connectivity and other landscape-scale components of resilience.
Goal 7: Develop, prioritize, and implement management strategies to preserve climate-sensitive cultural resources.	Objective 7.1: Use the best available science to develop and apply a process to prioritize cultural resource adaptation projects that combine established management tools with newer methods, such as vulnerability assessments.

Source: National Park Service, "Climate Change Response Strategy," September 2010. URL: www.nps.gov/climatechange

Table 6-2 (continued): Climate Change Response Strategy: Adaptation Goals Related to Transportation

Goal 8: Enhance the sustainable design, construction, and maintenance of park infrastructure.	Objective 8.1: Consider climate change vulnerability assessments and scenarios in decision processes for project approval and funding.
	Objective 8.2: Collaborate with federal, state, and local partners and programs to identify sustainability and adaptation designs for planning, design, and construction documents.
	Objective 8.3: Inventory high-risk facilities, assets, infrastructure, and utilities service wide; determine priorities for projection and adaptation; and implement actions.
	Objective 8.4: Incorporate sustainable designs in new construction and substantial restoration or rehabilitation of facilities where feasible.
	Objective 8.5: Incorporate sustainability and climate change adaptation into the maintenance and operations of existing facilities and programs.
	Objective 8.6: Revise the Development Advisory Board (DAB) guidelines to require LEED (Leadership in Energy and Environmental Design) certification on all NPS projects.
Goal 15: Model and communicate sustainable practices that lead by example.	Objective 15.1: Demonstrate how the public can reduce the impacts of climate change in their own lives and in national parks by interpreting NPS sustainable practices including agency operations, facilities, and use of technologies.

Source: National Park Service, "Climate Change Response Strategy," September 2010. URL: www.nps.gov/climatechange

6.3 Climate Adaptation Strategies

There are many ways transportation infrastructure can be adapted to a changing climate. Climate adaptation strategies include strengthening an asset structurally, elevating an asset, building storm barrier system(s) to protect resources and reduce erosion, rehabilitation of the asset after a climatic event, and/or retrofitting an asset to better handle future climate conditions. Creating redundancies in an asset's function is also an example of an adaptation strategy. For example, the National Park Service could reroute existing connections or improve existing facilities to create redundant connections. Locating or relocating infrastructure to areas projected to be less impacted by climate change is also an example of an adaptation strategy. Abandonment of infrastructure, although often a difficult decision, in some cases makes the most economical sense over time. Consider a bridge that is repeatedly washed out and will be affected by rising sea level and storm intensity; continuing to spend limited available funds on its maintenance and operation may not be financially sustainable for the long term.

The long term financial sustainability of infrastructure investments will depend on selecting the appropriate adaptation strategy. Examples of adaptation strategies specific to transportation infrastructure from the *Transportation Research Board's Adapting Transportation to the Impacts of Climate Change State of the Practice 2011 Report* are described in Table 6-3 below.

Many of these adaptation strategies are costly to implement, but the cost of inaction is also high. Damages to Northeast Region parks in FY 04 and FY 05 related to storm events amounted to more than $50 million. These damages were primarily the result of Hurricanes Gaston and Ivan and are inclusive of all damage, not just that to the transportation system. Total storm damage funding for the region from FY 06 to FY 10 was approximately $5.7 million with slightly over $2 million requested in FY 06. The amount requested decreased to $78,500 in FY 07, rose to $424,822 in 2008 and then to $917,700 in FY 09, followed by a sharp increase in FY 10 of $2,285,616. When deciding on a particular adaptation strategy, it is important to look not only at the strategy's implementation cost, but also at the costs that could result from damages in the absence of adaptation planning and strategies.

Table 6-3 Adaptation Strategies for Transportation Assets

Climate Change Impact	Transportation Adaptation Strategies
Sea Level Rise	Protect Infrastructure with dikes and levees Elevate critical infrastructure Abandon or move coastal transportation system. Reduce or eliminate development in coastal flood plains by providing local or federal incentives or by legislative mandate. Provide good evacuation routes and operational plans
Heat Waves	Research on new, heat-resistant or resilient materials Replacement of bridge and highway expansion joints Longer runways to account for lower lift-off capacities Design changes to reduce stresses in rail lines More nighttime construction to avoid undue heat stress for construction worker with the added benefit of less traffic disruption
Increases Storm Intensity	Revise Federal Emergency Management Agency flood plain maps which are out of date Update hydrological storm frequency curves Develop new design standards for hydraulic structures, e.g., culverts and drainage channels Protect existing and vulnerable structures, e.g., bridge piers Better land use planning in flood plains Construction of storm retention basins for short, high intensity storms
Hurricane Intensity	Move critical infrastructure systems inland Build or reconstruct more robust and resilient structures Design for higher storm surges that progress further inland Strengthen and elevate port and harbor facilities

Source: Transportation Research Board. "Adapting Transportation to the Impacts of Climate Change; State of the Practice 2011," Washington, DC: Transportation Research Board, 2011.

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7.0 CLIMATE MITIGATION INITIATIVES, GOALS, AND STRATEGIES

In addition to climate adaptation, climate mitigation is also a priority for the National Park Service. Reducing GHG emissions in the transportation sector can play an important role in helping the National Park Service meet its overall energy and emissions reduction goals set in *A Call to Action Preparing for a Second Century of Stewardship and Engagement*, the *Green Parks Plan*, and the *Climate Change Response Strategy*.

7.1 Mitigation Initiatives: Climate Friendly Parks Program

The Climate Friendly Parks program is focused on greenhouse gas (GHG) emissions and air quality impacts. National Park Service units participating in the Climate Friendly Parks program receive technical support and guidance moving through a “milestone” process that includes completing a GHG inventory, hosting a climate workshop or training, and developing an action plan or comprehensive environmental management system. Action plans focus on energy usage, transportation management (including fleets and fuels) and waste management, as well as providing education on climate change to staff and visitors. Once an implementation plan is in place the park becomes a certified member of the program. To retain certification, parks must participate in ongoing activities such as implementing their plans and conducting follow up GHG inventories.

The Northeast Region of the National Park Service currently has 16 parks participating in the program with seven certified Climate Friendly Parks. All 16 parks involved in the Climate Friendly Parks program are listed in the appendix by milestone.

7.2 Mitigation Goals and Objectives

The recent National Park Service publication *A Call to Action Preparing for a Second Century of Stewardship and Engagement*, *Green Parks Plan*, and *Climate Change Response Strategy* all contain goals and objectives focused on climate mitigation. Under the theme “Preserving America’s Special Places,” *A Call to Action Preparing for a Second Century of Stewardship and Engagement* sets a goal to “Manage the natural and cultural resources of the National Park System to increase resilience in the face of climate change and other stressors.” Action 23 calls for the National Park Service to “Go Green – Reduce the NPS carbon footprint and showcase the value of renewable energy to the public by doubling, over 2009 levels, the amount of renewable energy generated within parks and used by park facilities.” Reducing GHG emissions from transportation will help achieve this goal.

Table 7-1 and 7-2 lists the goals and references applicable objectives from the *Green Parks Plan* and *Climate Change Response Strategy* related to transportation. These items should be incorporated into the Northeast Region LRTP.

Table 7-1: Climate Change Response Strategy: Mitigation Goals Related to Transportation

Goal/Target	Objective
Climate Change Response Strategy	
Goal 4 Use best available science to evaluate and manage GHG storage and emissions in national parks.	Objective 4.1: Develop and apply a scientifically valid, standardized approach for reducing the National Park Service's carbon footprint.
Goal 9 Substantially reduce the National Park System's carbon footprint from 2008 levels by 2016 through aggressive commitment to environmentally preferable operations.	Objective 9.1: Implement a service wide 2008 baseline inventory of greenhouse gas emissions that accounts for all National Park System activities within the parks and NPS activities outside the parks.
	Objective 9.2: Develop Climate Friendly Action Plans so that every park, park concession, and administrative office promotes energy and water conservation; supports alternative transportation, infrastructure, programs, and policies; and eliminates waste.
	Objective 9.3: Participate in the Department of the Interior's Carbon Footprint Project to develop and implement a unified greenhouse gas emission reduction program.
	Objective 9.4: Support the development and application of renewable energy and the use of renewable energy technology in a manner consistent with the NPS mission.
	Objective 9.5: Investigate the effectiveness, applications, and verification for using carbon offset programs in NPS operations and visitor recreation.
Goal 10 Integrate climate change mitigation into NPS business practices.	Objective 10.1: Identify and evaluate greenhouse gas reduction options in general management plans and other planning and environmental compliance documents and processes.
	Objective 10.2: Mandate integration of greenhouse gas reduction strategies that are consistent with NPS resource stewardship responsibilities into current operational practices.
	Objective 10.3: Integrate greenhouse gas reduction into Environmental Management Systems (EMS), procurement, design and construction contracts, and new commercial services contracts and agreements.
	Objective 10.4: Aggressively promote the expanded use of flexible schedule and telecommuting arrangements for NPS employees where it will save energy and improve productivity without compromising public services.

Sources: National Park Service, "Green Parks Plan," 2012. URL: www.nps.gov/greenparksplan/downloads/NPS_2012_Green_Parks_Plan.pdf
National Park Service, "Climate Change Response Strategy," 2010. URL: www.nps.gov/climatechange/docs/NPS_CCRS.pdf

Table 7-2: Green Parks Plan: Mitigation Goals Related to Transportation

Goal/Target	Objective
Green Parks Plan	
Be Climate Ready and Climate Friendly The NPS will reduce GHG emissions and adapt facilities at risk from climate change.	Objective: The NPS will reduce Scope 1 and 2 GHG emissions by 35 percent by 2020 from the 2008 baseline. (Scope 1 and 2 emissions are associated with on-site fossil fuel combustion and electricity consumption from the grid, respectively.)
	Objective: The NPS will reduce Scope 3 GHG emissions by 10 percent by 2020 from the 2008 baseline. (Scope 3 emission sources such as commuter travel and off-site wastewater treatment are indirect in nature.)
Green our Rides The NPS will transform our fleet and adopt greener transportation methods.	Objective: The NPS will evaluate and transform the size, types of vehicles, and technologies used in our fleet
	Objective: The NPS will increase the use of high-efficiency and low-GHG-emitting vehicles and will reduce fossil fuel consumption by 20 percent by 2015 from the 2005 baseline.
	Objective: The NPS will support alternative commuting practices, including employee telework.
	Objective: The NPS will reduce GHG emissions attributable to official travel.
Goal: Adopt Best Practices The NPS will adopt sustainable best practices in all facility operations	Objective: The NPS will use Environmental Management Systems as an implementation tool for the *GPP* and will integrate sustainability into all planning initiatives.
	Objective: The NPS will include applicable sustainability requirements in all new contracts where possible.
	Objective: The NPS will reduce storm water runoff from existing facilities and employ storm water best management practices in the design and construction of new facilities and major renovations.
Goal: Foster Sustainability Beyond our Boundaries The NPS will engaged visitors about sustainability and invite their participation	Objective: The NPS will inform park visitors and communities about the actions we are taking to reduce our impact on the environment, and ask them to participate.
	Objective: The NPS will identify ways that visitors can reduce the impact of GHG emissions from personal vehicles in parks.
	Objective: The NPS will explain the threats to national parks posed by climate change and how we are adapting our management and operations.

Sources: National Park Service, “Green Parks Plan,” 2012. URL: www.nps.gov/greenparksplan/downloads/NPS_2012_Green_Parks_Plan.pdf
National Park Service, “Climate Change Response Strategy,” 2010. URL: www.nps.gov/climatechange/docs/NPS_CCRS.pdf

7.3 Mitigation Strategies

Climate Action Plans are currently available for four of the Climate Friendly Parks in the Northeast Region: Cape Cod National Seashore, Boston Harbor Islands National Recreation Area, Fire Island National Seashore, and Gateway National Recreation Area. Transportation is the largest source of GHG emissions in three of them. At two of these parks, Gateway National Recreation Area and the Cape Cod National Seashore, the majority of transportation emissions are estimated to be associated with visitor travel. Reducing GHG emissions from transportation will be beneficial in achieving the emissions reduction goals and targets in *A Call to Action Preparing for a Second Century of Stewardship and Engagement*, the *Green Parks Plan*, and the *Climate Change Response Strategy*.

The following tables summarize mitigation strategies identified in the action plans of the four Northeast Climate Friendly Parks: Transportation strategies being considered for the New Bedford Whaling Historical Park action plan are also included even though the park has not yet finalized its plan.

The strategies are categorized by four focus areas for reducing transportation emissions: Vehicle and Transit Fleets, Visitor Transportation Emissions, Employee Commute and Business Travel, and Other. The tables also indicate whether actions are already underway ("existing") or whether actions will be "planned" for the future. It should be noted that these action plans were drafted between 2003 and 2010 so several of the mitigation strategies identified in the tables as "planned" may have moved into the implementation stage. More detailed information on each mitigation strategy, including specific actions, is contained in each individual park's climate action plan.

All of the mitigation strategies highlighted in the following tables aim to reduce greenhouse gas emissions, use of materials that are harmful to the environment, and improve operations and maintenance efficiency. All of these strategies contribute the efforts of achieving *Green Parks Plan* and *Climate Change Response Strategy* goals and objectives.

Table 7-3: Mitigation Strategies for Reducing GHG Emissions from Vehicle and Transit Fleets

Type of Mitigation Strategies Identified in Plan	Park Name and Year of Climate Action Plan				
	Cape Cod NS (2008)	Boston Harbor Islands NRA (2010)	Fire Island NS (2008)	Gateway NRA (2003)	New Bedford Whaling NHP (TBD)
Vehicle and Transit Fleets					
Fleet alternative fuels / electric vehicles	Existing and Planned	Existing	Planned	Planned	Existing
Improved fleet efficiency / vehicle replacement program	Existing and Planned	Planned	Planned	Planned	Planned
Use bio-based or other environmentally friendly lubricants, greases, and oils.	Existing and Planned	Existing	Planned	n/a	n/a
Maintain and improve vehicle maintenance schedule	Existing and Planned	Existing and Planned	n/a	n/a	Planned
Improve efficiency of shuttle/ferry and other vehicle trips by eliminating unnecessary trips	n/a	Existing	Planned	n/a	n/a
Anti-idling initiatives	Planned	Planned	n/a	n/a	n/a
Promote efficient driving techniques	Existing and Planned	n/a	n/a	n/a	Planned
Right-sizing of fleet or vehicle functions	n/a	n/a	Planned	Planned	n/a

Sources: National Park Service, "Climate Friendly Parks Cape Cod National Seashore Action Plan", Workshop 5/19-20/2010.
Boston Harbor Islands Partnership, "Climate Friendly Parks: Boston Harbor Islands Action Plan", Adopted 12/14/2010.
National Park Service, "Climate Friendly Parks Fire Island National Seashore Action Plan", Adopted 11/11/2008.
Gateway National Recreation Area Headquarters, "Climate Friendly Parks Framework for Local Action Planning", June 2003.
National Park Service, "Climate Friendly Parks Action Planning Menu", NEBE action plan 5192010.xls [spreadsheet], May 2010.

Note: "n/a" indicates that the particular mitigation strategy was not included in the park's climate action plan.

Table 7-4: Mitigation Strategies for Reducing GHG Emissions from Visitor Travel

Type of Mitigation Strategies Identified in Plan	Park Name and Year of Climate Action Plan				
	Cape Cod NS (2008)	Boston Harbor Islands NRA (2010)	Fire Island NS (2008)	Gateway NRA (2003)	New Bedford Whaling NHP (TBD)
Visitor Transportation Emissions					
Encourage visitor public transit use. Coordinate service with local and state agencies	Existing and Planned	Planned and Existing	Planned	Planned	Existing
Alternative transportation in park	Existing and Planned	n/a	Planned	Planned	Existing
Bicycle and pedestrian incentives and infrastructure	Existing and Planned	Planned	Planned	Planned	n/a
Encourage visitor carpooling	Existing and Planned	n/a	n/a	n/a	n/a
Anti-idling Initiatives	Existing and Planned	n/a	n/a	n/a	n/a
Incentives for visitors arriving alternative fuel or high efficiency vehicles	Planned	n/a	n/a	n/a	n/a

Sources: National Park Service, “Climate Friendly Parks Cape Cod National Seashore Action Plan”, Workshop 5/19-20/2010.
Boston Harbor Islands Partnership, “Climate Friendly Parks: Boston Harbor Islands Action Plan”, Adopted 12/14/2010.
National Park Service, “Climate Friendly Parks Fire Island National Seashore Action Plan”, Adopted 11/11/2008.
Gateway National Recreation Area Headquarters, “Climate Friendly Parks Framework for Local Action Planning”, June 2003.
National Park Service, “Climate Friendly Parks Action Planning Menu”, NEBE action plan 5192010.xls [spreadsheet], May 2010.

Note: “n/a” indicates that the particular mitigation strategy was not included in the park’s climate action plan.

Table 7-5: Mitigation Strategies for Reducing GHG Emissions from Employee Commutes and Business Travel

Type of Mitigation Strategies Identified in Plan	Park Name and Year of Climate Action Plan				
	Cape Cod NS (2008)	Boston Harbor Islands NRA (2010)	Fire Island NS (2008)	Gateway NRA (2003)	New Bedford Whaling NHP (TBD)
Employee Commute and Business Travel					
Encourage staff/contractors to carpool to work	Planned	n/a	Planned	n/a	Planned
Webinars and teleconferences to reduce business travel	Existing and Planned	n/a	n/a	Planned	n/a
Encourage staff/contractor use of public transit to work	n/a	Existing	Planned	Planned	n/a
Encourage staff to bike to work	Planned	n/a	n/a	Planned	n/a
Encourage staff to carpool or use alternative transit modes within park	Planned	n/a	n/a	Planned	n/a
Provide housing for staff closer to the park	Planned	n/a	n/a	n/a	n/a
Teleworking and compressed work week	Planned	n/a	n/a	Planned	n/a

Sources: National Park Service, “Climate Friendly Parks Cape Cod National Seashore Action Plan”, Workshop 5/19-20/2010.
Boston Harbor Islands Partnership, “Climate Friendly Parks: Boston Harbor Islands Action Plan”, Adopted 12/14/2010.
National Park Service, “Climate Friendly Parks Fire Island National Seashore Action Plan”, Adopted 11/11/2008.
Gateway National Recreation Area Headquarters, “Climate Friendly Parks Framework for Local Action Planning”, June 2003.
National Park Service, “Climate Friendly Parks Action Planning Menu”, NEBE action plan 5192010.xls [spreadsheet], May 2010.
Note: “n/a” indicates that the particular mitigation strategy was not included in the park’s climate action plan.

Table 7-6: Mitigation Strategies for Reducing GHG Emissions from Other Transportation Areas

Type of Mitigation Strategies Identified in Plan	Park Name and Year of Climate Action Plan				
	Cape Cod NS (2008)	Boston Harbor Islands NRA (2010)	Fire Island NS (2008)	Gateway NRA (2003)	New Bedford Whaling NHP (TBD)
Other					
Anti-idling language in contracts for contractors	Planned	n/a	Planned	n/a	n/a
Use reclaimed materials for new roads and paving	Existing	n/a	n/a	n/a	n/a
Increase efficiency of businesses transporting items to island	n/a	n/a	Planned	Planned	n/a
Eliminate or reduce mowing	n/a	Planned	n/a	Planned	n/a

Sources: National Park Service, “Climate Friendly Parks Cape Cod National Seashore Action Plan”, Workshop 5/19-20/2010.
Boston Harbor Islands Partnership, “Climate Friendly Parks: Boston Harbor Islands Action Plan”, Adopted 12/14/2010.
National Park Service, “Climate Friendly Parks Fire Island National Seashore Action Plan”, Adopted 11/11/2008.
Gateway National Recreation Area Headquarters, “Climate Friendly Parks Framework for Local Action Planning”, June 2003.
National Park Service, “Climate Friendly Parks Action Planning Menu”, NEBE action plan 5192010.xls [spreadsheet], May 2010.
Note: “n/a” indicates that the particular mitigation strategy was not included in the park’s climate action plan.

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8.0 CAPE COD INTERAGENCY TRANSPORTATION, LAND USE, AND CLIMATE CHANGE SCENARIO PLANNING PILOT PROJECT

The Cape Cod Interagency Transportation, Land Use, and Climate Change Scenario Planning Pilot Project aimed to integrate climate adaptation and mitigation strategies into land use and transportation planning processes in Cape Cod, Massachusetts[12]. The Pilot Project brought together local, state, and federal stakeholders to develop strategies that both reduced GHG emissions and increased the region's resilience to climate change, specifically to sea level rise.

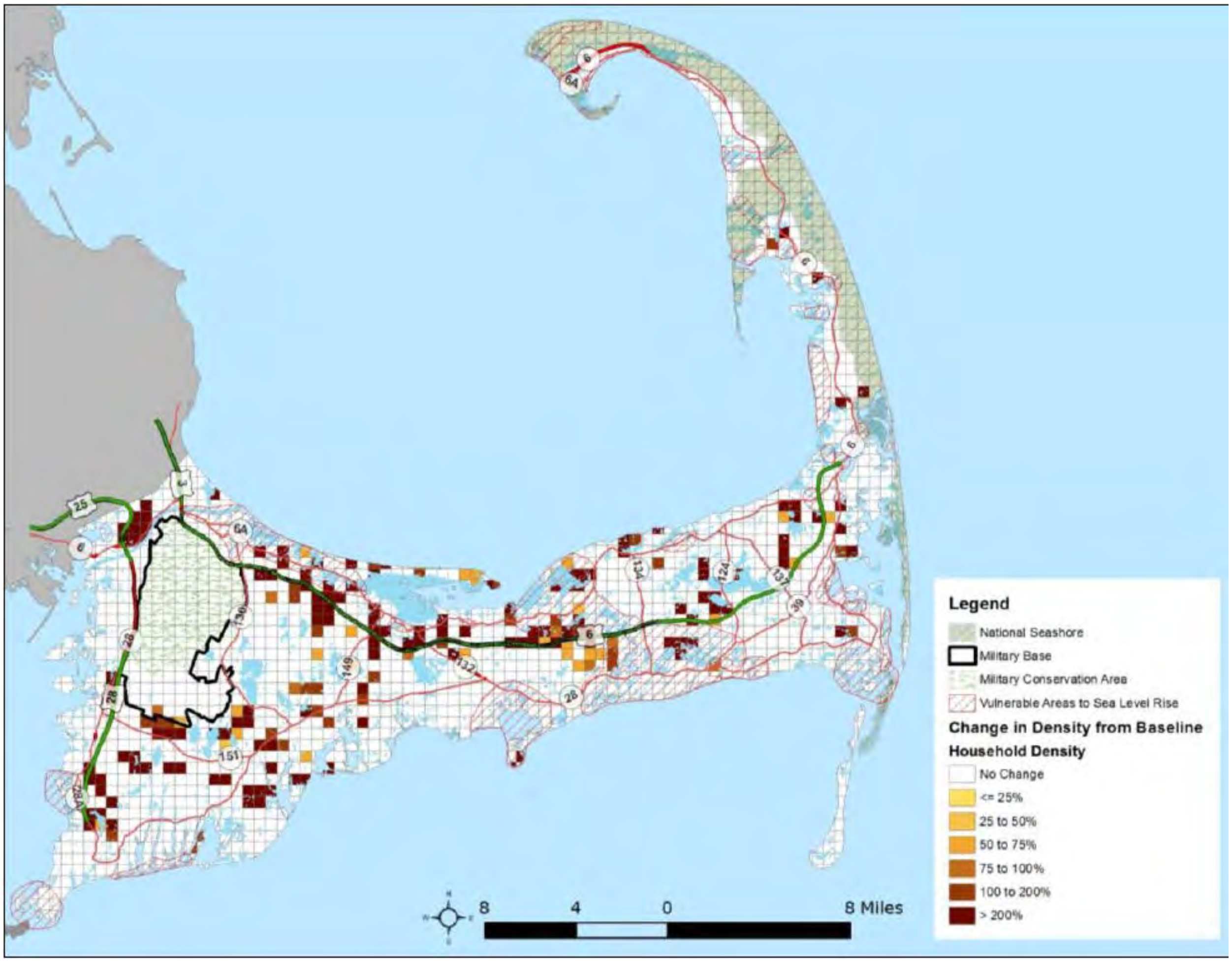
The objective was to evaluate the impact on GHG emissions under various scenarios of population growth, land use policies, and transportation programs. After gathering stakeholders, the initial step was to brainstorm a menu of possible land use and transportation strategies that would affect GHG emissions. The next step was to determine what up-to-date data are available for the Cape Cod region that can easily be integrated in to a single database for analysis. The following lists the variables that were changed in each scenario to complete this analysis.

- Population Trends
- Employment Trends
- Housing Density
- Job Density
- Transit Service Areas
- Number of transit choices (modes)
- Transit frequency

GIS was used to complete the project, specifically, CommunityViz®, an extension for ArcGIS® Desktop was the software used. Figure 8-1 shows the change in housing density in year 2030 for the Trend scenario. The grids are ¼ mile by ¼ mile.

[12] The Volpe Center, "Interagency Transportation, Land Use, and Climate Change Cape Cod Pilot Project," Cape Cod Commission, 2011.

Figure 8-1: Trend Scenario: Change in housing density over existing



Source: PlaceMatters and Placeways, "Interagency Transportation, Land Use, and Climate Change Pilot Project: Technical Scenario Report," 2011.

In order to evaluate the variable changes in each scenario a list of performance indicators was needed. The following is a list of all performance indicators that were evaluated for each scenario developed.

- GHG emissions
    - Percent change in GHG emissions
- Transport energy use
    - Fuel usage (cars/light trucks)
- Vehicle miles traveled (VMT)
    - Regional percent change in peak VMT
- Preservation of natural/existing ecosystems
    - Percent of new population in priority habitats
    - Percent land area developed (from previously undeveloped or rural)

    - Percent of new population in undeveloped or rural lands
    - Percent of new population in other high priority conservation areas
- Impact on other areas
    - Percent of new population in historic preservation areas
    - Percent of new population in water resource/wellhead protection areas and percent of new population in such areas with less than 3 dwelling units per acre
- Percent of new population in vulnerable areas, which include all areas within the Federal Emergency Management Administration (FEMA) Flood Insurance Rate Map risk areas as well as areas identified by an expert elicitation conducted for this study
- Accessibility indicators
    - New population served by transit (percent new population)
    - New employees served by transit (percent of new employment)

Ten different scenarios were developed for what the Cape Cod region could look like in 2030 based on different employment, population, and transportation growth assumptions. Scenarios 1 through 5 were the preliminary scenarios, each with a unique focus.

1. Trend
2. Dispersed Population Growth - Standard Transportation
3. Dispersed Population Growth - Enhanced Transportation
4. Targeted Population Growth - Standard Transportation
5. Targeted Population Growth - Enhanced Transportation

Stakeholders attended a two day workshop from November 15-16, 2010 to discuss these scenarios and identify an “ideal” scenario for 2030. Scenarios 6-10 were developed by four separate stakeholder groups attending this workshop. Participants developed scenarios 6-9 by making changes to the preliminary scenarios based on what they felt was important to the community and future growth. Finally, a refined scenario, scenario 10, was developed by a project team members based on the four stakeholder scenarios and input from the participants that takes all of this information into consideration. This agreed upon refined scenario could then be used as a goal that stakeholders could strive for in their own planning processes at their respective agencies. Currently, the climate mitigation strategies identified during the workshop have been incorporated into the National Park Service climate action plan for the Cape Cod National Seashore. They have also been incorporated into the Cape Cod Commission Action plan so that they could work with the local jurisdictions directly to reduce GHG emissions and plan strategically for areas of the Cape that are vulnerable to storm surge, flooding and sea level rise.

The workshop was successful in fostering discussion and raising awareness about climate change and its impact on the region. Project outputs that could help replicate this process in other regions include: a final report containing lessons learned from the project, a literature review, workshop agenda, documentation of data collection and scenario development methods, sea level rise vulnerability assessment report, and GHG reduction strategies and priority transportation strategies for the region. All outputs from the pilot project can be found on the Volpe National Transportation System Center's website: < www.volpe.dot.gov/coi/ppoa/publiclands/projects/interagencypilotproject.html>

This type of analysis with the level of agency cooperation that was achieved in the Cape Cod Interagency Transportation, Land Use, and Climate Change Scenario Planning Pilot Project could benefit any planning district and help inform policy and planning decisions before they are made and bring greater understanding to the impacts of thoughtful planning.

9.0 CONCLUSIONS AND RECOMMENDATIONS

The National Park Service is proactively working to incorporate climate change mitigation and adaptation strategies into long range transportation planning in the Northeast Region and across the nation. Inclusion of climate change factors into National Park Service transportation planning and management is in line with Executive Order 13514 and related guidance from the DOI. Considering climate change impacts in investment prioritization decisions will also maximize the financial sustainability of infrastructure. Future actions for the National Park Service to consider include the following.

9.1 Adaptation

- Expand the Sea Level Rise and Storm Surge Vulnerability Assessment.
    - Include trails, docks, and air facilities missing from the GIS transportation asset dataset.
    - Expand the assessment using less conservative estimates of sea level rise. A range of estimates would better provide an understanding of the sensitivity of risk when assessing investment strategies for the Long Range Transportation Plan.
    - Expand the assessment to include storm surge from a category three, four, and five hurricane that incorporates projected sea level rise projections.
    - Expand the assessment to include multiple potential climate change scenarios
- Conduct climate risk and vulnerability assessments for climate impacts beyond sea level rise. Changes in temperature and precipitation could affect resources and visitation. In particular for the Northeast Region, inland storm events during the past few years have had a substantial direct impact on transportation assets.
- Utilize the Climate Change Risk Assessment tool currently being piloted in a number of national parks in future LRTPs to assess transportation infrastructure at risk from climate change.
- Analyses and strategies in the Northeast Region LRTP should be updated as better climate data becomes available.
    - There are several monitoring entities in place, such as the NPS Inventory and Monitoring Program. The Climate Science Center for the Northeast is currently being established as required by Secretarial Order 3289 and should be looked to as a source of information and tools to respond to the changing climate and environment.
    - Most state departments of transportation and many local planning agencies are monitoring climate change and impacts to their infrastructure. Use of a multi-

disciplinary team to assess the risk and to prioritize infrastructure is crucial as the National Park Service is focused on more than just the movement of goods and people, but on the visitor experience and preservation of natural and cultural resources. The Cape Cod Interagency Transportation, Land Use, and Climate Change scenario planning pilot project is an example of the benefits of working with a multidisciplinary team.

9.2 Mitigation

- Incorporate transportation strategies from the Climate Friendly Parks action plans into the Northeast Region LRTP.
- Incorporate relevant mitigation goals, strategies, and targets from Executive Order 13514, the *Green Parks Plan, Climate Change Response Strategy,* and *A Call to Action Preparing for a Second Century of Stewardship and Engagement* into the Northeast Region LRTP.
- Replicate the Cape Cod Interagency Transportation, Land Use, and Climate Change Scenario Planning Pilot Project model in other metropolitan areas and planning regions within the Northeast Region to identify climate mitigation transportation strategies and integrate them into regional transportation plans.

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APPENDIX: NORTHEAST REGION CLIMATE FRIENDLY PARKS

The Northeast Region has 16 parks in the Climate Friendly Parks Program, of which seven are certified. In order to be a certified Climate Friendly Park four milestones must be met.

Milestone 1: Apply to be a Climate Friendly Park

Milestone 2: Complete a Greenhouse Gas Inventory and collect baseline data

Milestone 3: Host a Climate Workshop or Training

Milestone 4: Complete a 'comprehensive' Environmental Management System or Action Plan to become a certified Climate Friendly Park

	Milestone 1	Milestone 2	Milestone 3	Milestone 4
Acadia NP	✓			
Assateague NS	✓			
Boston Harbor Islands NRA				✓
Cape Cod NS				✓
Delaware Water Gap NRA				✓
Fire Island NS				✓
Gateway NRA				✓
Gettysburg NMP	✓			
George Washington Birthplace NM		✓		
Lowell NHP		✓		
Maggie L. Walker NHS		✓		
Marsh-Billings-Rockefeller NHP				✓
New Bedford Whaling NHP			✓	
New River Gorge NR				✓
Shenandoah NP			✓	
Saint-Gaudens NHS			✓	

Source: National Park Service, Climate Friendly Parks <www.nps.gov/climatefriendlyparks/parks/applicant_parks.html>

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The results of the transportation asset mapping under different sea level rise and storm surge scenarios by park follows. Additionally, tables containing GIS output data on the number of assets impacted by the sea level rise and storm surge scenarios will follow. This GIS Risk Assessment mapping and asset determination was completed by HDR in July 2011.

MAPPING OF TRANSPORTATION ASSETS

The Northeast Region of the NPS provided geospatial data containing transportation assets for each of the following 15 coastal parks selected for analyses:

- Acadia National Park (ME)
- Assateague Island National Seashore (MD, VA)
- Boston National Historical Park (MA)
- Boston Harbor Islands National Recreation Area (MA)
- Cape Cod National Seashore (MA)
- Castle Clinton National Monument (NY)
- Colonial National Historical Park (VA)
- Fire Island National Seashore (NY)
- Fort McHenry National Monument and Historic Shrine (MD)
- Gateway National Recreation Area (NY, NJ)
- George Washington Birthplace National Monument (VA)
- Governors Island National Monument (NY)
- New Bedford Whaling National Historical Park (MA)
- Salem Maritime National Historic Site (MA)
- Statue of Liberty National Monument (NY)

Transportation asset data included miles of “access roads,” “routes,” and number of parking areas. However, docks and air facilities were not available in the geospatial data sets for any park. In addition, transportation asset data were unavailable for New Bedford Whaling National Historical Park, Governors Island National Monument, and Boston Harbor National Recreational Area. The asset data, along with park boundaries and other available features, were mapped using GIS.

MAPPING OF SEA LEVEL RISE AND STORM SURGE SCENARIOS

Park areas and transportation assets affected by projected sea level rise and storm surge were mapped based on the National Elevation Data (NED). The NED is the primary elevation data product of the USGS; it is a seamless dataset with the best available raster elevation data of the conterminous United States, Alaska, Hawaii, and territorial islands. The NED is based on the old USGS Digital Elevation Model and is public domain. The NED is derived from diverse source data that are processed to a common coordinate system and unit of vertical measure. Typically the dataset is based on a one arc-second resolution (about 30 meter) which is considered medium resolution imagery. Within each 30 meter square of data, elevation data are available at one foot intervals. However, because this is based on sampling spaced at 30 meters, not all geographic elevation features are captured. More accurate data are frequently collected at local levels but local data are not available in completion at the national or regional level. Efforts are underway by numerous entities to refine additional climate change data and elevation data to be useful on a regional level.

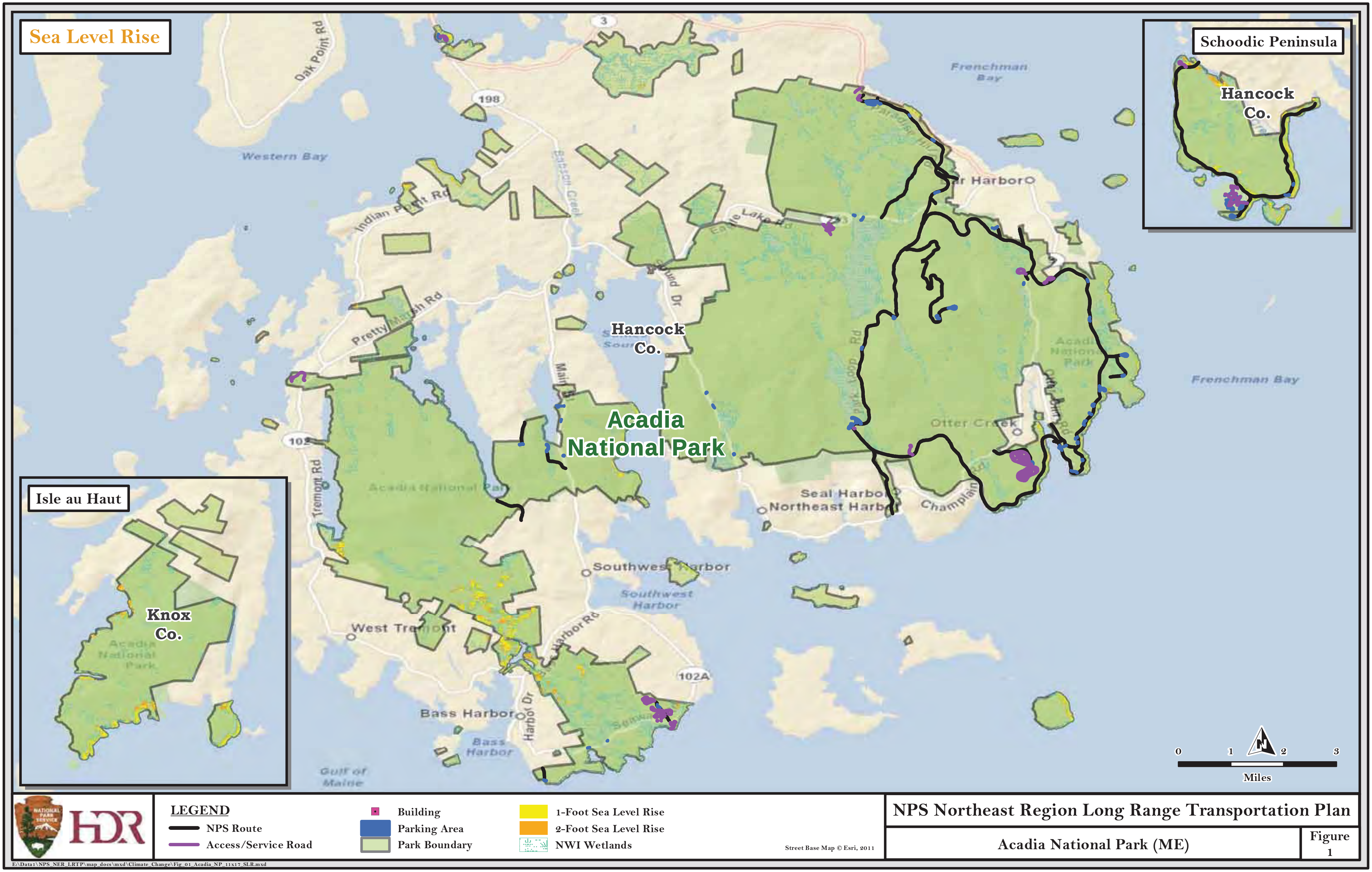
The Intergovernmental Panel on Climate Change (IPCC) projections indicate a seven to 23 inch global rise in sea levels, with the Northeast region expected to experience an additional six to eight inches above the global average by the end of the century[1]. However, the IPCC's sea level rise projections are considered conservative estimates of sea level rise. Projections completed in other studies have estimated global sea level rise as high as 79 inches by the end of the century[1]. For the purposes of this study, two sea level rise scenarios were modeled: a one foot rise and a two foot rise. An elevation change of 15 feet was used to model storm surge that might be associated with a category three storm (without sea level rise) making landfall along the eastern seaboard based on online NOAA modeling[2]. Future risk assessments should model the impact of storm surge based on projected sea levels as there are likely additional assets at risk to storm surge when sea level rise is accounted for.

[1] Federal Highway Administration. "Regional Climate Change Effects: Useful Information for Transportation Agencies.", 2010, http://www.fhwa.dot.gov/environment/climate_change/adaptation/resources_and_publications/climate_effects/index.cfm.

[2] NOAA/National Weather Service, "Storm Surge Interactive Risk Maps", http://www.nhc.noaa.gov/ssurge/risk/

Figures:

Tables:



Sea Level Rise
Schoodic Peninsula
Hancock Co.
Isle au Haut
Knox Co.
Acadia National Park
Hancock Co.
Acadia National Park
Frenchman Bay
Frenchman Bay
Western Bay
Oak Point Rd
Indian Point Rd
Pretty Marsh Rd
Eagle Lake Rd
Tremont Rd
Main St
Harbor Dr
Otter Creek
Seal Harbor
Northeast Harbor
Champlain
Southwest Harbor
Southwest Harbor
West Tremont
Bass Harbor
Bass Harbor
Gulf of Maine
198
102
102A
3
Miles
0
1
2
3
LEGEND
NPS Route
Access/Service Road
Building
Parking Area
Park Boundary
1-Foot Sea Level Rise
2-Foot Sea Level Rise
NWI Wetlands
Street Base Map © Esri, 2011
NPS Northeast Region Long Range Transportation Plan
Acadia National Park (ME)
Figure 1
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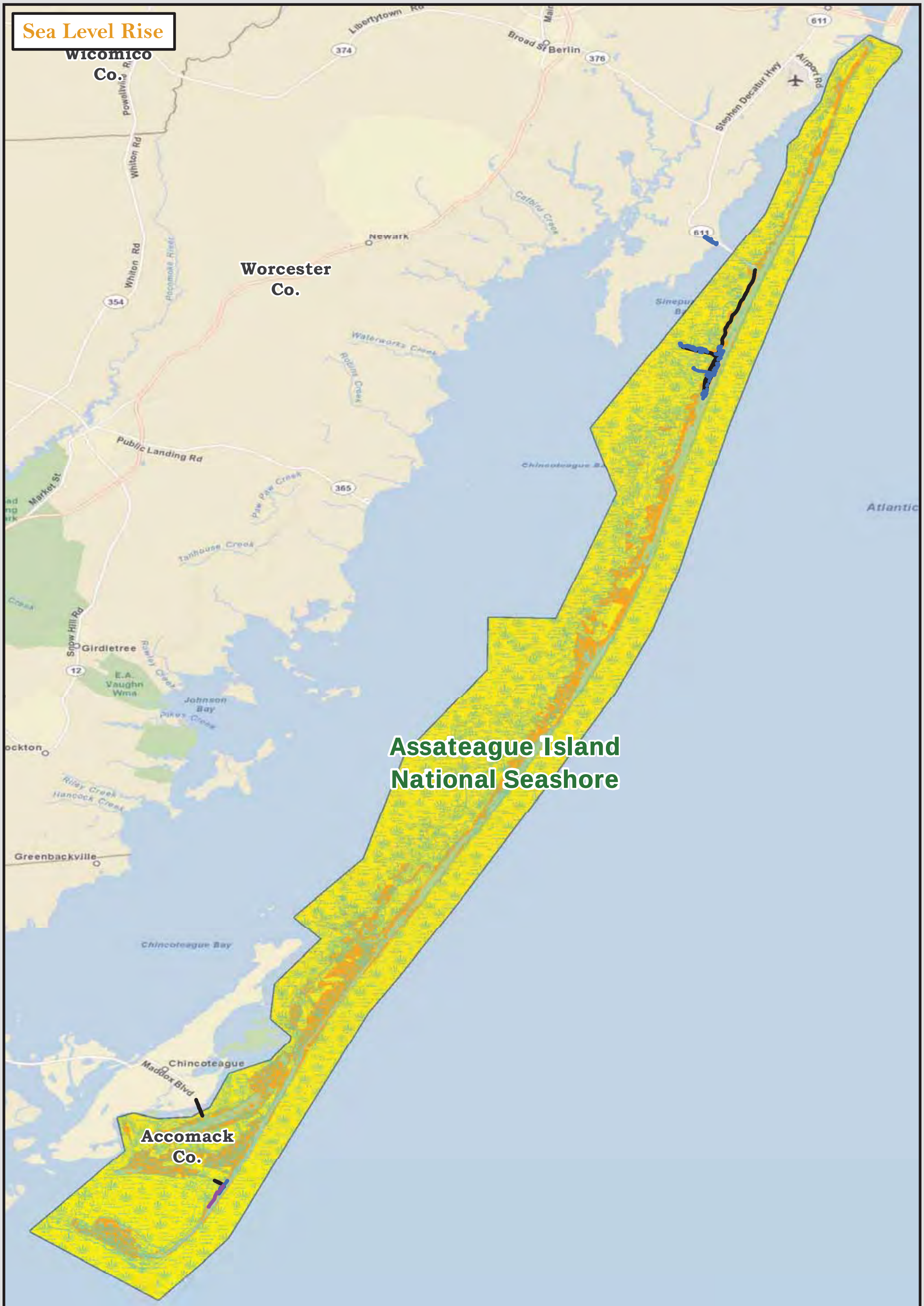

LEGEND

NPS Route	Building	1-Foot Sea Level Rise
Access/Service Road	Parking Area	2-Foot Sea Level Rise
	Park Boundary	NWI Wetlands

Street Base Map © Esri, 2011

0 2 4 6
Miles

NPS Northeast Region Long Range Transportation Plan

Assateague Island National Seashore (MD, VA)

Figure 2

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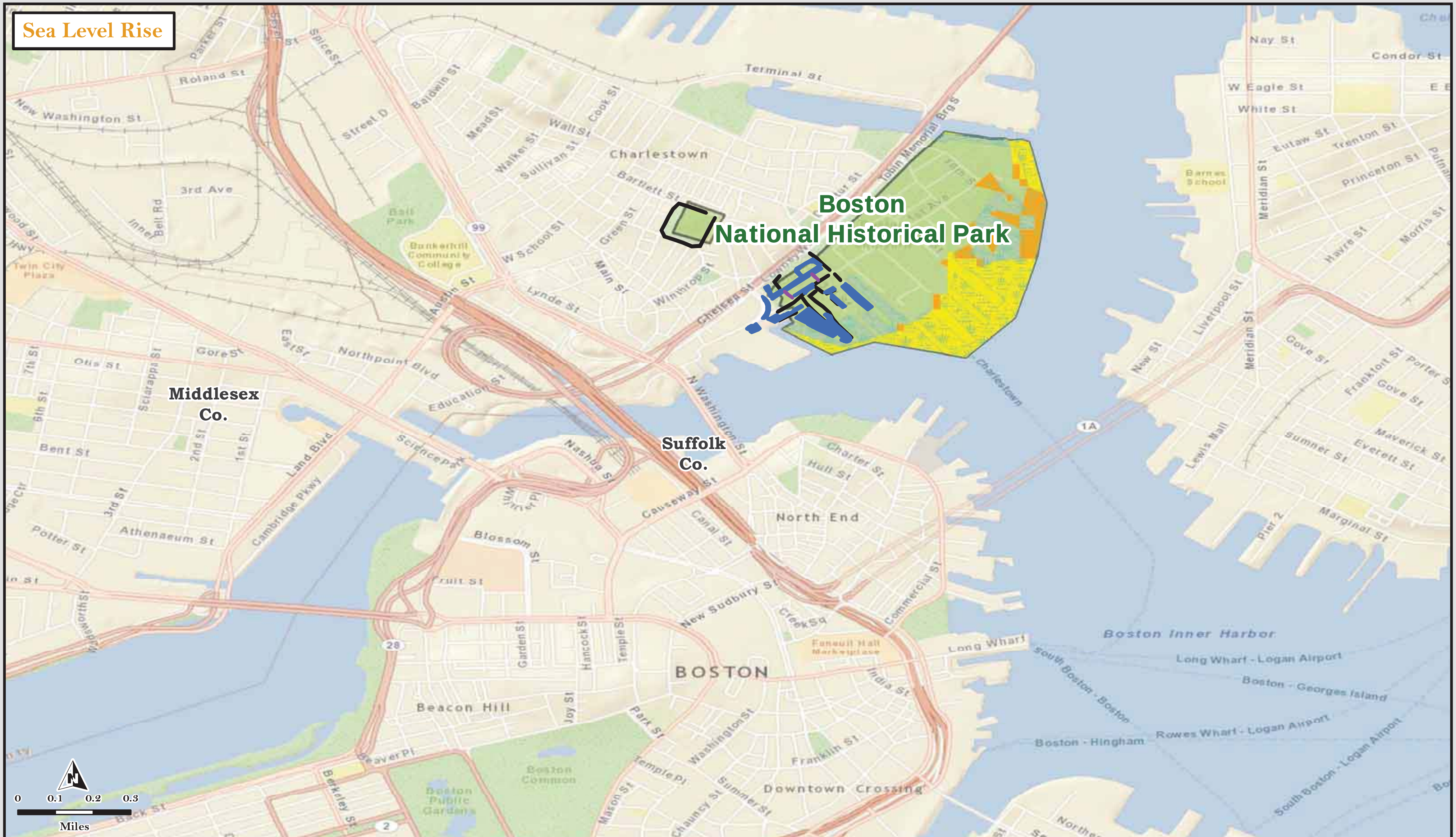

LEGEND

NPS Route	Building	1-Foot Sea Level Rise
Access/Service Road	Parking Area	2-Foot Sea Level Rise
	Park Boundary	NWI Wetlands

Street Base Map © Esri, 2011

NPS Northeast Region Long Range Transportation Plan

Boston National Historical Park (MA)

Figure 3

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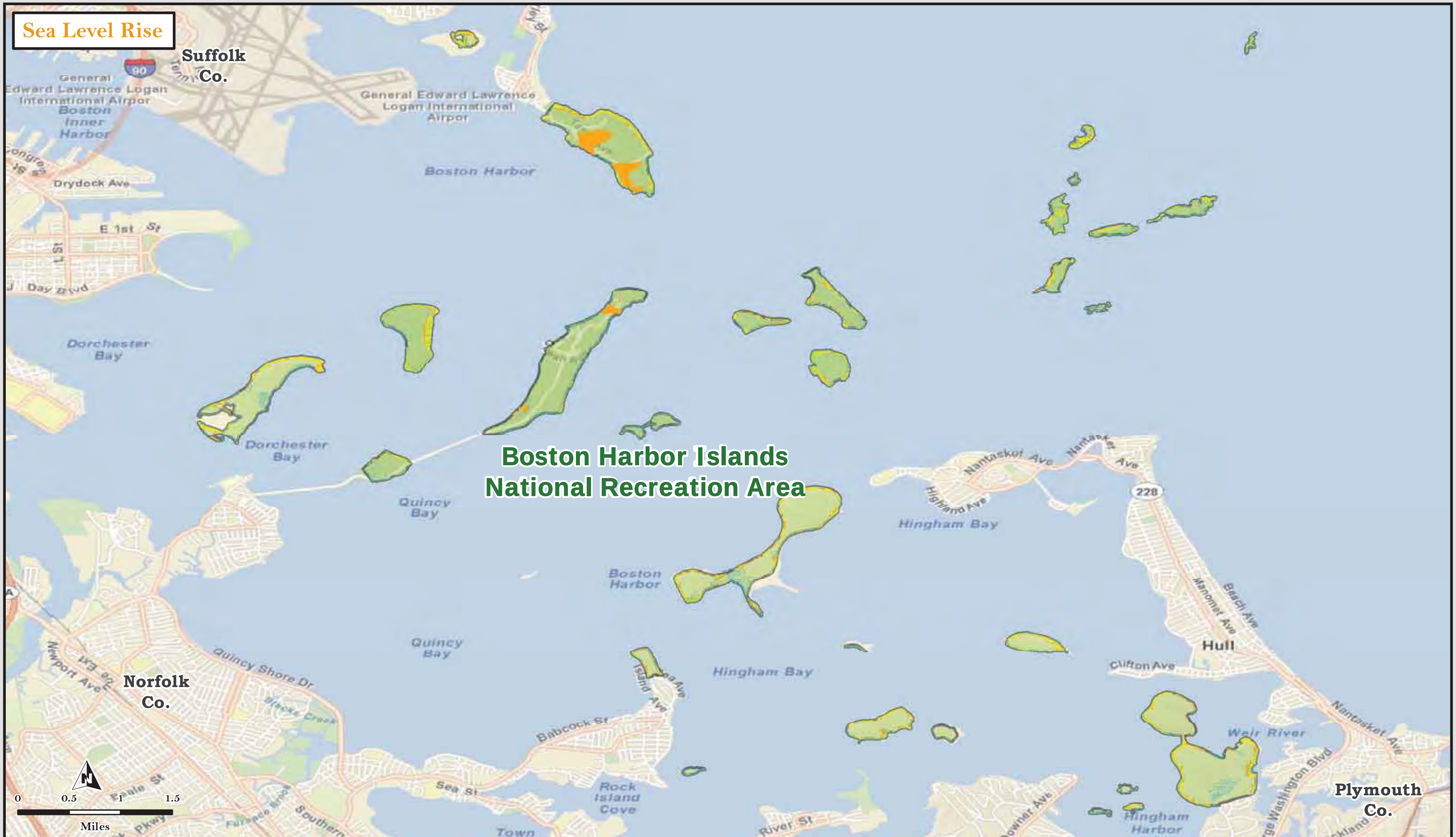


LEGEND

NPS Route	Building	1-Foot Sea Level Rise
Access/Service Road	Parking Area	2-Foot Sea Level Rise
	Park Boundary	NWI Wetlands

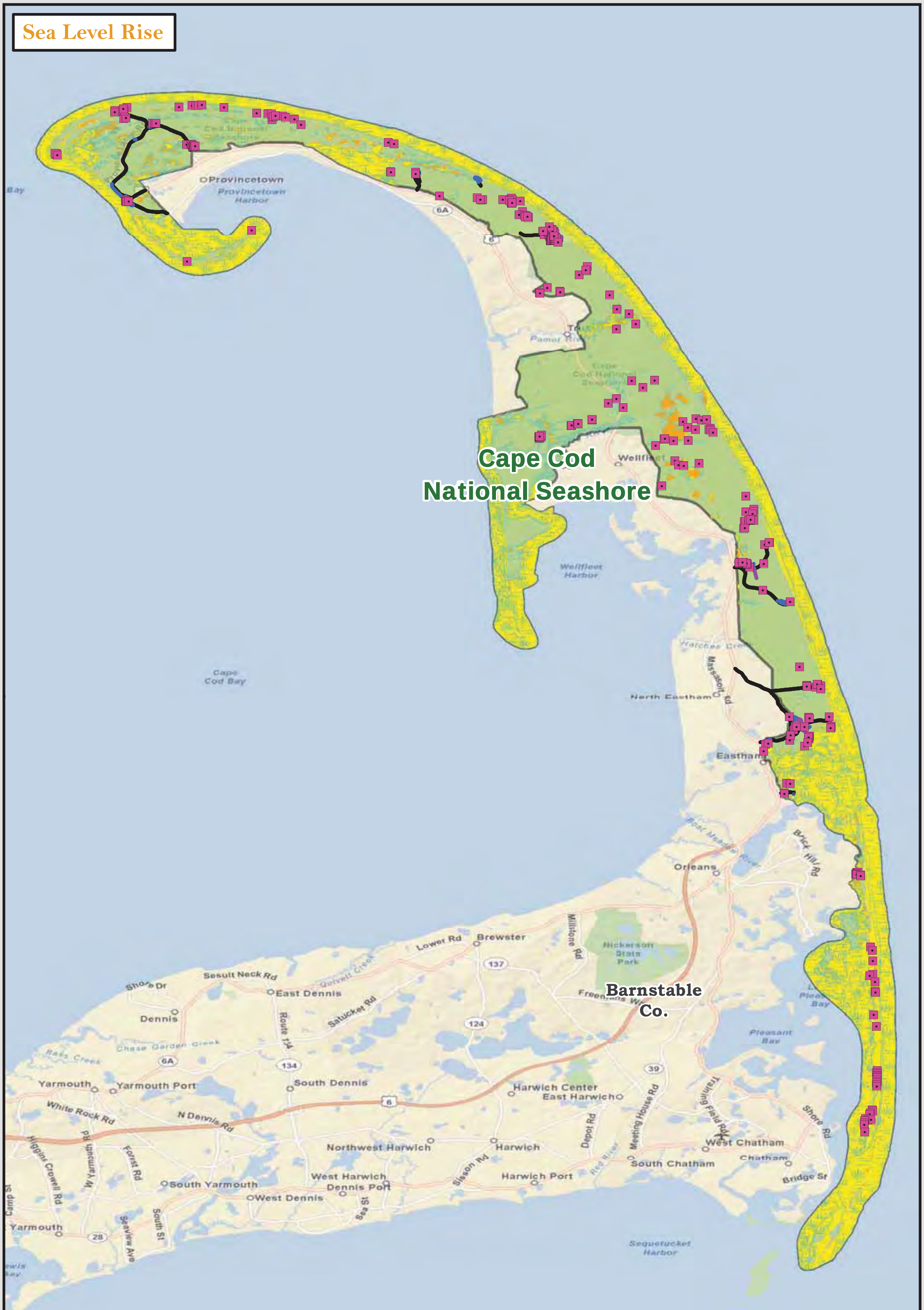
Street Base Map © Esri, 2011

NPS Northeast Region Long Range Transportation Plan

Boston Harbor Islands National Recreation Area (MA)

Figure 4

E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_04_Boston_Harbor_Islands_NRA_11x17_SLR.mxd



LEGEND

- NPS Route
- Access/Service Road
- Building
- Parking Area
- Park Boundary
- 1-Foot Sea Level Rise
- 2-Foot Sea Level Rise
- NWI Wetlands

Street Base Map © Esri, 2011

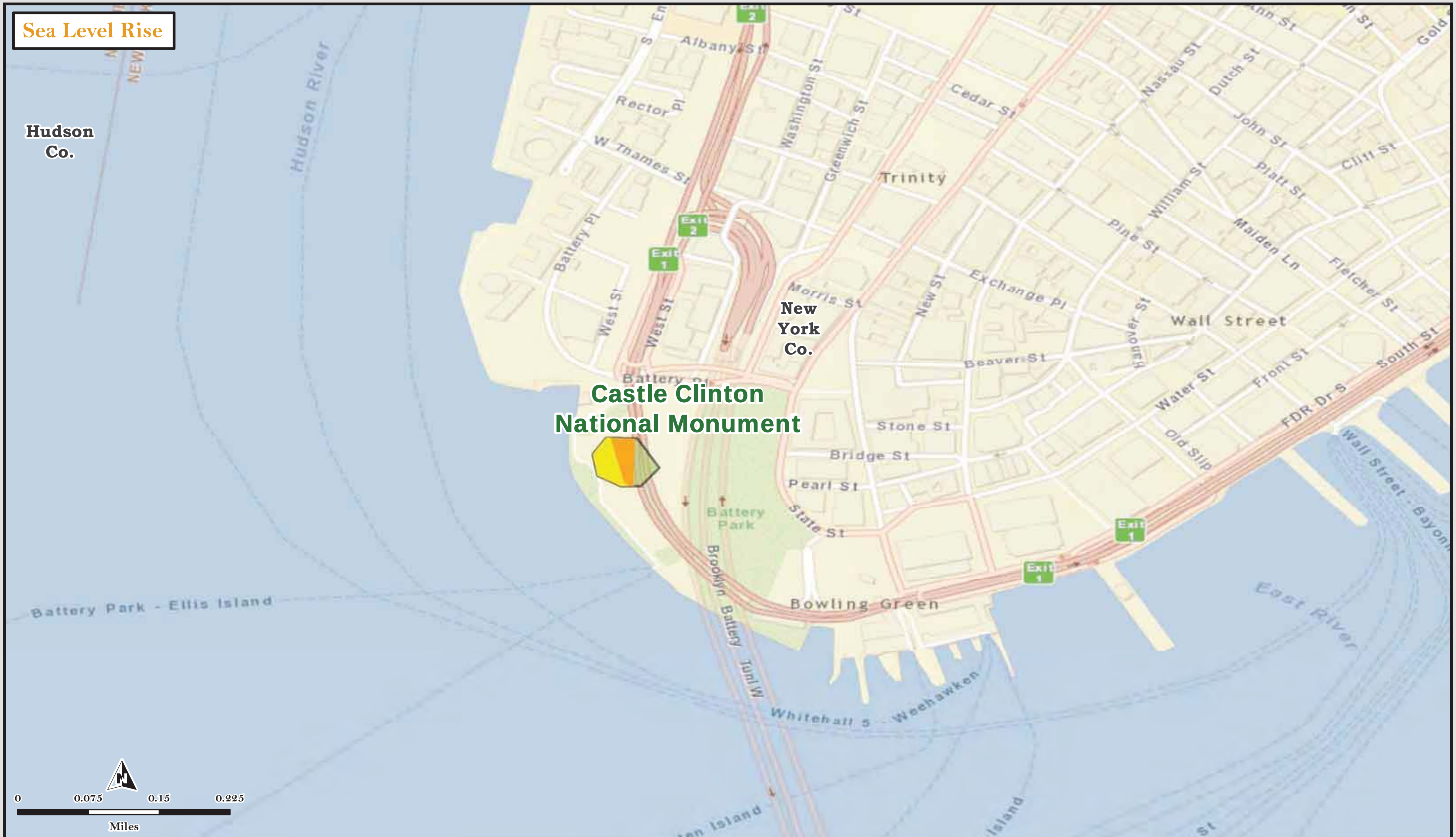
0 2 4 6
Miles

NPS Northeast Region Long Range Transportation Plan

Cape Cod National Seashore (MA)

Figure 5

E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_05_Cape_Cod_NS_11x17_SLR.mxd



LEGEND

- NPS Route
- Access/Service Road
- Building
- Parking Area
- Park Boundary
- 1-Foot Sea Level Rise
- 2-Foot Sea Level Rise
- NWI Wetlands

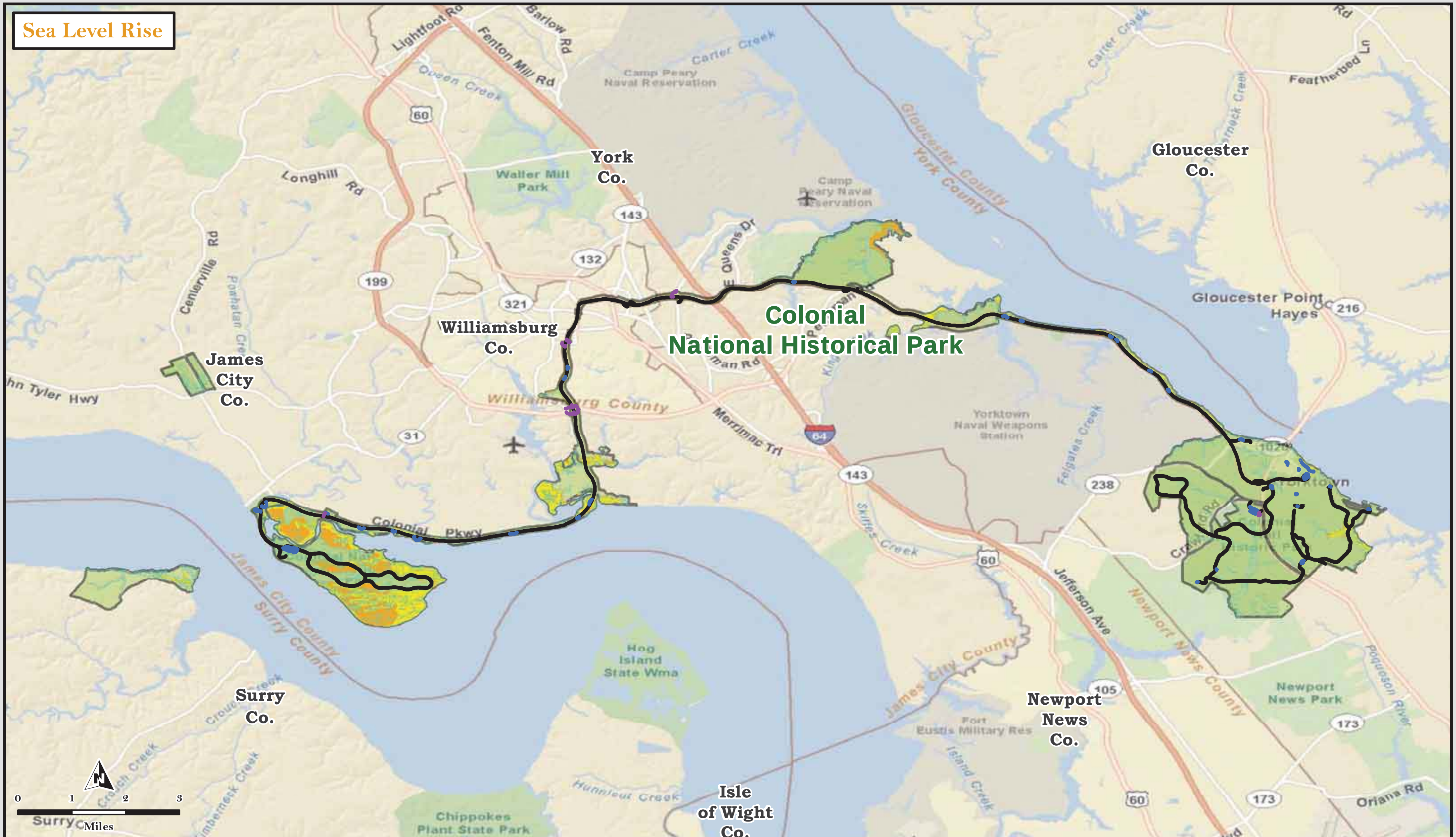
Street Base Map © Esri, 2011

NPS Northeast Region Long Range Transportation Plan

Castle Clinton National Monument (NY)

Figure 6

E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_06_Castle_Clinton_NM_11x17_SLR.mxd



LEGEND

- NPS Route
- Access/Service Road
- Building
- Parking Area
- Park Boundary
- 1-Foot Sea Level Rise
- 2-Foot Sea Level Rise
- NWI Wetlands

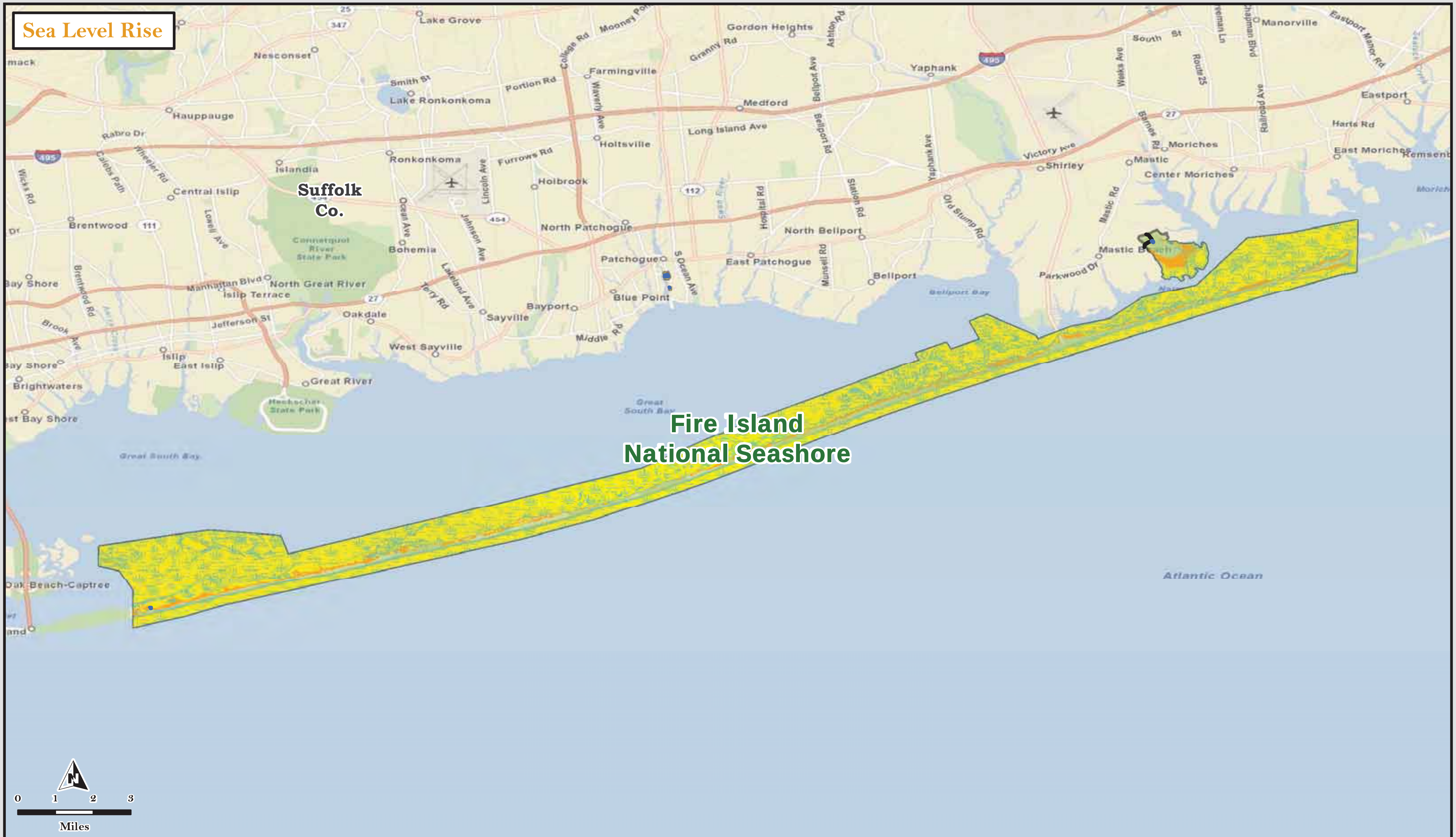
Street Base Map © Esri, 2011

NPS Northeast Region Long Range Transportation Plan

Colonial National Historical Park (VA)

Figure 7

E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_07_Colonial_NHP_11x17_SLR.mxd



LEGEND

- NPS Route
- Access/Service Road
- Building
- Parking Area
- Park Boundary
- 1-Foot Sea Level Rise
- 2-Foot Sea Level Rise
- NWI Wetlands

Street Base Map © Esri, 2011

NPS Northeast Region Long Range Transportation Plan

Fire Island National Seashore (NY)

Figure 8

E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_08_Fire_Island_NS_11x17_SLR.mxd

HDR

LEGEND

- NPS Route
- Access/Service Road
- Building
- Parking Area
- Park Boundary
- 1-Foot Sea Level Rise
- 2-Foot Sea Level Rise
- NWI Wetlands

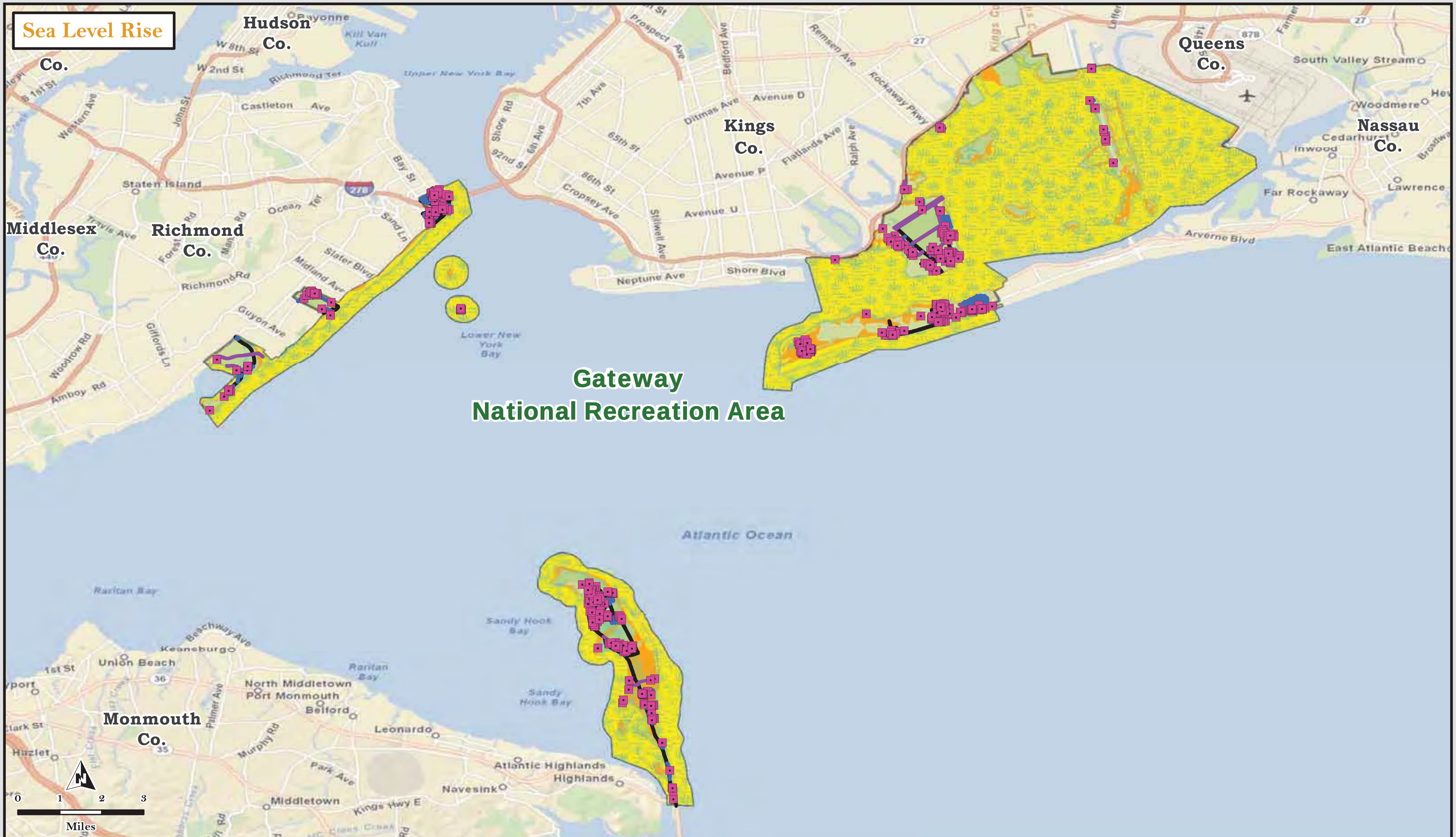
Street Base Map © Esri, 2011

NPS Northeast Region Long Range Transportation Plan

Fort McHenry National Monument and Historic Shrine (MD)

Figure 9

E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_09_Fort_McHenry_NM_11x17_SLR.mxd



LEGEND

- NPS Route
- Access/Service Road
- Building
- Parking Area
- Park Boundary
- 1-Foot Sea Level Rise
- 2-Foot Sea Level Rise
- NWI Wetlands

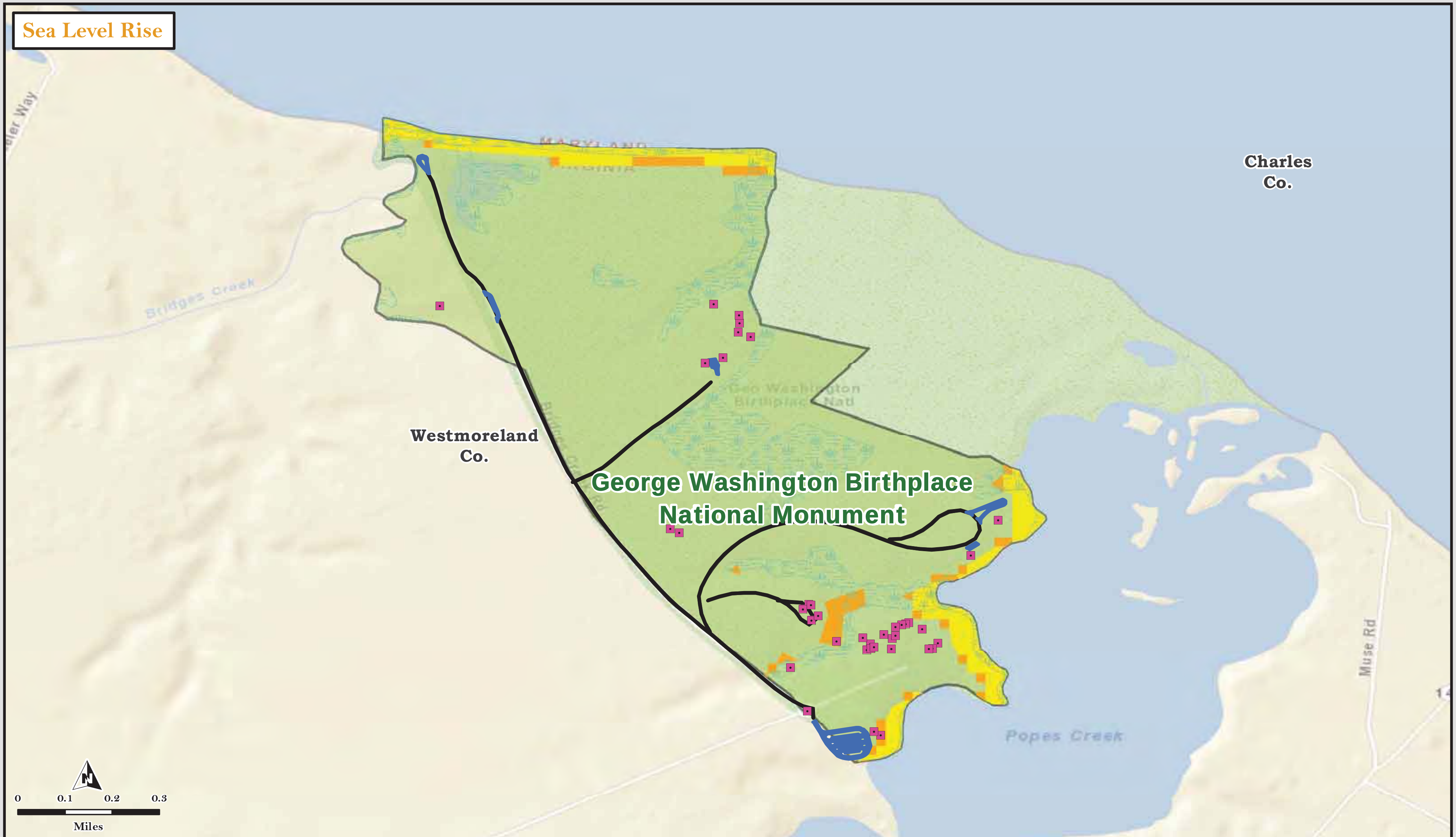
Street Base Map © Esri, 2011

NPS Northeast Region Long Range Transportation Plan

Gateway National Recreation Area (NY, NJ)

Figure 10

E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_10_Gateway_NRA_11x17_SLR.mxd



LEGEND

NPS Route	Building	1-Foot Sea Level Rise
Access/Service Road	Parking Area	2-Foot Sea Level Rise
	Park Boundary	NWI Wetlands

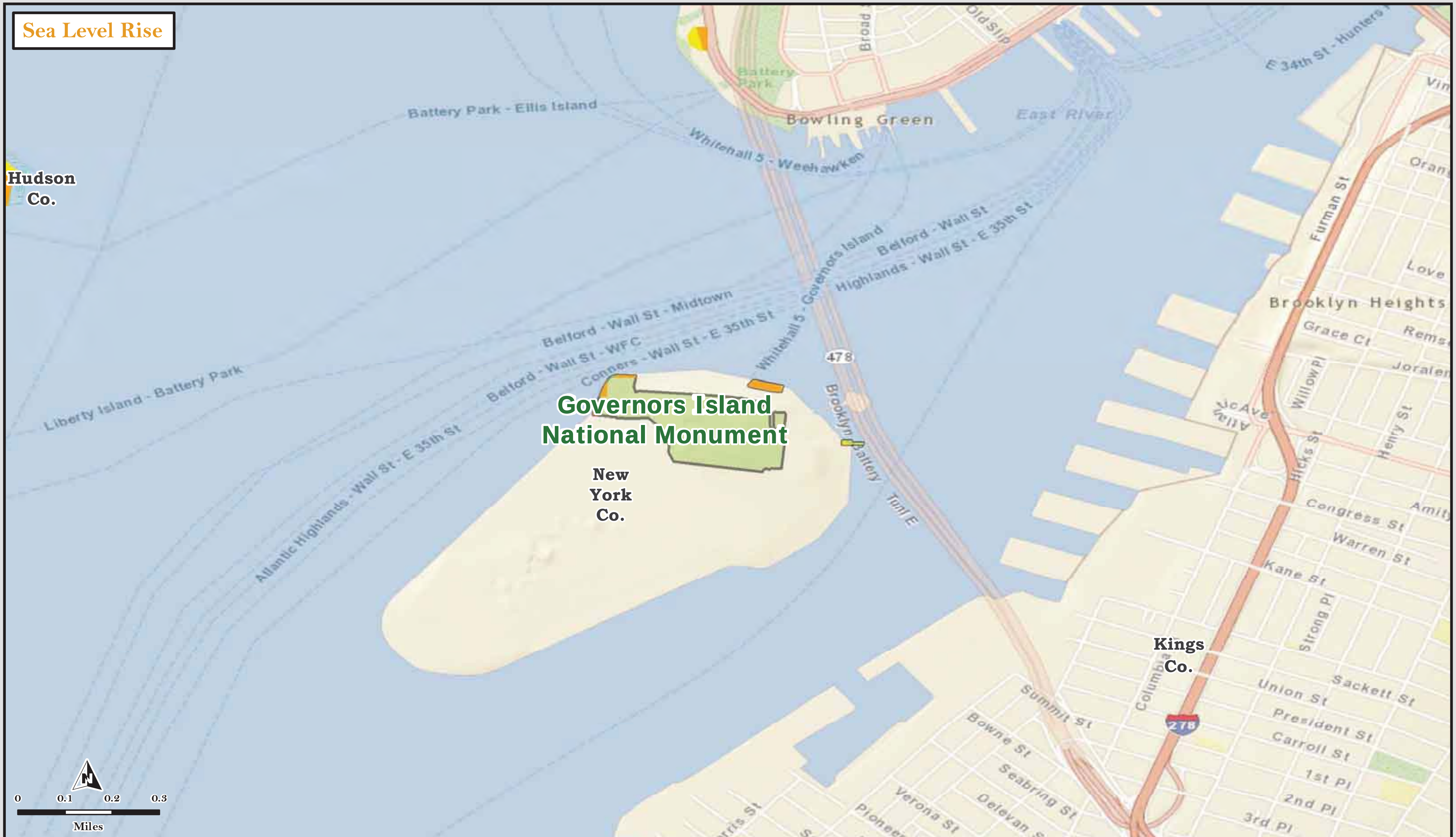
Street Base Map © Esri, 2011

NPS Northeast Region Long Range Transportation Plan

George Washington Birthplace National Monument (VA)

Figure 11

E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_11_George_Washington_Birthplace_NM_11x17_SLR.mxd



LEGEND

NPS Route	Building	1-Foot Sea Level Rise
Access/Service Road	Parking Area	2-Foot Sea Level Rise
	Park Boundary	NWI Wetlands

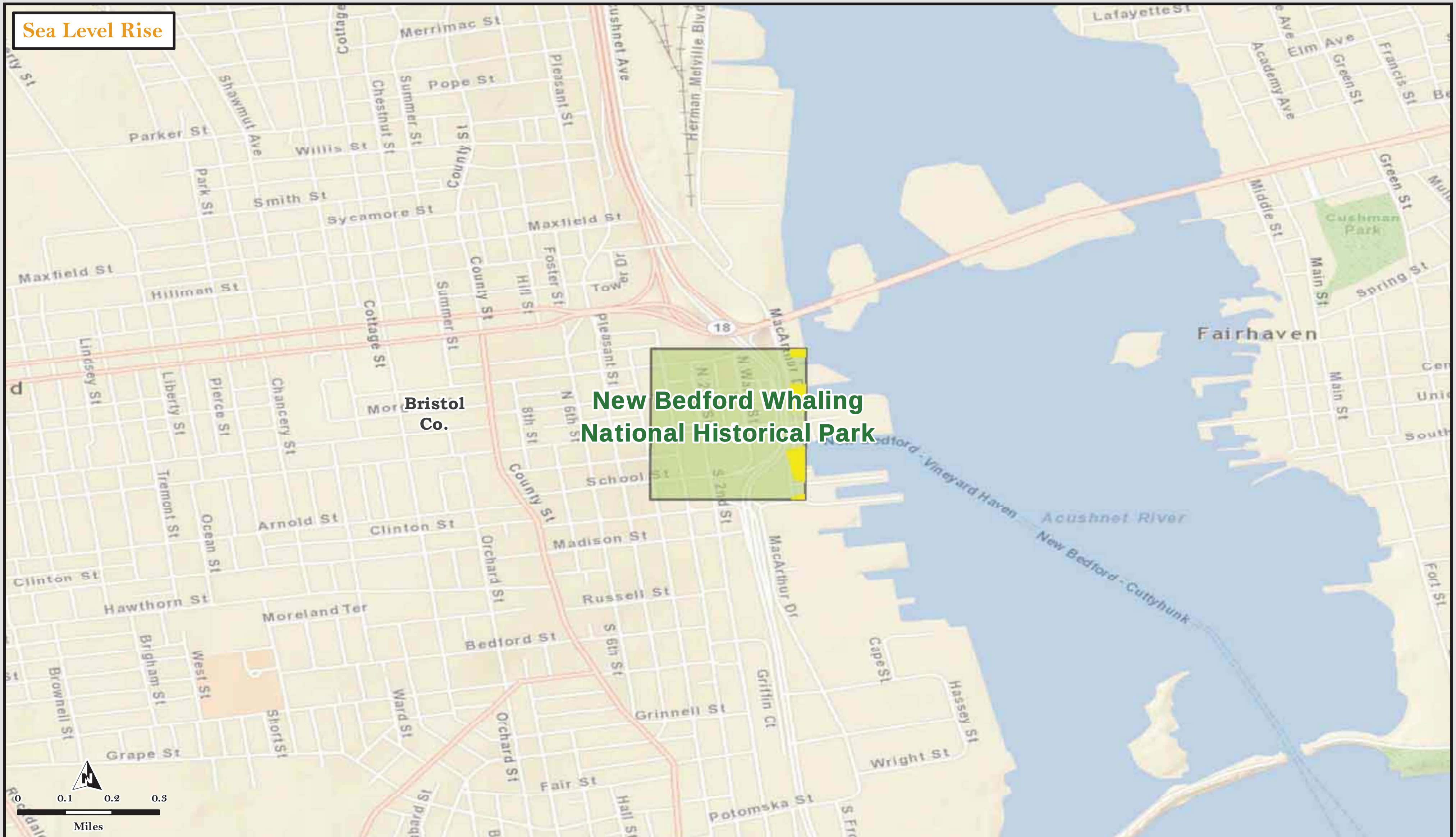
Street Base Map © Esri, 2011

NPS Northeast Region Long Range Transportation Plan

Governor's Island National Monument (NY)

Figure 12

E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_12_Governors_Island_NM_11x17_SLR.mxd



HDR

LEGEND

- NPS Route
- Access/Service Road
- Building
- Parking Area
- Park Boundary
- 1-Foot Sea Level Rise
- 2-Foot Sea Level Rise
- NWI Wetlands

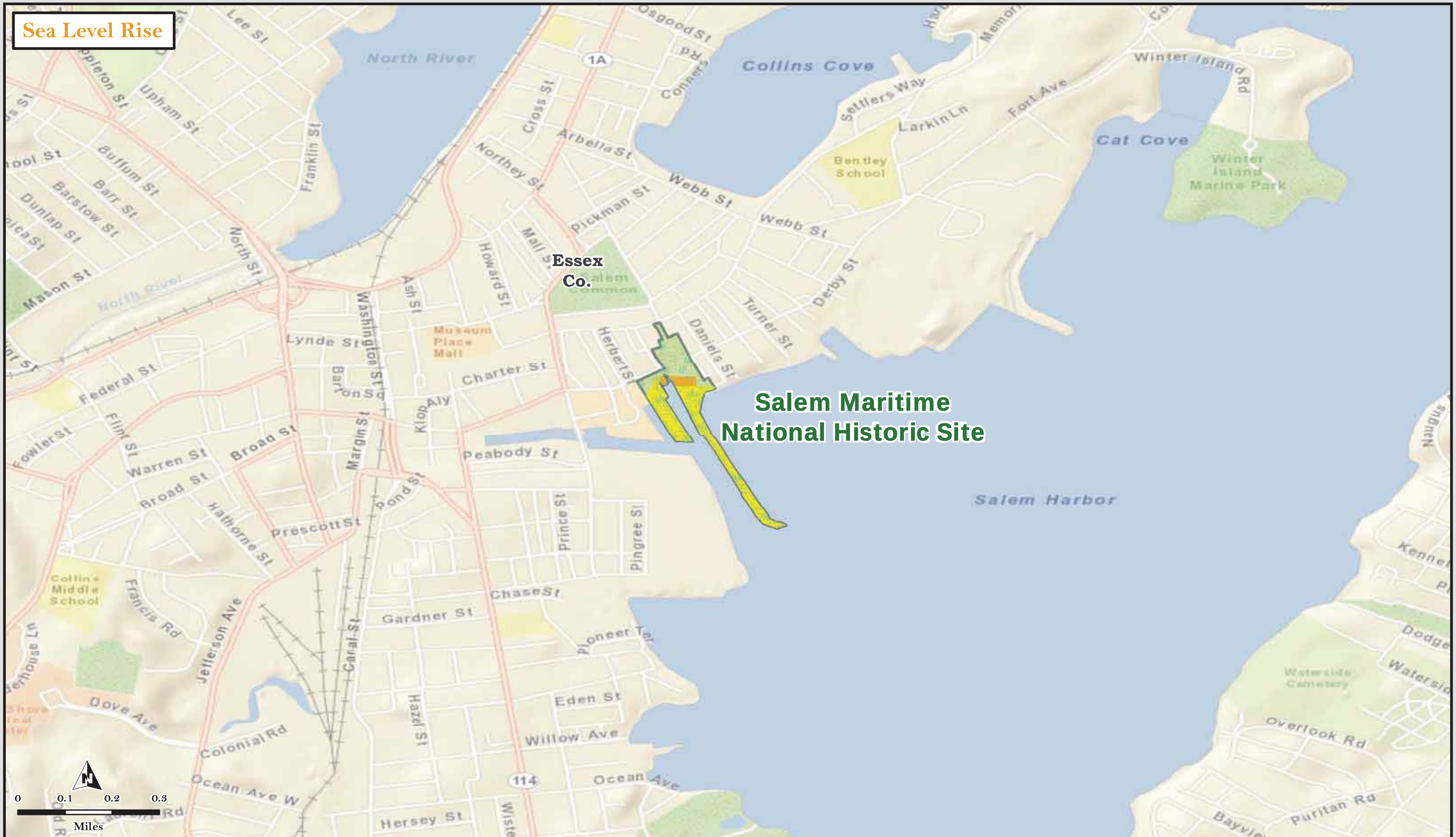
Street Base Map © Esri, 2011

NPS Northeast Region Long Range Transportation Plan

New Bedford Whaling National Historical Park (MA)

Figure 13

E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_13_New_Bedford_Whaling_NHP_11x17_SLR.mxd



LEGEND

- NPS Route
- Access/Service Road
- Building
- Parking Area
- Park Boundary
- 1-Foot Sea Level Rise
- 2-Foot Sea Level Rise
- NWI Wetlands

Street Base Map © Esri, 2011

NPS Northeast Region Long Range Transportation Plan

Salem Maritime National Historic Site (MA)

Figure 14

E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_14_Salem_Maritime_NHS_11x17_SLR.mxd

LEGEND

- NPS Route
- Access/Service Road
- Building
- Parking Area
- Park Boundary
- 1-Foot Sea Level Rise
- 2-Foot Sea Level Rise
- NWI Wetlands

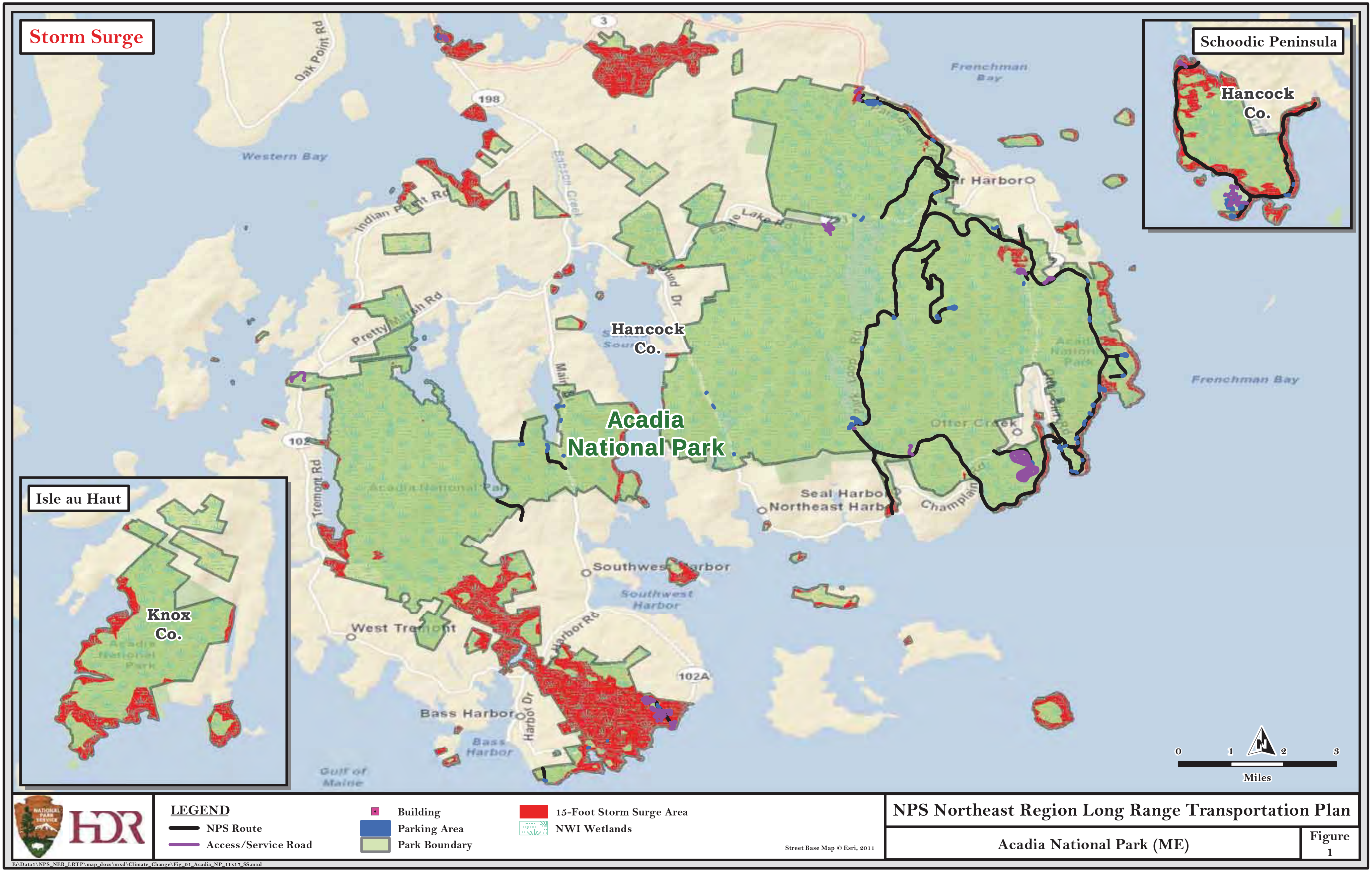
Street Base Map © Esri, 2011

NPS Northeast Region Long Range Transportation Plan

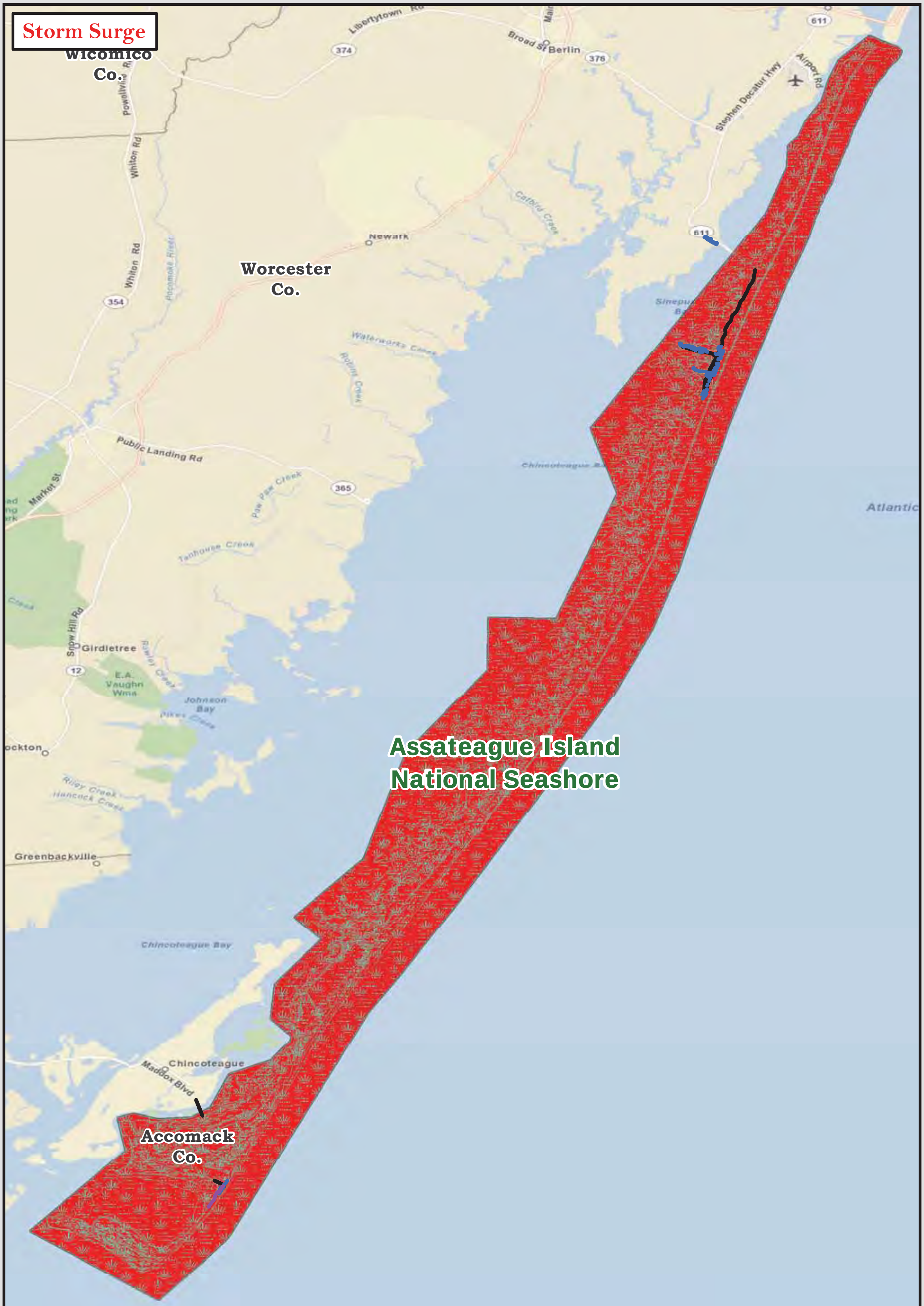
Statue of Liberty National Monument (NY)

Figure 15

E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_15_Statue_of_Liberty_NM_11x17_SLR.mxd


Storm Surge
Schoodic Peninsula
Hancock Co.
Isle au Haut
Knox Co.
Acadia National Park
Hancock Co.
Western Bay
Frenchman Bay
Frenchman Bay
Southwest Harbor
Bass Harbor
Gulf of Maine
Bar Harbor
Seal Harbor
Northeast Harbor
Southwest Harbor
West Tremont
Bass Harbor
Otter Creek
Oak Point Rd
Indian Point Rd
Pretty Marsh Rd
Tremont Rd
Harbor Dr
Eagle Lake Rd
Park Loop Rd
Champlain
198
102
102A
3
0 1 2 3
Miles
LEGEND
NPS Route
Access/Service Road
Building
Parking Area
Park Boundary
15-Foot Storm Surge Area
NWI Wetlands
HDR
Street Base Map © Esri, 2011
NPS Northeast Region Long Range Transportation Plan
Acadia National Park (ME)
Figure 1
E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_01_Acadia_NP_11x17_SS.mxd

Storm Surge



LEGEND

- NPS Route
- Access/Service Road
- Building
- Parking Area
- Park Boundary
- 15-Foot Storm Surge Area
- NWI Wetlands

Street Base Map © Esri, 2011

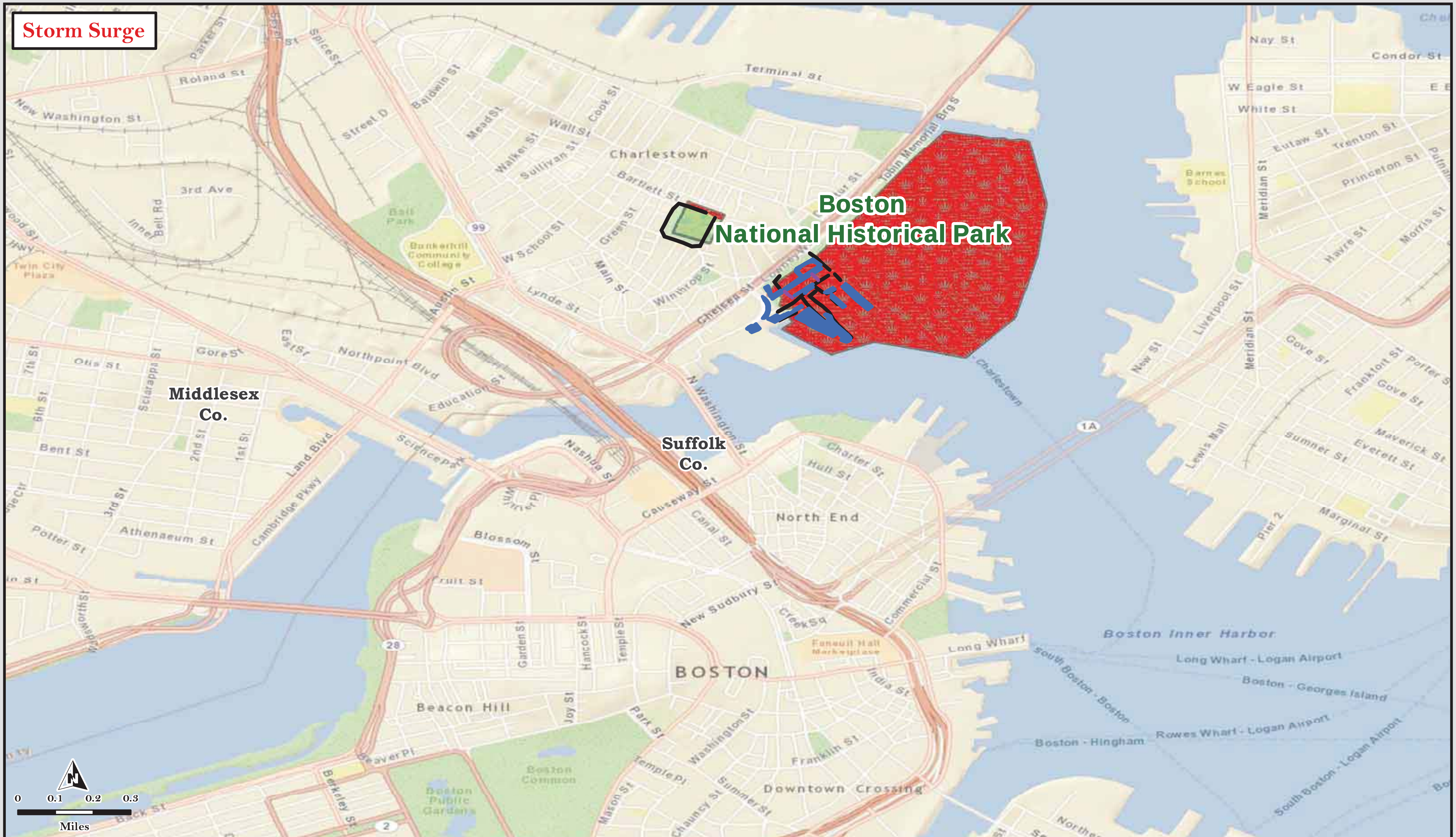
0 2 4 6
Miles

NPS Northeast Region Long Range Transportation Plan

Assateague Island National Seashore (MD, VA)

Figure 2

E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_02_Assateague_Island_NS_11x17_SS.mxd



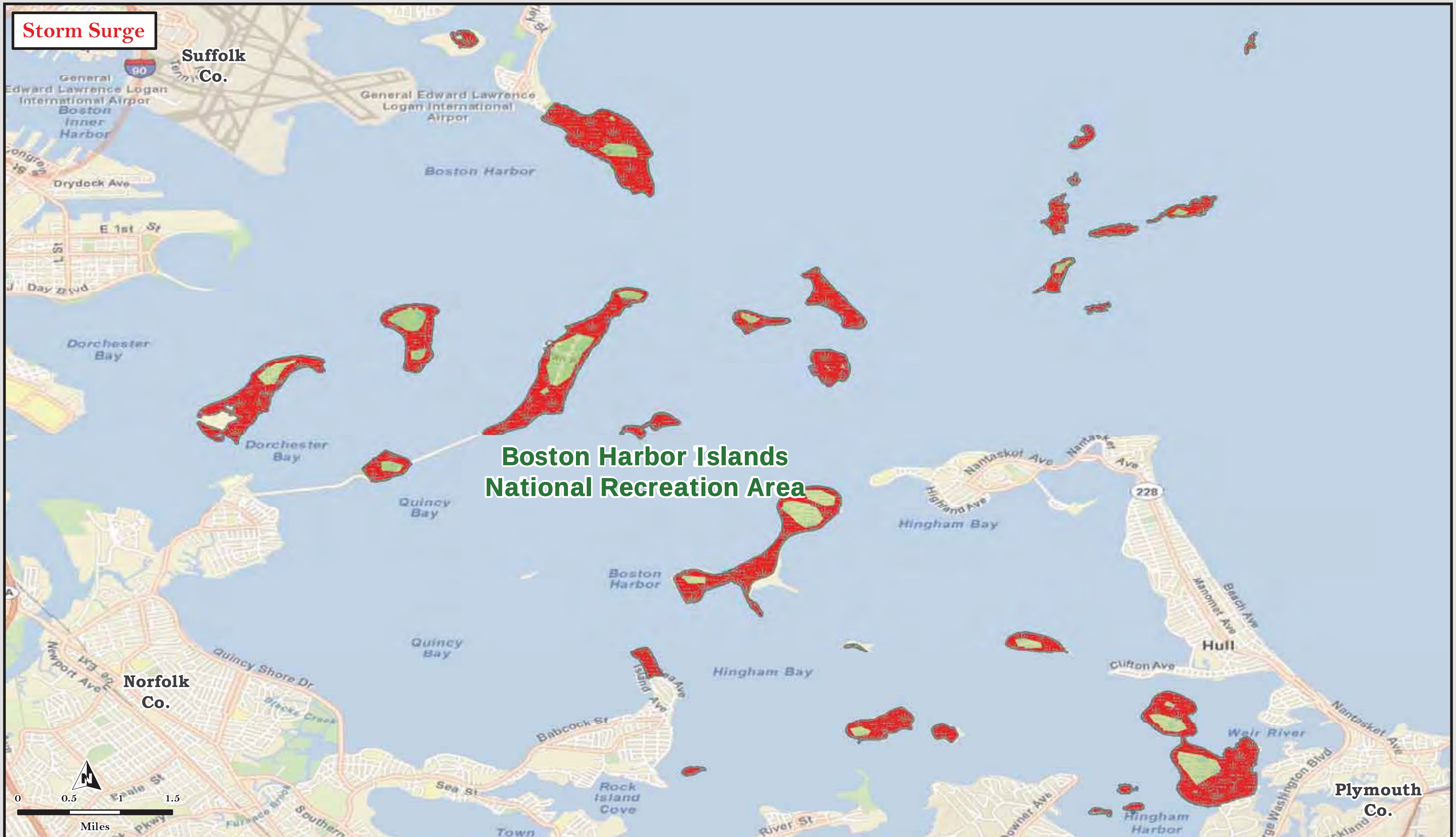
LEGEND			
NPS Route	Building	15-Foot Storm Surge Area	
Access/Service Road	Parking Area	NWI Wetlands	
	Park Boundary		Street Base Map © Esri, 2011

NPS Northeast Region Long Range Transportation Plan

Boston National Historical Park (MA)

Figure 3

E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_03_Boston_NHP_11x17_SS.mxd



LEGEND

- NPS Route
- Access/Service Road
- Building
- Parking Area
- Park Boundary
- 15-Foot Storm Surge Area
- NWI Wetlands

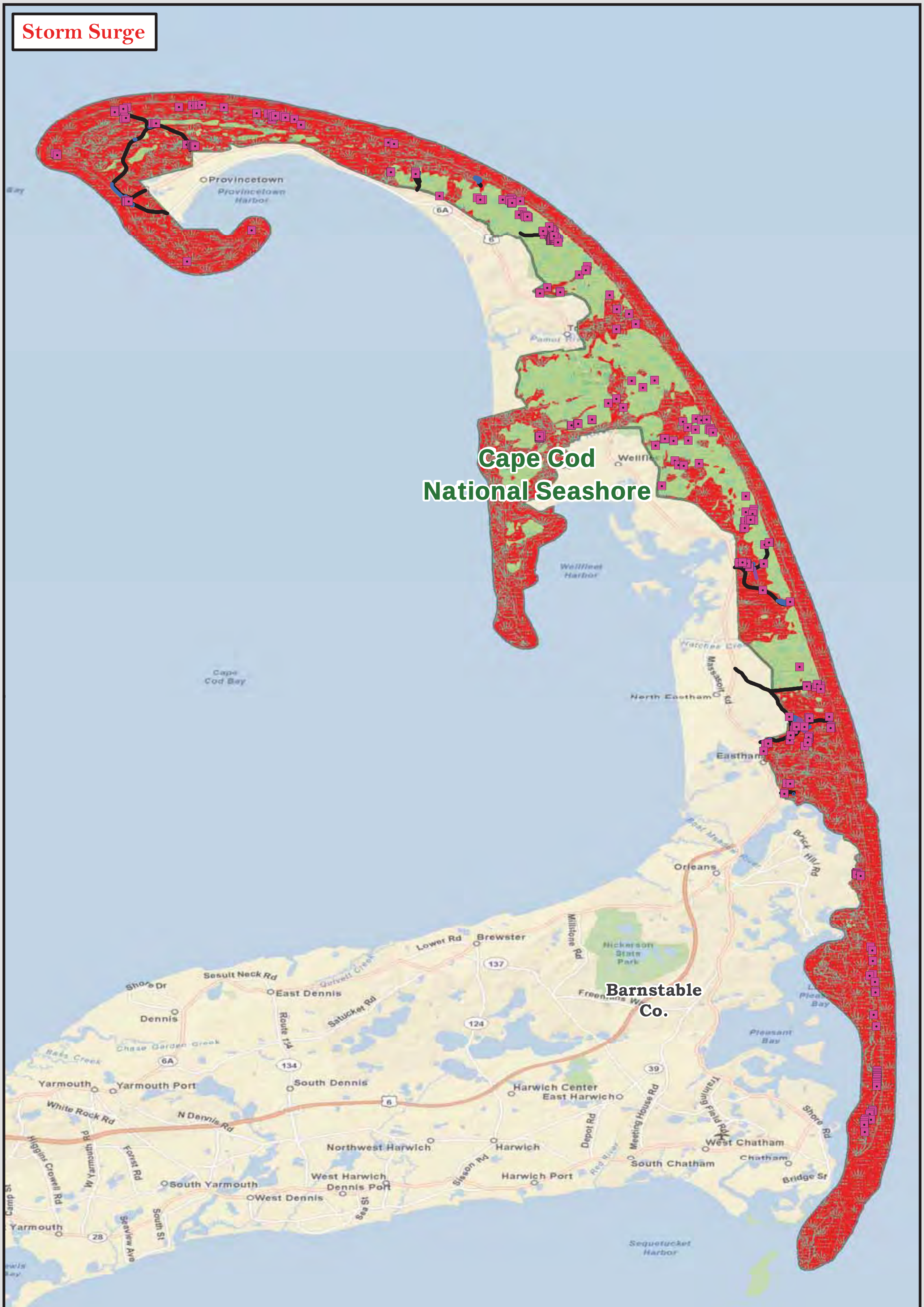
Street Base Map © Esri, 2011

NPS Northeast Region Long Range Transportation Plan

Boston Harbor Islands National Recreation Area (MA)

Figure 4

E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_04_Boston_Harbor_Islands_NRA_11x17_SS.mxd



LEGEND

- NPS Route
- Access/Service Road
- Building
- Parking Area
- Park Boundary
- 15-Foot Storm Surge Area
- NWI Wetlands

Street Base Map © Esri, 2011

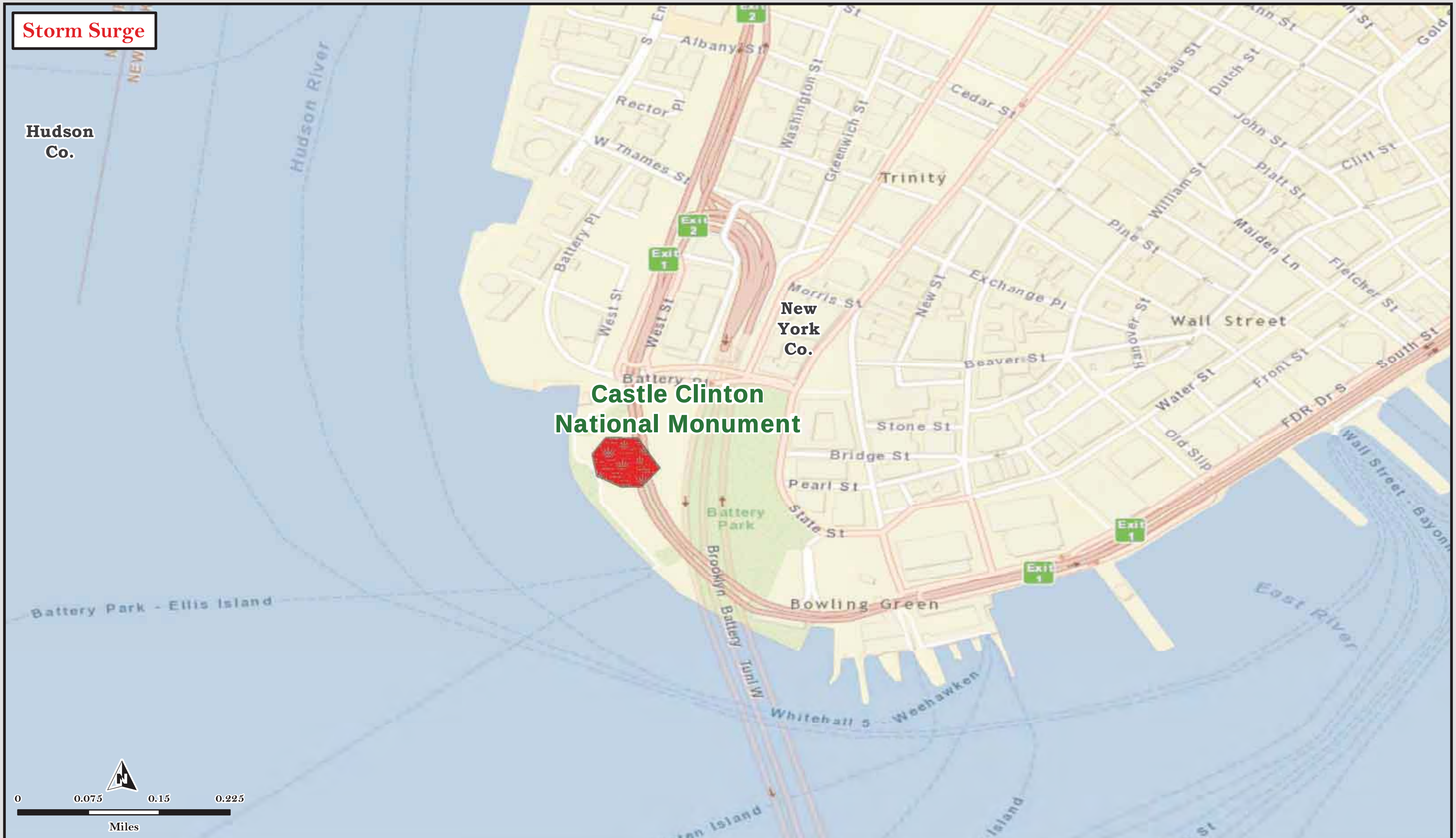
0 2 4 6
Miles

NPS Northeast Region Long Range Transportation Plan

Cape Cod National Seashore (MA)

Figure 5

E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_05_Cape_Cod_NS_11x17_SS.mxd



LEGEND

- NPS Route
- Access/Service Road
- Building
- Parking Area
- Park Boundary
- 15-Foot Storm Surge Area
- NWI Wetlands

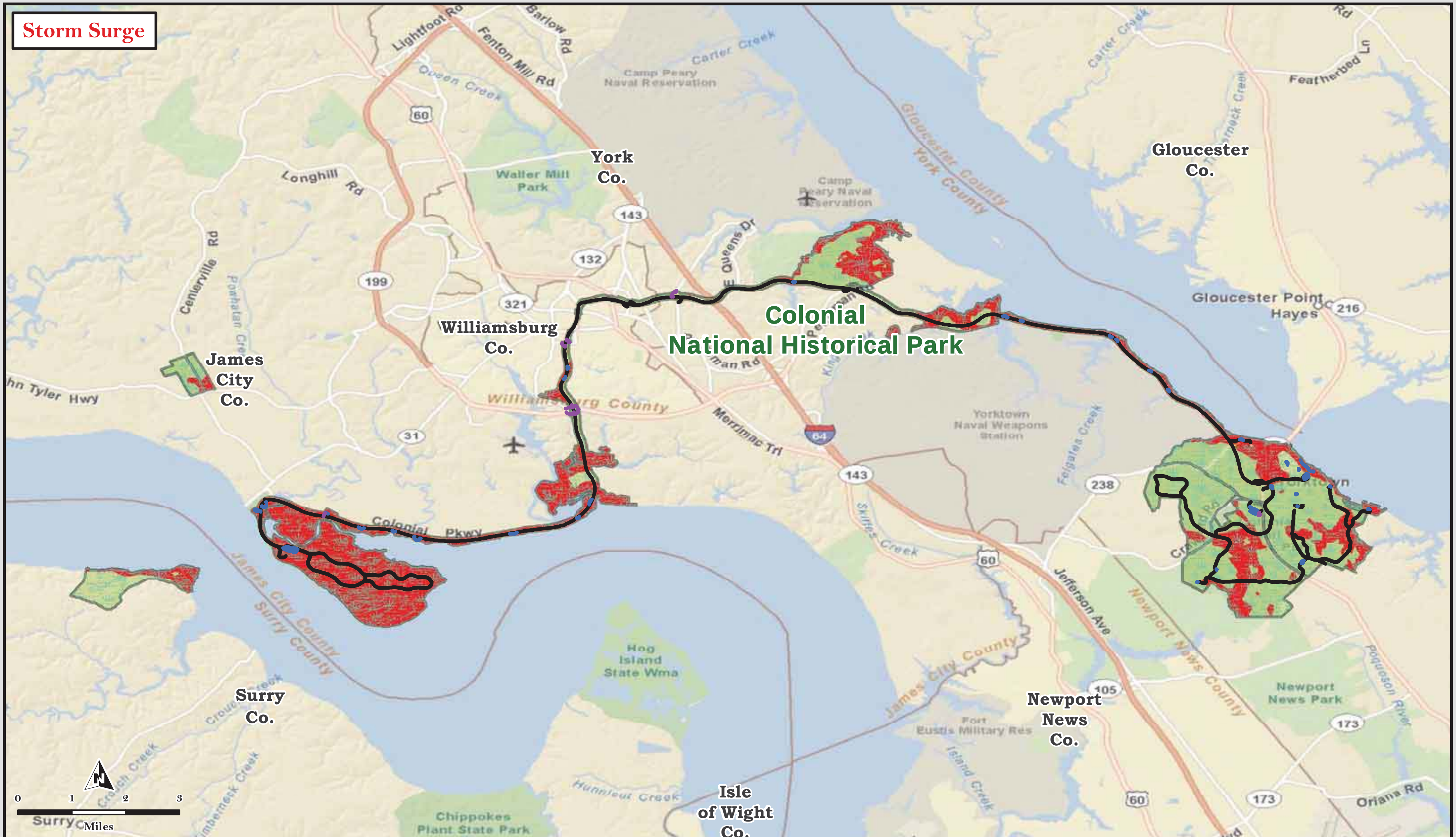
Street Base Map © Esri, 2011

NPS Northeast Region Long Range Transportation Plan

Castle Clinton National Monument (NY)

Figure 6

E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_06_Castle_Clinton_NM_11x17_SLR.mxd



LEGEND

- NPS Route
- Access/Service Road
- Building
- Parking Area
- Park Boundary
- 15-Foot Storm Surge Area
- NWI Wetlands

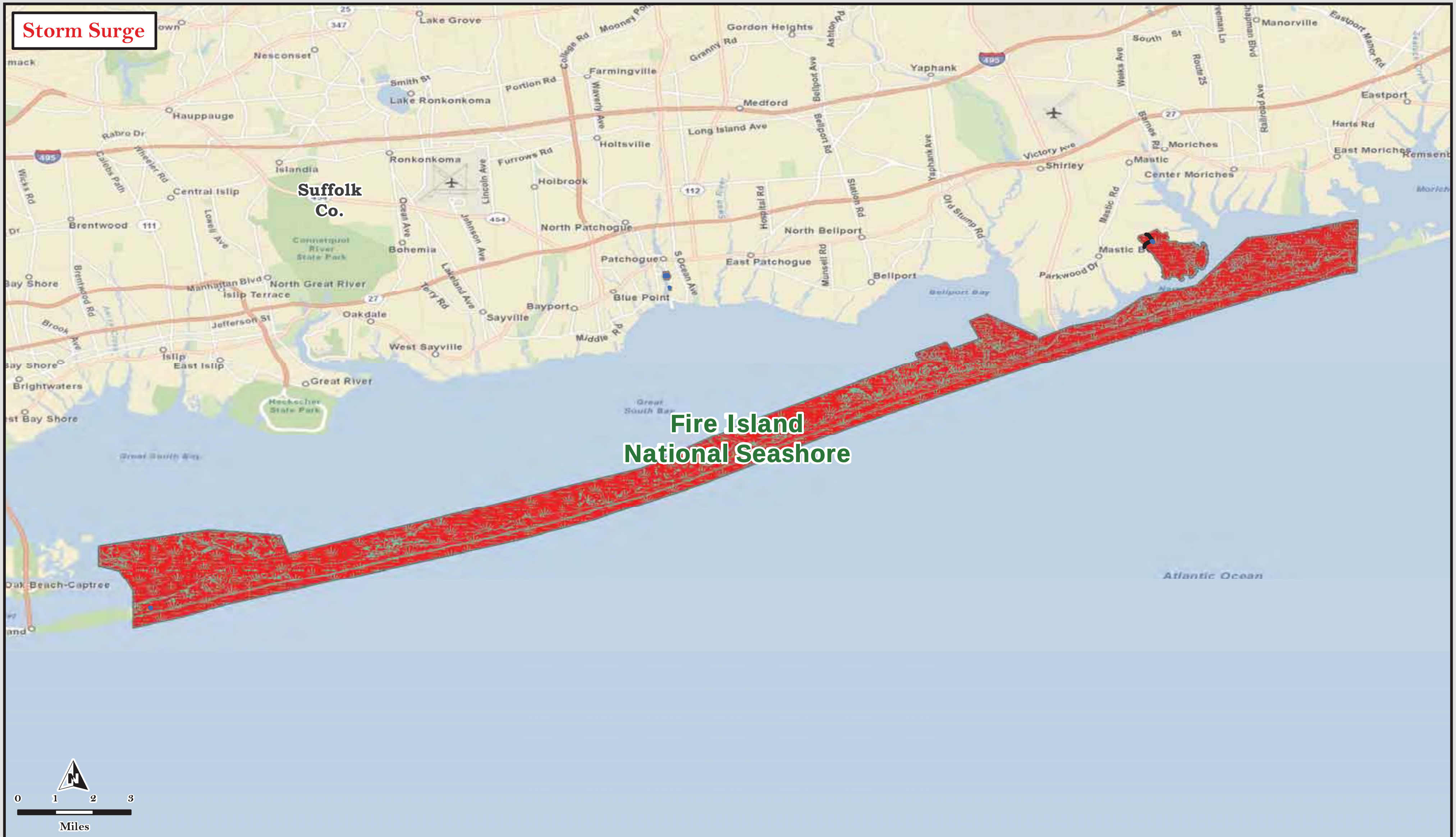
Street Base Map © Esri, 2011

NPS Northeast Region Long Range Transportation Plan

Colonial National Historical Park (VA)

Figure 7

E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_07_Colonial_NHP_11x17_SLR.mxd



LEGEND

- NPS Route
- Access/Service Road
- Building
- Parking Area
- Park Boundary
- 15-Foot Storm Surge Area
- NWI Wetlands

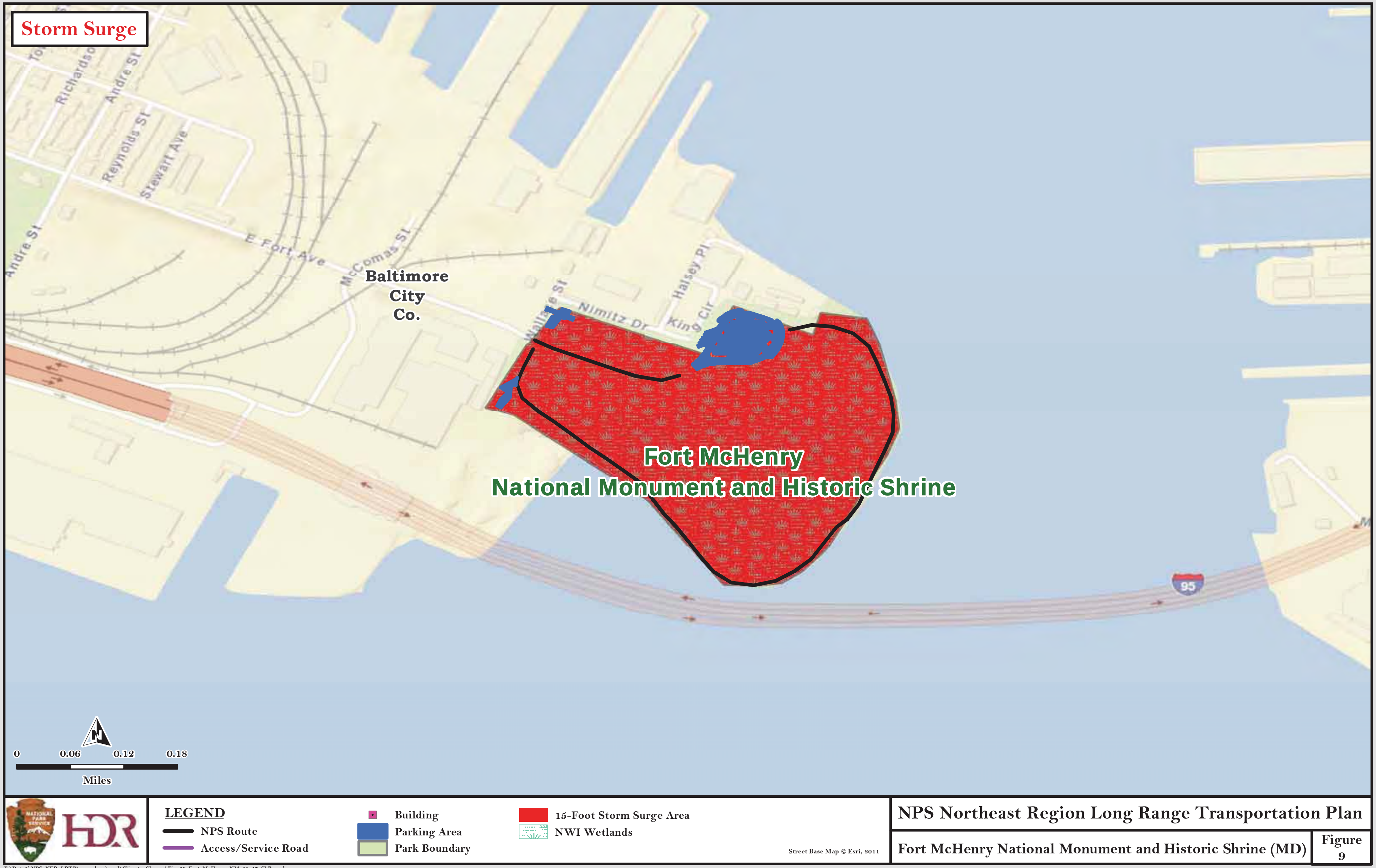
Street Base Map © Esri, 2011

NPS Northeast Region Long Range Transportation Plan

Fire Island National Seashore (NY)

Figure 8

E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_08_Fire_Island_NS_11x17_SLR.mxd



NPS Northeast Region Long Range Transportation Plan

Fort McHenry National Monument and Historic Shrine (MD)

Figure 9

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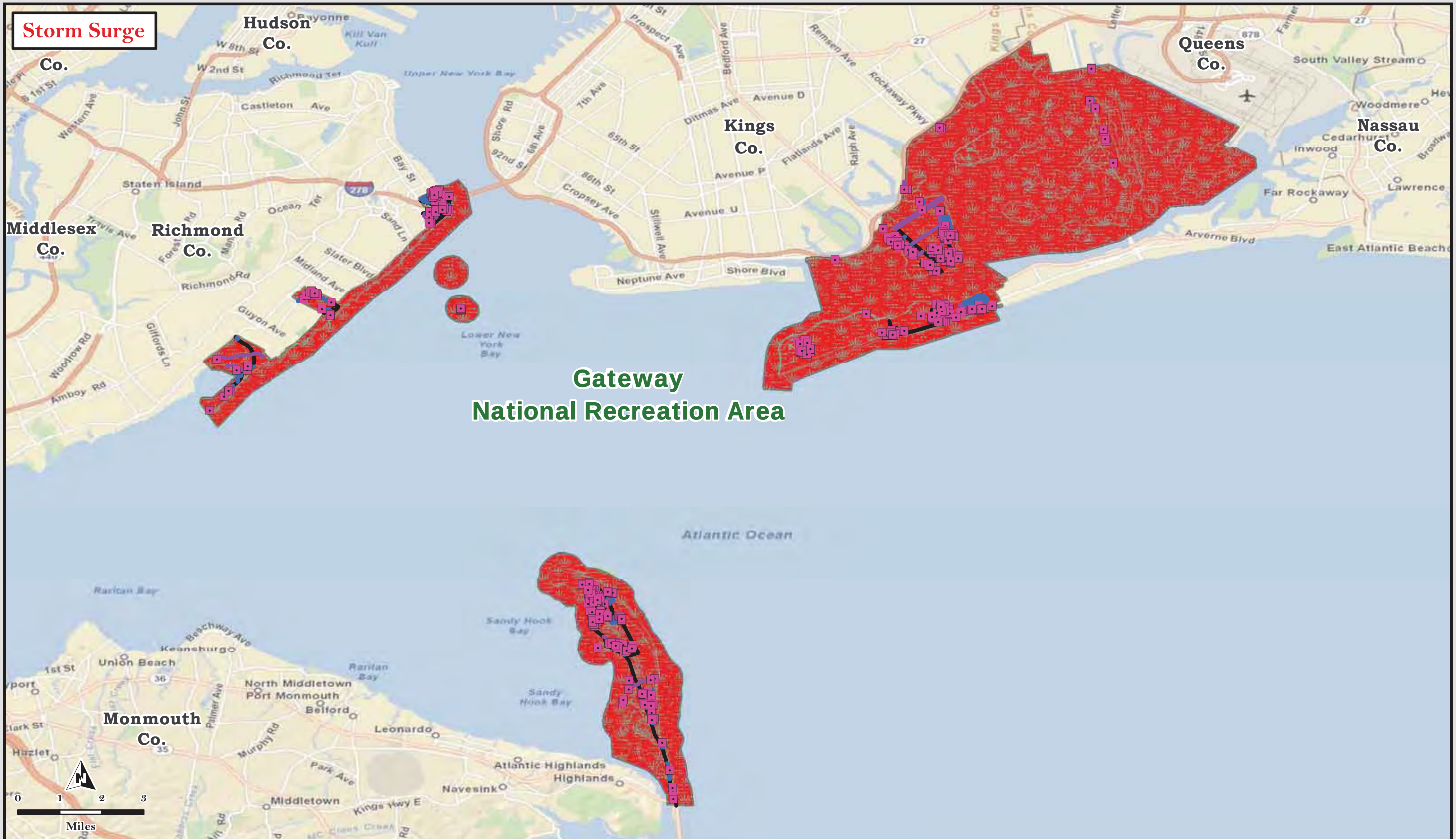

NPS Northeast Region Long Range Transportation Plan

Gateway National Recreation Area (NY, NJ)

Figure 10

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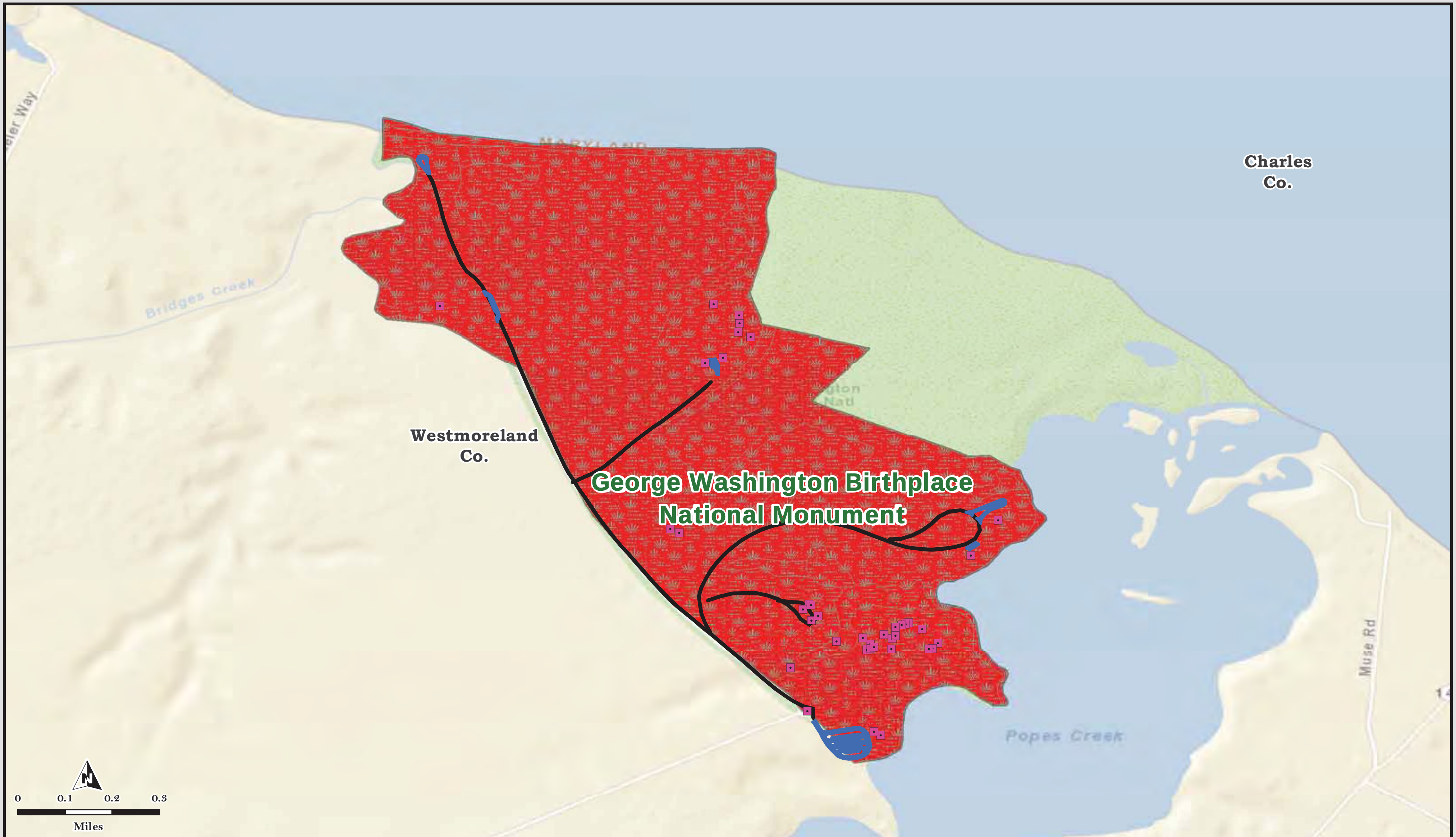


LEGEND

- NPS Route
- Access/Service Road
- Building
- Parking Area
- Park Boundary

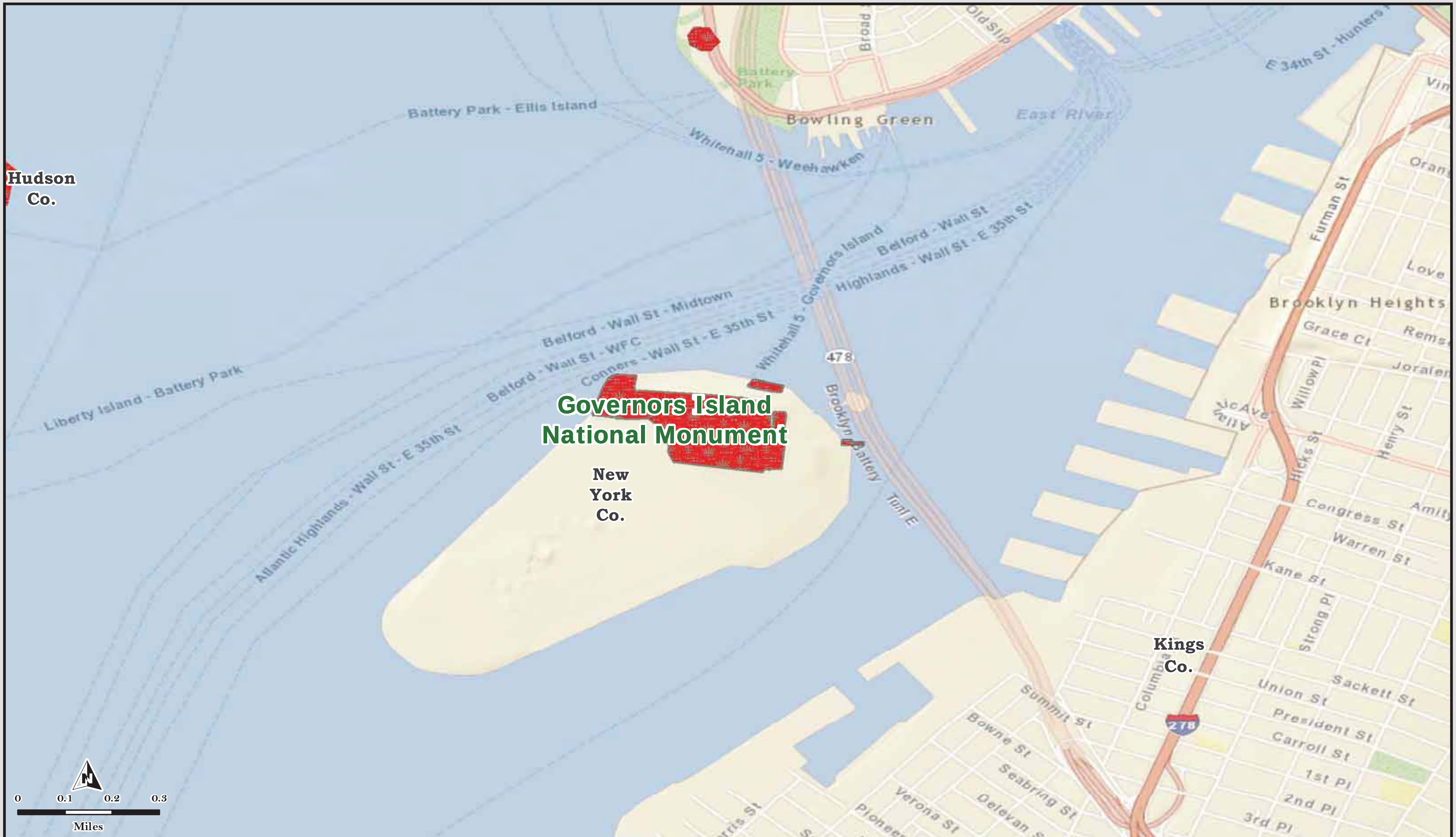
Street Base Map © Esri, 2011

NPS Northeast Region Long Range Transportation Plan

George Washington Birthplace National Monument (VA)

Figure 11

E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_11_George_Washington_Birthplace_NM_11x17_SS.mxd



LEGEND

- NPS Route
- Access/Service Road
- Building
- Parking Area
- Park Boundary

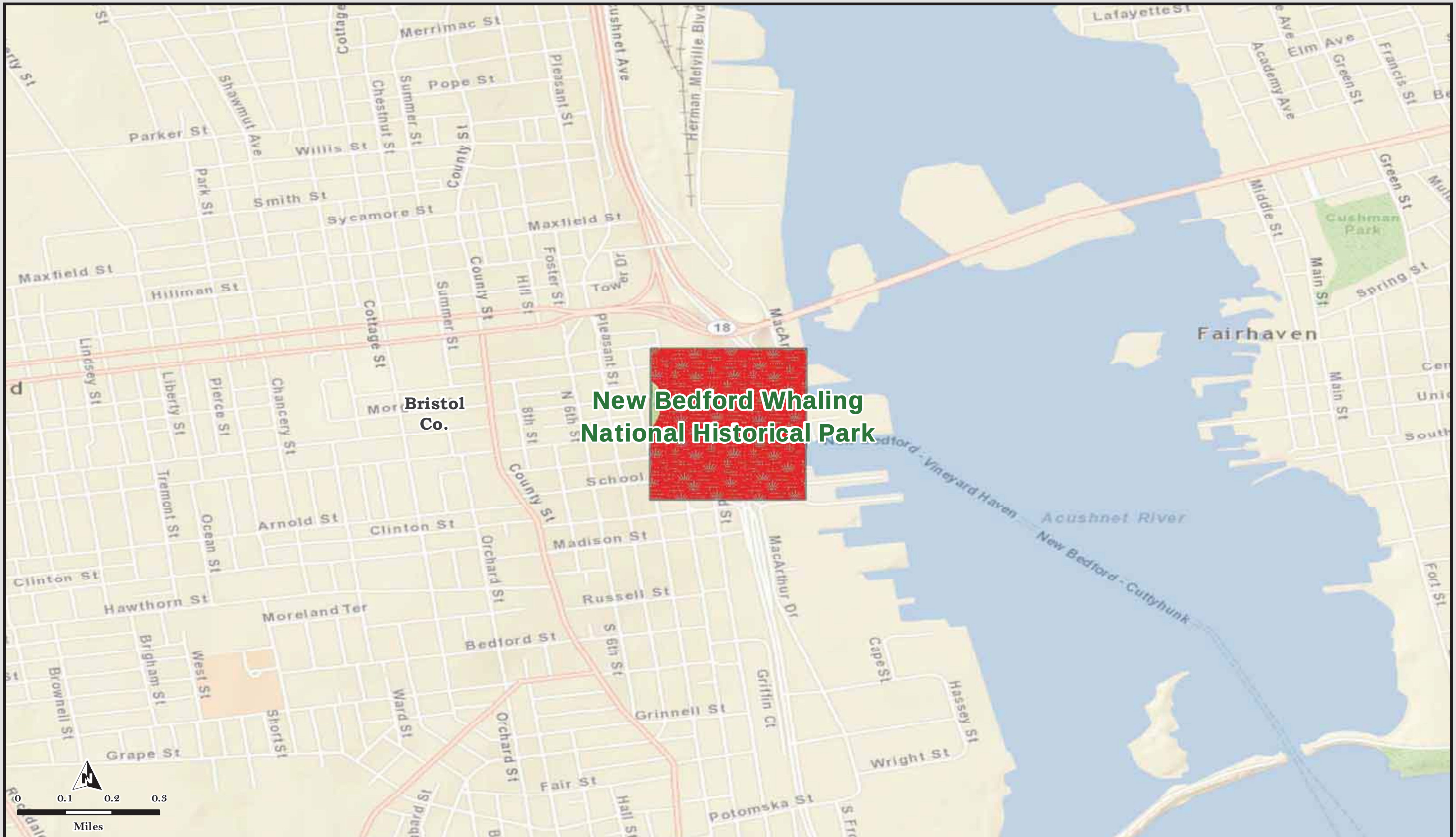
Street Base Map © Esri, 2011

NPS Northeast Region Long Range Transportation Plan

Governor's Island National Monument (NY)

Figure 12

E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_12_Governors_Island_NM_11x17_SS.mxd



LEGEND

- NPS Route
- Access/Service Road
- Building
- Parking Area
- Park Boundary

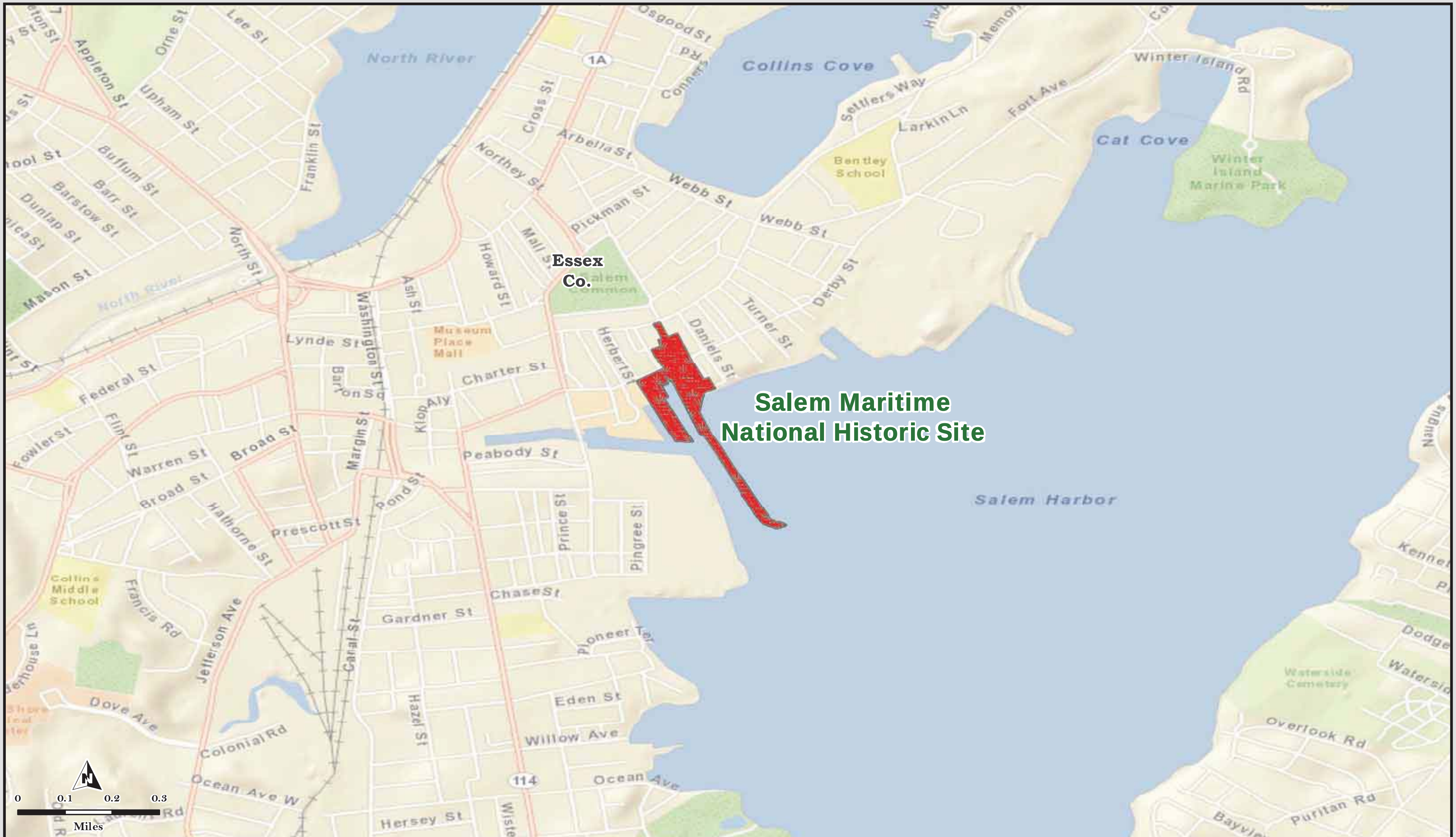
Street Base Map © Esri, 2011

NPS Northeast Region Long Range Transportation Plan

New Bedford Whaling National Historical Park (MA)

Figure 13

E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_13_New_Bedford_Whaling_NHP_11x17_SS.mxd



LEGEND

- NPS Route
- Access/Service Road
- Building
- Parking Area
- Park Boundary

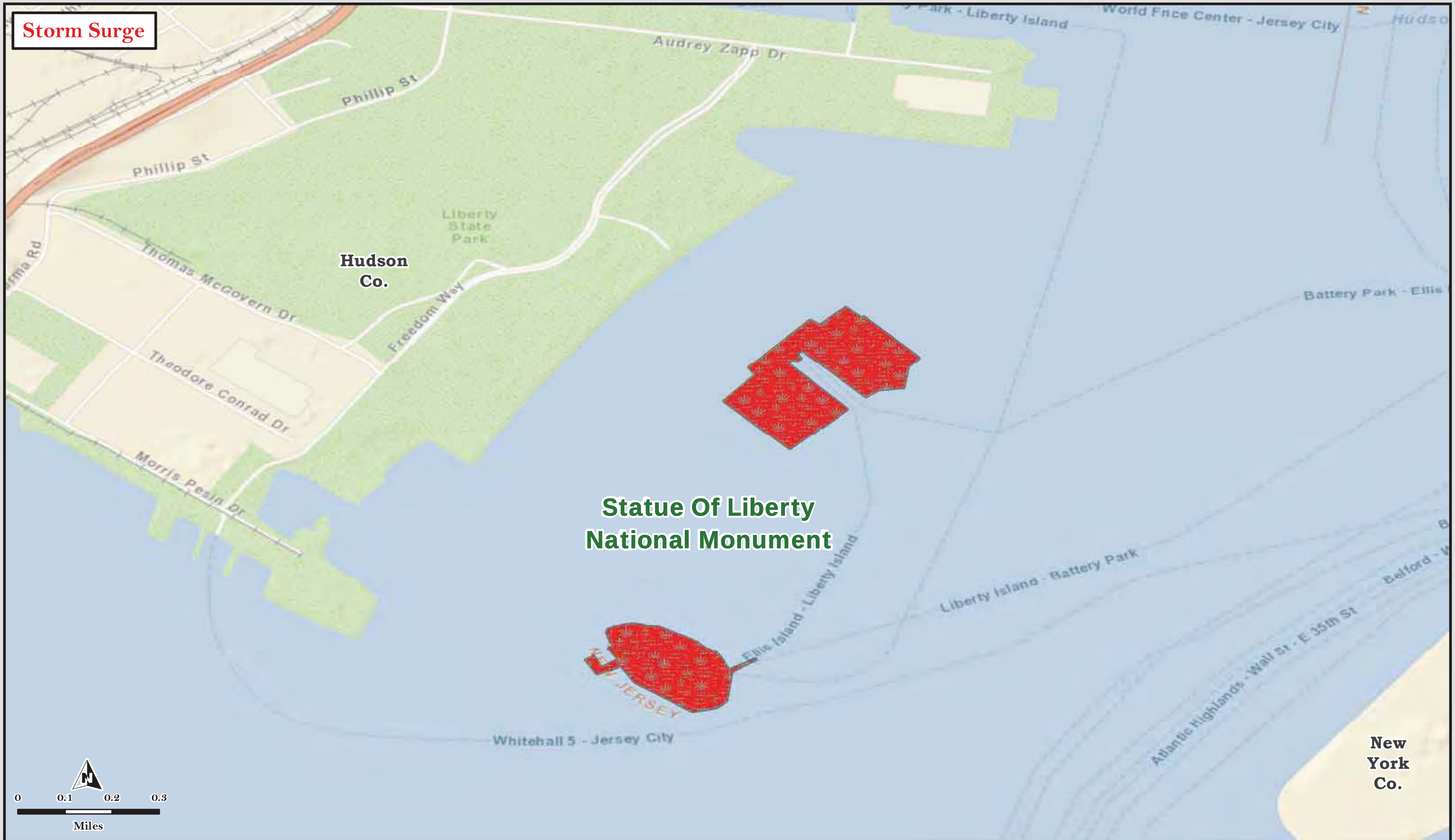
Street Base Map © Esri, 2011

NPS Northeast Region Long Range Transportation Plan

Salem Maritime National Historic Site (MA)

Figure 14

E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_14_Salem_Maritime_NHS_11x17_SS.mxd



NPS Northeast Region Long Range Transportation Plan

Statue of Liberty National Monument (NY)

Figure 15

E:\Data1\NPS_NER_LRTP\map_docs\mxd\Climate_Change\Fig_15_Statue_of_Liberty_NM_11x17_SS.mxd

SEA LEVEL RISE AND STORM SURGE RISK ASSESSMENT MAPPING RESULTS

Access Road Summary

PARK / SEA LEVEL RISE or STORM SURGE / ACCESS ROAD NAME
Acadia
0-1 Feet
ACADIA DRIVE
1-2 Feet
ACADIA DRIVE
FRAZER POINT PICNIC AREA
SEAWELL CAMPGROUND PICNIC AREA A
2-15 Feet
FRAZER POINT PICNIC AREA
HILLS COVE STORAGE AREA ROAD
HULLS COVE PARK RESIDENCE ROAD
SEAWALL CAMPGROUND LOOP A
SEAWALL CAMPGROUND LOOP B
SEAWALL CAMPGROUND LOOP C
SEAWALL CAMPGROUND LOOP D
SEAWALL CAMPGROUND MAINTENANCE ROAD
SEAWALL GROUP CAMPING AREA
SEAWALL RANGER RESIDENCE ROAD
SEAWELL CAMPGROUND PICNIC AREA A
SIEUR DE MONTS ROAD
THOMPSON ISLAND PICNIC AREA
Assateague Island
0-1 Feet
TOMS COVE ROAD
1-2 Feet
TOMS COVE ROAD
Boston
2-15 Feet
FOURTH STREET
THIRD STREET
Cape Cod
0-1 Feet
COAST GUARD BEACH SHUTTLE ACCESS ROAD
1-2 Feet
COAST GUARD BEACH SHUTTLE ACCESS ROAD
TOMAHAWK TRAIL
2-15 Feet
COAST GUARD BEACH SHUTTLE PICKUP ROUTE
COAST GUARD BEACH SHUTTLE ACCESS ROAD
COAST GUARD BEACH SHUTTLE BUS STOP ACCESS ROAD
PROVIDINCE LANDS RESIDENCE ROAD
PUMPHOUSE ROAD
TOMAHAWK TRAIL
Colonial
2-15 Feet
JAMES TOWN MAINTENANCE ACCESS ROAD

PARK / SEA LEVEL RISE or STORM SURGE / ACCESS ROAD NAME
Gateway
0-1 Feet
GREAT KILLS ADMIN ACCESS RD
1-2 Feet
BOARDWALK ACCESS
FISHERMAN'S PARKING ACCESS
GREAT KILLS ADMIN ACCESS RD
LAWSON LANE
LOT L ADMIN ROAD
MAINTENANCE SHOP ROAD A
MAINTENANCE SHOP ROAD B
MAINTENANCE SHOP ROAD C
NORTH BARETTE
NORTH BEACH SERVICE ROAD
POST OFFICE RD
RANDOLPH ROAD
ROMERO RD
RUNWAY C
SERVICE ROAD
THE BOARDWALK
2-15 Feet
ATHLETIC FIELD ACCESS RD
AYERS ROAD
BOARDWALK ACCESS
CANARSIE PIER ACCESS ROAD
CHAPEL RD
COMMUNITY GARDEN ACCESS RD
DAVIS ROAD
FISH AND WILDLIFE ADMIN ROAD
GREAT KILLS ADMIN ACCESS RD
GREAT KILLS NEW ROAD
GUNNISON ROAD BUS ACCESS
JACOB RIIS SERVICE RD
JAMAICA BAY RESIDENCE ROAD
LAWSON LANE
LOT L ADMIN ROAD
MAINTENANCE AREA ACCESS ROAD
MILLER FIELD RESIDENCE LOOP
NIKE MAINTENANCE ROAD
NOAA SERVICE ROAD
NORTH BARETTE
POST OFFICE RD
RANDOLPH ROAD
RIDING ACADEMY ACCESS
RUNWAY C
SAND SHED ROAD

PARK / SEA LEVEL RISE or STORM SURGE / ACCESS ROAD NAME
STEELE RD
TAXIWAY A
TAXIWAY B
TAXIWAY C
THE BOARDWALK
USS MISSOURI LANE

SEA LEVEL RISE AND STORM SURGE RISK ASSESSMENT MAPPING RESULTS
Route Summary

PARK / SEA LEVEL RISE / ROUTE NAME

Acadia

0-1 Feet

- Park Loop Road (right lane)
- Schoodic Loop Road
- Schoodic Point Road
- Stanley Brook Road

1-2 Feet

- Park Loop Road (right lane)
- Schoodic Loop Road
- Schoodic Point Road
- Stanley Brook Road

2-15 Feet

- Fish House Road
- Otter Cliff Road
- Paradise Hill Road
- Park Loop Road (right lane)
- Schoodic Loop Road
- Schoodic Point Road
- Seawall Campground Entrance Road
- Stanley Brook Road

Assateague Island

0-1 Feet

- BAYBERRY DRIVE
- MADDOX BLVD. BRIDGE

1-2 Feet

- BAYBERRY DRIVE
- BAYSIDE DRIVE
- BEACH ROAD
- MADDOX BLVD. BRIDGE
- OCEANSIDE DRIVE

2-15 Feet

- BAYBERRY DRIVE
- BAYSIDE DRIVE
- OCEANSIDE DRIVE

Boston

2-15 Feet

- BAXTER ROAD
- COMMANDANT'S HOUSE DRIVEWAY
- DRY DOCK 1 AND 2 CONNECTOR
- DRY DOCK 1 EAST
- DRY DOCK WEST
- FIFTH STREET
- FIRST AVENUE
- LINCOLN AVENUE
- SECOND AVENUE
- THIRD STREET/PIER 1

PARK / SEA LEVEL RISE / ROUTE NAME

Cape Cod

1-2 Feet

DOANE ROAD
MOORS ROAD
PROVINCE LANDS ROAD
RACE POINT ROAD

2-15 Feet

CABLE ROAD
DOANE ROAD
DOANE ROCK PICNIC AREA ROAD
FORT HILL AREA ROAD
HEAD OF THE MEADOW BEACH ROAD
MACPHERSON WAY
MARCONI BEACH ROAD
MARCONI EMPLOYEE PARKING ROAD
MARCONI MAINTENANCE AREA ROAD
MARCONI RESIDENCE ROAD
MARCONI SITE ROAD
MOORS ROAD
NAUSET LIGHT BEACH ACCESS ROAD
NAUSET ROAD
PROVINCE LANDS ROAD
RACE POINT COAST GUARD STATION ROAD
RACE POINT ROAD
STATE ROUTE 6

Colonial

0-1 Feet

COLONIAL PARKWAY
EAST TOUR ROAD
ISLAND DRIVE
ISLAND DRIVE (OUTER LOOP)
JAMESTOWN TOUR ACCESS ROAD

1-2 Feet

COLONIAL PARKWAY
EAST TOUR ROAD
ISLAND DRIVE
ISLAND DRIVE (OUTER LOOP)
JAMESTOWN TOUR ACCESS ROAD

2-15 Feet

APVA Access Road/Skip's Dirt Road
BATTLEFIELD TOUR ROAD
COLONIAL PARKWAY
EAST TOUR ROAD
FRENCH ENCAMPMENT TOUR ROAD
FUSILIER'S ROAD
ISLAND DRIVE

PARK / SEA LEVEL RISE / ROUTE NAME

ISLAND DRIVE (OUTER LOOP)
JAMESTOWN TOUR ACCESS ROAD
MOORE HOUSE ACCESS ROAD
SHORT LOOP ROAD
SURRENDER ROAD
TAZEWELL HALL ACCESS ROAD
US RTE 17 ACCESS ROAD
WASHINGTON'S HEADQUARTERS ROAD

Fire Island

2-15 Feet

MAIN ENTRANCE
MAIN EXIT

Fort McHenry

0-1 Feet

SEAWALL ROAD

1-2 Feet

SEAWALL ROAD

2-15 Feet

FORT AVENUE
SEAWALL ROAD

Gateway

0-1 Feet

AVIATION RD
EMMET ROAD
HARTSHORNE DRIVE (NORTHBOUND)
MILLER FIELD ACCESS RD
SANCHEZ ROAD EAST

1-2 Feet

ATLANTIC DRIVE
AVIATION RD
BARRETT ROAD
BEACH 193RD STREET
BREEZY POINT PARKING ACCESS
EMMET ROAD
HARTSHORNE DRIVE (NORTHBOUND)
HEINZELMAN RD
HUDSON ROAD
KEARNY DRIVE
KESSLER DRIVE
KNOX ROAD SOUTH
MCGRUDER DRIVE
MCNAIR ROAD
MERCER ROAD
MILLER FIELD ACCESS RD
PENNINGTON ROAD
SANCHEZ ROAD EAST

PARK / SEA LEVEL RISE / ROUTE NAME
2-15 Feet
ATHLETIC DRIVE
ATLANTIC DRIVE
AVIATION RD
BARRETT ROAD
BEACH 169TH STREET
BEACH 193RD STREET
BREEZY POINT PARKING ACCESS
BUILDING 272 ACCESS RD
CANFIELD ROAD
COMMUNITY GARDEN ACCESS RD
DAVIS ACCESS RD
DAVIS ROAD
ECOLOGY RD
EMMET ROAD
ENTERPRISE AVENUE
FISHING ACCESS RD
FLOYD BENNETT ENTRANCE ROAD
FORD ROAD
HAAN ROAD
HANAKI ROAD
HARTSHORNE DRIVE (NORTHBOUND)
HEINZELMAN RD
HERO ROAD
HUDSON ROAD
KEARNY DRIVE
KESSLER DRIVE
KILPATRICK ROAD
KNOX ROAD NORTH
KNOX ROAD SOUTH
MCGRUDER DRIVE
MCNAIR ROAD
MERCER ROAD
NEW GUNNISON ROAD
NORTH BRAGG DRIVE
OLD GUNNISON ROAD
OLD TRAILER CAMP LANE
PENNINGTON ROAD
RANGE ROAD
RANGER ROAD
RUNWAY A
SANCHEZ ROAD EAST
SANCHEZ ROAD WEST
SHORE ROAD
SOUTH BRAGG DRIVE
TAXIWAY C ACCESS

PARK / SEA LEVEL RISE / ROUTE NAME
THEATER RD
USS ARIZONA LANE
USS CONNECTICUT COURT
USS FLORIDA COURT
USS IOWA CIRCLE
USS NORTH CAROLINA ROAD
USS TENNESSEE ROAD
WEED ROAD
WORCESTER ROAD
George Washington Birthplace
2-15 Feet
BEACH ACCESS ROAD
MAINTENANCE AREA ROAD
PICNIC AREA ACCESS ROAD
RESIDENCE ACCESS ROAD

PARK / SEA LEVEL RISE OR STORM SURGE / PARKING LOT NAME

Acadia

0-1 Feet

BLUEBERRY HILL PARKING AREA
PARKING ON RTE 301

1-2 Feet

BLUEBERRY HILL PARKING AREA

2-15 Feet

BLUEBERRY HILL PARKING AREA
GORHAM MOUNTAIN PARKING AREA
LOWER SAND BEACH PARKING AREAS
OTTER POINT PARKING AREA
PARKING AREA (RIGHT) BETWEEN T-H
PARKING ON RTE 300, MP 6.5
PARKING ON RTE 300, MP 7.0
SEAWALL CAMPGROUND AMPITHEATER P
SHIP HARBOR NATURE TRAIL PARKING
THOMPSON ISLAND INFORMATION CENT
THUNDER HOLE PARKING
WONDER LAND PARKING

Assateague Island

0-1 Feet

FERRY LANDING ACCESS ROAD

1-2 Feet

BAYSIDE CAMPGROUND LOOP A
BAYSIDE CAMPGROUND LOOP B
BAYSIDE CAMPGROUND LOOP C
BAYSIDE PICNIC AREA
BONEYARD ACCESS
ENTRANCE STATION
FERRY LANDING ACCESS ROAD
HISTORY EXHIBITS
LIFE OF THE FOREST TRAIL PARKING
LIFE OF THE MARSH PARKING
NORTH BEACH PARKING
OCEANSIDE CAMPGROUND GROUP PARKING
OCEANSIDE DRIVE-IN EXIT
OCEANSIDE WALK-IN CAMPGROUND 42-65 PARKING
OCEANSIDE WALK-IN CAMPGROUND 66-85 PARKING
PARKING LOT P1
PARKING LOT P2
PARKING LOT P3
PARKING LOT P4
RECYCLING CENTER

2-15 Feet

AIR-UP STATION
BAYSIDE CAMPGROUND LOOP B

PARK / SEA LEVEL RISE OR STORM SURGE / PARKING LOT NAME

BAYSIDE CAMPGROUND LOOP C
BAYSIDE PICNIC AREA
BONEYARD ACCESS
DUMP STATION 1
DUMP STATION 2
ENTRANCE STATION
HISTORY EXHIBITS
LIFE OF THE DUNES PARKING
LIFE OF THE FOREST TRAIL PARKING
NORTH BEACH PARKING
OCEANSIDE CAMPGROUND GROUP PARKING
OCEANSIDE DRIVE-IN CAMPGROUND LOOP 1
OCEANSIDE DRIVE-IN CAMPGROUND LOOP 2
OCEANSIDE DRIVE-IN EXIT
OCEANSIDE WALK-IN CAMPGROUND 86-104 PARKING
ORV ZONE ACCESS
PARKING LOT P2
SOUTH BEACH PARKING

Boston

2-15 Feet

BAXTER ROAD PARKING
BUILDING 1 AND 269 PARKING
DRY DOCK 1 AND 2 CONNECTOR PARKING
DRY DOCK 1 EAST PARKING
DRY DOCK 1 WEST PARKING
FIRST AVENUE BUS PARKING A
FIRST AVENUE BUS PARKING B
LINCOLN AVENUE PARKING
MARINE BARRACKS PARKING
SECOND AVENUE PARKING A
SECOND AVENUE PARKING B
SECOND AVENUE PARKING C
SECOND AVENUE PARKING D
SECOND AVENUE PARKING E
SECOND AVENUE PARKING F
THIRD STREET/PIER 1 PARKING

Cape Cod

0-1 Feet

SALT POND VISITOR CENTER PARKING

1-2 Feet

BEECH FOREST PARKING
SALT POND VISITOR CENTER PARKING

2-15 Feet

BEECH FOREST PARKING
COAST GUARD BEACH BUS STOP PARKING
COAST GUARD BEACH ENVIRONMENTAL EDUCATION CENTER PARKING

PARK / SEA LEVEL RISE OR STORM SURGE / PARKING LOT NAME

DOANE ROCK PICNIC AREA PK
FORT HILL AREA PARKING
FORT HILL TRAILHEAD PARKING
HEAD OF THE MEADOW PARKING
HERRING COVE BEACH PARKING
MARCONI BEACH PARKING
MARCONI EMPLOYEE PARKING ROAD HELIPAD
MARCONI MAINTENANCE AREA PARKING
MARCONI RESIDENCE ROAD PARKING
NAUSET LIGHT BEACH PARKING
OLD VEHICLE STORAGE AREA
PARK HEADQUARTERS EMPLOYEE PARKING
PARK HEADQUARTERS PARKING
POVINCE LANDS MAINTENANCE PARKING
PROVINCE LANDS ROAD PARKING
RACE POINT AIR STATION PARKING
RACE POINT BEACH PARKING
RACE POINT RANGER STATION PARKING
SALT POND VISITOR CENTER PARKING

Colonial

0-1 Feet

YORKTOWN BEACH PARKING

1-2 Feet

ATTEMPTED SETTLEMENT
CORNWALLIS CAVE
NAVAL WEAPONS STATION #1
RINGFIELD PLANTATION
YORK RIVER #1
YORKTOWN BEACH PARKING

2-15 Feet

ARCHER'S HOPE
ATTEMPTED SETTLEMENT
BELLFIELD PLANTATION
CORNWALLIS CAVE
FUSILIERS REDOUBT
GLASS HOUSE PARKING
GLEBE LAND
GREAT NECK
INDIAN FIELD CREEK
JAMES RIVER
JAMES TOWN VISITOR CENTER PK
JAMESTOWN (OLD 113?)
JAMESTOWN MAINTENANCE PARKING
JAMESTOWN VISITOR'S CENTER PARKING
JONES MILL POND
MOORE HOUSE PK

PARK / SEA LEVEL RISE OR STORM SURGE / PARKING LOT NAME
NAVAL WEAPONS STATION #1
NECK OF LAND
POWHATAN'S VILLAGE
REAL ESTATE
RINGFIELD PLANTATION
YORK RIVER #1
YORKTOWN BEACH PARKING
Fire Island
0-1 Feet
ADMINISTRATIVE PARKING
FERRY TERMINAL PARKING
PUBLIC PARKING
1-2 Feet
FERRY TERMINAL PARKING
LIGHTHOUSE ANNEX PARKING
2-15 Feet
FERRY TERMINAL PARKING
WILLIAM FLOYD ESTATE PARKING
Fort McHenry
1-2 Feet
VISITOR CENTER PARKING
2-15 Feet
MAINTENANCE SHOP
STORAGE SHOP PARKING
VISITOR CENTER PARKING
Gateway
0-1 Feet
AL BANNERS EAST PARKING
BAYBERRY BEACH PARKING
CANARSIE PIER PARKING
CHOKECHERRY BEACH CENTER
ENTRANCE STATION PARKING
FEE COLLECTOR'S HOUSE PARKING
GATEWAY MARINA PARKING
MAINTENANCE AREA PARKING
PARKING AREA "E"
PARKING AREA "F"
QUARTER "600"
1-2 Feet
AL BANNERS EAST PARKING
AL BANNERS WEST PARKING
BAYBERRY BEACH PARKING
BOAT LAUNCH PARKING
CANARSIE PIER PARKING
CHOKECHERRY BEACH CENTER
EAST PARKING

PARK / SEA LEVEL RISE OR STORM SURGE / PARKING LOT NAME
ENTRANCE STATION PARKING
FEE COLLECTOR'S HOUSE PARKING
FISHERMAN'S PARKING AREA "F"
FORT HANCOCK THEATER PARKING
GATEWAY MARINA PARKING
GUNNISON BEACH PARKING
JACOB RIIS PARKING
LAWSON LANE PARKING
LOT "H" CAMPGROUND
LOT "L" RADAR SITE
LOT "M" GUARDIAN PARK
MAINTENANCE AREA PARKING
MAINTENANCE AREA SHOP PARKING
MAINTENANCE AREA SHOP PARKING A
MAINTENANCE AREA SHOP PARKING B
MILLER FIELD ENTRANCE PARKING
NIKE MISSILE SITE GAS STATION PARKING
NIKE MISSILE SITE MAINTENANCE BUILDING PARKING
NIKE MISSILE SITE PARKING
NIKE MISSILE SITE SHED PARKING
NORTH BEACH PARKING
OPPOSITE RANGER STATION PARKING
PARK RANGER PARKING
PARKING AREA "E"
PARKING AREA "F"
QUARTER "600"
RANGER PARKING A
RANGER PARKING B
RANGER STATION PARKING
REST AREA PARKING
SOUTH BEACH AREA "D"
SOUTH BEACH AREA "E"
2-15 Feet
AL BANNERS EAST PARKING
AL BANNERS WEST PARKING
BALL FIELD PARKING
BAY 17 PARKING
BEACH 169TH STREET PARKING
BEACH CENTER PARKING
BEACH PICKUP AREA
BOAT LAUNCH PARKING
BUILDING 129/131 PARKING A
BUILDING 129/131 PARKING B
BUILDING 40 PARKING
BUILDING 58 PARKING
BUILDING 60 PARKING

PARK / SEA LEVEL RISE OR STORM SURGE / PARKING LOT NAME
BUILDING 74 PARKING AREA
CANARSIE PIER PARKING
CAR TOP BOAT RAMP AND FISHING AREA PARKING
CIRCLE PARKING
COMMUNITY GARDEN AREA PARKING A
COMMUNITY GARDEN AREA PARKING B
COMMUNITY GARDENS PARKING
CRICKET AND SOCCER FIELD PARKING
DAVIS ACCESS ROAD PARKING
EAST PARKING
EMPLOYEE PARKING/PULLOUT
ENTRANCE AREA PARKING
FEE COLLECTOR'S HOUSE PARKING
FISHERMAN PARKING
FISHING ACCESS PARKING
FLOYD BENNETT NPS POLICE PARKING
FORT HANCOCK THEATER PARKING
GATEWAY MARINA PARKING
GATEWAY SPORTS PARKING
GREAT KILLS ENTRANCE PARKING
GREAT KILLS NEW PARKING
GUNNISON BEACH PARKING
JACOB RIIS PARKING
LAWSON LANE PARKING
LIGHTHOUSE PARKING
LOT "H" CAMPGROUND
LOT "L" RADAR SITE
LOT "M" GUARDIAN PARK
MAINTENANCE LOT
MAINTENANCE PARKING A
MAINTENANCE PARKING B
MARINE ACADEMY CAFETERIA PARKING
MARINE ACADEMY OF SCIENCES AND TECH PARKING
MILLER FIELD ENTRANCE PARKING
MODEL AIRPLANE FIELD PARKING
MOTOR POOL PARKING
NEW DORP HIGH SCHOOL PARKING A
NEW DORP HIGH SCHOOL PARKING B
NEW DORP HIGH SCHOOL PARKING C
NOAA PARKING A
NOAA PARKING B
NORTH BEACH PARKING
NPS HEADQUARTERS AREA PARKING B
NPS HEADQUARTERS AREA PARKING C
NPS HEADQUARTERS AREA PARKING D
NPS HEADQUARTERS AREA PARKING E

PARK / SEA LEVEL RISE OR STORM SURGE / PARKING LOT NAME
NPS HEADQUARTERS AREA PARKING F
NPS HEADQUARTERS AREA PARKING G
NPS PARK POLICE AREA PARKING
OPPOSITE NOAA PARKING
OPPOSITE RANGER STATION PARKING
PARKING AREA "A"
PARKING AREA "F"
PICNIC PARKING A
PICNIC PARKING B
POST OFFICE PARKING
RESIDENCE ACCESS PARKING
RESIDENCE PARKING
RYAN VISITOR CENTER EMPLOYEE PARKING
RYAN VISITOR CENTER PARKING
SANDY HOOK VISITOR CENTER PARKING
SEWAGE TREATMENT PARKING
SOUTH BEACH AREA "D"
SOUTH BEACH AREA "E"
TEACHERS PARKING
THEATER PARKING A
THEATER PARKING B
TYLUNAS HALL PARKING
USS NORTH CAROLINA AREA PARKING B
VISITOR CENTER AREA PARKING
VISITOR CENTER AREA PARKING A
VISITOR CENTER AREA PARKING B
VISITORS CENTER PARKING NW
VISITORS CENTER PARKING SE
WATER TREATMENT PLANT PARKING
WEED RD PARKING A
WEED RD PARKING B
WEED RD PARKING C
WEED RD PARKING D
WILDLIFE REFUGE PARKING
George Washington Birthplace
1-2 Feet
VISITOR CENTER ACCESS
2-15 Feet
BEACH PARKING
BURIAL GROUND PARKING
LOG HOUSE PARKING
MAINTENANCE AREA
PICNIC AREA PARKING
VISITOR CENTER ACCESS
VISITOR CENTER PARKING

SEA LEVEL RISE AND STORM SURGE RISK ASSESSMENT MAPPING RESULTS

Building Summary

PARK / SEA LEVEL RISE OR STORM SURGE	# OF BUILDINGS
Cape Cod	**155**
0-1 Feet	33
1-2 Feet	7
2-15 Feet	115
Gateway	**508**
0-1 Feet	21
1-2 Feet	126
2-15 Feet	361
George Washington Birthplace	**38**
1-2 Feet	2
2-15 Feet	36
Grand Total	**701**

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NORTHEAST REGION LONG RANGE TRANSPORTATION PLAN

Sustainability Subject Area Memorandum

Prepared for:

National Park Service
WASO Denver
12795 W. Alameda Parkway
P.O. Box 25287
Denver, CO 80225-0287

Prepared By:

Vanasse Hangen Brustlin, Inc.
351 McLaws Circle, Suite 3
Williamsburg, VA 23185-6316

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TABLE OF CONTENTS

1.0 INTRODUCTION

Sustainability is an integral part of the National Park Service mission and operations. Long before the Brundtland Commission of the United Nations (1987) described today's widely accepted definition of sustainable development as "*meeting the needs of current generations without compromising the ability of future generations to meet their own needs*" the National Park Service Organic Act (1916) defined the National Park Service mission similarly:

> *"...to promote and regulate the use of the...national parks...which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."* [1]

There are three generally accepted components of sustainability — economic, social, and environmental — and to be effective sustainability goals for the Northeast Region (NER) Long Range Transportation Plan (LRTP) should address all three. Actions that address each component will build upon one another.

Figure 1-1: Three Components of Sustainability

This memorandum addresses sustainability topics related to the current Northeast Region multimodal transportation system, and how the transportation system should/could be more sustainable in the future. The information is presented as follows:

- The **Summary of Guidance Documents** section presents policies, plans, and frameworks already in place that address sustainability in the National Park Service (NPS) and are applicable to the Northeast Region Long Range Transportation Plan. Specific goals, objectives, and actions from these documents are discussed in later sections.

[1] United States. Congress. National Park Service Organic Act, 16 U.S.C.1, 1916.

- The **Sustainability and the Current System** section discusses topics related to the current status of sustainability in the Northeast Region transportation system. The discussion separately addresses the three components of sustainability — economic, social, and environmental.
- The **Sustainability and the Future System** section discusses how the goals and objectives presented in *A Call to Action* and the *Green Parks Plan* are and can be integrated into the Northeast Region multimodal transportation system. Included is a discussion of measuring progress and effectiveness through metrics and a Sustainable Return on Investment analysis.
- The **Recommendations** section provides general recommendations for advancing sustainability in the transportation system, and a review of how recommendations from the Climate Change and Resource Stewardship technical subject areas memoranda align with the components of sustainability.

2.0 SUMMARY OF GUIDANCE DOCUMENTS

This section summarizes policies, plans, and frameworks already in place that address sustainability in the National Park Service and are applicable to the Northeast Region Long Range Transportation Plan. Specific goals, objectives, and actions from these documents are discussed in later sections of this report. To find more information on the documents discussed, complete citations for data sources are provided at the end of the document.

2.1 Executive Branch

Executive Order 13423 Strengthening Federal Environmental, Energy, and Transportation Management, January 2007

Executive Order 13423 serves as the basis for introducing sustainability into federal agencies, specifically from the perspective of transportation. Section 1, *Policy,* is quoted as follows.

> *It is the policy of the United States that Federal agencies conduct their environmental, transportation, and energy-related activities under the law in support of their respective missions in an environmentally, economically and fiscally sound, integrated, continuously improving, efficient, and sustainable manner.*

The statement not only recognizes the idea of making sustainable decisions, but also acknowledges two of the three components of sustainability: economic and environmental. The Executive Order goes on to set implementation goals to help agencies achieve the goals set in the policy including: improve energy efficiency in the agency; reduce greenhouse gas emissions, reduce water consumption, increase use of recycled materials, decrease the hazardous and toxic chemical use, follow sustainable construction standards and guidelines, reduce petroleum consumption in the vehicle fleet, and only purchase electronic equipment that meets energy and product standards that reduce energy use and the impact of product production and disposal.

Executive Order 13514 Federal Leadership in Environmental, Energy, and Economic Performance, October 2009

Executive Order 13514 builds upon energy and environmental performance requirements outlined in Executive Order 13423 for Federal Agencies. Under Executive Order 13514, all federal agencies must: develop greenhouse gas (GHG) emissions reduction targets for fiscal year 2020 (FY 20) relative to FY 08 baseline levels; submit a Strategic Sustainability Performance Plan that includes an evaluation of climate change vulnerabilities and risks to the agencies' operations; establish targets for low-GHG-emitting vehicles, alternative fuel vehicles, and optimizing the number of vehicles in agency fleets; reduce vehicle fleet petroleum consumption by two percent annually through FY 20, using FY 05 as a baseline; and ensure 95 percent of contracts use environmentally friendly products and services as defined in the Executive Order.

2.2 Department of the Interior

DOI Strategic Sustainability Performance Plan, Released June 2011 with Annual Updates
Executive Order 13514 requires all federal agencies to submit a Strategic Sustainability Performance Plan annually to the White House Council on Environmental Quality and the Office of Management and Budget. The Strategic Sustainability Performance Plan prioritizes agency actions based on a lifecycle return on investment strategy.

The DOI Strategic Sustainability Performance Plan outlines the Department's goals, strategies, and achievements in reducing GHG emissions and integrating sustainability into agency operations and decision making processes.

The DOI Strategic Sustainability Performance Plan (2011) identifies department goals related to (1) Greenhouse Gas Reduction, (2) Greenhouse Gas Inventories, (3) High-Performance Sustainable Design/Green Buildings and Regional and Local Planning, (4) Water Use Efficiency and Management, (5) Pollution Prevention/Waste Reduction, (6) Sustainable Acquisition, (7) Electronic Stewardship and Data Centers, and (8) Agency Innovation.

The Plan also outlines Department policy for identifying the return on investment for (1) Economic Lifecycle Cost; (2) Social Costs and Benefits; (3) Environmental Costs and Benefits; (4) Mission-Specific Costs and Benefits, including Asset Priority Index; (5) Operations and Maintenance and Deferred Investments; and (6) Climate Change Risk and Vulnerability.

2.3 National Park Service

Capital Investment Strategy
The National Park Service is in the process of developing a Capital Investment Strategy to help prioritize investments and ensure that the greatest impact can be made with available capital funds. The Capital Investment Strategy scores proposed project investments in four categories: Financial Sustainability, Visitor Experience, Resource Protection, and Health & Safety.

The current draft of the Capital Investment Strategy scoring generally supports an approach to investments that emphasizes sustainable investments. The scoring for Financial Sustainability is weighted the highest, accounting for half of the maximum score. Some of the key objectives in the financial sustainability strategy are to build only what can be maintained, right-size the asset portfolio, reduce liabilities, and eliminate non-essential development in parks in order to emphasize the essential natural and cultural experience. This should lead to a careful review of assets, and a thoughtful evaluation of whether to allocate constrained capital funds to assets that may result in an unsustainable investment.

Some elements of this scoring formula relate well to sustainability considerations. For example, one of the most significant point factors in the Financial Sustainability scoring category is the optimizer band of the asset. The optimizer band values range from 1 to 5 with values of 1 or 2 indicating a high priority asset for which there is a commitment by the park to maintain and thus protect any capital investment in that asset. Funding for high priority investments should always be considered sustainable because service-wide there is a commitment to ensuring the longevity of these assets.

The Health and Safety category also emphasizes some sustainable principles, specifically correcting deficiencies that may harm the public, staff, or environment. One principle of social sustainability is the ability to maintain environments that are safe and healthy for the public.

A Call to Action Preparing for a Second Century of Stewardship and Engagement, August 2011
This plan contains themes, goals, and actions for the National Park Service to achieve by 2016, the 100 year anniversary of the National Park Service. Goals and actions contained within *A Call to Action* are organized around four thematic areas: Connecting People to Parks, Advancing the NPS Education Mission, Preserving America's Special Places, and Enhancing Professional and Organizational Excellence. The plan contains a number of goals related to environmental, social, and economic sustainability in the National Park Service that are relevant for transportation. For the purpose of the Long Range Transportation Plan, the National Park Service has identified actions in the *Call to Action* that emphasize sustainable choices for the future of the National Park Service. These actions are summarized in Chapter 4 of this document.

Green Parks Plan, April 19, 2012
The *Green Parks Plan* provides a framework, including a vision, goals, and a set of performance objectives, for incorporating sustainability and greenhouse gas emissions reductions into all aspects of NPS operations. The vision that has been adopted by the *Green Parks Plan* incorporates a message about sustainability into the mission of the National Park Service.

> *The NPS will preserve park resources unimpaired for the enjoyment of current and future generations by reducing our environmental impact through sustainable operations, design, decisions, and management at every level of the organization.*

The *Green Parks Plan* specifically identifies nine strategic goals that focus on the impact of NPS operations on human welfare and the environment. These goals include improving environmental performance management, reducing greenhouse gas emissions and adapting to climate change, conserving energy and water, reducing waste, and greening the NPS transportation fleet. A number of the goals and initiatives adopted by the National Park Service have been identified for the purpose of the Long Range Transportation Plan as goals that emphasize sustainable choices. These goals and strategies are summarized in Chapter 4 of this document.

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3.0 SUSTAINABILITY AND THE CURRENT SYSTEM

To be sustainable a balance must exist between economic, environmental, and social needs and resources. These three principles are often interconnecting — a strategy that supports one often supports or in some way brings value towards another. Pursuing sustainable transportation systems means offering transportation services that provide equitable access to destinations, contribute to improved quality of life (or visitor experiences), and avoid or minimize environmental impacts.

This section outlines the current role of sustainability in transportation through economic, social, and environmental programs and strategies.

3.1 Economic Component of Sustainability

This section gives two examples of how the National Park Service is affected by economic sustainability. The first discusses how the National Park Service is able to bring economic sustainability to host communities, improving their economic sustainability. The second discusses how forming partnerships with other agencies or organizations to provide transportation services can make NPS operations more economically sustainable.

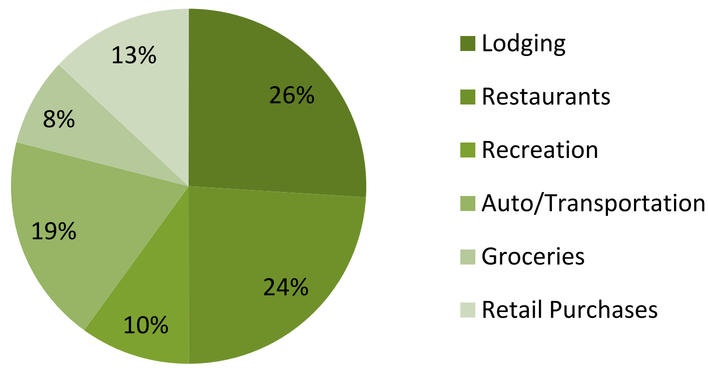
3.1.1 Financial Impacts of Visitor Spending

Parks are often valued contributors to local economies by drawing visitors to the area and generating employment opportunities. A recent study quantified the visitor spending and job creation of parks throughout the country, including the Northeast Region.[2] In 2010, national parks in the Northeast Region experienced more than 55 million recreational visits, with estimated non-local visitor spending of $1.80 billion at local establishments. Jobs attributable to non-local visitor spending were estimated to be approximately 25,642 and the National Park Service contributed another 4,569 jobs for individuals directly on their payroll.

As illustrated by Figure 3-1, spending by visitors occurs in several sectors including lodging, restaurants and grocery stores, recreation, and transportation. Lodging and restaurants account for slightly more than half of the spending.

[2] Stynes, Daniel J., "Economic benefits to local communities from national park visitation and payroll, 2010," Natural Resource Report NPS/NRSS/EQD/NRR—2011/481, 2011.

Figure 3-1: Distribution of National Park Visitor Spending



Source: Stynes, Daniel J., "Economic benefits to local communities from national park visitation and payroll, 2010," Natural Resource Report NPS/NRSS/EQD/NRR—2011/481, 2011.

Table 3-1 shows the estimated recreation visits, non-local visitor spending, jobs attributable to visitors, and NPS employment by the states that comprise the Northeast Region. It should be noted that because the *Economic Benefits to Local Communities from National Park Visitation and Payroll, 2010* study did not present data separately for the Northeast Region and the National Capital Region the information for Virginia, Maryland and West Virginia covers both regions.

Table 3-1: Impacts of NPS Visitor Spending and Payroll on Local Economies in States of the Northeast Region, CY 2010

State	Recreation Visits	Non-local Visitor Spending ($000s)	Jobs from Non-Local Visitor Spending	Payroll-related NPS Jobs	Total Jobs
Virginia	22,708,338	505,962	7,294	1,264	8,558
Massachusetts	9,913,501	393,235	5,297	671	5,968
New York	17,389,242	362,301	4,256	1,039	5,295
Pennsylvania	8,970,475	314,246	4,858	1,270	6,127
Maine	2,504,208	183,491	3,147	190	3,337
Maryland	3,541,570	164,885	2,198	386	2,583
New Jersey	5,858,443	121,506	1,848	278	2,127
West Virginia	1,811,722	59,713	785	488	1,273
Rhode Island	51,559	3,103	49	12	61
Vermont	31,209	1,44595	21	33	54
New Hampshire	30,941	1,076	17	18	35
Connecticut	19,313	1,162	13	17	30
Total	**72,830,521**	**2,255,275**	**29,783**	**5,666**	**35,448**

Source: Stynes, Daniel J., "Economic benefits to local communities from national park visitation and payroll, 2010," Natural Resource Report NPS/NRSS/EQD/NRR—2011/481, 2011.
Notes: Payroll-related jobs include NPS jobs and the induced effects of the NPS payroll on the local economy. Total job impacts include those supported by non-local visitor spending and the NPS payroll.

Table 3-2 and Table 3-3 present the recreation visits, non-local visitor spending, jobs attributable to visitors, and NPS employment for the ten Phase I Priority Parks.

Table 3-2: Spending and Economic Impacts of National Park Visitors on Local Economies by Select Parks in the Northeast Region

	Public Use Data		Visitor Spending 2010		Impacts of Non-Local Visitor Spending		
Park Name	**2010 Recreation Visits**	**2010 Overnight Stays**	**All Visitors ($000s)**	**Non-Local Visitors ($000s)**	**Jobs**	**Labor Income ($000s)**	**Value Added ($000s)**
Acadia National Park, ME	2,504,208	159,631	186,282	183,491	3,147	79,636	130,084
Gateway National Recreation Area, NY & NJ	8,820,757	12,985	161,040	65,265	750	35,747	58,536
Cape Cod National Seashore, MA	4,653,706	22,725	171,182	136,191	1,856	66,005	108,739
Assateague Island National Seashore, MD & VA	2,106,090	82,461	142,650	135,543	2,041	59,120	97,895
Delaware Water Gap National Recreational Area, NJ & PA	5,285,761	104,558	151,261	129,257	2,087	57,652	93,307
Shenandoah National Park, VA	1,253,386	301,700	71,751	63,347	968	25,199	41,107
Gettysburg National Military Park, PA	1,031,554	25,944	63,573	63,066	1,051	24,153	39,159
Colonial National Historical Park, VA	3,459,965	-	60,693	55,798	913	23,734	39,897
Valley Forge National Historical Park, PA	1,617,511	750	58,195	41,560	631	24,681	40,781
Lowell National Historical Park, MA	540,475	-	34,949	32,529	435	15,947	25,897
Priority Parks Total	**31,273,413**	**710,754**	**1,101,576**	**906,047**	**13,879**	**411,874**	**675,402**

Source: Stynes, Daniel J., "Economic benefits to local communities from national park visitation and payroll, 2010," Natural Resource Report NPS/NRSS/EQD/NRR—2011/481, 2011.

Table 3-3: Payroll Impacts of National Park Units on Local Economies by Select Parks in the Northeast Region

	Park Payroll		Impacts of Park Payroll			
Park Name	**Salary ($000'S)**	**Payroll Benefits ($000'S)**	**NPS Jobs**	**Total Jobs**	**Labor Income ($000'S)**	**Value Added ($000'S)**
Gateway National Recreation Area, NY & NJ	18,772	4,277	361	433	27,521	31,071
Shenandoah National Park, VA	10,317	2,955	234	314	16,206	18,700
Delaware Water Gap National Recreational Area, NJ & PA	7,344	1,882	121	164	10,919	12,404
Acadia National Park, ME	6,743	1,687	142	184	9,800	10,878
Cape Cod National Seashore, MA	6,532	1,640	108	144	9,652	10,981
Colonial National Historical Park, VA	4,388	1,241	84	104	6,205	6,935
Valley Forge National Historical Park, PA	4,672	1,248	67	95	7,326	8,433
Gettysburg National Military Park, PA	4,963	1,145	71	90	6,693	7,296
Lowell National Historical Park, MA	5,349	1,348	98	122	7,803	8,736
Assateague Island National Seashore, MD and VA	3,807	940	85	109	5,574	6,315
Priority Parks Total	**72,887**	**18,363**	**1,371**	**1,759**	**107,699**	**121,749**

Source: Stynes, Daniel J., "Economic benefits to local communities from national park visitation and payroll, 2010," Natural Resource Report NPS/NRSS/EQD/NRR—2011/481, 2011.

3.1.2 Transportation Partnerships

Partnerships provide an opportunity for the National Park Service to work with outside agencies to provide mutually beneficial goods and services that the visitors need to enhance their experience without the entire financial burden. Partnerships can be beneficial in direct ways such as reduced costs to the partners and indirect ways such as the improved air quality benefits that are derived from a more robust transit system.

Transportation partnerships can occur in many forms. Following are four examples of successful transportation partnerships in the Northeast Region.

- The centerpiece of **Acadia National Park** is a system of 45 miles of carriage roads and 17 stone-face bridges developed by John D. Rockefeller, Jr. The roads and bridges require extensive maintenance and the NPS partners with the Friends of Acadia to do so. The carriage roads were extensively reconstructed in the early 1990s with federal funds along with matching funds from the friends group. Most importantly, at that time the Friends of Acadia established an endowment to help protect the carriage roads in perpetuity and about $200,000 from that fund is used annually for maintaining the roads. In addition, each year volunteers work under the guidance of the Friends of Acadia cleaning ditches and culverts, clearing brush, and assisting with other restoration projects. Without the partnership the system could not be economically sustained. Furthermore, the current visitation of over two million annually, and Acadia NP's support of the local economy, would likely not be realized.

- **Steamtown National Historic Site** is located in the Scranton (Pennsylvania) railroad yard of the former Delaware, Lackawanna and Western Railroad and features a collection of locomotives, freight cars, passenger cars, and maintenance-of-way equipment from several historic railroads. The park is located adjacent to the core of downtown Scranton. The park opened in 1995 but planning began in 1986. While the park was being planned there was an ongoing redevelopment effort in the downtown that included a large shopping mall adjacent to the park site. The city, mall developers and the National Park Service coordinated their planning for the two projects. The result was not only that the shopping mall was branded as "The Mall at Steamtown", but a critical pedestrian link was established to the park site. The mall developers built a walkway over the rail tracks to enable people to walk from downtown and the mall into the park. This remains today the only pedestrian access into the park. The walkway is maintained by the owners of the mall and is open daily during park hours.
- **Cape Cod National Seashore** participated in the Cape Cod Interagency Transportation, Land Use, and Climate Change Scenario Planning Pilot Project aimed to integrate climate adaptation and mitigation strategies into land use and transportation planning processes in Cape Cod, Massachusetts. The project brought together local, state, and federal stakeholders for a two-day workshop to develop strategies that both reduced GHG emissions and increased the region's resilience to climate change, specifically to sea level rise. The objective was to evaluate the impact on GHG emissions for various scenarios of population growth, land use policies, and transportation programs.

  The workshop resulted in a development scenario that could be used as a goal that stakeholders could strive for in their own planning processes at their respective agencies. Currently, the climate mitigation strategies identified during the workshop have been incorporated into the climate action plan for Cape Cod National Seashore. They have also been incorporated into the Cape Cod Commission Action plan so that they could work with the local jurisdictions directly.

  The workshop was successful in fostering discussion and raising awareness about climate change and its impact on the region. This type of analysis with the level of agency cooperation that was achieved in the Cape Cod Interagency Transportation, Land Use, and Climate Change Scenario Planning Pilot Project could benefit any planning district and help inform policy and planning decisions before they are made and bring greater understanding to the impacts of thoughtful planning.
- **Acadia National Park** began a shuttle system in 1999 called the Island Explorer. The fare-free service helps provide connectivity over the 40,000 acres of lands that comprise Acadia National Park. This partnership has several participants including: Maine Department of Transportation (Maine DOT), Mount Desert Island League of Towns, Friends of Acadia, Downeast

Transportation, local businesses, Federal Highway Administration (FHWA), Federal Transit Administration (FTA), and L.L.Bean. All of the partners have played some role in planning, operations, and procuring funding to support the Island Explorer. The Maine Department of Transportation has played an integral role in applying for and procuring government funds to assist the program. Funds include FTA 5311, CMAQ, and state transportation funds. L.L.Bean made its first financial commitment in 2002 and has since contributed a total of $2 million to Acadia National Park for various initiatives, including its support for the Island Explorer. Currently, Maine DOT is the lead in planning and development for the Acadia Gateway Center. The Acadia Gateway Center will serve as a welcome center, multimodal transportation center, and a maintenance facility. The Federal Highway Administration and the Federal Transit Administration have both played a role in procuring government funds specifically in acquiring FTA funding and grants.

Broad-based support and financial assistance has enabled the Island Explorer system to be sustained and expanded for more than a decade. In the 2011 season, ridership on the Island Explorer was at 403,754 riders; the busiest one-day ridership in the 2011 season was 7,486 riders. In August 2011, the Island Explorer welcomed its 4 millionth passenger[3]. The Island Explorer is an excellent example of how successful a well-managed, broad-based partnership can be and what benefits it can bring to a national park and its host community.

Financial support from the state and local government and from the private sector allows for a robust and effective transit system. he direct benefit of this partnership is the financial burden that has been taken off of the National Park Service. The indirect benefit of this service on the community is in air quality benefits. According to the Island Explorer website, this service has prevented over 10,000 tons of greenhouse gas emissions and 16 tons of smog-causing pollutants as of July 2009. The Island Explorer illustrates the significances a transit service can play in sustainability and overall air quality improvements.

Overall, the costs associated with offering transportation facilities and services to visitors can be high. These examples have shown that partnerships are critical in managing the costs associated with offering multimodal transportation services. The National Park Service has many important economic partnerships with gateway communities, state government, and private funders. In FY 11, national parks in the Northeast Region received over $8 million in funding for alternative transportation services from these financial partners.

Table 3-4 lists Northeast Region parks that received funding for alternative transportation services from public and/or private partnerships and what percentage of total operational and capital costs were paid for by partner funds.

[3] Island Explorer, "Island Explorer News: Island Explorer Completes 13th Season," 2011. URL: http://www.exploreacadia.com/news.htm

Table 3-4: Northeast Region Parks Receiving Revenue from Local, State, and Private Partnerships for Alternative Transportation in FY 11

	Total Revenue ($) from Partnerships				Total AT Costs	
Park Name	**Municipal**	**State**	**Private**	**Total**	**Total Cost ($)**	**% Total Cost**
Governors Island National Monument, NY	4,521,915	0	0	4,521,915	4,560,348	99.2
Boston National Historical Park, MA	560,000	586,667	0	1,146,667	1,883,333	60.9
Boston Harbor Islands National Recreation Area, MA	23,567	1,224,538	448,174	1,696,279	3,198,555	53.0
Cape Cod National Seashore, MA	270,012	270,012	0	540,024	1,794,575	30.1
Marsh-Billings-Rockefeller National Historical Park, VT	7,665	0	8,865	16,530	57,580	28.7
Gettysburg National Military Park, PA	0	92,385	0	92,385	517,423	17.9
Acadia National Park, ME	67,549	36,300	256,686	360,535	2,368,778	15.2
Eisenhower National Historic Site, NY	0	0	4,495	4,495	10,884,051	0.04
Total	**5,450,707**	**2,209,901**	**718,519**	**8,379,127**	**25,264,643**	**33.2**

Source: Tom Crikelair Associates, "Total Cost of Facility Ownership" (spreadsheet), TCFO pivot_5.xlsx, March 30, 2012.

Table 3-4 shows that national parks in the Northeast Region receive various levels of funding for alternative transportation systems from partners. One commonality between many of these parks is that they are an integral element of the cultural landscape such as Cape Cod National Seashore, Boston National Historical Park, and Acadia National Park. The cultural significance of these sites draws high numbers of visitors and partnership funding to help sustain tourism and the economic strength in these locations.

3.2 Social Component of Sustainability

The social principles of sustainability encompass the community relationships, health, safety, equity, and cultural preservation of a place or system. Improvements in these areas can improve the overall quality of life of a community.

The National Park Service helps foster a sense of place for gateway communities and provides everyone an opportunity to experience natural and cultural resources. The Resource Stewardship subject area memorandum highlights culturally significant transportation assets found in the Northeast Region.

The presence of a national park can also lead to improved transportation facilities and opportunities for creating partnerships with local stakeholders. Partnerships with the community can lead to transportation systems that not only meet the needs of the park, but also meet the needs of the community. Transportation is a key element in everyone's day-to-day life. Even small changes made to transportation can have a significant impact and serve as a catalyst to other lifestyle and cultural changes.

The following discussion of social sustainability covers two ways in which transportation can be utilized to provide improved social sustainability in communities. The first is through creating more livable communities. Livability has become an important initiative of the U.S. Department of Transportation and its various components such as Federal Highway Administration (FHWA). The FHWA's principles of livability through transportation are entirely applicable in the context of the National Park Service as well. Second, a discussion of the benefits of greenhouse gas (GHG) reductions and adverse health impacts of high levels of GHG emissions is presented. Transportation is a major contributor to greenhouse gas levels in the atmosphere. Reducing transportation's contribution to GHG emissions could reduce risks to human health and ultimately provide more socially sustainable communities.

3.2.1 Livability

The U.S. Department of Transportation has taken on a 'Livability Initiative' to help promote and foster livable communities through transportation initiatives. The U.S. Department of Transportation has defined livability as follows:

> *Livability is about tying the quality and location of transportation facilities to broader opportunities such as access to good jobs, affordable housing, quality schools, and safe streets. This includes addressing safety and capacity issues on all roads through better planning and design, maximizing and expanding new technologies such as ITS and the use of quiet pavements, using Travel Demand Management approaches to system planning and operations, etc.*[4]

To expand on this definition, the U.S. Department of Transportation has developed six guiding principles to livability.[5]

- **Provide more transportation choices** to decrease household transportation costs, reduce our dependence on oil, improve air quality and promote public health.
- **Expand location- and energy-efficient housing choices** for people of all ages, incomes, races and ethnicities to increase mobility and lower the combined cost of housing and transportation.
- **Improve economic competitiveness of neighborhoods** by giving people reliable access to employment centers, educational opportunities, services and other basic needs.
- **Target federal funding toward existing communities** – through transit-oriented and land recycling – to revitalize communities, reduce public works costs, and safeguard rural landscapes.

[4] Federal Highway Administration, "Livability Initiative," Retrieved April 16, 2012, from What is Livability? URL: https://www.fhwa.dot.gov/livability/

[5] United States Department of Transportation, "Livability 101," Retrieved April 16, 2012, from DOT Livability. URL: http://www.dot.gov/livability/101.html

- **Align federal policies and funding** to remove barriers to collaboration, leverage funding and increase the effectiveness of programs to plan for future growth.
- **Enhance the unique characteristics of all communities** by investing in healthy, safe and walkable neighborhoods, whether rural, urban or suburban.

Transportation impacts everyone's lives, everyday. The guiding principles are inclusive: all peoples, all communities, all demographics are intended to obtain livable infrastructure and services and utilize their benefits. The guiding principles focus on multimodal alternative transportation systems. There is specific mention of providing a variety of modes, walkable neighborhoods, and transit-orientated communities. The guiding principles emphasize reductions in oil use and improvements in non-motorized transportation. Lastly, there is a theme of connectivity both in terms of individual collaboration and transportation connectivity. Livability and these guiding principles could be used to achieve a socially sustainable community.

The principles of livability align well with the Northeast Region multi-modal transportation system. Transit systems and bicycle and pedestrian networks are integral in a livable community. A national park can be an active member in the community by advancing community growth and relationships.

The *Cape Cod Interagency Transportation, Land Use, and Climate Change Scenario Planning Pilot Project* is one example of how a national park can be an active member of the community, as described in the Climate Change subject area memorandum. This project highlights how the participation of multiple agencies in the planning process produced a long-term plan focused on livability that met the approval of community stakeholders. The following lists all of the variables considered in the development of potential land use planning scenarios.

- Population Trends
- Employment Trends
- Housing Density
- Job Density
- Transit Service Areas
- Number of transit choices (modes)
- Transit frequency

The refined scenario that was developed out of this process includes increases in housing and job density along primary transportation corridors and 30 minute transit frequencies. The existing condition suggested that housing and job density was highly dispersed compared to the refined scenario with smaller increases in density than the refined scenario. This is particularly true for housing density. Additionally, transit frequency in the refined scenario is improved from 60 minute headways to 30 minute headways. The refined scenario that will serve as a starting point for future land use planning is an excellent example of how a livable community should be structured. Dense housing and employment will allow greater opportunities for non-motorized transportation and transit system improvements and will serve more residents needing to make longer trips.

3.2.2 Human Health

Sustainable development can result in societal improvements that may not be easily measurable. One of which, is the improvement to human health. The health benefits that could result from developing livable communities and pursuing greenhouse gas reducing initiatives are related to fighting obesity and improved air quality.

3.2.2.1 Fighting Obesity

Obesity and overweight are major health concerns that accounts for 5 percent of global mortality[6]. In the United States, over 75 million adults are obese. Obesity increases the risk for heart disease, type 2 diabetes, high blood pressure, certain cancers, and other chronic conditions. Weight gain is caused by over eating and inactivity.

Inactivity alone has been cited as causing approximately 21–25 percent of breast cancer and colon cancer, 27 percent of diabetes and approximately 30 percent of ischemic heart disease. Regular physical activity has been shown to reduce the risk of these health issues and risks to depression, and is key to weight control.

In the fight against obesity, the National Park Service can help to prevent inactivity and sedentary lifestyles. As one of the goals set in *A Call to Action*, the National Park Service is seeking to:

> ***EXPAND*** *the use of parks as places for healthy outdoor recreation that contributes to people's physical, mental, and social well-being.*

National parks provide communities with an excellent resource to allow visitors to be active. Recreational parks provide opportunities for visitors to get outdoors and be active through walking, running, biking, and playing. Parks that are not recreational in nature still provide an affordable activity that gets visitors out of their homes and into the community, and can be an enjoyable experience regardless of weather and other external factors. Both recreational and non-recreational parks can contribute to ending sedentary lifestyles and keeping visitors active.

3.2.2.2 Improved Air Quality

Alternative transportation systems can be an ideal solution for providing equitable transportation options that facilitate improvements in health and safety by mitigating greenhouse gas emissions. The majority of visitation in the Northeast Region occurs in parks that are located at least partially in air quality nonattainment zones and maintenance zones. These parks are in areas that do not meet the current National Ambient Air Quality Standards for ozone or struggle to maintain the standard.

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[6] Statistics in this section are from World Health Organization, "Global health risks: mortality and burden of disease attributable to selected major risks," 2009. And from World Health Organization, "Global Recommendations on Physical Activity for Health," 2010.

Greenhouse gases and climate change each have an impact on human health. Greenhouse gas emissions reductions have a direct benefit on human health such as reduced asthma rates. The impacts of climate change on human health are the indirect impacts of greenhouse gases. The U.S. Global Change Research Program produced a report in 2009 titled *Global Climate Change Impacts in the United States* which documents the impacts of climate change across several fields. Health risks associated with climate change include the following.

- Heat stress
- Waterborne diseases (due to heavy downpours and higher temperatures)
- Poor air quality
- Extreme weather events
- Diseases caused by insects and rodents
- Pollen increase

The report also notes that children, the elderly, and the poor are most vulnerable to climate-related health effects.

The direct and indirect health impacts associated with greenhouse gas emissions pose a serious threat to society; however, if actions are taken to reduce emissions from man-made sources future generations may not be faced with the same threats that exist today.

3.3 Environmental Component of Sustainability

Environmental sustainability is generally the first component of sustainability that comes to mind in today's society. Environmental sustainability has to do with preserving the environment, its natural resources, and its ability to care for the planet. Rising levels of carbon dioxide emissions and air and water pollutants, increasing rates of severe weather events, and a changing climate are all taking a toll on the environment and inhibit society's ability to pass on a healthy planet to the next generation. Environmental sustainability is about making decisions today that will help to preserve the planet for future generations.

Making decisions that are economically sustainable and socially sustainable will contribute to a system that is environmentally sustainable. For example, economically sustainable investments can be made through partnerships to serve multiple purposes. Northeast Region partnerships provide services including transit services that are able to serve a broader base of riders. Redundant services would not only cost more financially but would also have a greater impact on the environment. By working in partnership an efficient transit system can be put in place taking the greatest total number of vehicles off of the road, thus reducing greenhouse gas emissions.

The livability initiatives that are intended to yield a more socially sustainable transportation system emphasize expansion of non-motorized transportation options, developing transportation options that do not require a personal vehicle, and a community focused approach. All of these factors will reduce greenhouse gas emissions, reduce oil consumption, and improve air and water quality.

By making decisions that are economically and socially sustainable, environmental sustainability can be achieved. Specific goals to keep in mind when striving for environmental sustainability are greenhouse gas emissions and other air and water pollutant reductions, reduced resource consumption such as oil and water, and increased use of recycled materials.

From a transportation perspective, these goals can be achieved by designing, implementing, and enhancing alternative transportation systems such as trail and transit networks and connections; updating vehicle fleets with vehicles that have lower emissions rates; designing facilities to lower the impacts of run-off and storm water; use of recycled materials during construction; and avoiding fragmentation or disruption of critical natural habitats to achieve environmental sustainability through resource protection.

4.0 SUSTAINABILITY AND THE FUTURE SYSTEM

This section discusses how sustainability is being included in the future of the National Park Service on a servicewide and on a regional scale. First, the goals and objectives of the National Park Service presented in *A Call to Action* and the *Green Parks Plan* are aligned with the sustainability components to emphasize the connections between them. Next, the priorities of the Northeast Region multimodal transportation system, specifically the Transit Evaluation Matrix from the Alternative Transportation Management System (ATMS), are reviewed and aligned with the components of sustainability. Finally, a discussion of measuring progress and effectiveness through performance metrics to achieve a sustainable return on investment is discussed.

4.1 National Sustainability Initiatives

The *Green Parks Plan* and *A Call to Action Preparing for a Second Century of Stewardship and Engagement* both contain numerous sustainability related goals. The major goals are outlined in the tables below by sustainability component. The following four tables outline the goals and objectives or actions found in each. Each table relates to a separate pillar of sustainability.

Table 4-1: Green Parks Plan and A Call to Action: Economic Sustainability Goals Related to Transportation

Goal	Objective/Action
Green Parks Plan	
Adopt Best Practices The NPS will adopt sustainable best practices in all facility operations.	The NPS will include applicable sustainability requirements in all new contracts where possible.
Be Climate Ready and Climate Friendly The NPS will reduce GHG emissions and adapt facilities at risk from climate change.	The NPS will develop and implement guidance on adapting the location, structure, or function of park facilities in anticipation of climate change, including severe weather impacts.
A Call to Action Theme: Connecting People to Parks	
DEVELOP and nurture life-long connections between the public and parks—especially for young people—through a continuum of engaging recreational, educational, volunteer, and work experiences.	14 Value Added: Develop awareness among the American public of the many ways national parks contribute to the economic vitality of our nation. To do so we will complete a study on the economic value of the full range of NPS activities and programs (visitor spending, ecosystem services, community assistance, tax benefits, etc.) and promote the results.
A Call to Action Theme: Preserving America's Special Places	
MANAGE the natural and cultural resources of the National Park System to increase resilience in the face of climate change and other stressors. **ACHIEVE** a standard of excellence in cultural and natural resource stewardship that serves as a model throughout the world.	24 Invest Wisely: Focus investments from all maintenance fund sources on high priority national park assets to address critical deferred maintenance and code compliance needs. By doing so we will correct the health and safety, accessibility, environmental, and deferred maintenance deficiencies in at least 25 percent of the facilities that are most important to park visitor experience and resource protection.

Table 4-2: Green Parks Plan and A Call to Action; Social Sustainability Goals Related to Transportation

Goal	Objective/Action
Green Parks Plan	
Green Our Rides The NPS will transform our fleet and adopt greener transportation methods.	The NPS will support alternative commuting practices, including employee telework.
Preserve Outdoor Values The NPS will minimize the impact of facility operations on the external environment.	The NPS will ensure that all facilities and operations are sustainably integrated into the park landscape to minimize impact on the natural and cultural environment.
A Call to Action Theme: Connecting People to Parks	
DEVELOP and nurture life-long connections between the public and parks—especially for young people—through a continuum of engaging recreational, educational, volunteer, and work experiences. **CONNECT** urban communities to parks, trails, waterways, and community green spaces that give people access to fun outdoor experiences close to home. **EXPAND** the use of parks as places for healthy outdoor recreation that contributes to people's physical, mental, and social well-being. **WELCOME** and engage diverse communities through culturally relevant park stories and experiences that are accessible to all.	1 Fill in the Blanks: Identify a national system of parks and protected sites (rivers, heritage areas, trails, and landmarks) that fully represents our natural resources and the nation's cultural experience. To achieve this we will work with communities and partners to submit to Congress a comprehensive National Park System plan that delineates the ecological regions, cultural themes, and stories of diverse communities that are not currently protected and interpreted.
	4 In My Back Yard: Improve urban residents' knowledge of and access to outdoor and cultural experiences close to home by ensuring that every national park located in an urban area has a well-promoted physical connection to the public transportation system or to a pedestrian/bicycle path.
	5 Parks for People: Enhance the connection of densely populated, diverse communities to parks, greenways, trails, and waterways to improve close-to-home recreation and natural resources conservation. We will achieve this through a proactive Rivers, Trails, and Conservation Assistance Program that mobilizes citizens in support of improved access to outdoor areas in at least 50 of the communities nationwide with the least access to parks.
	6 Take a Hike, Call Me in the Morning: Expand the health community's use of parks as a healing tool and increase citizen recognition of the value of parks to improve health and well-being by establishing 50 formal partnerships with health and medical providers across the country.
	11 Focus the Fund: Increase the benefits of NPS community assistance by strategically selecting projects that support urban parks, waterways, and large landscape conservation. To achieve this we will work with stakeholders to create a new competitive state grant program within the Land and Water Conservation Fund State Assistance Program.
	12 Follow the Flow: Support communities' efforts to expand access to water-based recreation and to protect and restore waterways across the country by establishing a national system of water trails.

Table 4-3: Green Parks Plan: Environmental Sustainability Goals Related to Transportation

Goal	Objective/Action
Green Parks Plan	
Be Climate Ready and Climate Friendly The NPS will reduce GHG emissions and adapt facilities at risk from climate change.	The NPS will reduce Scope 1 and 2 GHG emissions by 35 percent by 2020 from the 2008 baseline. (Scope 1 and 2 emissions are associated with on-site fossil fuel combustion and electricity consumption from the grid, respectively.)
	The NPS will reduce Scope 3 GHG emissions by 10 percent by 2020 from the 2008 baseline. (Scope 3 emission sources such as commuter travel and off-site wastewater treatment are indirect in nature.)
	The NPS will develop and implement guidance on adapting the location, structure, or function of park facilities in anticipation of climate change, including severe weather impacts.
Green our Rides The NPS will transform our fleet and adopt greener transportation methods.	The NPS will evaluate and transform the size, types of vehicles, and technologies used in our fleet
	The NPS will increase the use of high-efficiency and low-GHG-emitting vehicles and will reduce fossil fuel consumption by 20 percent by 2015 from the 2005 baseline.
	The NPS will support alternative commuting practices, including employee telework.
	The NPS will reduce GHG emissions attributable to official travel.
Buy Green and Reduce, Reuse, and Recycle The NPS will purchase environmentally friendly products and increase waste diversion and recycling.	The NPS will purchase environmentally preferable products and services in order to improve our Servicewide environmental purchasing program.
	The NPS will utilize sustainable materials in construction and maintenance operations.
Preserve Outdoor Values The NPS will minimize the impact of facility operations on the external environment.	The NPS will reduce light pollution from park facilities with the goal of dark night sky preservation.
	The NPS will minimize sound pollution in the outdoor environment.
	The NPS will ensure that all facilities and operations are sustainably integrated into the park landscape to minimize impact on the natural and cultural environment.
Adopt Best Practices The NPS will adopt sustainable best practices in all facility operations.	The NPS will use Environmental Management Systems as an implementation tool for the *GPP* and will integrate sustainability into all planning initiatives.
	The NPS will reduce storm water runoff from existing facilities and employ storm water best management practices in the design and construction of new facilities and major renovations.
Foster Sustainability Beyond Our Boundaries The NPS will engage visitors about sustainability and invite their participation.	The NPS will identify ways that visitors can reduce the impact of GHG emissions from personal vehicles in parks.

Table 4-4: A Call to Action: Environmental Sustainability Goals Related to Transportation

Goal	Objective/Action
A Call to Action Theme: Preserving America's Special Places	
MANAGE the natural and cultural resources of the National Park System to increase resilience in the face of climate change and other stressors. **CULTIVATE** excellence in science and scholarship as a foundation for park planning, policy, decision making, and education. **ACHIEVE** a standard of excellence in cultural and natural resource stewardship that serves as a model throughout the world. **COLLABORATE** with other land managers and partners to create, restore, and maintain landscape-scale connectivity.	23: Go Green: Reduce the NPS carbon footprint and showcase the value of renewable energy to the public by doubling, over 2009 levels, the amount of renewable energy generated within parks and used by park facilities. 25: What's Old is New: Modernize historic preservation methods and technologies, show how historic structures can be made sustainable, and support efforts to rebuild the economic vitality of rural and urban communities by updating the Secretary of the Interior's Standards and Guidelines for the Treatment of Historic Properties in consultation with historic preservation partners. 27: Starry, Starry Night: Lead the way in protecting natural darkness as a precious resource and create a model for dark sky protection by establishing America's first Dark Sky Cooperative on the Colorado Plateau in collaboration with other federal agencies, partners, and local communities.

4.2 Northeast Region Alternative Transportation System Priorities

The Northeast Region has made Alternative Transportation Systems (ATS) a strong focus of their transportation program. One resource that has been developed by Tom Crikelair Associates is the Alternative Transportation Management System. These efforts have been documented in a white paper titled *Alternative Transportation Management System for the Northeast Region* dated March 30, 2011. There were seven basic elements of the work.

1. Inventory of Alternative Transportation Services
2. Transit Evaluation Matrix
3. Comparison of Project Rankings and Costs
4. Marketing and Public Outreach
5. Capital and Infrastructure Needs
6. Future Need of Operating Subsidies
7. Total Cost of ATS Ownership

The Transit Evaluation Matrix makes this management system both a unique and invaluable tool in terms of understanding the sustainability impacts of an ATS on a park and a transportation system as a whole. It is used to evaluate proposed new services as well as evaluate options for modifying existing services. Transit systems have been shown to have a positive impact on economic, social, and environmental sustainability. Table 4-5 shows how the Transit Evaluation Matrix uses a number of criteria to evaluate systems that can be tied directly back to sustainable principles. This table highlights primary sustainability components that the criteria address.

Table 4-5: ATMS Transit Evaluation Matrix and Sustainability

	Primary Emphasis Areas		
	Economic	**Social**	**Environmental**
Transit Evaluation Matrix Category			
▪ Critical Access ▫ For some park sites, shuttles or ferries provide the only means of access for most visitors. For other parks, shuttles are needed because the supply of available parking is inadequate to accommodate visitor demand. Some parks provide ATS rides or tours that are an essential component of the park experience	✓		
▪ Resource Protection ▫ Transit systems can limit negative visitor impacts to natural and cultural resources. They can improve air quality, and they can provide examples of environmental stewardship.			✓
▪ Safety ▫ Alternative transportation systems an address a variety of safety issues, including concerns related to congestion, unsafe or confusing roadways, an overflow parking. Transportation alternatives can improve safety by reducing the number of vehicle miles traveled at national parks.		✓	
▪ Visitor Experience, Diversity and Car-free Travel ▫ Transit systems often allow visitors to relax and enjoy park sites and scenery. They can help with orientation and way finding. And they can result in improved choices for visitors trying to reach destinations inside and outside the park.		✓	
▪ Visitor Diversity/Car-free Travel ▫ Shuttle or ferry services can provide opportunities for people who might otherwise have difficulty visiting a NPS site. This includes low-income families without cars, young people who do not drive, senior citizens and others with mobility limitations, and people from distant locations who travel to the area without a car.		✓	

Source: text from Tom Crikelair Associates, "Alternative Transportation Management System for the Northeast Region," Appendix A, March 31, 2011. Draft White Paper.

Table 4-5 (continued): ATMS Transit Evaluation Matrix and Sustainability

	Economic	Social	Environmental
Transit Evaluation Matrix Category			
▪ Regional Economy ▫ Many transit programs involve partnerships with state governments, gateway communities, and local businesses. These partnerships promote economic activity while addressing parking and congestion problems, protecting natural and cultural resources, and safeguarding the quality of visitor experience.	✓		
▪ Recreation & Education ▫ Transit programs can play an important role in providing improved visitor access to recreational activities, museums, and other educational programs.		✓	
▪ Ridership & Productivity ▫ The Management System focuses on average daily ridership during the peak season. It examines ridership for individual routes and for the transit system as a whole. It assesses the average number of riders carried by each bus or ferry. It also considers the number of riders per scheduled round trip and compares this with the number of available seats.	✓		
▪ Cost Effectiveness ▫ Cost effectiveness is measured in terms of total operating cost per rider, and NPS operating cost per rider. Cost effectiveness is also assessed in terms of the adequacy of available revenue sources to cover ongoing transportation operating expenses.	✓		

Source: text from Tom Crikelair Associates, "Alternative Transportation Management System for the Northeast Region," Appendix A, March 31, 2011. Draft White Paper.

The Alternative Transportation Management System has been well received in the Northeast Region and has been adopted for use in prioritizing ATS projects for programming. It was used to develop the most recent multiyear ATS investments plan. A number of projects in the multiyear plan involve expansion of current systems or reconfiguration of existing systems to maximize benefits, and improve access to and mobility within parks. Those projects include:

- Expansion of the Lowell National Historical Park trolley, Lowell, MA
- Delaware Water Gap National Recreation Area regional visitor shuttle, NJ & PA
- Fort Necessity National Battlefield shuttle to Ohiopyle State Park, Wharton, PA
- Multi-Use trails at Floyd Bennett Field (Gateway National Recreation Area), New York, NY

- Bike path connections between Assateague Island National Seashore and the wildlife refuge, MD & VA
- Erie Canal Water Trail connections to Fort Stanwix National Monument, Rome, NY
- Multi-Use transportation path at Cape Cod National Seashore, Provincetown, MA

In developing multi-modal systems, considerations should be made when evaluating the sustainability of the system or project. Table 4-6 lists a number of such considerations.

Table 4-6: Multi-modal Transportation System Development Considerations

Economic	Social	Environmental
•Developing partnerships can help ease costs to all parties involved •Lifetime annual operations and maitenance costs should be considered for all projects. High-efficiency and well-maintained vehicles achieve maximum serivce life and yield fuel savings •Working with local communities can open up funding unrealized opportunities •Using locally sourced services and materials can help create savings and provide economic support to local economies •Smart investments in new and emerging technologies in the field of sustainability and green engineering should be explored	•Partnerships can be used to provide services and transportation infrastructure to serve larger segments of society •Effort should be made to provide equitable service and access to under served communities •Providing opportunities for greater active transportation (walking, biking) in communities can improve human health and well-being •Filling in missing links in the pedestrian and bicycle network will provide access to the park's neighboring communities •Playing a role in providing a livable community will allow society to make more sustainable choices	•Pursuing transportation systems that take vehicles off of the road and reduce vehicle miles tralved will have a positive impact on the surrounding environment •A low-emissions vehicle fleet will contribute to greenhouse gas emissions reductions •Avoid fragmenting wildlife habitats to improve their resilience to survive into future generations •Materials and services that have a lower carbon footprint should be selected to improve the overall environmental impacts of investment, operations, and maintenance. •Keeping vehicles well-maintained will reduce their impact on the environment

4.3 Measuring Progress

Tracking and reporting progress towards achieving sustainability goals is essential to the success of a project and to making real change in the community and the environment. By effectively incorporating sustainability principles into decision making, goals become easier to achieve. Establishing core metrics that demonstrate progress towards a goal is an important component for reporting. The following metrics are examples of what could be measured and reported as progress towards National park Service sustainability goals:

- Revenue or ridership rates from alternative transportation systems
- Percentage of alternative transportation funding from private or public partnerships
- Percentage of contracts with sustainability requirements
- Percentage of transportation assets vulnerable to climate change impacts
- Number of alternative fuel or hybrid vehicles in fleet
- Percentage of roadway and parking areas using permeable pavement and other environmentally friendly materials
- Number of parks accessible by public transportation
- Number of parks with bicycle and pedestrian infrastructure, miles of bikeways, or number of different types of bicycle and pedestrian infrastructure
- Number of parks with shuttle buses or other forms of public transportation / number of shuttle buses and/or routes
- Vehicle to park visitor ratio
- Percentage petroleum use and GHG emissions from park and visitor vehicles and NPS fleets
- Number of Climate Friendly Parks with action plans addressing transportation
- Number of wildlife-vehicle crashes / percent of vehicle crashes attributed to wildlife
- Cost per visitor for maintenance of transportation infrastructure
- Number of park visitors arriving by public transit, bicycle, or foot
- Number of transportation cultural and natural assets vulnerable to sea level rise, storm surge, or other climate impacts with adaptation strategies identified
- Number or miles of new trails established
- Number of community partnerships and educational programs with gateway communities
- Percentage / number of collisions resulting in injury caused by a wildlife-vehicle collision

Another method for measuring sustainability needs and achievements is to prioritize investments by determining the sustainable return on investment (SROI) of a project.

Return on Investment is a measure of money earned or lost relative to money invested in a particular project. Sustainable Return on Investment (SROI) adds to the typical financial return on investment (FROI) calculations the return on investment of impacts that are not traditionally quantified, such as air and water quality impacts among others.

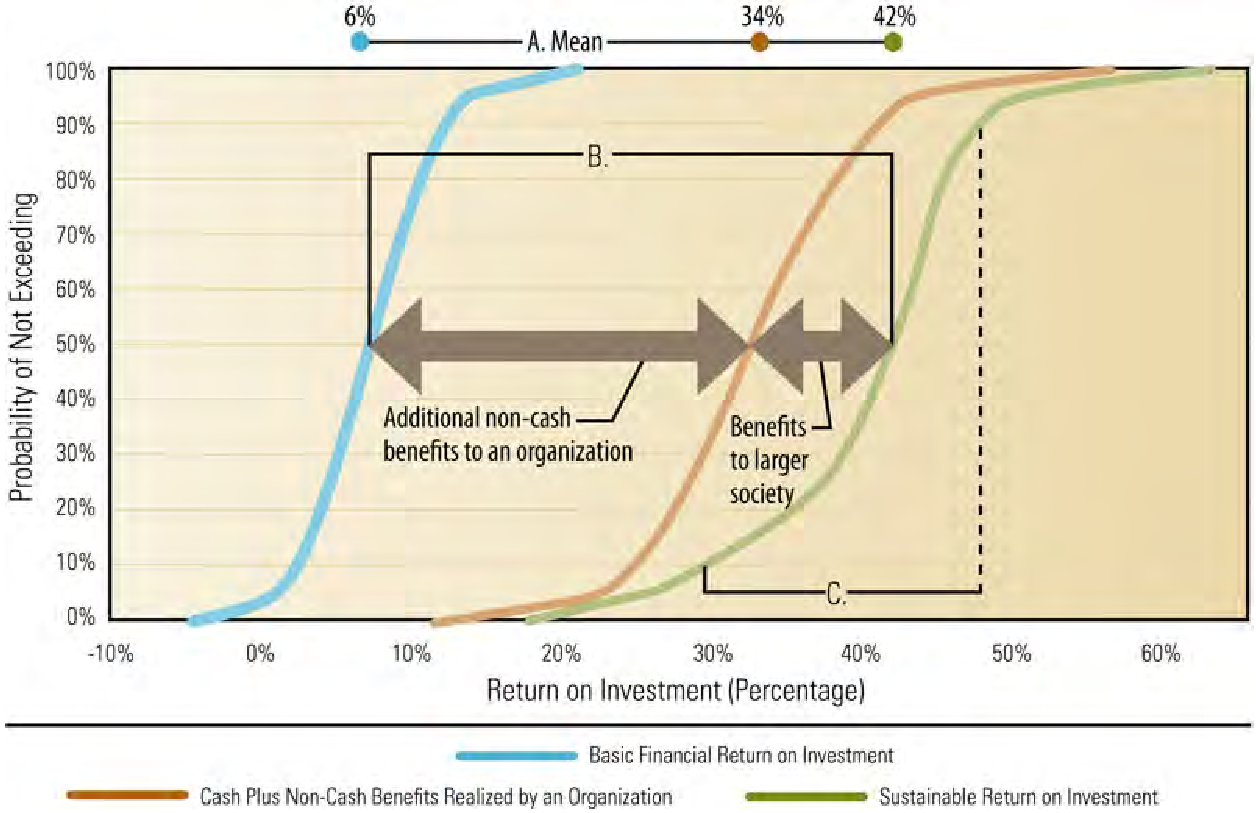
Evaluating the sustainable return on investment is done by calculating the triple bottom line. The triple bottom line considers benefits and costs associated with financial, social, and environmental changes that result from a project. The triple bottom line considers earnings or losses on a project that are financial and non-financial. Non-financial outcomes have to be monetized to be compared to other factors. For example, a reduction in property damage crashes can be monetized based on a typical financial cost of such a crash. Air quality impacts such as carbon dioxide emissions could be monetized by ton of emissions. Figure 4-1 shows an example of what factors could be considered in the economic, social, and environmental sections of a sustainable return on investment analysis.

Figure 4-1: Example Elements of the Triple Bottom Line

Source: Stephane Larocque, HDR, Inc., “Sustainable Return on Investment (SROI)”, Presented to The Associated General Contractors of America, March 21, 2011.

Figure 4-2 illustrates the triple bottom line concept. The blue line illustrates the basic financial return that might be associated with a generic type of investment. The mean value of the probability of return on that example investment is approximately six percent. The additional benefits quantified from an SROI include non-cash benefits to the organization and benefits to the larger society. The consideration of these two benefits would increase the mean value of the probable return on this investment to approximately 42 percent. The range of return on investment highlighted as “C”, from 30 percent to just under 50 percent, is based on a statistical analysis that the projected return will fall within an 80 percent confidence interval.

Figure 4-2: S-Curve Diagram



Source: Stephane Larocque, HDR, Inc., "Sustainable Return on Investment (SROI)", Presented to The Associated General Contractors of America, March 21, 2011.

Calculating the Sustainable Return on Investment for a project or series of projects could help to prioritize projects by including factors that cannot be included in a typical financial return on investment. For a transportation project that sees little in terms of financial return on investment this could be a desirable method for monetizing and comparing benefits to visitor safety, employee health and safety, and air and water quality.

Before implementing SROI processes for all National Park Service related transportation projects in the Northeast Region, consideration should be given to cost and the quality of the existing data. An SROI analysis can cost $30,000 to $150,000 so it is not financially practical for some projects. An SROI analysis is a data intensive calculation that requires uniform, high-quality data. Detailed historic data are required to make accurate assumptions about the monetary benefits and costs of the non-cash factors.

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5.0 RECOMMENDATIONS

There are three components of sustainability — economic, social, and environmental — and, to be effective, sustainability goals for the Northeast Region Long Range Transportation Plan should address all three. It is anticipated that the initial framework for implementing and measuring sustainability will be refined in future Northeast Region LRTP phases as more data become available and the process becomes more refined through application and lessons learned. Some of the critical factors identified thus far for the Northeast Region to address sustainability in its LRTP are as follows.

5.1 General Recommendations

Effectively integrating the principles of sustainability – economic, environmental, and social – into the Northeast Region LRTP is essential and in line with current NPS, DOI, and Administration goals and requirements. Sustainability is at the core of the NPS mission, and numerous policies and plans support integrating sustainability into NPS operations. The following recommendations can be used by the NPS to incorporate sustainability into the Northeast Region LRTP and create a transportation system that supports the identified sustainability goals:

- Establish a baseline for sustainability of NPS transportation systems, and conduct a comprehensive sustainability planning process
    - Engage Stakeholders to define sustainability for the National Park Service
    - Establish a baseline (existing conditions) for sustainability of NPS transportation systems
    - Establish the how current Northeast Region practices align with the goals and objectives of the *Green Parks Plan* and *A Call to Action* from a sustainability perspective
    - Confirm sustainability goals, objectives, and actions identified in current plans and policies that relate to transportation
    - Establishing a baseline is necessary for quantifying the existing status of sustainable measures
    - Identify and fill any gaps in transportation sustainability goals, objectives, or actions as necessary
    - Highlight the co-benefits of each strategy and the ability to address multiple goals through a single action
    - Identify metrics to measure progress towards meeting NPS transportation sustainability goals
    - Track and report on progress on an annual basis
- Confirm and leverage existing sustainability goals as the framework for the Northeast Region LRTP moving forward and identify any gaps in goals, objectives, actions, or metrics

  - Sustainability principles should be integrated throughout all facets of the LRTP
  - Integrate the relevant goals, strategies, and actions from the *A Call to Action* report and the *Green Parks Plan* into the Northeast Region LRTP

- Evaluate and prioritize all transportation projects using the Capital Investment Strategy criteria of financial sustainability, visitor use, resource protection, and health and a safety. In addition:
  - Consider the impact of climate change in all aspects of sustainability
  - Consider prioritizing actions that address multiple components of sustainability. For example, an action that addresses both the environmental and social aspects of sustainability might be prioritized over a project that addresses only one of these aspects

This memorandum has illustrated some of the unique and varied approaches that the National Park Service could take to integrate more sustainable practices into everyday operations and, by doing so, improve the visitor experience and satisfaction with the National Park Service. The following list provides some broad recommendations for how the National Park Service can continue to making sustainable decisions to achieve economic, social, and environmental sustainability.

- Make reducing GHG emissions a priority for the Northeast Region LRTP. Incorporate transportation strategies from Climate Friendly Parks action plans into the Northeast Region LRTP.
- Coordinate with local and regional organizations and public-private partnerships to help fund alternative transportation to parks and within parks.
- Continue improving access to parks through increased water trails and alternative transportation options. Prioritize park connections in urban areas so local residents can enjoy the emotional, physical, and educational benefits associated with recreation in natural areas.
- Implement actions that reduce wildlife-vehicle collisions in parks.
- Encourage NPS employees to carpool or take alternative modes of transportation to work.
- Incorporate sustainability requirements into transportation contracts where feasible.
- Identify transportation assets that may be vulnerable to climate change. Begin identifying adaptation strategies for those assets.
- Use recycled pavements and materials in transportation projects where possible.
- Create policies and design transportation projects that minimize noise and light pollution in national parks.
- Use green infrastructure best practices in all transportation projects and try to maintain or enhance the natural resources.
- Ensure transportation projects and infrastructures are integrated into the landscape in a way that is minimally invasive to the cultural context of the park.

5.2 Cross Subject Recommendations

In order to understand how sustainability can be integrated in to the LRTP, Tables 5-1 and 5-2 illustrate how recommendations from the climate change subject area and resource stewardship subject area memorandums align with the three components of sustainability: environmental, social, and economic.

Among the recommendations are implementing improved assessments of transportation assets vulnerable to sea level rise, storm surge, and other climate variables. These improved assessments will be essential for the NPS to make economically sustainable decisions regarding transportation infrastructure investments. Because projected changes in climate will likely affect visitation patterns, natural resource distribution, cultural assets, and the structural integrity of many pieces of transportation infrastructure, it is important that the best available knowledge be used to make investment decisions.

The Climate Change subject area memorandum includes recommendations to conduct additional sea level rise and storm surge vulnerability assessments that use more complete and detailed data sets. These studies should also highlight culturally significant transportation infrastructure, along with park visitation rates, that could be impacted by future sea level rise, storm surge, and other types of climate impacts. The NPS will need to identify strategies and decide whether to adapt, relocate, or abandon the specific infrastructure elements affected by the scenarios.

The Resource Stewardship subject area recommendations are tied to the three topics that were discussed within the context of resource stewardship: Congestion Mitigation and Air Quality (CMAQ) Improvement, Culturally Significant Assets, and Wildlife-Vehicle Collisions.

The purpose of the CMAQ program is to fund projections geared towards reducing greenhouse gas emissions from transportation sources. This purpose ties into environmental sustainability and the goals and objectives of the *Green Parks Plan* and *A Call to Action*. Table 5-2 shows links between the CMAQ program and the components of sustainability.

Ultimately, these tables show that the National Park Service has been pursuing sustainable initiatives whether or not that was the intended goal. Now that these opportunities have been recognized and the links to sustainability have been established, the National Park Service and the Northeast Region can further refine their approach to sustainable transportation measures in the development of the Long Range Transportation Plan.

Table 5-1: Alignment of Climate Change Subject Area Recommendations and Sustainability Components

Recommendation	Economic	Social	Environmental
Adaptation			
▪ Expand the Sea Level Rise and Storm Surge Vulnerability Assessment. ▫ Include docks and air facilities missing from the GIS transportation asset dataset. ▫ Expand the assessment using less conservative estimates of sea level rise. ▫ Expand the assessment to include storm surge from a category three hurricane that incorporates projected sea level rise projections.	✓		✓
▪ Conduct climate risk and vulnerability assessments for climate impacts beyond sea level rise, such as temperature and precipitation changes.	✓		✓
▪ Utilize the Climate Change Risk Assessment tool currently being tested in the NPS in future LRTPs to assess transportation infrastructure at risk from climate change.	✓		
▪ Analyses and strategies in the Northeast Region LRTP should be updated as better climate data becomes available. ▫ There are several monitoring entities in place, such as the NPS Inventory and Monitoring Program. The Climate Science Center for the Northeast is currently being established and should be looked to as a source of information and tools to respond to the changing climate and environment. ▫ Most state departments of transportation and many local planning agencies are monitoring climate change and impacts to their infrastructure. Use of a multi-disciplinary team to assess the risk and to prioritize infrastructure is crucial as the NPS is focused on more than just the movement of goods and people, but on the visitor experience and preservation of natural and cultural resources.	✓		✓
Mitigation			
▪ Incorporate transportation strategies from the Climate Friendly Parks action plans into the Northeast Region LRTP.	✓		✓
▪ Incorporate relevant mitigation goals, strategies, and targets from Executive Order 13514, *Green Parks Plan, Climate Change Response Strategy,* and *Call to Action* into the LRTP.	✓		✓
▪ Replicate the Cape Cod Interagency Transportation, Land Use, and Climate Change Scenario Planning Pilot Project model in other metropolitan areas and planning regions within the Northeast Region to identify climate mitigation transportation strategies and integrate them into regional transportation plans.	✓	✓	✓

Table 5-2: Alignment of Resource Stewardship Subject Area Recommendations and Sustainability Components

Recommendation	Economic	Social	Environmental
Congestion Mitigation and Air Quality Improvement Program			
▪ Actively work with the local community and planning body. ▫ Play an active role in the community ▫ Work together to develop and fund mutually beneficial projects ▫ Find new opportunities for transportation project funding	✓	✓	
▪ Pursue Congestion Mitigation and Air Quality Improvement program funding through the local planning body to fund transportation projects that can reduce congestion or improve air quality, such as Alternative Transportation System projects.	✓		✓
Culturally Significant Assets			
▪ Transportation asset investments should be focused on maintenance, particularly of high priority assets	✓	✓	
▪ Culturally significant asset maintenance and investments should be prioritized to help preserve our special places		✓	
Wildlife-Vehicle Collisions			
▪ Crash records for vehicle-wildlife collisions are not detailed enough, more details should be included to better understand what wildlife resource losses are taking place. ▫ Species involved in crashes ▫ Geographic location based on a universal system			
▪ Measures should be taken to prevent vehicle-wildlife collisions ▫ Educate visitors ▫ Direct animals away from roadways ▫ Implement animal detection systems		✓	✓
▪ Outcomes from the Valley Forge Deer Management Program should be reviewed for changes to vehicle crash rates as it becomes available.			

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NORTHEAST REGION LONG RANGE TRANSPORTATION PLAN

Resource Stewardship Subject Area Memorandum

Prepared for:

National Park Service
WASO Denver
12795 W. Alameda Parkway
P.O. Box 25287
Denver, CO 80225-0287

Prepared By:

Vanasse Hangen Brustlin, Inc.
351 McLaws Circle, Suite 3
Williamsburg, VA 23185-6316

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TABLE OF CONTENTS

1.0 INTRODUCTION

Resource stewardship is a broad field that covers topics in all areas of the National Park Service (NPS). This document presents information regarding three topics relating to resource stewardship and transportation in the Northeast Region (NER). The information is in support of the ongoing development of a Long Range Transportation Plan for the Northeast Region.

The memorandum is limited to the three topics listed below and is not intended to cover all aspects of integrating resource stewardship into the Long Range Transportation Plan. The three topics are:

1. Congestion Mitigation and Air Quality Improvement Program Adherence and Opportunity Identification

2. Culturally Significant Transportation Assets

3. Wildlife-Vehicle Collisions

These topics highlight both threats that transportation places on other National Park Service resources and some of the threats faced by historic transportation resources within the National Park Service.

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2.0 CONGESTION MITIGATION AND AIR QUALITY IMPROVEMENT PROGRAM ADHERANCE AND OPPORTUNITY IDENTIFICATION

This section presents information regarding the Congestion Mitigation and Air Quality (CMAQ) program as it relates to selected national park system units in the Northeast Region. The CMAQ program provides federal transportation funding to help state and local communities improve air quality through bicycle, pedestrian and transits projects, as well as roadway projects that reduce congestion and emissions. The following section provides information about which parks are in locations eligible for CMAQ funding, the state organizations through which funding is coordinated, and a review of regional transportation plans to provide examples of current CMAQ-funded projects that are beneficial to the parks.

2.1 Northeast Region Air Quality

The Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for ground-level ozone and other air pollutants. Those areas in the country that historically fail to achieve the standards are designated by the EPA as "nonattainment" or "maintenance" areas. The designation of nonattainment describes areas which are currently unable to attain low enough air pollutant levels to meet the standard as established by NAAQS. The designation of maintenance is applied in areas which may currently be in compliance with NAAQS, but struggle to maintain the low levels of air pollutants necessary.

The population density and weather patterns of the Northeast Region contribute to the air quality issues. The Northeast Region has a high population relative to the rest of the country with four out of the top ten most populated urbanized areas in the United States as shown in Table 2-1.

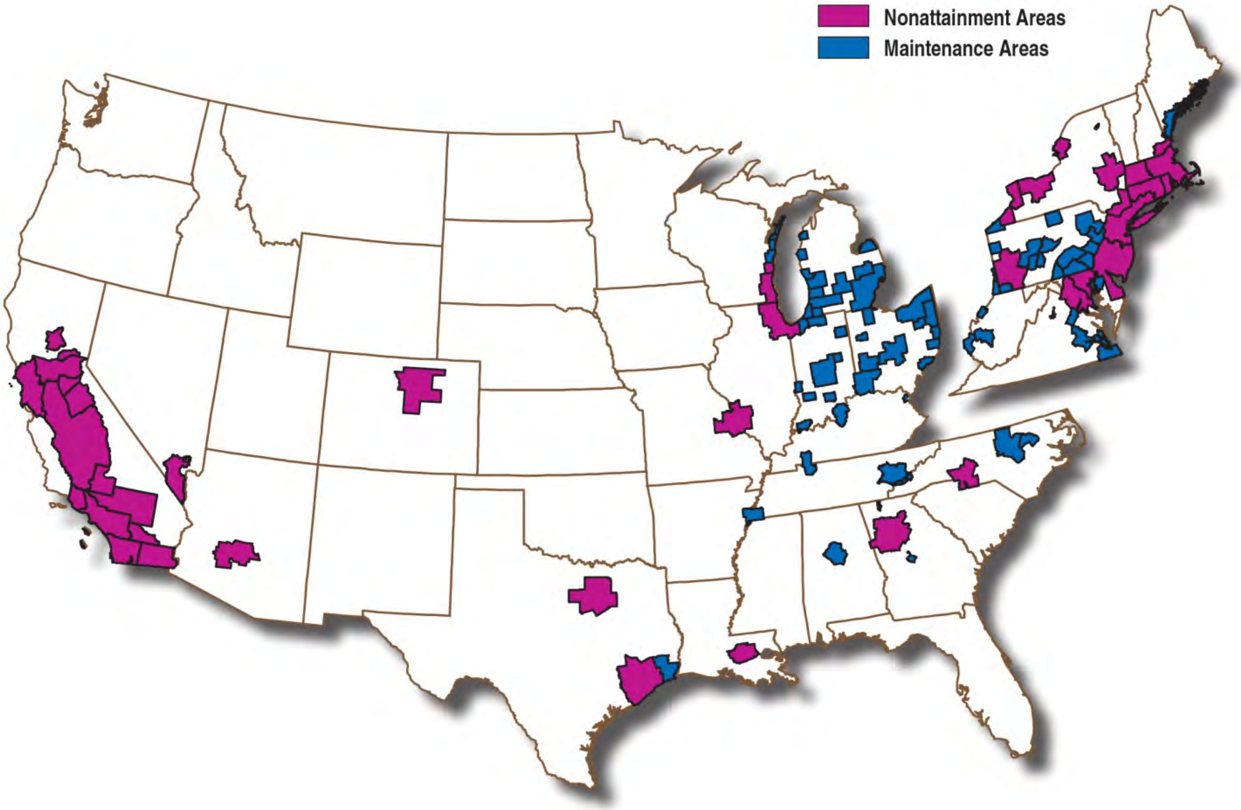
Table 2-1: Northeast Region Population Centers among the Top 10 Nationally

Rank	Metropolitan Statistical Area	Population
1	New York-Northern New Jersey-Long Island, NY-NJ-PA MSA	18,897,109
6	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA	5,965,343
7	Washington-Arlington-Alexandria, DC-VA-MD-WV MSA	5,582,170
10	Boston-Cambridge-Quincy, MA-NH MSA	4,552,402

Source: U.S. Census Bureau, "Population Distribution and Change: 2000 to 2010," March 2011.

A high population density itself can be a factor in air quality degradation; however, the problem is worsened by weather patterns in the Northeast. Winds enter the Northeast by traveling both eastward from the Great Lakes region and up the Atlantic coast. This pattern carries air pollutants from the industrial areas of the Great Lake region and from other coastal cities into the Northeast Region. These patterns result in a large number of nonattainment and maintenance areas in the Northeast Region. As illustrated by Figure 2-1, there are more ozone nonattainment and maintenance areas in the Northeast Region than in any other National Park Service region.

Figure 2-1: Environmental Protection Agency 8-hour Ozone Nonattainment and Maintenance Areas



Note: When only a portion of a county is shown in color, it indicates that only that part of the county is within an area boundary.
Source: Environmental Protection Agency, "Greenbook," April 2011.
URL: http://www.epa.gov/airquality/greenbook/map8hrnm.html

Table 2-2 lists the park units in the Northeast Region and their status for compliance with the NAAQS 8-hour ozone standards. Two-thirds of the park units in the Northeast Region are located in nonattainment areas. Eighty percent are in either nonattainment or maintenance areas, thus projects in those locations are eligible for CMAQ funding.

Table 2-2: NAAQS 8-hour Ozone Status for Park Units in the Northeast Region

Park Name	State	Non Attainment Area	Maintenance Area	Attainment Area
Acadia National Park	ME		✓	
Adams National Historical Park	MA	✓		
African Burial Ground National Monument	NY	✓		
Allegheny Portage Railroad National Historic Site	PA		✓	
Appomattox Court House National Historical Park	VA			✓
Assateague Island National Seashore	MD/VA			✓
Bluestone National Scenic River	WV			✓
Boston African American National Historic Site	MA	✓		
Boston Harbor Islands National Recreation Area	MA	✓		
Boston National Historical Park	MA	✓		
Booker T. Washington National Monument	VA			✓
Castle Clinton National Monument	NY	✓		
Cape Cod National Seashore	MA	✓		
Colonial National Historical Park	VA		✓	
Delaware Water Gap National Recreation Area	NJ/PA	✓		
Edgar Allan Poe National Historic Site	PA	✓		
Thomas Edison National Historical Park	NJ	✓		
Eisenhower National Historic Site	PA		✓	
Eleanor Roosevelt National Historic Site	NY	✓		
Federal Hall National Memorial	NY	✓		
Fire Island National Seashore	NY	✓		
Flight 93 National Memorial	PA			✓
Fort McHenry National Monument and Historic Shrine	MD	✓		
Fort Monroe National Monument	VA	✓		
Fort Necessity National Battlefield	PA	✓		
Fort Stanwix National Monument	NY			✓
Friendship Hill National Historic Site	PA	✓		
Frederick Law Olmsted National Historic Site	MA	✓		
Fredericksburg & Spotsylvania National Military Park	VA		✓	
Gauley River National Recreation Area	WV			✓
Gateway National Recreation Area	NY	✓		
General Grant National Memorial	NY	✓		
Gettysburg National Military Park	PA		✓	
George Washington Birthplace National Monument	VA			✓
Governors Island National Monument	NY	✓		
Great Egg Harbor National Scenic and Recreational River	NJ	✓		
Hamilton Grange National Memorial	NY	✓		
Hampton National Historic Site	MD	✓		
Home of Franklin D. Roosevelt National Historic Site	NY	✓		
Hopewell Furnace National Historic Site	PA		✓	
Independence National Historical Park	PA	✓		
John F. Kennedy National Historic Site	MA	✓		
Johnstown Flood National Memorial	PA		✓	
Lower East Side Tenement Museum NHS	NY	✓		
Longfellow National Historic Site	MA	✓		
Lowell National Historical Park	MA	✓		
Marsh-Billings-Rockefeller National Historical Park	VT			✓
Martin Van Buren National Historic Site	NY			✓
Maggie L. Walker National Historic Site	VA		✓	
Minute Man National Historical Park	MA	✓		
Morristown National Historical Park	NJ	✓		
New Bedford Whaling National Historical Park	MA	✓		
New River Gorge National River	WV			✓
Paterson Great Falls National Historical Park	NJ	✓		

Table 2-2 (continued): NAAQS 8-hour Ozone Status for Park Units in the Northeast Region

Park Name	State	Non Attainment Area	Maintenance Area	Attainment Area
Petersburg National Battlefield	VA		✓	
Richmond National Battlefield Park	VA		✓	
Roger Williams National Memorial	RI	✓		
St. Croix Island International Historic Site	ME			✓
Saint-Gaudens National Historic Site	NH			✓
Sagamore Hill National Historic Site	NY	✓		
Saugus Iron Works National Historic Site	MA	✓		
Salem Maritime National Historic Site	MA	✓		
Saint Paul's Church National Historic Site	NY	✓		
Saratoga National Historical Park	NY	✓		
Shenandoah National Park	VA			✓
Springfield Armory National Historic Site	MA	✓		
Steamtown National Historic Site	PA		✓	
Statue of Liberty National Monument	NY	✓		
Thomas Cole National Historic Site	NY	✓		
Thaddeus Kosciuszko National Memorial	PA	✓		
Theodore Roosevelt Birthplace National Historic Site	NY	✓		
Theodore Roosevelt Inaugural National Historic Site	NY	✓		
Thomas Stone National Historic Site	MD	✓		
Upper Delaware Scenic & Recreation River	NY/PA	✓		
Valley Forge National Historical Park	PA	✓		
Vanderbilt Mansion National Historic Site	NY	✓		
Weir Farm National Historic Site	CT	✓		
Women's Rights National Historical Park	NY			✓

2.2 Congestion Mitigation and Air Quality Program Funding

Since 1991 the CMAQ program has allocated federal transportation funding to state departments of transportation (DOTs) and to metropolitan planning organizations (MPOs) to help state and local communities improve air quality. This program dovetails with objectives of the National Park Service and the Northeast Region Long Range Transportation Plan such as protecting natural resources and sustaining healthy communities. Funding is available for projects in areas that have been designated as “nonattainment” or “maintenance” with regards to achieving National Ambient Air Quality Standards. The funding supports bicycle and pedestrian projects, transit projects, and other congestion management projects that reduce greenhouse gas emissions.

The CMAQ program can not only provide funding opportunities for implementing projects that directly affect a park, but the program can also provide opportunities for parks to work with gateway communities to complete projects that will benefit both the park and the community. In fact, the process for creating CMAQ projects effectively requires this partnership. All potential projects must first be submitted to MPOs for review and evaluation. Those recommended by the MPO are then submitted to the state DOTs for possible inclusion on the state’s multiyear Transportation Improvement Program (TIP).The TIP includes a wide variety of transportation projects, and those seeking funding through the

CMAQ program are a relatively small number of the total. All the transportation projects are assessed with regards to the regional conformity analysis and a list of prioritized projects is then developed based on available funding.

2.2.1 Northeast Region Parks and Local Planning Organizations

In order to get involved in state and local CMAQ projects, parks should be working with the local and regional planning organization. Metropolitan Planning Organizations are policy boards that develop programs and allocate funding for the metropolitan transportation planning process in urban areas with a population greater than 50,000 people.

The 10 priority parks from the LRTP Phase I work and the 15 park sample designated for the climate change tasks were reviewed to identify their respective metropolitan planning organizations.[1] Some parks are large enough to be located in multiple counties or states meaning the air quality status may vary. In all, 16 of the parks are at least partially located in a nonattainment area and two parks are located partially in maintenance areas.

Table 2-3 lists the parks and the associated planning body. Following Table 2-3 are figures showing the locations of metropolitan planning organizations in the Northeast Region and the locations of the parks of the Northeast Region (Figure 2-2 and Figure 2-3), and a figure showing Nonattainment and Maintenance air quality areas in the Northeast Region and the locations of parks (Figure 2-4). Using these maps, parks can determine whether they are located in an area that is eligible for CMAQ funding and what local planning body should be contacted to begin the process of getting a project funded.

[1] Due to overlap on the list, the number of individual parks was 23.

Table 2-3: Parks by Planning Body and CMAQ Designation (Maine, Maryland, Massachusetts)

Maine		
	Hancock County Planning Commission (HCPC)	
	Hancock County, Maine	Maintenance
	Acadia National Park	
	Washington County Council of Governments (WCCOG)	
	Washington County, Maine	Attainment
	St. Croix Island International Historic Site	
Maryland		
	Baltimore Metropolitan Council (BMC)*	
	Baltimore County, Maryland	Nonattainment
	Fort McHenry National Monument and Historic Shrine	
	Tri-County Council for the Lower Eastern Shore of Maryland	
	Worcester County, Maryland	Attainment
	Assateague Island National Seashore	
Massachusetts		
	Boston Region Metropolitan Planning Organization (BRMPO)*	
	Essex County, Massachusetts	Nonattainment
	Salem Maritime National Historic Site	
	Suffolk County, Massachusetts	Nonattainment
	Boston Harbor Islands National Recreation Area	
	Boston National Historical Park	
	Cape Cod Metropolitan Planning Organization (CCMPO)*	
	Barnstable County, Massachusetts	Nonattainment
	Cape Cod National Seashore	
	Northern Middlesex Council of Governments (NMCOG)*	
	Middlesex County, Massachusetts	Nonattainment
	Lowell National Historical Park	
	Southeast Region Planning & Economic Development District (SRPEDD)*	
	Bristol County, Massachusetts	Nonattainment
	New Bedford Whaling National Historical Park	

Note: Those planning bodies that are MPOs are designated with an asterisk (*).

Table 2-3 (continued): Parks by Planning Body and CMAQ Designation (New Jersey, New York)

New Jersey		
	New Jersey Transportation Planning Authority (NJTPA)*	
	Monmouth County, New Jersey	Nonattainment
	Gateway National Recreation Area	
	Sussex and Warren counties, New Jersey	Nonattainment
	Delaware Water Gap National Recreation Area	
	South Jersey Transportation Planning Organization (SJTPO)*	
	Atlantic and Ocean counties, New Jersey	Nonattainment
	Great Egg Harbor National Scenic and Recreational River	
New York		
	New York Metropolitan Transportation Council (NYMTC)*	
	Hudson County, New York	Nonattainment
	Statue of Liberty National Monument	
	Nassau County, New York	Nonattainment
	Sagamore Hill National Historic Site	
	New York County, New York	Nonattainment
	Castle Clinton National Monument	
	Kings County, New York	Nonattainment
	Governors Island National Monument	
	Richmond, Kings, and Queens counties, New York	Nonattainment
	Gateway National Recreation Area	
	Suffolk County, New York	Nonattainment
	Fire Island National Seashore	

Note: Those planning bodies that are MPOs are designated with an asterisk (*).

Table 2-3 (continued): Parks by Planning Body and CMAQ Designation (Pennsylvania, Virginia)

Pennsylvania		
	Delaware Valley Regional Planning Commission (DVRPC)*	
	Montgomery and Chester counties, Pennsylvania	Nonattainment
	Valley Forge National Historical Park	
	Northeast Pennsylvania Alliance	
	Pike County, Pennsylvania	Maintenance
	Delaware Water Gap National Recreation Area	
	Monroe County Planning Commission	
	Monroe County, Pennsylvania	Maintenance
	Delaware Water Gap National Recreation Area	
	Adams County Transportation Planning Organization	
	Adams County, Pennsylvania	Maintenance
	Gettysburg National Military Park	
Virginia		
	Accomack-Northampton Planning District Commission (A-NPDC)	
	Accomick County, Virginia	Attainment
	Assateague Island National Seashore	
	Hampton Roads Transportation Planning Organization (HRTPO)*	
	James City, Surry, Williamsburg, and York Counties, Virginia	Maintenance
	Colonial National Historical Park	
	Harrisonburg-Rockingham Metropolitan Planning Organization (HRMPO)*	
	Rockingham and Augusta counties, Virginia	Attainment
	Shenandoah National Park	
	Northern Neck Planning District Commission	
	Westmoreland County, Virginia	Attainment
	George Washington Birthplace National Monument	
	Rappahanock-Rapidan Regional Commission	
	Rappahannock and Madison counties, Virginia	Attainment
	Shenandoah National Park	
	Thomas Jefferson Planning District Commission (TJPDC)*	
	Greene and Albemarle counties, Virginia	Attainment
	Shenandoah National Park	
	Win-Fred Metropolitan Planning Organization*	
	Page and Warren counties, Virginia	Attainment
	Shenandoah National Park	

Note: Those planning bodies that are MPOs are designated with an asterisk (*).

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Connecticut	
CCRPA	Central Connecticut Regional Planning Agency
COGCNV	Council of Governments of the Central Naugatuck Valley
CRCOG	Capital Region COG
CRERPA	Connecticut River Estuary Regional Planning Agency
GBRPA	Greater Bridgeport / Valley MPO
HVCEO	Housatonic Valley Council of Elected Officials
MRPA	Midstate Regional Planning Agency
SCCOG	Southeastern Connecticut COG
SCRCOG	South Central Regional COG
SWRPA	South Western Region MPO
VCOG	Greater Bridgeport / Valley MPO

Delaware	
D/KC MPO	Dover / Kent County MPO
WILMAPCO	Wilmington Area Planning Council

Massachusetts	
BMPO	Berkshire MPO
CCMPO	Cape Cod MPO
CMRPC	Central Massachusetts MPO
MMPO	Montachusett MPO
MVMPO	Merrimack Valley MPO
NMMPO	Northern Middlesex MPO
OCPC	Old Colony MPO
PVMPO	Pioneer Valley MPO
SRPEDD	Southeastern Regional Planning & Economic Development District

Maryland	
BRTB	Baltimore Regional Transportation Board
SWMPO	Salisbury-Wicomico MPO

Maine	
ATRC	Androscoggin Transportation Resource Center
BACTS	Bangor Area Comprehensive Transportation System
KACTS	Kittery Area Comprehensive Transportation System
PACTS	Portland Area Comprehensive Transportation System

New Hampshire	
NRPC	Nashua Regional Planning Commission
RPC	Rockingham Planning Commission
SNHPC	Southern New Hampshire Planning Commission
SRPC	Strafford Regional Planning Commission

New Jersey	
SJTPO	South Jersey Transportation Planning Organization

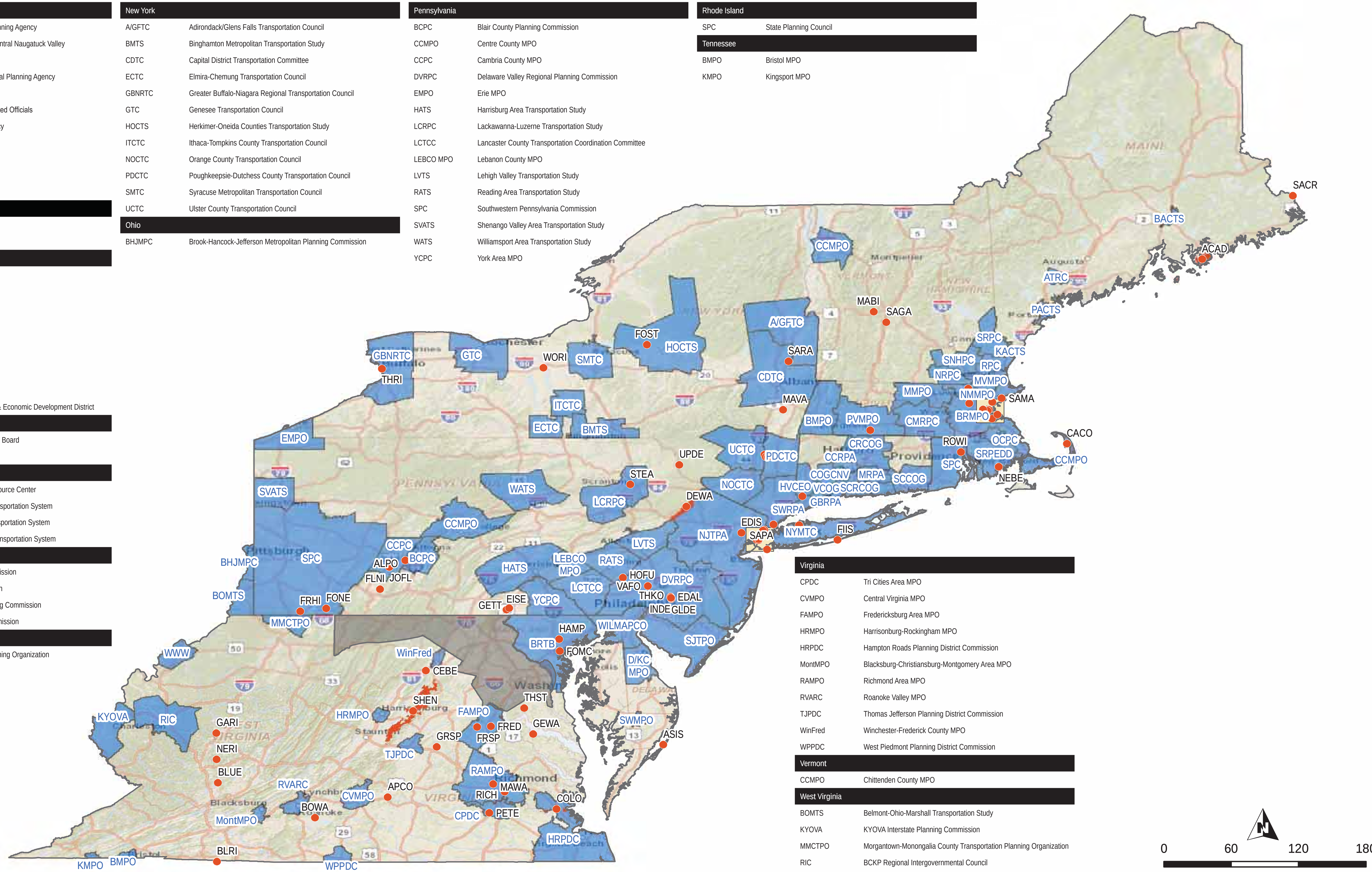
New York	
A/GFTC	Adirondack/Glens Falls Transportation Council
BMTS	Binghamton Metropolitan Transportation Study
CDTC	Capital District Transportation Committee
ECTC	Elmira-Chemung Transportation Council
GBNRTC	Greater Buffalo-Niagara Regional Transportation Council
GTC	Genesee Transportation Council
HOCTS	Herkimer-Oneida Counties Transportation Study
ITCTC	Ithaca-Tompkins County Transportation Council
NOCTC	Orange County Transportation Council
PDCTC	Poughkeepsie-Dutchess County Transportation Council
SMTC	Syracuse Metropolitan Transportation Council
UCTC	Ulster County Transportation Council

Ohio	
BHJMPC	Brook-Hancock-Jefferson Metropolitan Planning Commission

Pennsylvania	
BCPC	Blair County Planning Commission
CCMPO	Centre County MPO
CCPC	Cambria County MPO
DVRPC	Delaware Valley Regional Planning Commission
EMPO	Erie MPO
HATS	Harrisburg Area Transportation Study
LCRPC	Lackawanna-Luzerne Transportation Study
LCTCC	Lancaster County Transportation Coordination Committee
LEBCO MPO	Lebanon County MPO
LVTS	Lehigh Valley Transportation Study
RATS	Reading Area Transportation Study
SPC	Southwestern Pennsylvania Commission
SVATS	Shenango Valley Area Transportation Study
WATS	Williamsport Area Transportation Study
YCPC	York Area MPO

Rhode Island	
SPC	State Planning Council

Tennessee	
BMPO	Bristol MPO
KMPO	Kingsport MPO



Virginia	
CPDC	Tri Cities Area MPO
CVMPO	Central Virginia MPO
FAMPO	Fredericksburg Area MPO
HRMPO	Harrisonburg-Rockingham MPO
HRPDC	Hampton Roads Planning District Commission
MontMPO	Blacksburg-Christiansburg-Montgomery Area MPO
RAMPO	Richmond Area MPO
RVARC	Roanoke Valley MPO
TJPDC	Thomas Jefferson Planning District Commission
WinFred	Winchester-Frederick County MPO
WPPDC	West Piedmont Planning District Commission

Vermont	
CCMPO	Chittenden County MPO

West Virginia	
BOMTS	Belmont-Ohio-Marshall Transportation Study
KYOVA	KYOVA Interstate Planning Commission
MMCTPO	Morgantown-Monongalia County Transportation Planning Organization
RIC	BCKP Regional Intergovernmental Council
WWW	Wood-Washington-Wirt Interstate Planning Commission

0 60 120 180
Miles

NER Parks*
MPO Boundaries*
NER Parks*
National Capital Region

* National Park abbreviations are in black and MPO abbreviations are in blue.

VHB

National Park and MPO Boundaries

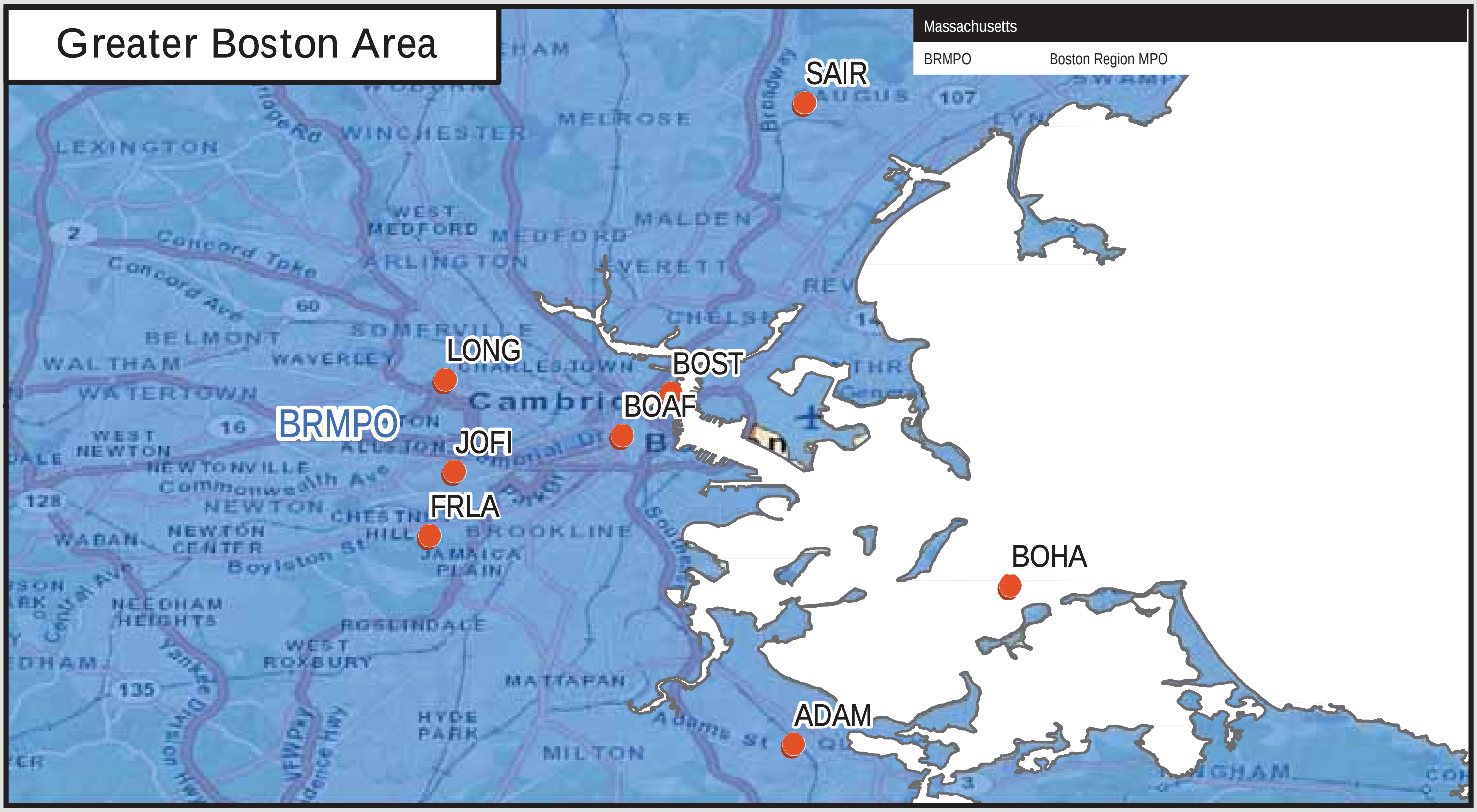
NPS Northeast Region Long Range Transportation Plan

Figure 2-2

National Park and MPO Boundaries

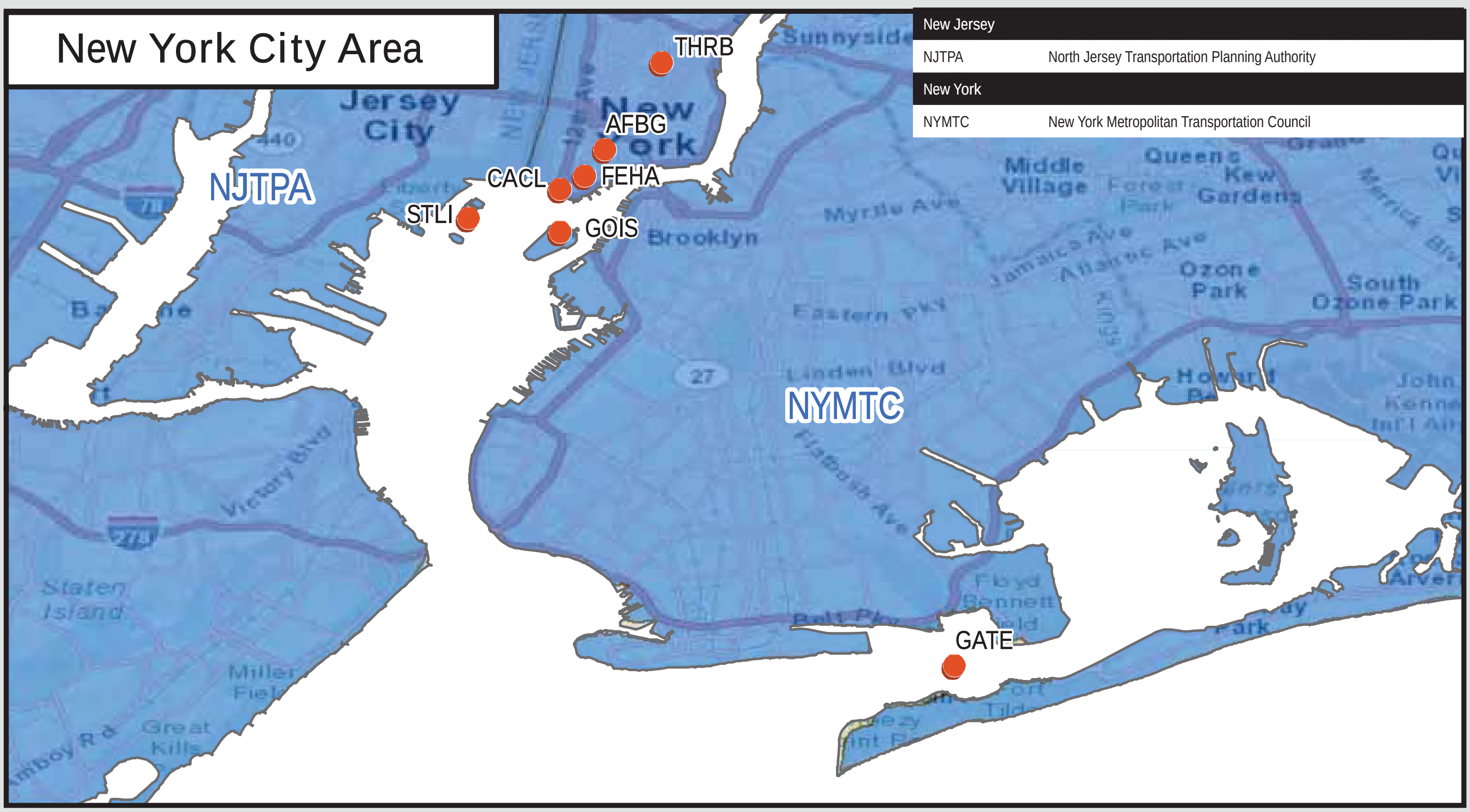
Greater Boston Area

Massachusetts	
BRMPO	Boston Region MPO



New York City Area

New Jersey	
NJTPA	North Jersey Transportation Planning Authority
New York	
NYMTC	New York Metropolitan Transportation Council



● NER Parks* MPO Boundaries*

NER Parks* * National Park abbreviations are in black and MPO abbreviations are in blue.

Figure 2-3

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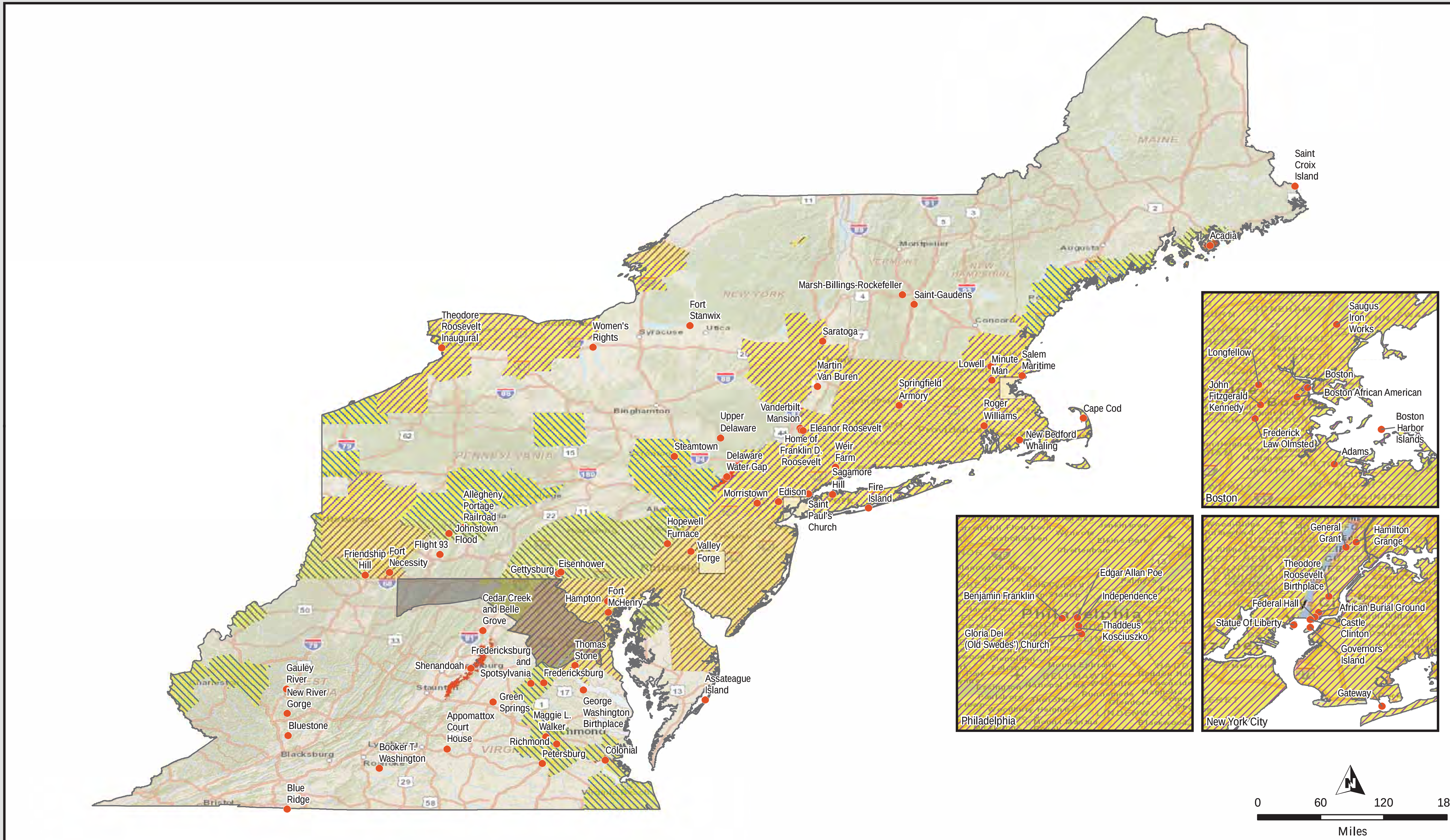


Maintenance Area
NER Parks
National Capital Region
Non-attainment Area
NER Parks

2011 8-hour Ozone Non-attainment and Maintenance Areas (1997 Standard)

NPS Northeast Region Long Range Transportation Plan

Figure 2-4

2.3 CMAQ Funded Projects

Projects funded through the CMAQ program include pedestrian, bicycle and transit projects, as well as roadway and intersection projects designed to reduce congestion and emissions. The decision as to what types of CMAQ projects are placed on the state's Transportation Improvement Plan is up to each state's DOT and MPOs.

CMAQ funding is not entirely new to the Northeast Region. CMAQ funding was instrumental in the development and implementation of Acadia National Park's Island Explorer bus service. The first eight buses procured for the Island Explorer were purchased using CMAQ funding in 1998. As is typical for CMAQ-funded transit projects, the funding was available to help start the project but not for continued annual funding. Since the start of the Island Explorer service, the original buses have been replaced thanks to further funding partnerships and corporate sponsorship. It is clear that the investment of CMAQ funds helped to establish a transit system that has successfully removed vehicles from the road and reduced negative impacts on air quality.

All of the current TIPs for planning agencies related to the 10 Priority Parks in Phase I were reviewed to identify projects that might be beneficial to the parks. Each of the TIPs had the majority of their CMAQ funding allocated to transit projects. Moreover, the funding was generally line-item funding to various transit agencies and did not provide sufficient project details to identify specific projects that might be relevant to a specific park. For the other types of projects, there were only a few directly relevant to any of the priority parks, but they provide good examples of the benefits of community partnerships in pursuing CMAQ program projects.

- Valley Forge National Historical Park lies in Montgomery County, Chester County, and Delaware County, Pennsylvania and falls within the Delaware Valley Regional Planning Commission MPO. Each of these counties has been making efforts towards planning and constructing a bike path network that provides access to natural and cultural destinations throughout the counties. In Montgomery County, the Perkiomen Trail and the Schuylkill River Trail provide access to Valley Forge National Historical Park from the northwest and from the east respectively, and CMAQ funding contributed to both projects. Currently, the Chester Valley Trail Extension is programmed to be designed, right-of-way acquired, and constructed using a combination of CMAQ and local funds. These phases are programmed to take place from fiscal year 2011 (FY 11) to FY 14. The 12-mile Chester Valley Trail travels through several of Chester County's busiest communities and passes less than one mile from the park. The continued development of the Montgomery, Chester, and Delaware County bike trail networks will open up new opportunities for bicycle and pedestrian activity in the community and new points of access to the park.

- Colonial National Historical Park is another example of how CMAQ funding has already had a positive impact on transportation in Northeast Region parks. The Hampton Road Transportation Planning Organization has programmed a project for FY 12 to construct a multiuse trail on Cook Road (State Route 704) from Surrender Road in the south and Ballard Street towards the north. Cook Road runs through the northeast section of Colonial National Historical Park in Yorktown, Virginia. A short distance north of this trail is the park's visitor center and south of this trail is York High School. This trail will provide an opportunity for pedestrians and cyclists to access the park and new opportunities for educational connections between the park and nearby students.

- The Cape Cod Commission is the planning body for the Cape Cod region of Massachusetts, which includes the Cape Cod National Seashore. The state's Transportation Improvement Plan shows projects programmed for FY 12 through FY 15. Included on this list is a rail trail extension project that will connect the towns of Dennis and Yarmouth. Rail trail initiatives seek to convert abandoned rail lines into a network of trails nationwide. This project should be seen as an opportunity for the Cape Cod National Seashore to begin a conversation with the Cape Cod Commission and local communities about how the bike trail can be further improved and expanded to incorporate the national seashore into the bicycle network.

2.4 Summary of Findings

The majority of park units in the Northeast Region are located in areas that are not in compliance with NAAQS standards for ground-level ozone. The CMAQ program provides funding for bicycle, pedestrian and transit projects, as well as roadway projects that reduce congestion, for locations not in compliance with the NAAQS standards.

At this point, it appears that the parks in the Northeast Region do not have a consistent approach for making the best of the opportunities afforded by the CMAQ program. The program has been used in the past for some projects, but no current park-sponsored projects using CMAQ funding were identified in current state Transportation Improvement Plans. There are, however, some trail projects on the TIPs that were developed by gateway communities that could benefit certain parks and the parks should assist those communities in advocating for the projects to ensure their timely implementation.

Parks should always be aware of the regional planning process that goes into the development of the TIPs. Perhaps the most important action is to reach out to the planning organizations in gateway communities. The first step in implementing a project through the CMAQ program is to form partnerships with gateway communities to identify and advocate projects that can be mutually beneficial. Most trail and transit projects at parks would likely be eligible for CMAQ funding, but that funding could only be obtained through the participation in the regional transportation planning process.

3.0 CULTURALLY SIGNIFICANT TRANSPORTATION ASSETS

This chapter presents inventory and condition data of the historic transportation-related assets of the Northeast Region. The data are from an analysis conducted by Booz-Allen-Hamilton using the NPS Facility Management System Software (FMSS) database. As part of this work, the FMSS data were reviewed and refined to create the list of transportation assets discussed in this chapter. A white paper titled "Identifying the Transportation Asset Inventory for the Northeast Region Long Range Transportation Plan" can be found in the Compendium of Technical Studies. The white paper provides detailed information on how the FMSS database was refined for the purposes of this study.

3.1 Historic Transportation Asset Inventory and Value

As shown in Table 3-1, the Northeast Region has 2,898 National Park Service owned active transportation assets with a current replacement value (CRV) of almost $2.8 billion. Historic transportation assets make up about 23 percent of all transportation assets and represent approximately 47 percent of the current replacement value of the entire Northeast Region FMSS transportation asset portfolio.

Table 3-1: Summary of Northeast Region Assets

Asset Type	Number of Assets	Percentage of Assets	Current Replacement Value	Percentage of CRV
Historic Transportation Assets	664	23%	$1,290,845,658	47%
Other Transportation Assets	2,234	77%	$1,482,627,170	53%
All Northeast Region Transportation Assets	**2,898**	**100%**	$2,773,472,828	**100%**

Note: For the purpose of this analysis a "Historic Asset" is one that is a National Historic Landmark, National Register Listed, or National Register Eligible.

As shown in Table 3-2, there are 396 miles of roads, 90 bridge assets, 38 miles of trails, and 99 acres of parking that are historic. Of note is that nearly half of road miles and bridges are deemed historic.

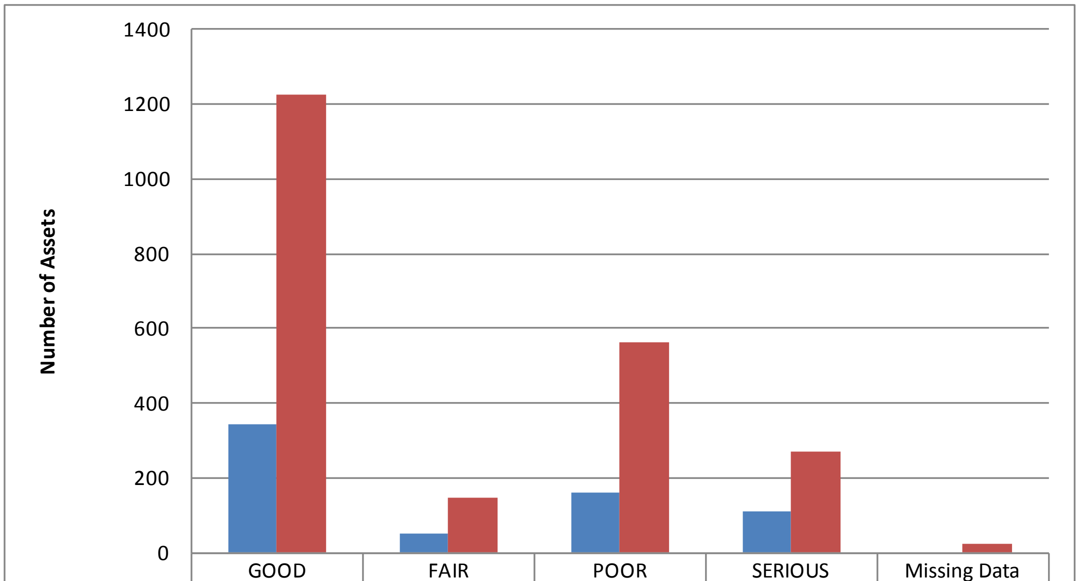
Table 3-2: Summary of Northeast Region Transportation Assets by Historic Status

	All Assets	Historic Assets	National Historic Landmark	Percentage of Historic Assets
Roads (miles)	875	396	16.05	45%
Trails (miles)	156	38	1.15	24%
Parking (acres)	610	99	1.63	16%
Bridges	196	87	5	44%

3.2 Condition and Deferred Maintenance of Historic Transportation Assets

The condition of transportation assets are categorized as “good”, “fair”, “poor”, or “serious” based on the Facility Condition Index (FCI) of the asset. The Facility Condition Index is calculated by dividing the deferred maintenance by the current replacement value. Figure 3-1 shows the ranking and historic designation of Northeast Region transportation assets. The condition of historic transportation assets is similar to that of all transportation assets. Over half are in “good” condition, and about 40 percent are in “poor” or “serious” condition.

Figure 3-1: Northeast Region Transportation Assets by Condition Ranking



	GOOD	FAIR	POOR	SERIOUS	Missing Data
Historic	342	53	160	109	0
Non-Historic	1225	149	564	273	23

Table 3-3 shows the total current replacement value, deferred maintenance, and critical systems deferred maintenance on all transportation assets and on historic transportation assets. There is approximately $220.3 million in deferred maintenance of historic transportation assets, including $143.4 million of critical systems deferred maintenance. When compared to current replacement value, the deferred maintenance for historic transportation assets is proportionally the same as for other transportation assets. However, historic transportation assets have proportionally more critical systems deferred maintenance than other transportation assets.

Table 3-3: Summary of Northeast Region Transportation Asset Metrics

	All Transportation Assets	Historic Transportation Assets	Percentage of Historic Assets
Current Replacement Value	$2,773,472,828	$1,290,845,658	47%
Deferred Maintenance	$490,154,916	$220,292,672	45%
Critical Systems Deferred Maintenance	$232,591,707	$143,353,310	62%

3.3 Optimizer Banding of Historic Transportation Assets

Optimizer banding of assets is a method for prioritizing investments in assets. Assets are designated with optimizer band values of 1, 2, 3, 4 or 5. Funding prioritization is highest for low-cost preventive maintenance on high-value assets. Little or no funding is provided to low-value assets.

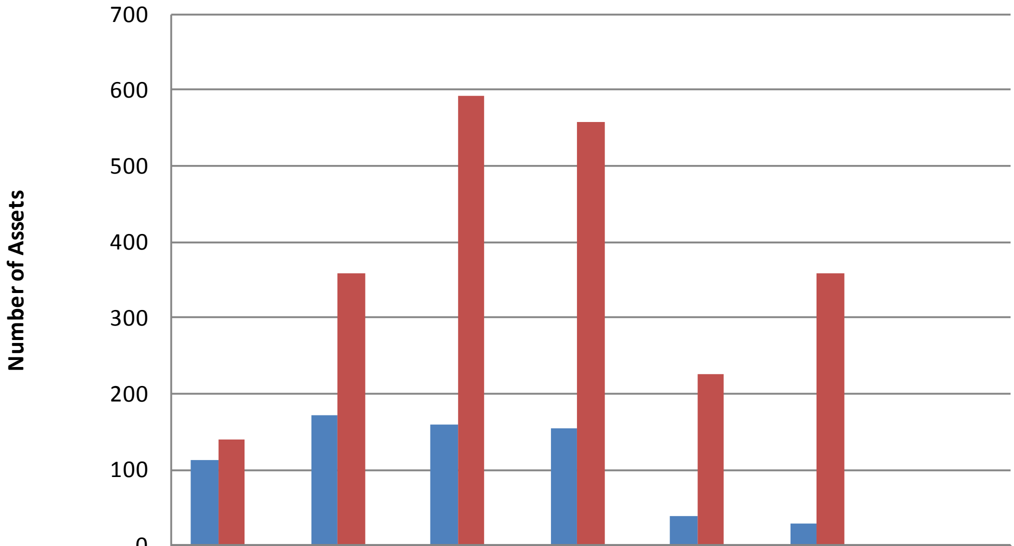
The designation of optimizer band for a particular asset is determined using both a quantitative formula and a qualitative process. As shown by Figure 3-2, the quantitative formula uses the Asset Priority Index and the Facility Condition Index. The Facility Condition Index is calculated by dividing the deferred maintenance by the current replacement value. The Asset Priority Index is a metric for how an asset contributes to the park mission, and is measured on a scale from 1 to 100 with 100 being the highest priority assets.

Once this initial designation is made the parks review the assets and, if necessary, adjust an asset's band designation to take into account funding constraints. The result is a prioritized list of assets for investment.

Figure 3-2: Optimizer Bands

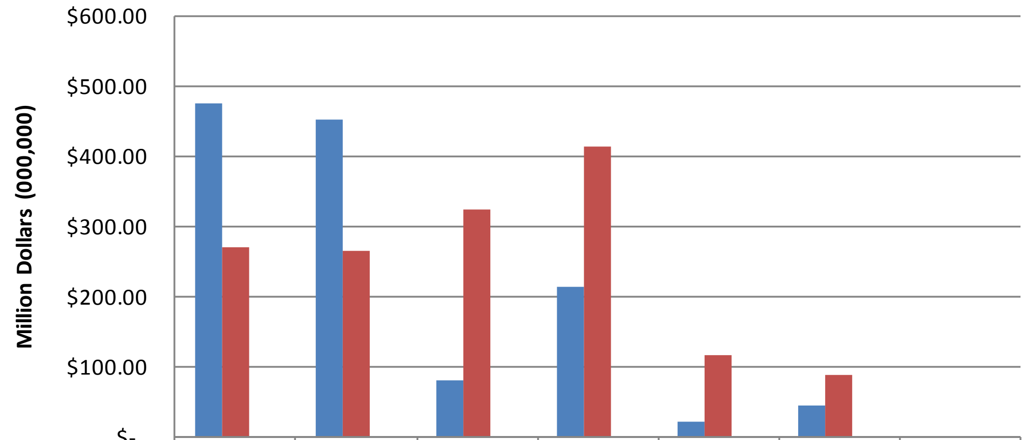
The evaluation of optimizer banding for historic transportation assets indicates that the Northeast Region is prioritizing investments in historic transportation assets over investments in other transportation assets. The National Park Service Capital Investment Strategy emphasizes investments in optimizer band 1 and 2 assets. Figure 3-3 shows the distribution of transportation assets in the Northeast Region by optimizer band. Some 43 percent of historic transportation assets are in optimizer bands 1 or 2, compared to 22 percent for other transportation assets. The weighting of current replacement value in optimizer bands 1 and 2 for historic transportation assets is even greater than for the number of assets (Figure 3-4). CRV of historic transportation assets in bands 1 and 2 make up 72 percent of historic asset CRV, while 36 percent of the CRV of other transportation assets is of assets designated as optimizer band 1 or 2.

Figure 3-3: Northeast Region Transportation Assets by Optimizer Band



	1	2	3	4	5	Missing Data	Total
Historic	113	171	160	154	38	28	664
Non-Historic	140	358	593	558	226	359	2234
Total	253	529	753	712	264	387	2898

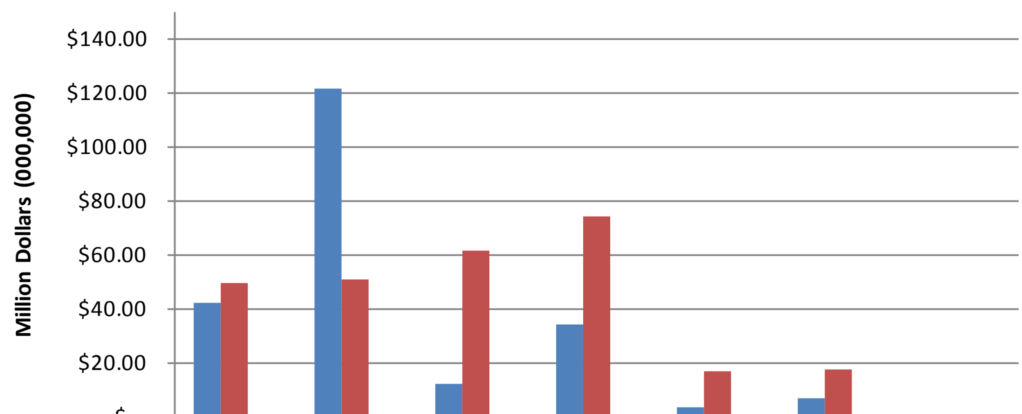
Figure 3-4: Northeast Region Transportation Assets by Current Replacement Value



	1	2	3	4	5	Missing Data	Total
Historic	$475.03	$453.09	$80.38	$214.33	$21.50	$46.52	$1,290.85
Non-Historic	$271.90	$266.16	$323.72	$415.06	$116.16	$89.62	$1,482.63
Total	$746.93	$719.25	$404.10	$629.40	$137.65	$136.14	$2,773.47

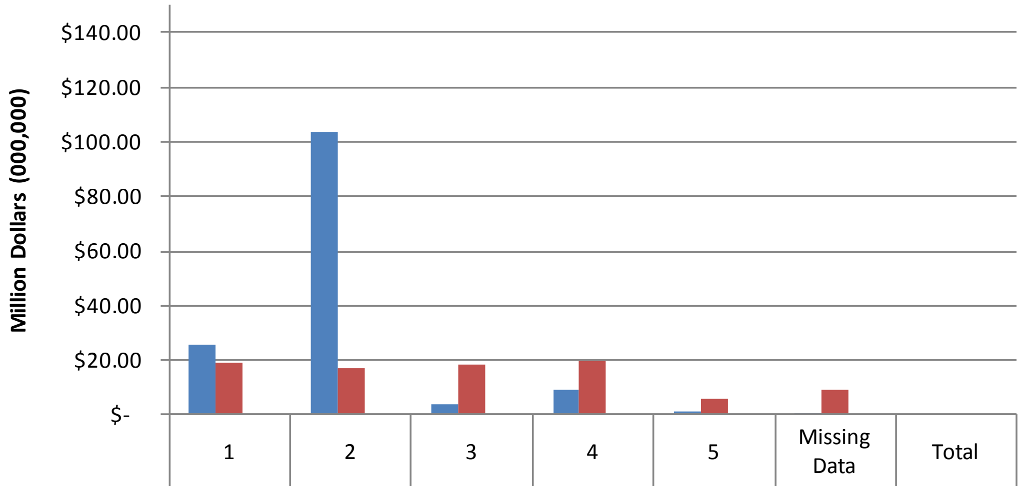
A review of deferred maintenance and critical systems deferred maintenance also illustrates the investment priority in historic assets. Historic transportation assets designated as optimizer band 1 or 2 account for 74 percent of deferred maintenance amounts for those assets, compared to 39 percent for non-historic transportation assets (Figure 3-5). Ninety percent of critical systems deferred maintenance of historic transportation assets is in assets designated as optimizer band 1 or 2, compared to 31 percent for non-historic transportation assets (Figure 3-6).

Figure 3-5: Northeast Region Transportation Assets by Deferred Maintenance



	1	2	3	4	5	Missing Data	Total
Historic	$42.30	$121.46	$12.10	$34.21	$3.53	$6.69	$220.29
Non-Historic	$49.60	$50.85	$61.39	$73.91	$16.62	$17.50	$269.86
Total	$91.90	$172.32	$73.49	$108.12	$20.15	$24.19	$490.15

Figure 3-6: Northeast Region Transportation Assets by Critical Systems Deferred Maintenance



	1	2	3	4	5	Missing Data	Total
Historic	$25.56	$103.67	$3.66	$9.39	$0.88	$0.18	$143.35
Non-Historic	$19.11	$16.98	$18.45	$19.39	$5.89	$9.41	$89.24
Total	$44.67	$120.66	$22.12	$28.78	$6.77	$9.60	$232.59

3.4 Operation and Maintenance Costs of Historic Transportation Assets

As described in the Asset Management subject area memorandum and supporting documentation by Booz-Allen-Hamilton, existing data resources do not provide a precise means of determining operations and maintenance needs for individual transportation assets or even the O&M for all transportation assets. Several means of estimating the O&M were evaluated and the consensus is that the O&M monies expended for all transportation assets in the Northeast Region is between $7 and $10 million and that the need is in the range of $14 to $17 million. Assuming that O&M is proportional to CRV, the annual O&M spending on historic transportation assets would be in the range of $3.3 to $3.7 million and the need for O&M spending on historic transportation assets would be $6.6 to $8.0 million annually.

3.5 Northeast Region Investment Strategies and *A Call to Action*

Investment strategies and prioritization, including how they relate to historic assets, are explored more fully in the Funding and Financial subject area memorandum. This section provides a summary of how the current Northeast Region investment strategy relating to historic transportation assets aligns to the newest initiative – *A Call to Action: Preparing for a Second Century of Stewardship and Engagement*.

A Call to Action establishes 15 goals and 36 actions for the National Park Service to take towards achieving the vision of the second century of the National Park Service. The actions that have been identified by the National Park Service as directly relating to culturally significant assets all fall under the theme 'Preserving America's Special Places". The three actions most applicable to culturally significant transportation assets are "invest wisely", "what's old is new", and "park pulse".

- 24. INVEST WISELY- Focus investments from all maintenance fund sources on high priority national park assets to address critical deferred maintenance and code compliance needs. By doing so, we will correct the health and safety, accessibility, environmental, and deferred maintenance deficiencies in at least 25 percent of the facilities that are most important to park visitor experience and resource protection.

- 25. WHAT'S OLD IS NEW- Modernize historic preservation methods and technologies, show how historic structures can be made sustainable, and support efforts to rebuild the economic vitality of rural and urban communities by updating the Secretary of the Interior's Standards and Guidelines for the Treatment of Historic Properties in consultation with historic preservation partners.

- 28. PARK PULSE- Assess the overall status of park resources and use this information to improve park priority setting and communicate complex park condition information to the public in a clear and simple way. To accomplish this, we will complete 50 "State of the Park" reports that synthesize monitoring information, resource inventories, facilities condition data, and visitor surveys.

Although Action 25, to make historic structure sustainable, is focused on historic buildings, the objective of responsible preservation practices can apply to all of the Northeast Region's many historic transportation assets. The Secretary of the Interior's *Standards for the Treatment of Historic Properties with guidelines for preserving, rehabilitating, restoring & reconstructing historic buildings* identifies four treatment approaches (Preservation, Rehabilitation, Restoration and Reconstruction) and notes that choosing the most appropriate treatment requires a careful consideration of factors such as the assets' relative importance in history, physical condition, and mandated accessibility, safety and other code requirements. The Northeast Region routinely considers those factors when planning and designing transportation projects.

Action 28, to complete "State of the Park" reports, is an opportunity for the Northeast Region. Many of the technical tasks done by the region as part of the Long Range Transportation Plan would contribute to the transportation-related elements of the effort to synthesize monitoring information, resource inventories, facilities condition data, and visitor surveys.

As for Action 24, Invest Wisely, the Northeast Region is well aligned with this policy. The Northeast Regions historic transportation assets are predominately roads and bridges and the region has focused most investment on those types of facilities. The region prioritizes safety by bringing all bridges, including the many historic bridges, to a minimum of "fair" condition. The region's roadways investments target those roadways used by the majority of visitors and many of them are historic loop roads and scenic byways. For example, a small sample of the current multiyear plan includes work on the following historic transportation assets.

- Skyline Drive, Shenandoah National Park
- Hill-Ewell Drive, Fredericksburg-Spotsylvania National Military Park
- Jordan Pond Road, Acadia National Park
- Bard Rock Road and Lower Gatehouse Road, Vanderbilt Mansion National Historic Site

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4.0 WILDLIFE-VEHICLE COLLISIONS

Consideration of wildlife-vehicle collisions in transportation planning for the National Park Service is important because wildlife-vehicle collisions are directly tied to several areas of the NPS mission, notably protection of threatened and endangered species, and safety of park visitors and staff. The following section summarizes wildlife-vehicle information from a safety study completed by CH2MHILLfor the Northeast Region and a memorandum prepared by the Western transportation Institute, with a focus on losses of threatened and endangered species.

4.1 Vehicle-Wildlife Collisions in the Northeast Region

The *Northeast Region Transportation Safety Management System Summary Report*[2] presents the findings of a region-wide safety study done by CH2MHILL. The work involved detailed evaluation of Northeast Region parks with numbers of accidents, as identified from the Service-wide Traffic Accidents Reporting System (STARS) data from 1990 to 2005 for all Northeast Region parks. The study found that vehicle-animal crashes were significant enough in the Northeast Region that "Reducing Animal Crashes" was one of seven recommended Safety Emphasis Areas for the Northeast Region.

The STARS data showed that that 29 percent of all reported vehicle crashes in the Northeast Region involved a collision with an animal, and that wildlife-vehicle crashes accounted for 12 percent of all crashes resulting in an injury.

As shown in Table 4-1, wildlife-vehicle crashes were highly focused on four parks, Delaware Water Gap National Recreation Area, Shenandoah National Park, Valley Forge National Historical Park, and Colonial National Historical Park. Those top four parks account for 95 percent of all wildlife-vehicle crashes in the Northeast Region. By itself, Valley Forge NHP accounted for 37 percent of all wildlife-vehicle crashes and 62 percent of wildlife-vehicle crashes that resulted in injury to the driver and/or passengers.

[2] CH2M Hill, "Northeast Region Transportation Safety Management System Summary Report," January 2012.

Table 4-1: Top Animal Collision Parks in the Northeast Region

	Crash Types			
	All Crashes	Wildlife-Vehicle Crashes	Crashes Resulting in Injury	Wildlife-Vehicle Crashes Resulting in Injury
Northeast Region	**9,380**	**2,675**	**1,617**	**187**
Valley Forge NHP	2,173 (23%)	985 (37%)	416 (26%)	116 (62%)
Delaware Water Gap NRA	2,307 (25%)	775 (29%)	446 (28%)	26 (14%)
Shenandoah NP	1,342 (14%)	571 (21%)	234 (14%)	33 (18%)
Colonial NHP	754 (8%)	222 (8%)	119 (8%)	6 (3%)
Sum of the 4 parks	**6,576 (70%)**	**2,553 (95%)**	**1,215 (75%)**	**181 (97%)**

Source: National Park Service, “Servicewide Traffic Accident Reporting System,” 1990-2005.

4.2 Threatened and Endangered Species Loss

The STARS database does not maintain a record of what wildlife is lost in a wildlife-vehicle crash, but park staff have indicated that the vast majority of wildlife-vehicle crashes involve white-tail deer and few if any involve threatened or endangered species.

The National Park Service Threatened and Endangered Species Database provides lists of threatened and endangered species for every park unit and those lists were reviewed for the top four parks for wildlife-vehicle crashes. This review revealed that there are currently no threatened or endangered species residing in Valley Forge National Historical Park. In Colonial National Historical Park the only threatened or endangered species being protected is plant life. The wildlife species being protected at Delaware Water Gap NRA and Shenandoah National Park are listed below.

- Delaware Water Gap National Recreation Area
    - Bog Turtle (Threatened)
    - Dwarf Wedgemussel (Endangered)
- Shenandoah National Park
    - Shenandoah salamander (Endangered)

As noted previously, there is no record of the species being lost in wildlife-vehicle crashes; however, the threatened and endangered species listed at Delaware Water Gap NRA and Shenandoah NP are not typically found to contribute to collisions with motorized transportation.

At the Valley Forge National Historical Park a deer management program was initiated to reduce deer populations to a level that is approximately 75 percent of the pre-program level. This program was initiated primarily due to the need to protect the habitat, but it will undoubtedly have substantial impacts on reducing vehicle crashes. This program was recently completed. If wildlife-vehicle crashes decline by 75 percent at Valley Forge NHP that would reduce the number of total Northeast Region animal with vehicle collisions by 28 percent and would reduce all vehicle crashes in the entire Northeast Region by 8 percent.

Colonial National Historical Park is also trying to determine the best way to address a growing deer population. Colonial NHP is conducting a study to assess the existing conditions and inventory of deer in the park and to determine the feasibility of implementing a deer management plan.

4.3 Findings of Related Studies

The issue of wildlife-vehicle collisions is not new to the National Park Service, and has been addressed through other projects as well. The discussion that follows summarizes findings associated with other projects that relate to vehicle-wildlife collisions.

4.3.1 Northeast Region Transportation Safety Management System Summary Report

The *Northeast Region Transportation Safety Management System Summary Report* acknowledges that specific locations showing high rates of animal collisions should be identified if applicable. To address difficulties with animal collisions four countermeasures are suggested. These countermeasures all generally address animal-vehicle interactions, selecting specific countermeasures should be done on a case to case basis.

- Implement an education campaign for visitors
- Enhance routine park ranger patrols
- Direct animals away from roads
- Implement animal detection and warning systems

This report makes general recommendations about safety management in the National Park Service, some of which relate to wildlife-vehicle collisions. A recommendation is made that calculation of the cost of animal crashes should be broadened to provide a more accurate value. Currently the cost of animal crashes is calculated in the same way as other crashes, by determining the value of losses to the drivers, passengers, and vehicles involved. Other potential costs to consider are the costs to park resources involved such as resource damages, animal death, incident response, and site repair.

4.3.2 Western Transportation Institute

On behalf of the National Park Service, the Western Transportation Institute (WTI) reviewed a number of wildlife-vehicle collision documents and provided some findings and recommendations[3]. The memorandum included a broad discussion of countermeasures that could be implemented.

WTI highlighted that knowing what species is lost in a collision is important. Knowing the general size, and the genus, of animals lost is necessary to select the best countermeasure and to design and implement the countermeasure in the most effective manner. WTI also noted that without knowing which species are being impacted by collisions no clear conclusions can be made about the dangers posed to threatened and endangered species and countermeasure efforts cannot be focused on species of greatest value.

A second data need for the crash database is improved location details. The location data currently provided in the crash database describes the location relative to other landmarks within the park. A database that records location based on a universal system, such as latitude and longitude, could be more cohesive and open up new opportunities for analyzing and mapping this data. A similar recommendation is made in the *Northeast Region Transportation Safety Management System Summary Report.*

4.4 Considerations for the Future

The recommendations from CH2MHILL and the Western Transportation Institute regarding wildlife-vehicle crash data records are necessary before large-scale investments such as wildlife crossing structures or animal detection systems can be considered. In the near term, given that the available evidence, albeit anecdotal, indicates that the overwhelming issue with wildlife-animal collisions in the Northeast Region is related to overpopulation of white-tail deer in a few parks, it will be important to review recent crash data for Valley Forge NHP once it becomes available. The data may confirm that vehicle safety has been substantially improved for visitors and staff at the park, and provide quantified safety-related benefits for consideration with deer management programs at other parks.

[3] Huijser, Marcel and James Begley, Western Transportation Institute, November 10, 2011, memorandum.

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NORTHEAST REGION LONG RANGE TRANSPORTATION PLAN

Visitor Experience Subject Area Memorandum

Prepared for:

National Park Service
WASO Denver
12795 W. Alameda Parkway
P.O. Box 25287
Denver, CO 80225-0287

Prepared By:

Vanasse Hangen Brustlin, Inc.
351 McLaws Circle, Suite 3
Williamsburg, VA 23185-6316

August 22, 2012

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1.0 Purpose and Intent of this Report

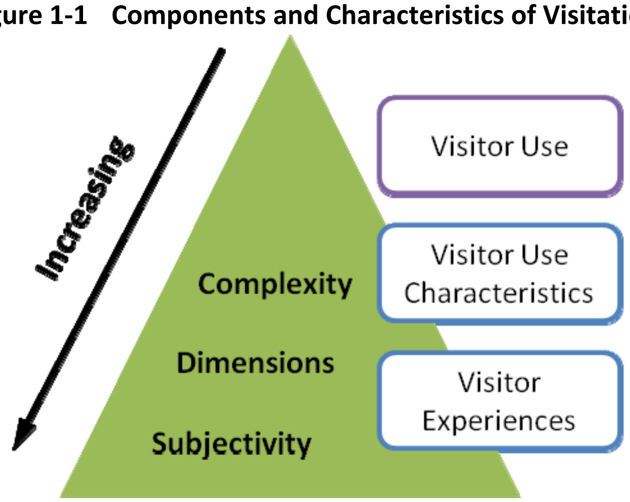
Providing positive visitor experiences is at the core of the National Park Service mission. This memorandum explores the relationship between visitors and the transportation system that they might use to access and travel within the park units of the Northeast Region. The intent of the analysis and discussion contained herein is to provide insight on how to better link transportation policies, strategies, and decision-making with their inherent relationships to visitors.

Understanding the influences that visitor use, visitor characteristics, and visitor experiences might have on transportation (and vice versa) first requires a definition of terms:

> ***Visitor use*** *is defined as the physical, human presence in an area for recreational, educational, inspirational, or scientific purposes*[1].
>
> ***Visitor use characteristics*** *are defined as the levels of use, timing and distribution of use, and activities and behaviors of visitors*[2].
>
> ***Visitor experience*** *is the perceptions, feelings, and reactions a person has before, during and after a visit to a park site*[3].

All of these components are relevant to transportation and transportation planning for the Northeast Region (NER); however, the complexity, dimensions, and subjectivity increases significantly as one moves from visitor use (quantitative and fairly straightforward), to visitor use characteristics (more dimensions, with both quantitative and qualitative information generally available), to visitor experiences (complex, multi-dimensional, and highly subjective), as illustrated in Figure 1-1.

Figure 1-1 Components and Characteristics of Visitation



[1] Source: Interagency Visitor Use Management Council
[2] Ibid.
[3] Visitor Experience Technical Report for the Golden Gate National Recreation Area, Muir Woods National Monument, and Fort Point National Historic Site Long-range Transportation Plan, Denver Service Center, March 2012, Draft.

Visitor use data generally provides information on the demands for transportation being placed on the system by visitors, differences in demands by park unit and park type (where data are available), and the potential for growth in the future based on historic trends.

Exploring visitor use characteristics provides additional insight on the temporal distribution of visits to the park unit, the types of visitors (based on various sociodemographic factors), activities, modal use, etc. These data are helpful to assess how the existing transportation is addressing visitor needs and where future opportunities might exist for enhancements to visitor transportation systems.

As previously mentioned, visitor experience is multi-dimensional and highly personal (or subjective). (Consider for a moment that there were more than 53 million *different* visitor experiences in the Northeast Region in 2011). Because of this complexity, there is a tendency to align similar visitor experiences with transportation strategies and enhancements by exploring in more detail the different types of visitors, their desired park experiences, choice of modes, etc. Regardless, transportation systems have broad potential to either enhance or detract from visitor safety, satisfaction, understanding and appreciation of the park unit resources.

This memorandum discusses visitor use, visitor characteristics, and visitor experiences in the Northeast Region, and discusses transportation needs and opportunities to improve visitor experiences.

2.0 VISITOR USE

Existing visitor use and visitor use trends in the Northeast Region are helpful in the assessment of existing and potential transportation strategies by understanding the:

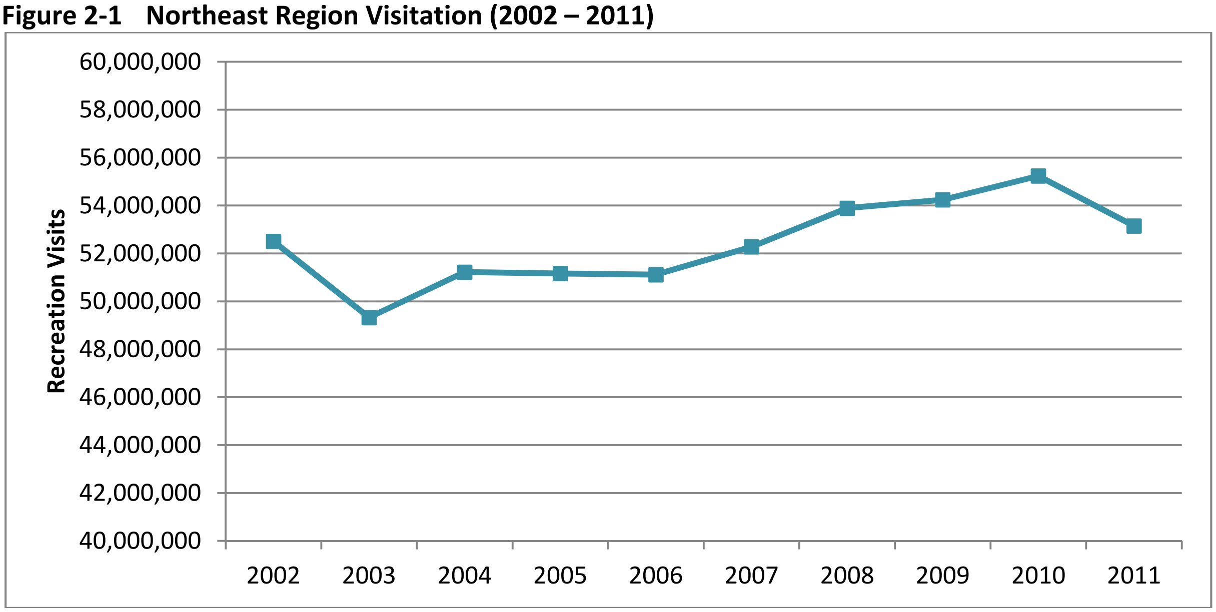
- Actual demands for transportation being placed on the system by visitors
- Relative differences in demands by park unit (where data are available)
- Potential for growth in the future based on historic trends

The following sections provide current and historic calendar year visitation data for the Northeast Region.

2.1 Annual Visitation

Figure 2-1 shows Northeast Region annual visitation for the past 10 years.[4] In 2011, there were more than 53 million visits among the Northeast Region park units. Over the last ten years, the Northeast Region has seen moderate but steady growth in recreation visitors after some decreases early in the 2000s. The 2011 visitation of 53 million is up 8% from the 10-year low of 49 million visitors in 2003.

Figure 2-1 Northeast Region Visitation (2002 – 2011)



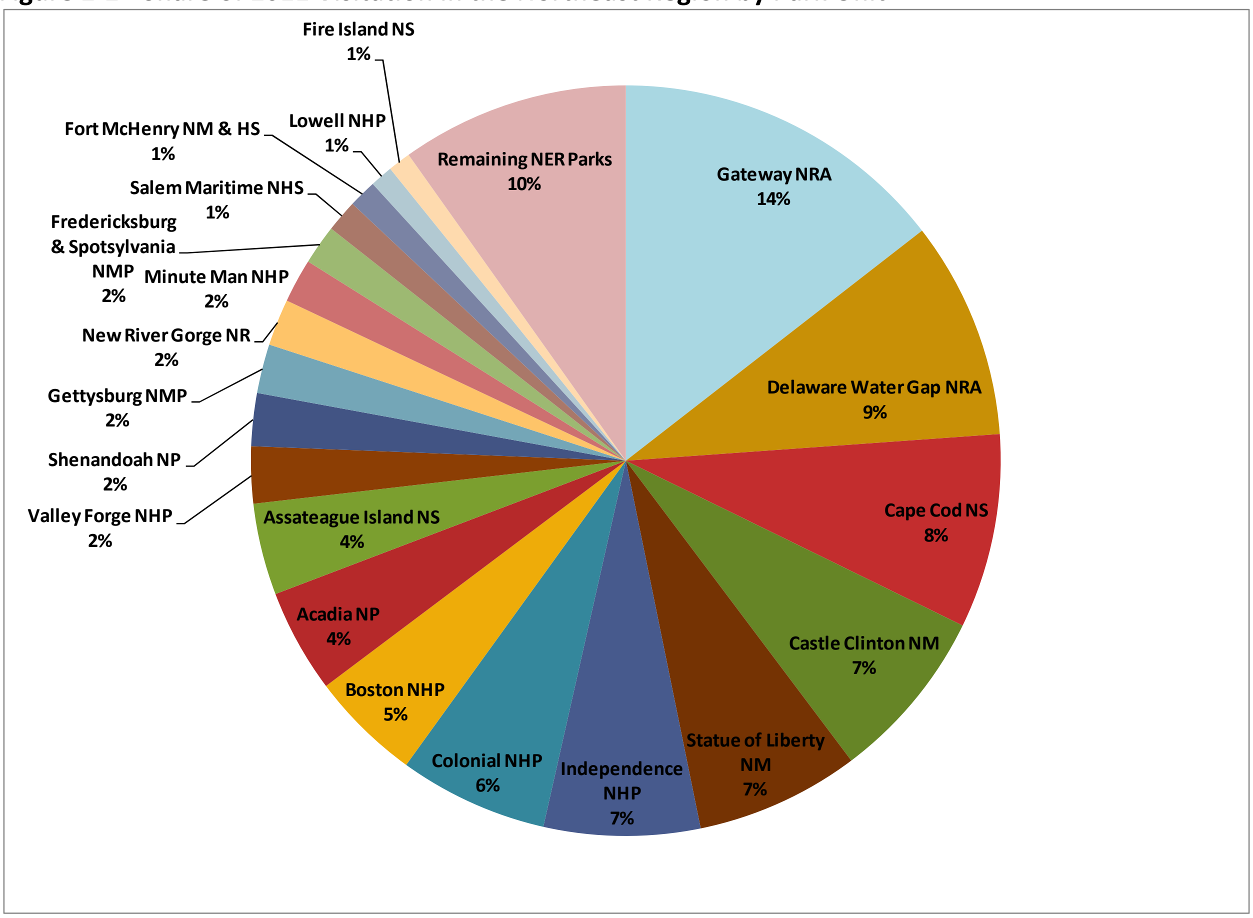
Source: National Park Service Public Use Statistics Office, “Annual Recreation Visits Report,” 2002-2001.
Note: Data presented for the 71 park units for which data are available.

[4] For the purposes of this document, visitation data refers to “recreation visit” data from the NPS Public Use Statistics Office for the 71 Northeast Region park units for which such data are available.

2.2 Highest Visitation Park Units

Of the 71 park units of the Northeast Region for which visitation data are available, the top 20 park units account for 90% of visitation in the region. As shown in Figure 2-2, the top three park units for visitation are the Gateway National Recreation Area, the Delaware Water Gap National Recreation Area, and Cape Cod National Seashore. These data offer one indicator of the importance of these park units as recreational resources for the urban populations of the northeast. The magnitude of visitation at a park unit, when combined with the park type, seasonal visitation, area classification, and park users, influences the types of transportation strategies that are appropriate and where further refinement and enhancements in transportation options may be cost effective. A complete list of Northeast Region parks with available visitation data and visitation figures for 2011 can be found in the Appendix.

Figure 2-2 Share of 2011 Visitation in the Northeast Region by Park Unit



Source: National Park Service Public Use Statistics Office, "Annual Recreation Visits Report," 2002-2011.
Note: Data presented for the 71 park units for which data are available.

2.3 Visits by Park Unit Type

The purpose of a visit to a park unit and its context may influence visitors' choice of transportation mode, length of stay (for example, visiting a national historic site is typically a shorter length of visit than visiting a national recreation area), and transportation requirements within the park unit.

To provide a broad overview of the region-wide visitation, the annual visitation data for the Northeast Region were grouped into two categories: Cultural/Historical and Recreational. The list of park units categorized as Cultural/Historical sites is comprised of National Battlefields, National Battlefield Parks, National Historic Sites, National Historical Parks, National Memorials, National Military Parks, and National Monuments. There are 60 such park units in the Northeast Region for which visitation data are available. The list of park units categorized as Recreational is comprised of National Parks, National Recreation Areas, National Rivers, and National Seashores. There are 11 such park units for which visitation data are available. Table 2-1 presents annual visitation between the two categories of park units.

Table 2-1 2011 Park Visitation by Park Unit Type

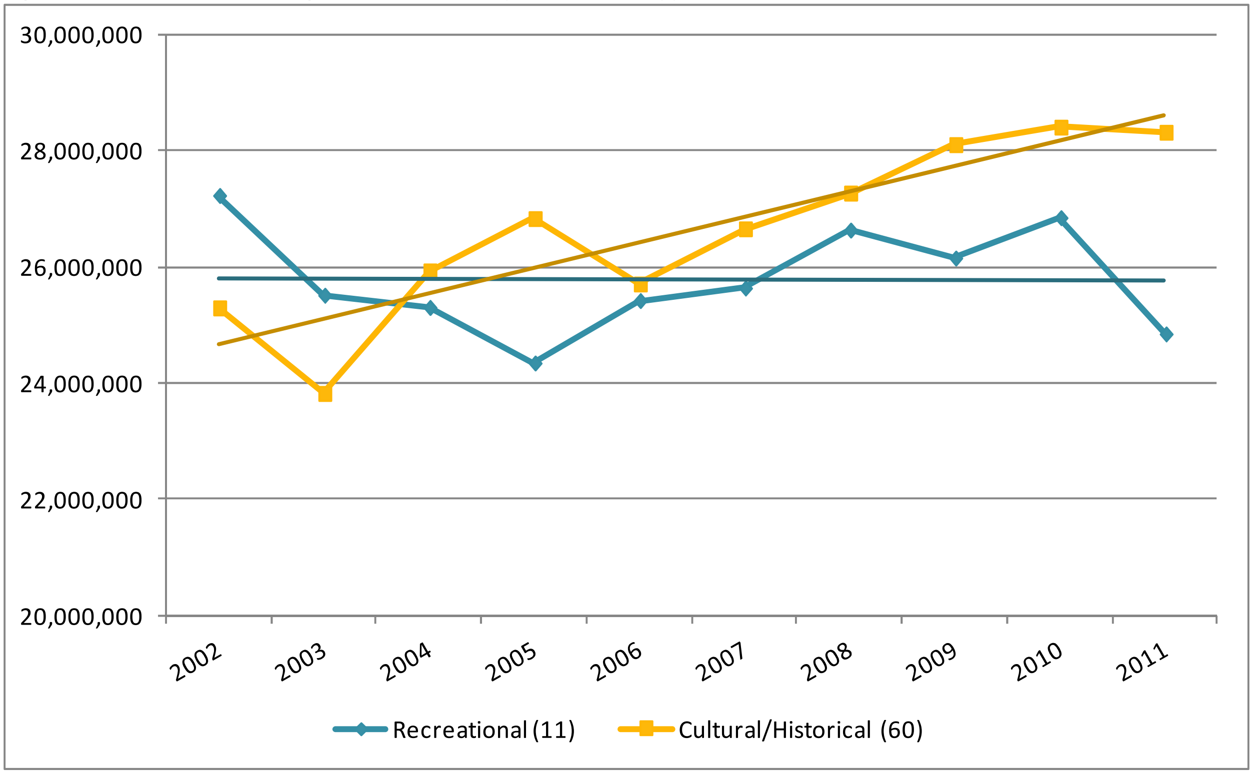
Park Unit Type	Park Units	Total Visitation	Average Park Unit Visitation	Highest Park Unit Visitation	Lowest Park Unit Visitation
Recreational	11	24,841,246	2,258,295	7,697,727 (Gateway NRA)	41,670 (Bluestone NSR)
Cultural/Historical	60	28,307,978	471,799	3,985,366 (Castle Clinton NM)	1,949 (Kosciuszko NMEM)
Total	71	53,149,224	748,581		

Source: Data summarized from NPS Public Use Statistics Office, Annual Recreation Visits Report.

In 2011, Cultural/Historical park units accounted for 53% of the region-wide visitation. Presently, Recreational park units, while making up only 15.5% of park units, account for 47% of total visitation. Average visitation to Recreational park units is more than four times higher than average visitation to Cultural/Historical park units.

Figure 2-3 shows the annual visitation over the last 10 years for these two categories of park units. In general, visitation among the Cultural/Historical group is typically higher than for the Recreational group by a range of one to two million visitors.

Figure 2-3 Northeast Region Visitation by Park Unit Type



Source: National Park Service Public Use Statistics Office, "Annual Recreation Visits Report," 2002-2001.
Note: Data presented for the 71 park units for which data are available.

Figure 2-3 also shows the historic growth trends in visits by park unit type. While the average visitation to Recreational park units has remained relatively flat over the past decade (despite notable fluctuations in visitation year to year), visits to Cultural/Historical park units have been growing at an average rate of 1.3 percent per year.

It is worth noting that the most popular subset of recreational park units is the water-based park units. Cape Cod National Seashore, Delaware Water Gap National Recreation Area, and Assateague Island National Seashore, alone, represent 21% of all visits in the Northeast Region. These park units are more likely to attract visitors for full day or multi-day trips, such as families on a vacation. Regardless of proximity to urban centers and transit, these areas may attract visitors traveling by automobile to a hotel but who will also enjoy bicycling or walking to more intimately explore the park unit.

The intensity of the visits to recreational park units, further exacerbated by the seasonality of these visits as described in the next section of this report, has led to more active transportation management strategies to serve visitors, such as advanced traveler information systems to advise on traffic congestion and the availability of parking, intercept parking locations, shuttle services, and more bicycle and pedestrian connections.

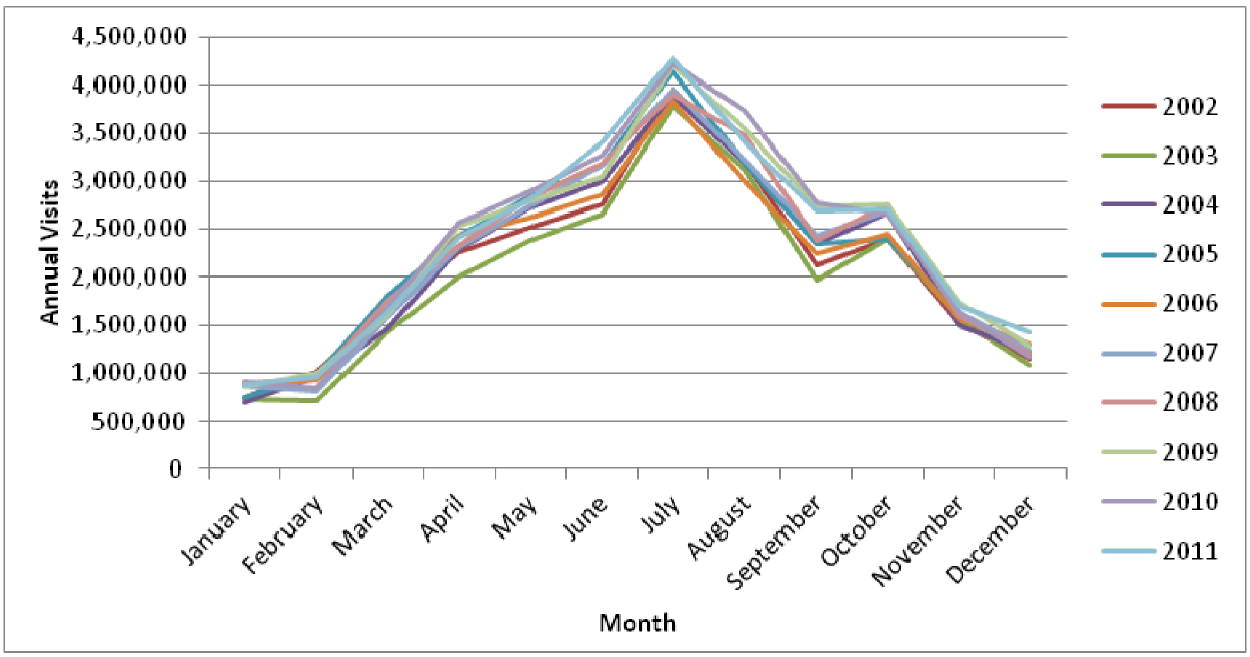
3.0 VISITOR USE CHARACTERISTICS

Exploring visitor use characteristics provides additional insight on the temporal distribution of visits to the park unit, the types of visitors (based on various sociodemographic factors), activities, modal use, etc. These data are helpful to assess how the existing transportation is addressing visitor needs and where future opportunities might exist for enhancements to visitor transportation systems.

3.1 Seasonal Variations in Visitor Use

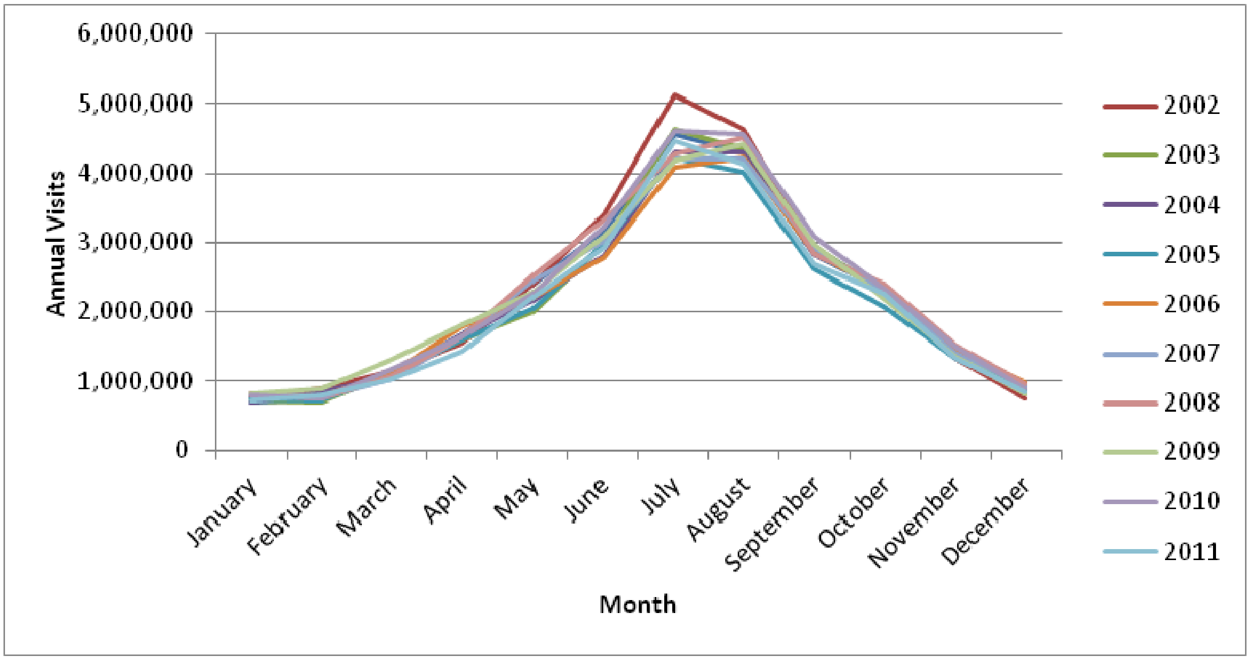
Figures 3-1 and 3-2 present the recent history of visitor use over the course of a year for Cultural/Historical and Recreational park units, respectively. As examination of these figures reveal, there has been little fluctuation in the overall seasonal pattern of visitor use of park units in the region.

Figure 3-1 Visits to Cultural/Historical Park Units of the Northeast Region by Month (2002 to 2011)



Source: NPS Public Use Statistics Office. The visitation to all Cultural/Historical park units was summed by month and by year to develop these figures.

Figure 3-2 Visits to Recreational Park Units of the Northeast Region by Month (2002 to 2011)



Source: NPS Public Use Statistics Office. The visitation to all Recreational park units was summed by month and by year to develop these figures.

Examining data for the past five years (2007 to 2011) confirms that both types of park units experience their heaviest visitor demands during the month of July with a slightly more intense peaking characteristic for trips to Recreational park units (16.7% vs. 14.8%). Accordingly, the summer months comprise a greater share of annual visits to Recreational park units over Cultural/Historical park units (45.4% vs. 39.0%). Spring and fall each account for about 25% of all visits to Cultural/Historical park units with winter months contributing only 11% of annual visitation. Cultural/Historical park units exhibit a consistent increase in October visitation from September visitation, while Recreational park units' seasonal visitation consistently decreases from its summer peak through the fall and winter.

Examining the changes in visits by month and season for the five-year period from 2002 to 2006 with the five-year period from 2007 to 2011, shows fairly small changes: there was a slight reduction in absolute peaking during July (perhaps indicating some capacity limitations at park units or visitors balking over crowds); and some increases in the shoulder months, particularly in the spring where trips to Recreational park units in May grew by more than 6% and in the fall where visitation to Cultural/Historical park units in September grew by more than 8%. More details on this analysis are provided in the Appendix to this report.

With respect to transportation planning and the provision of services, this information is instructive because, as examples:

- It can guide where and when more aggressive traffic management and demand management should be focused.
- It deepens the understanding of how and for what duration transportation facilities (e.g., parking lots) should be actively managed.

- It instructs the schedules and capacities for alternative transportation systems.
- It informs planning by providing a statistical basis for factoring seasonal transportation data and as input to the benefit/cost analysis associated with various transportation strategies as they are explored.

3.1.1 Climate Change Considerations

Potential changes in the earth's climate may further influence seasonal visitation patterns over the long term. In the Northeast Region, it is projected that average temperatures will grow warmer and that this change will occur at a greater rate than previously experienced. Monitoring supports both of these expectations. Higher average temperatures are likely to result in a change in the duration of seasons and increase in the number of extreme heat days. These impacts are likely to be greater in states that are within the southern portion of the region while states like New York, Maine, New Hampshire, and Vermont are expected to experience the same trends, only to a lesser degree.

Higher heat days in the future could result in an increase in visitation to water-based parks like Cape Cod National Seashore and Delaware Water Gap National Recreation Area or, alternatively, air-conditioned activities at Cultural/Historical park units in the region. This warming trend could also affect winter recreation through a reduction of duration and thickness of ice on water bodies and precipitation as rain instead of snow.

The potential extension of the overall construction season due to a later freeze and earlier thaw could negatively impact spring or fall visitors looking to visit park units during "quieter times". This construction activity could cause delays that the off-season visitors are unaccustomed to encountering, as well as construction-related noise, dust, and aesthetic impacts to visitor experiences.

3.2 Area Classification

The park units of the Northeast Region have been categorized over the years by area classification, as described below.[5] These area classifications are useful as park units with similar contexts often face common transportation issues and needs and opportunities for improvements. The area classifications are defined below with examples of park units that are located in that type of area.

1. ***Urban Area Park Unit:*** An urban area park unit is defined as a park unit located within the central city of a Metropolitan Statistical Area (MSA). The context of urban park units in the Northeast Region varies considerably by scale. Some urban centers are identifiable on a national scale and attract visitors on an international scale. Characteristics of national urban centers include strong tourism appeal, robust transit systems, high-densities of local population, and often walkable attractions. Examples include the following park units:
    - Boston National Historical Park
    - Fort McHenry National Monument and Historic Shrine

[5] Source: NPS Public Use Statistics Office

- Independence National Historical Park

Other urban park units in the region reside in small to medium-sized cities. Characteristics of these regional urban centers are local tourism appeal, somewhat limited transit systems, and automobile access is a viable transportation option, if not the obvious option. Attractions may be somewhat densely located, but may or may not be “walkable”. Examples include:

- Lowell National Historical Park
- Richmond National Battlefield Park
- Steamtown National Historic Site

2. ***Suburban Area Park Unit:*** The Suburban category is defined as a park unit located outside the central city but still within a MSA with a population of greater than one million people. Suburban areas generally have a moderate population density and an auto-focused transportation culture. Transit, if available, is usually oriented to the urban center and thus provides little mobility within the Suburban area. Tourism is driven primarily by attractions in the urban center. Examples include:

    - Adams National Historical Park
    - Colonial National Historical Park
    - Sagamore Hill National Historic Site

3. ***Rural Area Park Unit**:* Rural area park units in the Northeast Region are those park units that lie outside of any MSA but are accessible by a paved highway. Characteristics of rural areas are limited transit or none at all, usually limited tourism attractions (other than the park unit itself), low population density, and a highly auto-dependent transportation infrastructure. Examples include:

    - Friendship Hill National Historic Site
    - Shenandoah National Park
    - Flight 93 National Memorial

4. ***Outlying Area Park Unit:*** An outlying area park unit is defined as a park unit located in a MSA with a population of less than one million people. In the northeast, many of the transportation characteristics of park units in outlying areas mirror those of suburban or rural area park units with automobile-centric access modes. Examples include:

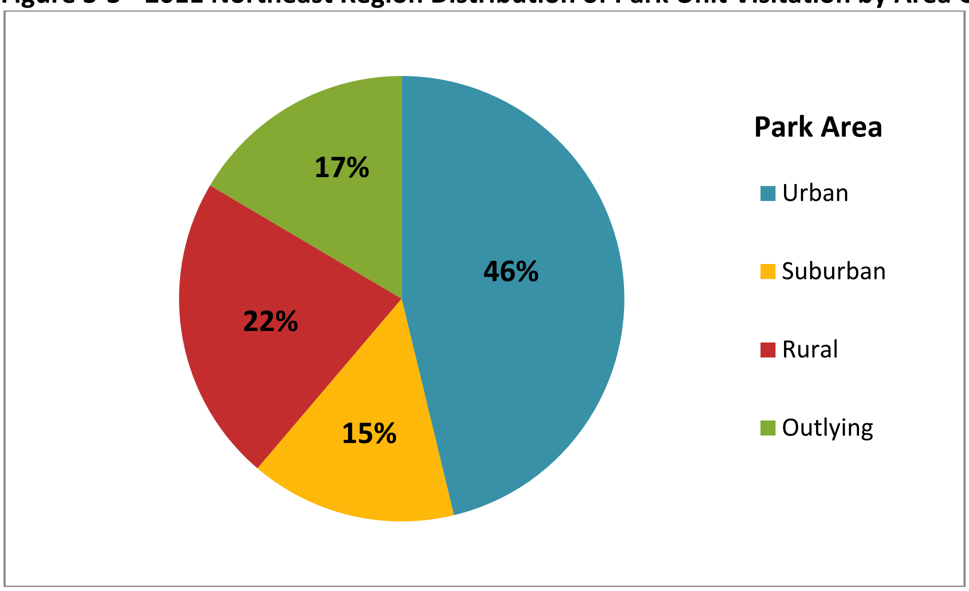
    - Delaware Water Gap National Recreation Area
    - Saratoga National Historical Park
    - Gettysburg National Military Park

Currently, 27 park units are classified as Urban, 14 as Suburban, 16 as Rural, and 15 as Outlying in the Northeast Region. A complete list of the classification of each park unit is provided in the Appendix. Additional analysis of the context of park units in the Northeast Region, in conjunction with the region’s response to *A Call to Action: Preparing for a Second Century of Stewardship,* is discussed later in this report.

The location of a park unit can affect not only the availability of travel modes for visitors but also visitors' expectation of multimodal transportation strategies. Multimodal transportation could be one opportunity to enhance the transportation-related visitor experience, particularly for park units in urban areas. In fact, 56% of the park units in the Northeast Region have some level of public transit access and 47% of park units are proximate to navigable waterways.[6] In addition, urban centers tend to have better developed bicycle and pedestrian networks and a local visitor population that is comfortable with, and often even prefers, the use of travel modes other than private automobiles.

The percent of annual visitation among the categories of park unit area classification is illustrated by Figure 3-3. The highest share of visitation comes from park units in urban areas. While the 27 urban parks represent 37.5% of park units, they account for about 46% of the annual visitation in the Northeast Region.

Figure 3-3 2011 Northeast Region Distribution of Park Unit Visitation by Area Classification



Source: NPS Public Use Statistics Office, "2011 Region Report", 2011.

3.3 Types of Park Unit Users

Three categories of visitors are defined by the user's proximity to the park unit and the frequency of their visits. Proximity to a park unit helps to define what transportation modes are viable options for visitors and frequency of park unit visits relates to how much knowledge visitors have of the surrounding area and, therefore, how much assistance they might require in determining convenient travel options to the park unit.

[6] Preliminary results from an analysis of *A Call to Action* policy implications completed by The Volpe Center, 2012.

1. ***Local User:*** A local user is from a community near the park unit who has visited the unit at least once in the past year. The local user generally has knowledge of the surrounding transportation network to make a trip to the park unit with little difficulty. Many local users are auto-oriented and use their car to access the park unit. Local visitors to park units in urban areas may be amenable to using transit if the service is convenient and inexpensive. Local users that live within a bicycle trip or walk trip from a park unit (for the purposes of this report, approximately five miles or less) and many of those visiting recreational park units would bicycle or walk if safe and comfortable pedestrian and bicycle connections were available.

2. ***Non-Local User****:* Non-local users are visitors to the park unit who do not live in the immediate park unit environs (this could mean those from more than an hour away, or even from a different state or country). Non-local users who are making their first visit to a park unit may not be familiar with the area and their trip would benefit from advanced trip planning. Non-local users may be making their trip exclusively to visit the park unit or may be linking their trip with other purposes in the area. A multi-destination/multi-purpose trip often limits the likelihood of car-free travel to the park unit unless visitors are taking advantage of a bus tour. Depending upon the age, origin, and trip purpose, these users may be comfortable traveling using transit if the connections are well communicated and convenient to the park unit. A non-local user may also be able to walk or bicycle to a park unit if they are staying overnight near-by.

3. ***Local Non-Users:*** Local non-user are residents from near-by communities who do not visit the park unit for any purpose. The local non-user generally has knowledge of the surrounding transportation network but may or may not have knowledge about the park unit and its resources. Previous studies have investigated the many factors that contribute to local residents not taking advantage of park units in their own backyards. According to the Comprehensive Survey of the American Public (CSAP), sponsored by the National Park Service (NPS) and completed in 2000, respondents with lower income and education levels were considerably less likely to visit a national recreation area than those with higher income and education levels (NPS 2001). The CSAP also found that, when presented with a list of possible barriers to visitation, survey respondents chose (1) overall cost, (2) not knowing about NPS sites, and (3) travel distance as the top three barriers. A more recent study commissioned by the Golden Gate National Recreation Area and the Golden Gate National Parks Conservancy[7], sought to better understand the obstacles to ethnic minority groups' use of parklands. Primary factors limiting use of, or visitation to, Golden Gate NRA parklands and/or other national recreation areas related to transportation included:

    - lack of personal/private vehicle
    - poor public transit links
    - lack of knowledge for accessing transportation to reach the park unit
    - cost of gas, parking, and food for the trip

[7] *Visitor/Non-visitor Use Constraints: Exploring Ethnic Minority Experiences and Perspectives*, General Technical Report; Nina S. Roberts; Golden Gate National Recreation Area, National Park Service. San Francisco, CA: San Francisco State University; 2007.

- lack of signage and brochures/materials printed in languages other than English and/or lack of knowledge that such resources exist

3.4 Other Visitor Use Characteristics

The University of Idaho Visitor Services Project conducts visitor surveys at national park units nationwide. Survey questions asked at each park are unit specific but a subset of questions is the same to provide consistent, comparable results. A number of park units are surveyed each year, but there is no strict schedule for when or how often a park unit is surveyed. These surveys can be used to provide a view of visitor experiences in park units of the Northeast Region; however, not all questions are asked on all surveys and not all response options are identical from one survey to the next which can make it difficult to statistically aggregate and analyze survey results. In future years, it would be beneficial if more transportation-related questions could be asked with responses that are easily comparable over multiple park units in the region.

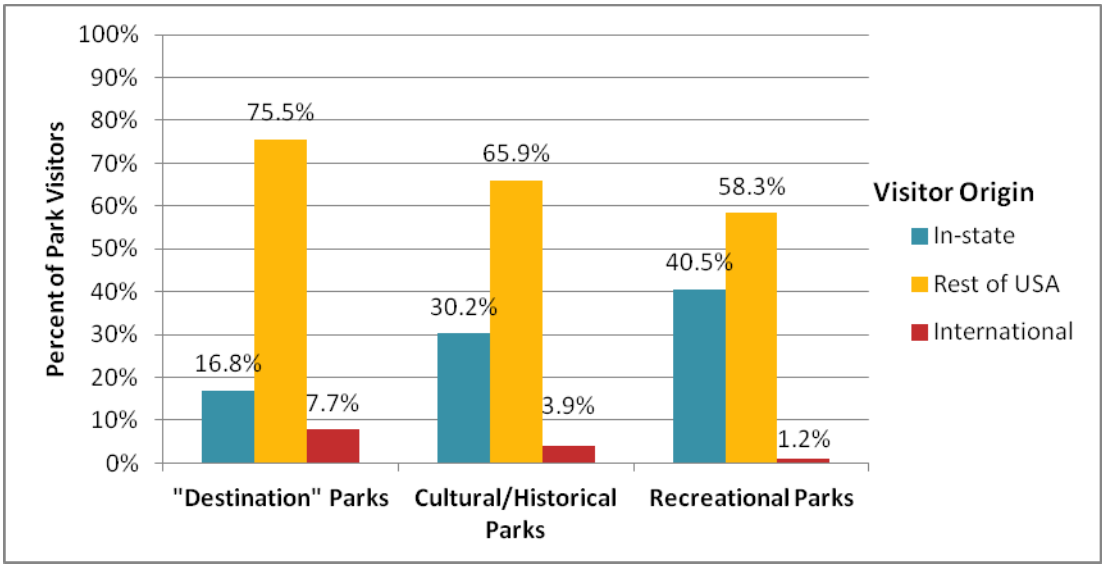
3.4.1 Data on Visitor Origins

A fairly consistent question on these visitor surveys asks people to identify their state of residence, which provides a basis for understanding the local vs. non-local composition of visitors by park unit type[8]. A 2008 analysis of visitor surveys from 15 park units in the Northeast Region provides some insight on the geographic reach of Northeast Region park units, as summarized in Figure 3-4.[9] As noted from the data, Recreational park units attract the highest percentage of local visitors and correspondingly less out-of-state and international visitors. Several of the better known “destination” park units, which include two Recreational park units (Acadia and Shenandoah National Parks) and one Cultural/Historical park unit (Statue of Liberty National Monument), attract more than 83 percent of their visitors from out-of-state or international origins.

[8] Simply asking a visitor’s state of residence is not ideal in that the Northeast Region is made up of many smaller states, as compared to other regions, and a “local” trip (say within an hour of home) may actually cross state borders. An enhancement in future surveys might be to ask both state or origin and travel time to park.

[9] Analysis in support of the Northeast Region Long-Range Transportation Plan, Vanasse Hangen Brustlin, Inc., 2008.

Figure 3-4 Origins of Visitors to Northeast Region Park Units



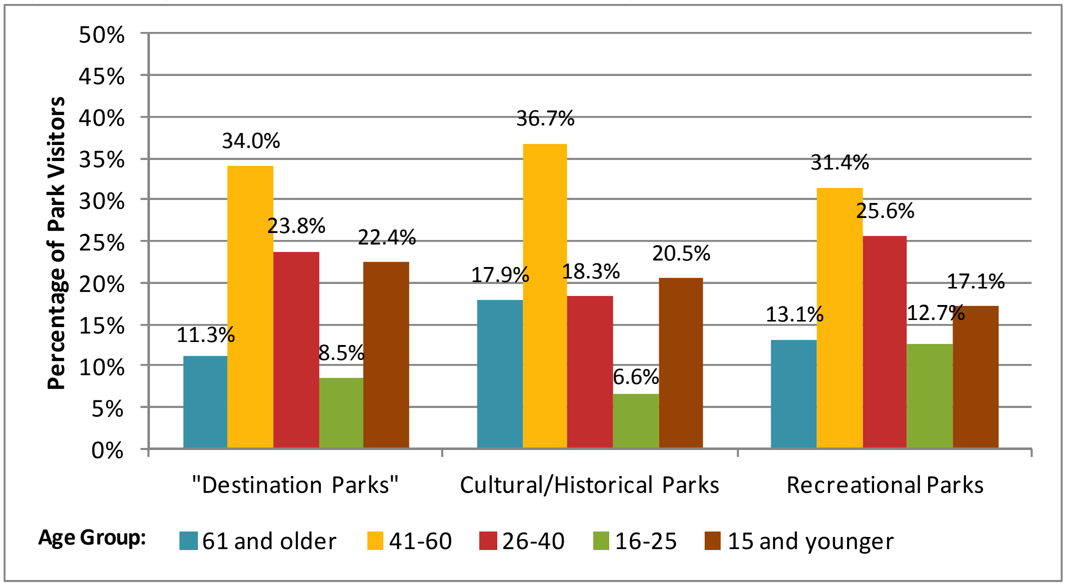
Source: University of Idaho Visitor Surveys in the NER (1989 to 2006). "Destination" Parks includes survey data from 3 parks: Acadia National Park (1998), Shenandoah National Park (2001), and the Statue of Liberty (1989). Historical/Cultural Parks includes survey data from 10 parks: Valley Forge National Historical Park (2001), Colonial National Historical Park (2001), and Adams National Historical Park (1995), Gettysburg National Military Park (1994), John Fitzgerald Kennedy National Historic Site (2006), Saint-Gaudens National Historic Site (2004), George Washington Birthplace National Monument (2004), Hopewell Furnace National Historic Site (2002), Eisenhower National Historic Site (2000), and Petersburg National Battlefield (1990). Recreational Parks includes survey data from 2 parks: New River Gorge National River (1992 and 2004) and the Delaware Water Gap National Recreation Area (1989)

Accommodating local visitor transportation needs, regardless of access modes, tends to focus more on day-of-trip and in-vehicle trip planning (e.g., traffic conditions, parking availability, transit schedules). Out-of-state and international travelers require more advanced trip planning and can be influenced by travel advice, including the use of alternative modes, by internet websites and travel guides.

3.4.2 Age Distribution of Visitors to Northeast Region Park Units

Data on the age groups of visitors to Northeast Region park units were examined for the same series of University of Idaho surveys and are presented in Figure 3-5.

Figure 3-5 Age Groups for Visitors to Northeast Region Park Units



Source: University of Idaho Visitor Surveys in the NER (1989 to 2006). "Destination" Parks includes survey data from 3 parks: Acadia National Park (1998), Shenandoah National Park (2001), and the Statue of Liberty (1989). Historical/Cultural Parks includes survey data from 10 parks: Valley Forge National Historical Park (2001), Colonial National Historical Park (2001), and Adams National Historical Park (1995), Gettysburg National Military Park (1994), John F. Kennedy National Historic Site (2006), Saint-Gaudens National Historic Site (2004), George Washington Birthplace National Monument (2004), Hopewell Furnace National Historic Site (2002), Eisenhower National Historic Site (2000), and Petersburg National Battlefield (1990). Recreational Parks includes survey data from 2 parks: New River Gorge National River (1992 and 2004) and the Delaware Water Gap National Recreation Area (1989)

The 41 to 60 years age range represents the largest age group of visitors to the park units of the Northeast Region that were surveyed. Cultural/Historical park units attract the oldest visitors with almost 55% of visitors over 41 years of age and about 18% over 61 years of age. Youth (ages 15 and younger), predominantly traveling with their families or as part of school groups, represent 17 to 22% of visitors.

With respect to park unit resources, data suggest that older visitors, possibly with a disability or special need, have different expectations, preferences, and needs than younger visitors, which may affect visitor use patterns at national park units.[10] Older visitors may be more likely to visit park units with greater accessibility for persons with disabilities; park units that include guided tours; and park units that feature landmarks, viewsheds and facilities accessible with limited walking. Accessibility, convenience, and level of exertion required to explore a park unit's resources seem to be key considerations in the older visitors' advanced trip planning and, ultimately, choice of modes. The 16 to 40 age group tend to be the most open to bicycling, walking, or hiking or other types of physical activity. Parents or school groups most often dictate the travel characteristics for children under16 years of age.

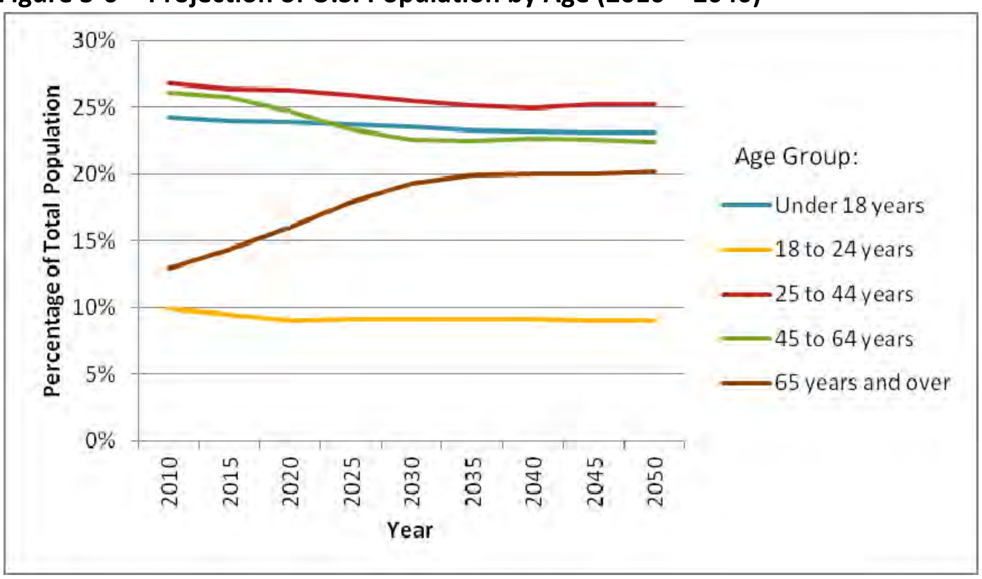
[10] Statement of Marcia Blaszak, http://www.doi.gov/ocl/2006/VisitationTrendsInTheNPS.htm.

Aging Population

Visitors to national park units tend to be older than the national median; the percentage of park unit visitors age 45 and above is greater than their representation in the U.S. population as a whole.[11] Furthermore, the number of Americans age 65 and older is expected to more than double by the year 2050 (see Figure 3-6). In the short- to medium-term, the aging of the Baby Boomers (people born between 1946 and 1964) and the resultant substantial growth in the demographic group most likely to visit national park units – older non-Hispanic whites – could translate to increased visitation. NPS resources in the Northeast Region, in particular, may benefit from their close proximity to population centers and the accompanying amenities that Baby Boomers seek when they travel.

While demographic shifts point to greater numbers of older visitors to national park units, fewer younger people are visiting park units. Between 1989 and 2004, visitors in their mid-teens to mid-thirties dropped from 27% to 19% of all park unit visitors, a level well below this age group's corresponding representation in the U.S. population (28%). [12] Without intervening action by the National Park Service, this trend is likely to continue, as it appears to coincide with a continuing shift in young people's preferences away from outdoor recreation activities and toward technology and electronic-based entertainment options.[13]

Figure 3-6 Projection of U.S. Population by Age (2010 – 2040)



Source: United States Bureau of the Census, 2010.

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[11] Statement of Marcia Blaszak, http://www.doi.gov/ocl/2006/VisitationTrendsInTheNPS.htm.

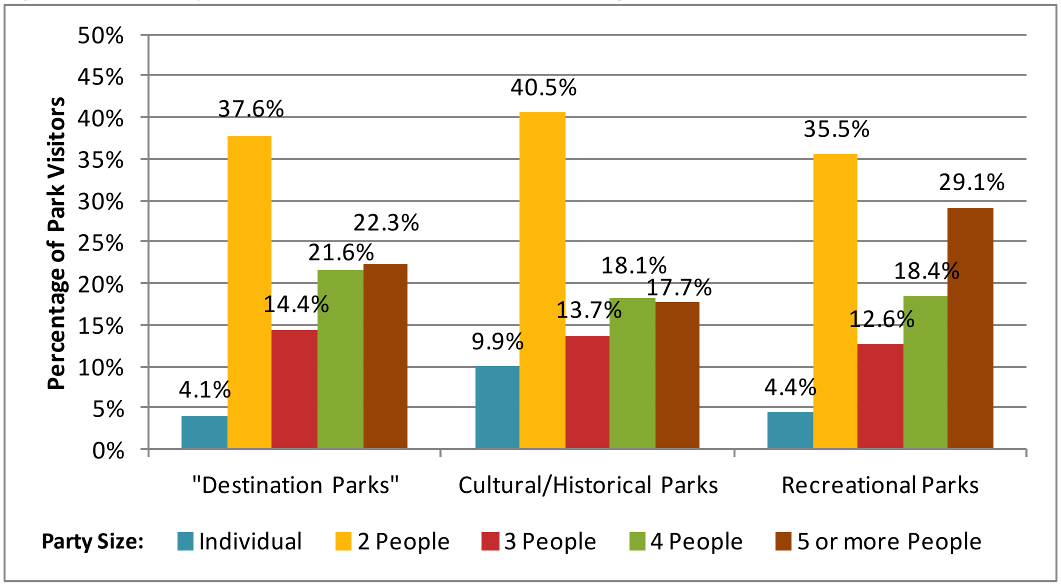
[12] Ibid.

[13] Pergrams, Oliver, and Patricia Zaradic. "Is Love of Nature in the U.S. Becoming Love of Electronic Media?" Journal of Environmental Management 80(4). September 2006.

3.4.3. Size of Parties Visiting Northeast Region Park Units

Figure 3-7 presents data on the party sizes for individuals and groups visiting Northeast Region park units. Individuals and couples comprise more than half of all visitors to Cultural/Historical park units while families and groups of 4 or more make up about 48 percent of visitors to Recreational park units. From a transportation perspective, larger parties (with the exception of educational trips and charter bus tours) tend to be more likely to travel by automobile. Individuals and couples tend to have more flexibility when considering their travel options.

Figure 3-7 Party Sizes for Visitors to Northeast Region Park Units



Source: University of Idaho Visitor Surveys in the NER (1989 to 2006). "Destination" Parks includes survey data from 3 parks: Acadia National Park (1998), Shenandoah National Park (2001), and the Statue of Liberty (1989). Historical/Cultural Parks includes survey data from 10 parks: Valley Forge National Historical Park (2001), Colonial National Historical Park (2001), and Adams National Historical Park (1995), Gettysburg National Military Park (1994), John F. Kennedy National Historic Site (2006), Saint-Gaudens National Historic Site (2004), George Washington Birthplace National Monument (2004), Hopewell Furnace National Historic Site (2002), Eisenhower National Historic Site (2000), and Petersburg National Battlefield (1990). Recreational Parks includes survey data from 2 parks: New River Gorge National River (1992 and 2004) and the Delaware Water Gap National Recreation Area (1989)

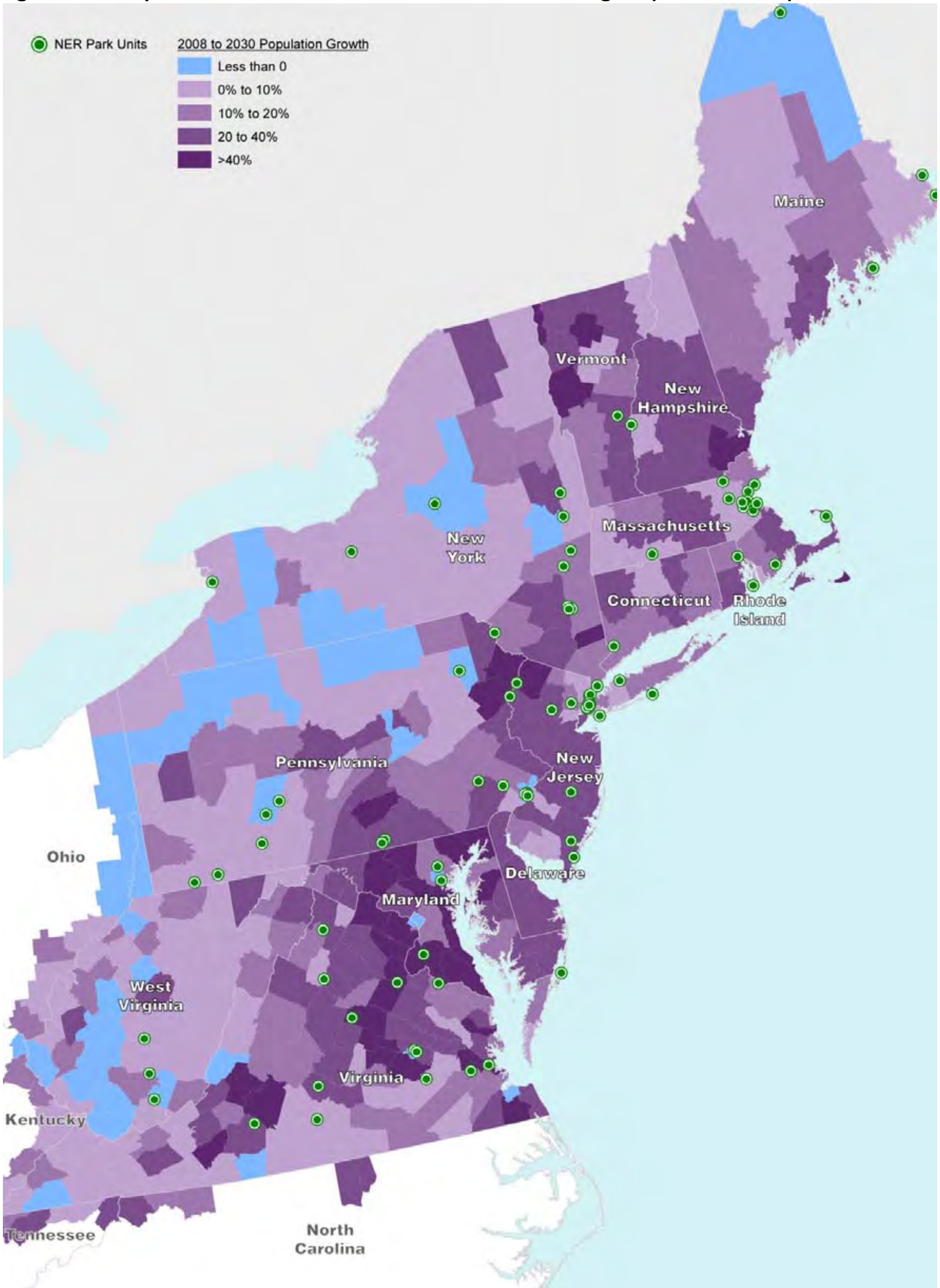
3.5 Changing Demographics

There are several demographic trends that could influence visitation to park units in the Northeast Region, with visitation likely to increase in the near future and trends less clear over the longer term.

The population of the United States is projected to grow by 45% by the year 2050,[14] which almost certainly will translate to greater numbers of visitors to national park units. Figures 3-8 and 3-9 present population and employment growth forecasts, respectively, for the Northeast Region through 2030, the end of the Long Range Transportation Plan planning horizon. As noted by the figures, most areas surrounding park units in the region are forecast to grow by more than 20% in both population and jobs, and many by more than 40% over this planning horizon.

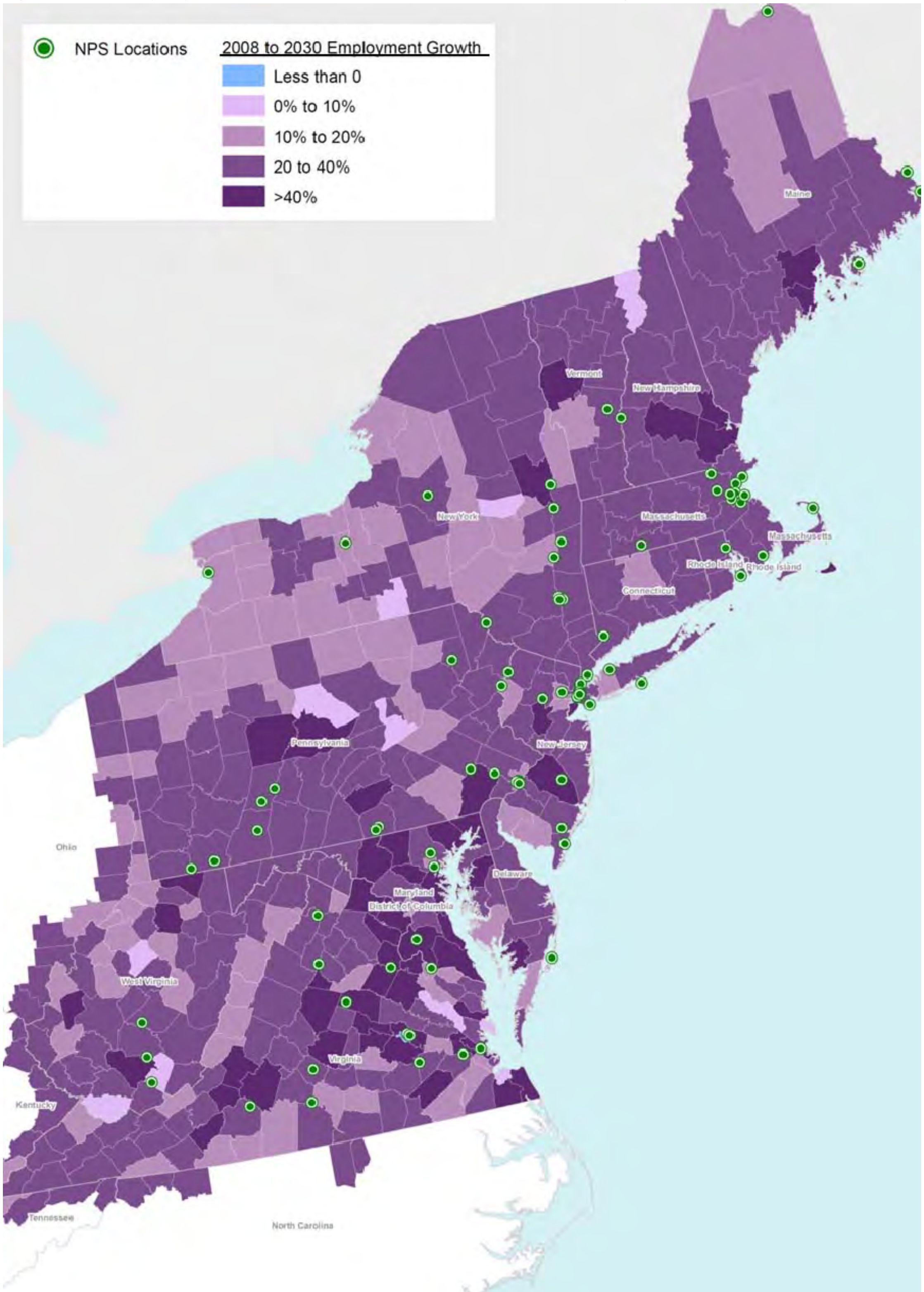
[14] Bureau of the Census, U.S. Department of Commerce. "An Older and More Diverse Nation by Midcentury." Press release. August 14, 2008.

Figure 3-8 Population Growth Forecast in the Northeast Region (2008 to 2030)



Source: United States Bureau of the Census

Figure 3-9 Employment Growth Forecast in the Northeast Region (2008 to 2030)

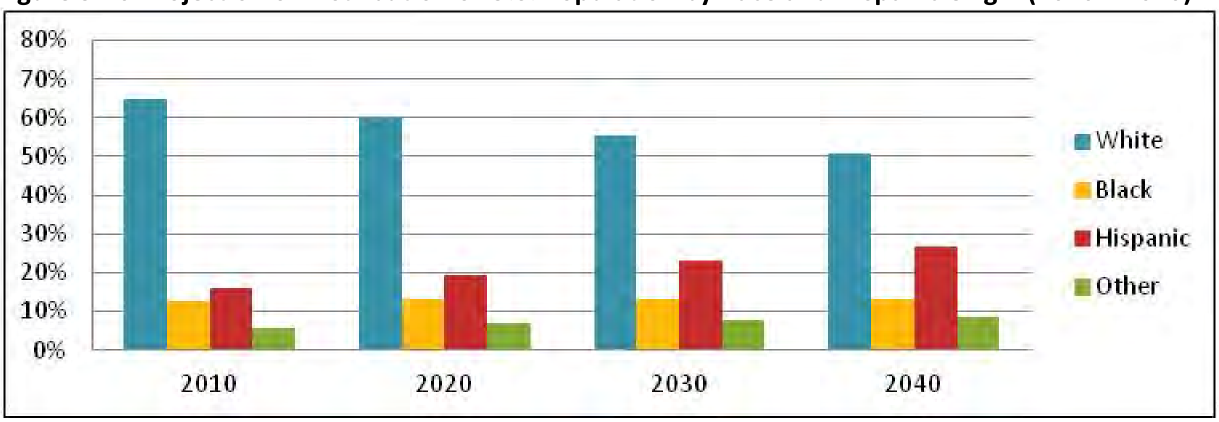


Source: United States Bureau of the Census

Park unit visitation also appears to be benefitting from a weak dollar, at least in the short term, with the number of foreign travelers to the United States having spiked in recent years.[15] Approximately 20 percent of foreign travelers visit a national park unit during their stay.[16]

However, additional data indicate that anticipated growth in the numbers of park unit visitors is influenced by more than sheer population growth. Another factor that will potentially affect future park unit visitation is the growing diversity of the United States population. The Northeast Region should reconsider visitor needs and expectations to account for the perspectives of a diverse population. The share of white non-Hispanics is projected to decline from 65% to just over 50% of the total U.S. population between 2010 and 2040; in that same span, the African-American population is projected to maintain its share of the overall population, and the Hispanic population is expected to increase its share from 16% in 2010 to nearly 27% of the total population in 2040 (see Figure 3-10).[17] These two minority groups historically have been among the least likely to visit national park units – a national survey conducted for the National Park Service by Northern Arizona University in 2000 found that 13% of African Americans and 27% of Hispanics had visited a national park unit within the previous two years, compared to 36% of non-Hispanic whites.[18]

Figure 3-10 Projection of Distribution of U.S. Population by Race and Hispanic Origin (2010 – 2040)



Source: United States Bureau of the Census

The need for a collective response to many of these changing demographics and other challenges facing the future of the park system led to the development of *A Call to Action: Preparing for a Second Century of Stewardship,* discussed in the next section of this report.

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15 U.S. Department of Commerce. "2007 Sets All Time International Tourism Record for U.S." Press release. March 10, 2008.

16 Statement of Marcia Blaszak. Regional Director, Alaska Region, National Park Service, Department of the Interior, before the Subcommittee on National Parks, House Committee on Resources, regarding trends in visitation to the national park system. April 6, 2006

17 Bureau of the Census, U.S. Department of Commerce, "An Older and More Diverse Nation by Midcentury," press release, August 14, 2008.

18 Solop, Frederick, Kristi Hagen, and David Ostergren. "Ethnic and Racial Diversity of National Park System Visitors and Non-Visitors." The National Park Service Comprehensive Survey of the American Public. National Park Service Social Science Program and Northern Arizona University, December 2003.

4.0 VISITOR EXPERIENCE CONSIDERATIONS

This section describes some important factors that may influence future visitors to the park units of the Northeast Region and the consideration of transportation strategies to enhance visitor experiences.

4.1 A Call to Action

The National Park Service is preparing to celebrate its 100th anniversary in 2016. To renew its course for moving forward and stay relevant with changing visitor desires and demographics, the National Park Service issued *A Call to Action: Preparing for a Second Century of Stewardship (Call to Action).* In this document, the National Park Service lays out it Vision and Goals:

> In our second century, the *National Park Service must recommit to the exemplary stewardship and public enjoyment of these places*. We must promote the contributions that national parks and programs make to create jobs, strengthen local economies, and support ecosystem services. We must use the collective power of the parks, our historic preservation programs, and community assistance programs to expand our contributions to society in the next century.
>
> A SECOND-CENTURY NATIONAL PARK SERVICE
> Connects People to Parks and helps communities protect what is special to them, highlight their history, and retain or rebuild their economic and environmental sustainability.
>
> Advances the Education Mission by strengthening the NPS role as an educational force based on core American values, historical and scientific scholarship, and unbiased translation of the complexities of the American experience.
>
> Preserves America's Special Places and is a leader in extending the benefits of conservation across physical, social, political, and international boundaries in partnership with others.
>
> Enhances Professional and Organizational Excellence by adapting to the changing needs of visitors, communities, and partners; encouraging organizational innovation; and giving employees the chance to reach their full potential.
>
> IN OUR SECOND CENTURY, *we will* fully represent our nation's ethnically and culturally diverse communities. To achieve the promise of democracy, *we will* create and deliver activities, programs, and services that honor, examine, and interpret America's complex heritage. By investing in the preservation, interpretation, and restoration of the parks and by extending the benefits of conservation to communities, the *National Park Service will* inspire a "more perfect union," offering renewed hope to each generation of Americans.[19]

[19] National Park Service, "A Call to Action: Preparing for a Second Century of Stewardship and Engagement," August 25, 2011, p.5.

This policy document reinforces the National Park Service's commitment to providing positive visitor experiences through a broad array of actions. A number of the goals and their actions highlight the important relationships between transportation and visitor experiences – in particular, within the "Connecting People to Parks" and "Advancing the NPS Education Mission" themes, as described below.

Theme: Connecting People to Parks

To Connect People to Parks, the NPS *must:*

> DEVELOP and nurture life-long connections between the public and parks—especially for young people—through a continuum of engaging recreational, educational, volunteer, and work experiences.
>
> CONNECT urban communities to parks, trails, waterways, and community green spaces that give people access to fun outdoor experiences close to home.
>
> EXPAND the use of parks as places for healthy outdoor recreation that contributes to people's physical, mental, and social well-being.
>
> WELCOME and engage diverse communities through culturally relevant park stories and experiences that are accessible to all.

Specific actions to deliver these goals include:

> IN MY BACKYARD: Improve urban resident's knowledge of and access to outdoor and cultural experiences close to home by ensuring that every national park located in an urban area has a well-promoted physical connection to the public transportation system or to a pedestrian/bicycle path.
>
> PARKS FOR PEOPLE: Enhance the connection of densely populated, diverse communities to parks, greenways, trails, and waterways to improve close-to-home recreation and natural resources conservation. We will achieve this through a proactive Rivers, Trails, and Conservation Assistance program that mobilize citizens in support of improved access to outdoor areas in at least 50 of the communities nationwide with the least access to parks.
>
> FOLLOW THE FLOW: Support communities' efforts to expand access to water-based recreation and to protect and restore waterways across the country by establishing a national system of water trails.

Theme: Advancing the NPS Education Mission

Within the theme of Advancing the NPS Education Mission, *Call to Action* states that the NPS *must* use leading-edge technologies and social media to effectively communicate with and capture the interest of the public, and defines these specific actions:

GO DIGITAL: Reach new audiences and maintain a conversation with all Americans by transporting the NPS digital experience to offer rich, interactive, up-to-date content from every park and program. To accomplish this, we will create a user-friendly web platform that supports online and mobile technology including social media.

OUT WITH THE OLD: Engage national park visitors with interpretive media that offer interactive experiences, convey information based on current scholarship, and are accessible to the broadest range of the public. To that end, we will replace 2,500 outdated, inaccurate, and substandard interpretive exhibits, signs, films, and other media with innovative, immersive, fully accessible and learner-centered experiences.

The Northeast Region is engaged in on-going planning to embrace and integrate these *Call to Action* themes and actions into their transportation program. For example, The Volpe Center is in the process of analyzing opportunities to better connect urban park units of the region to their adjacent communities drawing on such factors as population densities (both total and under-represented constituents), car ownership, access to transit, and regional trail connections. The next section of this report highlights “Best Practices” and other project opportunities to incorporate new technologies and information systems into the transportation systems of the Northeast Region.

4.2 Modal Influences on Visitor Experience

The Northeast Region is responsible for the operation and upkeep of 875 miles of roads (both paved and unpaved), more than 200 bridges, approximately 600 acres of parking, 23 alternative transportation systems[20], and countless miles of trails. These facilities, as well as the transportation systems within park units’ adjacent communities, provide countless ways for visitors to experience the vast resources of the Northeast Region. The *Visitor Experience Technical Report for Golden Gate National Recreation Area*[21] describes the influence of transportation on visitor experiences by mode and their conclusions regarding travel mode and visitor experiences generally apply to the park units of the Northeast Region as well.

4.2.1 Private Automobile

The most common form of transportation used to get to and from national park units in the Northeast Region was found to be the private automobile, based on visitor surveys by the University of Idaho.[22]

[20] These include a wide array of systems from ferries to shuttles, and including historic transportation systems featuring trains and trolleys. A full list of existing systems is included in the Appendix to this report.
[21] Visitor Experience Technical Report for the Golden Gate National Recreation Area, Muir Woods National Monument, and Fort Point National Historic Site Long-range Transportation Plan, Denver Service Center, March 2012, Draft.
[22] University of Idaho Park Studies Unit, Visitor Services Project. The sample of survey data analyzed was for Northeast Region park units over the last ten years.

This travel mode has several potential benefits and detriments to visitor experiences, as described below.

Benefits to Visitor Experience

- *Degree of choice* – includes such factors as choosing travel companions, in-vehicle climate, ability to listen to music, how much and what can be packed, what route to take, and what intermediate stops can be made.
- *Flexibility* – refers to the fact that visitors traveling in their own automobile do not have to conform to a required timetable and can vary their course, time of travel, or sequence of park facilities visited as they please.
- *Driving for Pleasure* – recognizes the visual stimulation which vehicle drivers and passengers receive from observing the surroundings and areas which differ from those which they normally encounter in their daily activities (Skyline Drive is a notable example of a roadway which someone may choose to drive for pleasure).

Detriments to Visitor Experience

- *Automobile Filter* – reflects that studies have found that traveling in an automobile dilutes the travel experience for passengers by placing a filter between passengers and the surrounding environment (especially in contrast to walking or bicycling through natural and historic surroundings).
  - *Facility Condition* – automobile travel is subject to the condition of roads and parking areas -- something that national park units cannot always control due to lack of ownership or limited funds – and studies have found that poorly maintained facilities (or unsafe or congested facilities) can detract from visitors' appreciation for scenic views and landscapes[23].
  - *Parking* – parking availability can be a challenge for visitors traveling in their own vehicle, especially for those traveling in recreational vehicles or with a trailer in tow.

4.2.2 Bicycling and Walking

Bicycling and walking are the modes of transportation that allow visitors the greatest level of interaction with park resources. Increasing pedestrian/bicycle connections are also key strategies within the *Call to Action* goal of *Connecting People to Parks*, particularly in urban areas. The Northeast Region already offers many opportunities for walking and bicycling in national park units such as extensive cycling in Acadia National Park and walking the Freedom Trail in Boston National Historical Park.

This travel mode has several potential benefits and detriments to visitor experiences, as described below.

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[23] Iverson Nassauer, Joan, et al. "Aesthetic Initiative Measurement System," Final Report, Center for Transportation Research and Education, Iowa State University, March 2001. Prepared for the Minnesota Department of Transportation.

Benefits to Visitor Experience

- *Level of Access* – reflects that visitors can have closer, more personal interactions with park resources when on-foot or by bicycling, and at their own pace.
- *Scale* – visitors can enjoy resources in greater detail and utilize more of their senses while using non-motorized travel modes rather than traveling by automobile or transit.
- *Health and Wellness* – walking and bicycling modes offer a form of healthy outdoor recreation and contribute to visitor health and wellness.

Detriments to Visitor Experience

- *Level of Physical Effort* – bicycling and walking are active forms of transportation and are more physically demanding than automobile or transit options.
- *Park Coverage* – the physical demands and slower pace of travel by foot or bicycle reduces the distance or park coverage that can be accomplished during a visit.
- *Facility Condition* – poorly maintained trails and pedestrian or bicycle amenities can easily detract from visitor experiences for travelers by these modes.
- *Vulnerability to Weather* – poor weather conditions more directly impact visitors who are walking or bicycling and can be limiting factors for these modes.

4.2.3 Transit Systems

Transit can come in many different forms such as bus, rail, ferry boat, or trolleys and all these exist at Northeast Region park units. Transit tends to provide two distinct roles affecting visitor experiences at a park unit. Public transit can provide travel to and from a national park unit while park unit operated transit provides mobility within a park unit, particularly larger park units that have multiple sites.

Benefits to Visitor Experience

- *An Added Attraction* – the transit trip itself can enhance visitor experiences, particularly services such as ferry boats that provide entertainment and pleasant views during travel or trolley on an historic trolley.
- *Reduced Stress* – leaving the driving to others and eliminating the stress of driving, wayfinding, and parking can improve visitor experiences, especially in congested park environs or park units with remote or limited parking.
- *Interpretive Services* – friendly and knowledgeable bus drivers or tour operators can enhance transit travel by providing additional interpretive information on the park unit and its resources.

Detriments to Visitor Experience

- *Service Quality* – the quality of the transit service being provided to visitors – for which the National Park Service often has little if any control -- including frequency of service, duration of travel time, and cleanliness of the vehicle can influence visitor experiences.

- *Advance Trip Planning* – using transit to access and travel within a park unit requires an additional level of advancing planning for visitors (such as acquiring transit schedules and stop locations) and this can detract from the pure spontaneity of park unit exploration.

While, in general, it can be difficult for park managers to affect the day-to-day visitor experience on public transit, in-park transit and shuttle systems operated by or for the parks provide many opportunities to enhance visitor experiences. The presentation entitled “The Disney Approach to Transportation” (February 9, 2004) provides some basic considerations for the National Park Service to ensure a positive visitor experience that incorporates transit[24]. Disney transportation managers found that the top three factors related to visitor acceptance and satisfaction of these systems are: frequency (15 minutes or less), cleanliness, and driver friendliness. To be most effective, these services should also not require multiple transfers or have too many stops along the way, as real and perceived waiting time are key reasons that visitors do not use existing or are dissatisfied with existing services.

Park access to transit is important to achieve the *Call to Action* goal to connect urban communities to parks and can help reach ethnically and culturally diverse communities and those potential park users who are transit dependent.

One intent of a transit system within a park unit is to enhance visitor experiences; many park units do this by adding interpretive education to the transit trip. ”Best Practices” of some alternative transportation services provided in the Northeast Region are provided in the next section

4.3 Travel and Recreation Patterns

There are many factors that play into a person’s decision to travel and to what destination. In addition, because National Park Service has a wide variety of resources under its care, the factors that could affect decisions to visit specific types of resources can vary. As an example, the recent increase in energy costs, if sustained, may result in lower visitation to more isolated resources, located further away from population centers in the long-term. (National news media and tourist boards have dubbed the decision to vacation closer to home in response to the current energy crisis, the “staycation”). As the nation approaches several important anniversary events, a national increase in interest in heritage could lead to increased visitation at related resources is another example of possible changes in travel trends affecting the Northeast Region of the National Park Service.

In general, Americans’ travel behavior has in fact changed significantly over the past few decades, most notably in the length of trips. Due in part to increased work demands, difficulty in coordinating vacation schedules in two-income families, and, more recently, energy costs, Americans are taking less vacation time and are making shorter trips in terms of time duration.[25] As a result of this trend toward shorter

[24] National Park Service- Denver Service Center, “The Disney Approach to Transportation,” presentation given at the National Mall Workshop, February 9, 2004.

[25] Expedia.com and Harris Interactive, “Expedia.com 2008 International Vacation Deprivation Survey Results.”

vacations, the number of overnight stays in national park units has decreased every year for the last 10 years.[26]

Although Americans are taking shorter trips, those trips have tended to be more frequent and over longer distances. A growing number of people now fly to jumping-off points, then either rent a vehicle or take a charter bus or cruise ship to tour a circuit of attractions that often includes national park units. As a result, national park units that are located on old driving routes but are not near population centers or regional gateways (such as Las Vegas, Miami, and Seattle) are experiencing a stagnation or decline in visitation, as air travelers bypass them for other locales.[27]

Due to its population density and relatively smaller size, however, the Northeast Region may not experience the negative influences of shorter trip durations and increased air travel to the extent that other regions do. In fact, Northeast Region park units may actual benefit from increases in energy costs due to their close proximity to major population centers along the east coast. Most of the NPS resources within the Northeast Region are accessible within several hours' drive of a major metropolitan area, which fits with the trend toward shorter but more frequent vacations and the trend of travelers visiting multiple NPS resources in a single trip.

Another significant travel trend over the past two decades is a shift away from nature-based recreation activities. A 2006 study by the University of Illinois at Chicago noted a universal decline in nature-based recreation activities, most notably among younger people.[28] The study found that the 20-year decline in national park unit visitation rates is significantly correlated with a number of electronic entertainment indicators, including hours of television, movies, video games, and internet use. Other research indicates that people's favorite leisure-time interests as an adult are most often learned as a child,[29] which has led the National Park Service to focus on using new technologies to reach schoolchildren in an attempt to expose them to more forms of outdoor activities.

While it is difficult to predict whether the trend away from nature-based activities will continue over the next several decades, it appears certain that the popularity and accessibility of electronic media and entertainment options will not diminish, and likely will continue to increase. The National Park Service's efforts to leverage technology to appeal to a wider audience – particularly children and young adults – could be key to sustaining or increasing visitation numbers in the future.

Another important consideration in the development of a long-range transportation plan is that a number of resources managed by the Northeast Region of the National Park Service could see substantially increased visitation as the nation and National Park Service mark important anniversaries and host special events in the coming years. National Park Service has planned extensive, multi-year programs and initiatives for the Civil War sesquicentennial in 2011-2015.[30] The Park Service will

[26] Statement of Marcia Blaszak.
[27] Statement of Marcia Blaszak.
[28] Pergrams, Oliver, and Patricia Zaradic. "Is Love of Nature in the U.S. Becoming Love of Electronic Media?" Journal of Environmental Management 80(4). September 2006.
[29] Place, Greg, "Youth Recreation Leads to Adult Conservation: Outdoor Playtime Integral During Childhood Development," Parks & Recreation, February 2004.
[30] National Park Service, "The American Civil War,…150 Years Later," Web page.

celebrate the 100th anniversary of its founding in 2016. And the 250th anniversaries of the signing of the Declaration of Independence and of the Revolutionary War will take place in 2026 and 2025-2033, respectively. With the Northeast Region home to numerous Civil War and Revolutionary War battlefields and nearly 50 percent of the country's National Historic Landmarks,[31] National Park Service resources in the region could see several sustained increases in visitation over the next 25 years.

4.4 Visitor Use of Technology

Advances in consumer, transportation and travel-related technologies have greatly influenced the way government agencies manage their resources and transportation infrastructure, as well as the way people plan and execute leisure trips. The National Park Service already takes advantage of technology in numerous ways to share information with visitors and enhance the overall visitor experience. Technology can and does help the National Park Service provide information in a timely and efficient manner, improve mobility in and around NPS resources, enhance the ability of NPS personnel to respond to changing conditions or visitor feedback, and help the National Park Service better manage its resources. The *A Call to Action* theme of *Advancing the NPS Educational Mission* emphasizes the importance to leveraging new technologies to improve visitor engagement and experiences through its GO DIGITAL and OUT WITH THE OLD actions.

4.4.1 Smartphone Technology

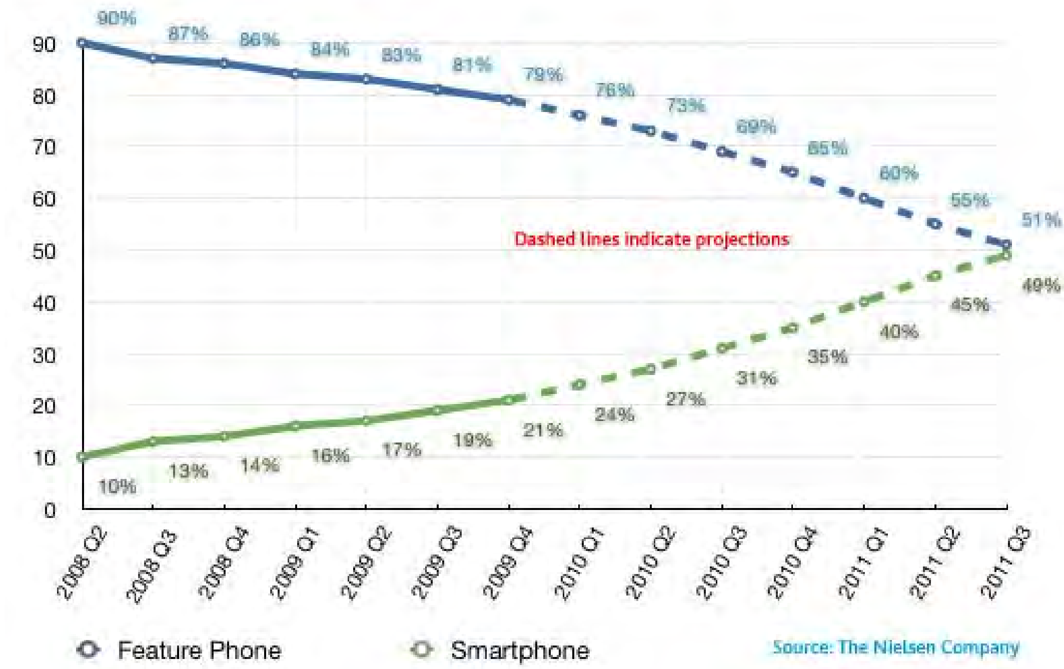
Smartphone technology provides an opportunity for the National Park Service Northeast Region to enhance visitor experiences by presenting natural, historical, and cultural context directly to visitors. The first smartphones, a high-end mobile phone with personal digital assistant (PDA) functions and access to the internet, were introduced in the early 1990s, but did not take off until the early 2000's. Since then, smartphone sales have become a significant percentage of mobile phone sales. According to Nielsen, 18% of mobile device sales are smartphones (up from 13% in 2008) and as smartphone prices continue to decrease and their capabilities increase, their market share is expected to grow further. Exhibit 4-1 shows that by the end of 2011 there will be more smartphones in the U.S. market as there are feature phones[32]. Furthermore, of the estimated 150 million smartphone user base, 120 million users access the internet via their smartphones. [33]

[31] National Park Service, "Northeast Region," Web page, URL: http://www.nps.gov/nero/

[32] Feature phones come with their own operating system and have "features" beyond a basic cell phone. Most feature phones have full HTML browsers, texting and multimedia, and often come with the popular social networking sites like Facebook and Twitter. Smartphones are those devices which run on third party operating systems. Smartphones are also capable of running other third party software which are termed as "apps" or "applications" (email, maps, scheduling, customized software, etc.).

[33] Entner, Roger, "Smartphones to Overtake Feature Phones in U.S. by 2011," March 26, 2010. Retrieved October14, 2011, from NielsenWire: http://blog.nielsen.com/nielsenwire/consumer/smartphones-to-overtake-feature-phones-in-u-s-by-2011/.

Figure 4-1 U.S. Smartphone Penetration and Projections



Source: Entner, Roger. "Smartphones to Overtake Feature Phones in U.S. by 2011." March 26, 2010.

Many cultural, historical, and natural resource providers are starting to cater to smartphone users, developing applications (apps) that provide content directly to the smartphone user without interfacing with an internet browser. Institutions such as the American Museum of Natural History and the Metropolitan Museum of Art are providing context and content to exhibits via smartphone apps[34].

Third parties have already developed apps for popular park units. Chimani, a developer of apps for the outdoors, provides travel guides and content for park visitors such as audio tours, sunrise/sunset data, and information about ranger-led events for parks in the northeast region such as Acadia National Park and Cape Cod National Seashore,[35] as discussed in the next section of this report. The National Parks Conservation Association has developed a field guide app for the iPhone for fifty National Parks around the country. Information such as native plant and animal species that a visitor would encounter at each park unit is provided in the app.[36]

4.4.2 Social Media

Social media is an internet based form of communication that allows users to play an interactive role in media by commenting on the media and interacting with other users. At this time, facebook and Twitter are common, highly utilized social media applications. A 2011 inventory of the use of Social Media Applications as a new medium for providing traveler information in the Northeast Region found that 30 park units, one national heritage corridor, and two multi-unit park organizations (National Parks of New

[34] Grobart, S., "Multimedia Tour Guides on Your Smartphone," The New York Times, March 16, 2011.
[35] Chimani, LLC, "Welcome to the Chimani Parks." Retrieved October 14, 2011, from Chimani website: http://www.chimani.com/parks.html.
[36] National Parks Conservation Association, "National Park Field Guides iPhone App," Retrieved October 14, 2011, from National Parks Conservation Association website: http://www.npca.org/parks/app.html.

York Harbor- NPNH and National Parks of Massachusetts) are using social media to communicate with and among their constituents. Twitter appears to be the dominant social media being used to convey information, with 25 units in the Northeast Region having accounts. Gettysburg Military Park is not using Twitter; rather, it is using Facebook to share information and allows visitors to access an Automated Reservation System to simplify their visit. Gateway National Recreation Area is the only park with a cited need to better develop social media platforms such as Facebook, Flickr, Podcasts/Webcasts, website improvements, and other applicable outlets.

A recent survey of Twitter activity associated with parks in the Northeast Region is summarized in Table 4-1. Although currently there is little transportation-related information being shared, the extent of Twitter use across Northeast Region parks suggests that it has potential as a means to communicate with visitors in the future.

Table 4-1 Twitter Use at Parks in the Northeast Region

Park	Twitter Account	Number of Followers	Number of tweets	Frequency of posts	Transportation Topics Discussed?	Notes
African Burial Ground National Monument	AFBurialGrndNPS	73,132	12,852	5	None found	Great interaction with followers
Assateague Island National Seashore	AssateagueNPS	1,750	784	3	Intermingled	Mentions of limited parking over holiday weekends .A lot of their feed is from agencies like the USGS and NOAA that they are following.
Chesapeake & Ohio Canal National Historical Park						Accounts for the Volunteers-In-Parks and the Canal Trust found on twitter, but not the park itself. @chohvip, @CanalTrust
Colonial National Historical Park	ColonialParkNPS	1,244	19	1	None found	Appears to be inactive since June 2010
Ellis Island National Monument	EllisIslandNPS	1,399	2,052	5	None found	
Federal Hall National Monument	FederalHallNPS	742	73	3	None found	
Fort Necessity National Battlefield	FtNecessityNPS	914	167	4	Intermingled	Some talk of trails and making plans to visit, but not specific issues of transportation
Gateway National Recreational Area	GatewayNPS	1,752	2,318	5	Intermingled	Some talk of kayak and walking trails, announcing programming
Governors Island National Monument	GovIslandNPS	1,754	3,107	5	Intermingled	Some talk of encouraging visitors to plan their visit
Hamilton Grange National Memorial	HamiltonGrngNPS	838	566	5	None found	
Harpers Ferry National Historical Park	HarpersFerryNPS	1,926	128	4	None found	
Hyde Park National Historic Sites	NPS_HydePark	995	280	5	None found	
Johnstown Flood National Memorial	JohnstownFldNPS	536	378	5	None found	
Lowell National Historical Park	Lowell_NPS	1,797	2,988	5	None found	
Morristown National Historical Park	MorristownNPS	980	95	3	None found	
National Parks of New York Harbor	NYHarborParksNPS	1,366	2,816	5	None found	
Niagara Falls State Park	NiagaraParksPR	6,381	4,084	5	None found	*Verify that this is the official state parks account

Park	Twitter Account	Number of Followers	Number of tweets	Frequency of posts	Transportation Topics Discussed?	Notes
Richmond National Battlefield Park	RichmondNPS	671	250	5	Intermingled	Some mention of walking trails and warnings that terrain is rough and uneven
Sagamore Hill National Historic Site	SagamoreHillNHS	717	102	3	None found	
Shenandoah National Park	ShenandoahNPS	3,603	465	5	yes	Mentions of parking lots being full or having space, trail closure reports, etc.
Statue of Liberty National Monument	StatueLibrtyNPS	5,424	1,321	5	None found	
Theodore Roosevelt, Birthplace National Historic Site	TRBirthplaceNPS	1,383	1,003	5	None found	
Thomas Stone National Historic Site	ThomasStoneNHS	800	193	4	None found	
Valley Forge National Historical Park	ValleyForgeNHP	1,973	1,101	4	Intermingled	Some mention of the shuttle service and trail advisories
Weir Farm National Historic Site	WeirFarmNPS	729	316	5	None found	

Frequency Legend : 5=Daily or multiple times, a day; 4=Weekly; 3=Monthly; 2=Periodically through a year; 1=Infrequently
Source: Research completed by the Denver Service Center, July 2012.

4.5 Potential Influences of Energy Costs

Energy costs will influence decisions to make recreational trips, including those to park units. Higher fuel prices will reduce funds available for recreation, and will also result in fuel being a larger portion of a recreational trip budget. The uncertainty of future fuel prices could also result in a preference to save money rather than take recreational trips.

Recent increases in fuel costs have had an influence on travel. Federal Highway Administration's Office of Highway Policy Information reports that travel has decreased to date in 2008, compared to the same months of 2007, based on traffic volume data used to estimate total vehicle miles traveled. In June 2008, travel on all roads was estimated at 4.7 percent less than in June 2007, equivalent to 12.2 billion vehicle miles. For the first six months of 2008, this was a 2.8 percent decline over the first six months of 2007.[37]

A continued increase in fuel prices, or a steadying of the prices, could lead to a sustained decrease in travel. This would then likely have a long term influence on park unit visitation, and all recreational travel. The influences on park unit transportation needs would include less demand for shuttle services provided by National Park Service, and the need for less capacity on park unit roads. For roads that become less frequently traveled, maintenance expenditures would be less justified, and the closing of some roadways may be more feasible than maintaining them.

For facilities in urban areas, where there are multiple modes available for traveling to park units, there may be some shifting or growth in demands for sightseeing buses or mass transit to reach the park unit and to travel throughout the resources. This, in turn, would create the need for more in-park transportation facilities. While higher fuel costs may increase the need for in-park transportation in some facilities and decrease the need in others, higher energy costs would also influence parks' abilities to provide transportation facilities. Shuttle services may need to be minimized or eliminated, and equipment used to maintain transportation facilities will be more costly to operate.

Many of the aforementioned potential influences of increased energy prices would play out in the short to medium-term. In the longer-term, the influences of increased energy prices are less clear. A variety of factors – a continued push for reduced emissions, increased desire for energy independence, and consumer demand for more affordable energy – likely will drive innovation, with possible results ranging from development of alternative energy sources to more fuel-efficient vehicles. These innovations, in turn, could mitigate the effects that higher energy prices likely will have on recreation travel and park unit visitation in the future.

[37] Federal Highway Administration- Office of Highway Policy Information, "Traffic Volume Trends," June 2008.

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5.0 "BEST PRACTICES" TO ENHANCE VISITOR EXPERIENECES

Transportation systems have broad potential to either enhance or detract from visitor safety, satisfaction, understanding and appreciation of the park resources, as summarized in Table 5-1.

Table 5-1 Understanding the Relationship between Transportation and Visitor Experiences (VE)

<table>
<tr><td colspan="2">Definition of Visitor Experience:

Visitor experience is the perceptions, feelings, and reactions a person has before, during and after a visit to a park site.</td></tr>
<tr><th>Examples of <u>Positive</u> Transportation Influences on VE</th><th>Examples of <u>Negative</u> Transportation Influences on VE</th></tr>
<tr><td>Park-related:

▪ Accurate, reliable, and accessible information on how to access and travel within the park unit
▪ Transportation facilities in good condition
▪ Transportation facilities that feel (and are) safe
▪ Clear wayfinding signage or guidance
▪ A choice of modes that are aligned with the desired park experience
▪ Transportation connections that facilitate the visitor's planned itinerary
▪ Interpretation of resources that are integrated with transportation</td><td>Park-related:

▪ Poor/no trip planning information
▪ Transportation facilities in poor condition
▪ Unsafe transportation facilities
▪ Congestion that impedes the visitor's planned itinerary
▪ Lack of parking
▪ Outdated, inconsistent, or a lack of wayfinding guidance
▪ Strictly auto-dependent access and circulation that interferes with the desired park experience
▪ Gaps in transportation connections to access park resources</td></tr>
<tr><td>Area/Gateway Community:

▪ Accurate, reliable, and accessible information on how to access the park unit
▪ Regional connections by private automobile and transit
▪ Non-motorized connections to park unit

Traveler amenities (gas, provisions, restrooms, etc.)</td><td>Area/Gateway Community:

▪ Poor information/wayfinding on how to access the park unit
▪ Lack of regional connections by modes other than the private automobile

No traveler amenities (gas, provisions, restrooms, etc.)</td></tr>
</table>

The following sections explore some “Best Practices” of transportation strategies that have been deployed in the Northeast Region to enhance visitor experiences.

5.1 Travel Planning “Best Practices”

Visitor experiences begin with time spent prior to the visit planning park activities and how to travel to the park unit. A poor experience planning for a park unit visit could, at worse, discourage potential visitors from visiting at all and, at best, fail to provide visitors with understanding of all the park unit has to offer.

For many park units, particularly those that are historical sites in auto-oriented areas and which tend to have low repeat visitation, the park unit’s standard National Park Service website is usually adequate for travel planning. But for other park units, those that may have high, concentrated visitation or are large in size, visitor experiences can be enhanced by an advanced travel planning system. Among the types of park units where enhance travel planning systems are likely to be most beneficial are:

- Large park units that that have multiple destination sites within the park unit,
- Park units that are located in a vacation area where visitors are often staying in the area multiple days and which the park unit is a destination on one of those days,
- Park units near others that share a common historical character and which might be visited by the same person on the same day, and
- Park units that are part of “trails” that share similar subjects (e.g., Civil War parks) and which might attract visitors to different park units over several days,
- Park units offering, or even requiring, multiple modes of transportation,
- Park units that require a fee for the required mode of transport, (e.g., a ferry boat ride).

Several good examples of travel planning resources are presented to illustrate tools that are currently available for travel planning to park units.

5.1.1 Captain John Smith Chesapeake National Historic Trail Travel Planner

The Captain John Smith Chesapeake National Historic Trail, in partnership with the Chesapeake Bay Gateways and Water Trails Network and the Chesapeake Bay Program, maintain a website (www.smithtrail.net) that provides comprehensive information about the history of the voyage of Captain John Smith in the Chesapeake Bay and information about the present water-based trail and activities for visitors to participate in during a visit. The “smithtrail” website can be accessed through the Captain John Smith Chesapeake National Historic Trail website (www.nps.gov/cajo) under ‘Plan Your Visit’. The website describes over 100 different sites in the Chesapeake Bay including hours of operations, fees, events, and a location map.

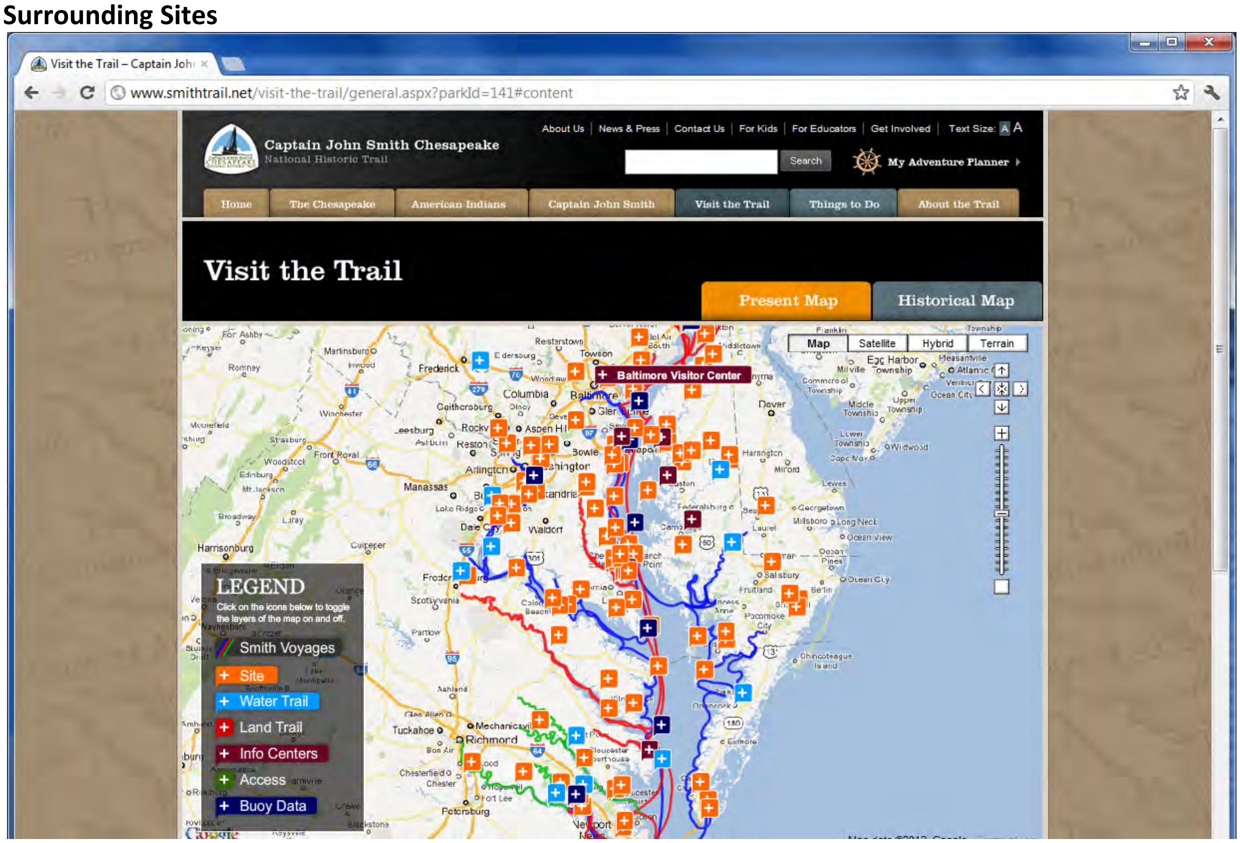
The “Present Map” of the Chesapeake Bay Water Trail (Figure 5-1) shows the locations of sites, water trails, land trails, information centers, access points, and buoys along the trail in such a way that facilitates trip planning. To further assist in trip planning, the website offers a tool called “My Adventure

Planner" (Figure 5-2) that allows users to mark sites and events of interest which are then compiled for the user with relevant information such as hours of operation, location address, and links to relevant websites. This tool also provides links to partner sites that visitors might also enjoy.

This tool assists in the trip planning with the development of a trip itinerary that allows visitors to explore the trail and the many small sites in the surrounding areas at their own pace. Custom itineraries can be very helpful for planning a visit and navigating a diverse and multi-destination park unit such as the Captain John Smith Chesapeake National Historic Trail.

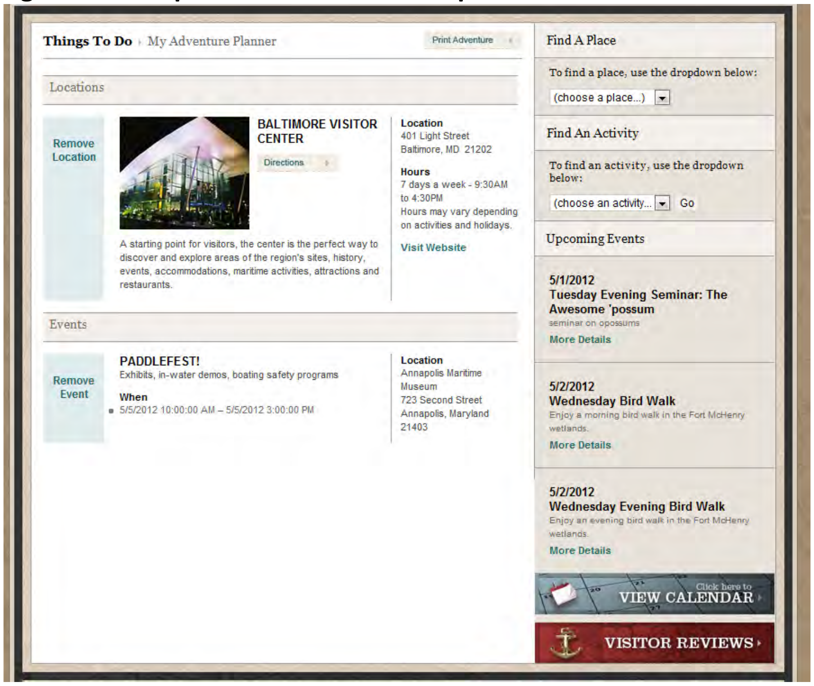
The Captain John Smith Chesapeake National Historic Trail Travel Planner is an opportunity for the Northeast Region to progress both the *Connecting People to Parks* and *Advancing NPS Educational Mission* themes of *Call to Action*. This tool also supports *Call to Action's* FOLLOW THE FLOW by supporting expanded awareness and accessibility to and park access information and supports community partners and GO DIGITAL and OUT WITH THE OLD actions through the interactive interpretive content provided on the web site that is available to both computers and mobile technology.

Figure 5-1 Present Map of the Captain John Smith Chesapeake National Historic Trail and Surrounding Sites



Source: National Park Service, "Captain John Smith Chesapeake National Historic Trail," URL: http://www.smithtrail.net/visit-the-trail/

Figure 5-2 Captain John Smith Chesapeake National Historic Trail: My Adventure Planner



Source: National Park Service, "Captain John Smith Chesapeake National Historic Trail," URL: http://www.smithtrail.net/things-to-do/adventure-planner/

This type of strategy has potential for broader application for the more complex units of the Northeast Region, such as the Gateway National Recreation Area, Delaware Water Gap National Recreation Area, and Colonial National Historical Park.

5.1.2 Roosevelt Ride Trip Itineraries

The website for the Home of Franklin D. Roosevelt National Historic Site (www.nps.gov/hofr) provides information on the Roosevelt Ride on its homepage. The Roosevelt Ride links four park sites located within a three mile radius -- the Home of Franklin D. Roosevelt National Historic Site, Vanderbilt Mansion National Historic Site, Eleanor Roosevelt National Historic Site, and Top Cottage. The Roosevelt Ride also provides a reservation-based connection to a nearby train station that enables a car-free day visit from New York City and its Hudson Valley suburbs.

This very simple strategy improves the visitor experience in several important ways. First, it helps overcome the challenges that visitors, in particular non-local, first-time and older visitors, have in learning how to use transit service to access multiple sites within a park unit by providing simple but straightforward information on the service and details of several itineraries for day trips. Secondly, the transit service provides a more convenient means over personal automobile to experience all that the park has to offer in one day and without delays.

Application of strategies like the *Roosevelt Ride Itineraries* to other park units in the Northeast Region that are in suburban, outlying or rural locations may be helpful in advancing *Call to Action*'s *Connecting People to Parks* theme. A similar example follows with the *Cape Cod Smart Guide*.

Figure 5-3 Example Visit Itinerary using the Roosevelt Ride Service

Franklin and Eleanor, with Top Cottage (Top Cottage, lunch, FDR, Val-Kill)

10:40 am-	NPS Shuttle Bus (the Roosevelt Ride) picks you up at the Poughkeepsie Train Station
10:55 am-	Arrive at the Wallace Visitor Center at the FDR site. Purchase tour tickets for the 11:10 Top Cottage tour, and for the 1:30 pm FDR Home tour, and the FDR Home/Presidential Library Museum
11:10 am-	Board the Roosevelt Ride at the Wallace Visitor Center for Top Cottage (FDR's Retreat)
11:30 am-	Program at Top Cottage
12:30 pm-	Board the Roosevelt Ride at Top Cottage for a return trip to the Wallace Visitor Center
1:00 pm-	Lunch at Mrs. Nesbitt's cafe'
1:30 pm-	Take a guided tour of the FDR Home
2:30 pm-	Take a quick, self guided tour of the FDR Presidential Library/Museum
3:10 pm-	Board the Roosevelt Ride at the Wallace Visitor Center for Val-Kill (the home of Eleanor Roosevelt)
3:30 pm-	View the orientation film "Close to Home" and take a guided tour of Val-Kill Cottage
4:40 pm-	Board the Roosevelt Ride at Val-Kill for a return trip to the Wallace Visitor Center and a short break before departing back to the Poughkeepsie Train Station
5:10 pm-	Depart Wallace Visitor Center for Poughkeepsie Train Station

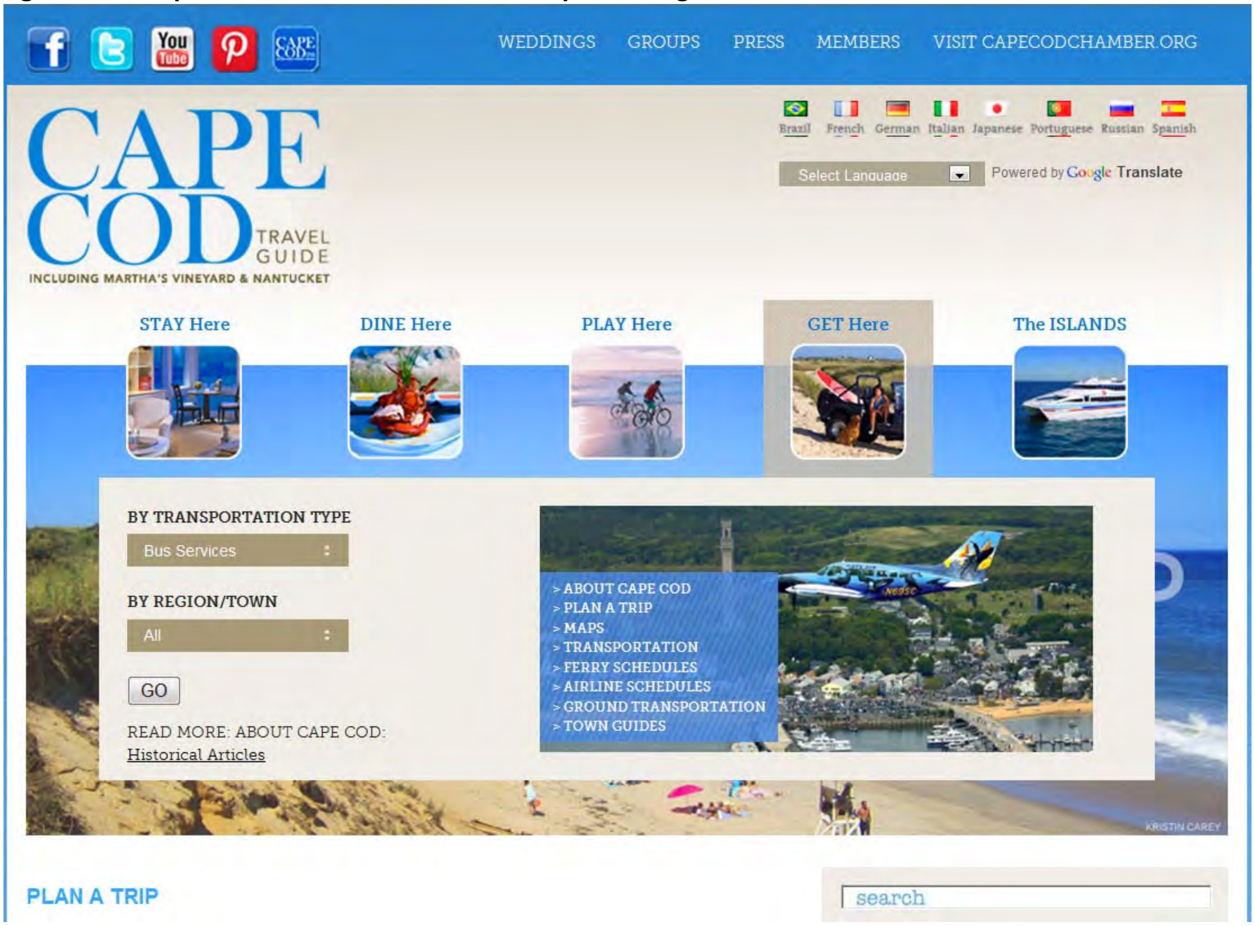
National Park Service, "Captain John Smith Chesapeake National Historic Trail,"
URL: http://www.nps.gov/hofr/planyourvisit/upload/FDR-all-day-Itinerary.pdf

5.1.3 Cape Cod Smart Guide

The Cape Cod *Smart Guide*, www.smartguide.org, provides users with information for multimodal options for travel to Cape Cod including Car-Free travel and Car-Smart travel. The website is not only available to view on computers but also has a mobile specific website that makes it easy to view from smart phones and other mobile devices. The website also provides links to the Cape Cod Commerce, Facebook, Twitter, YouTube, and Pinterest pages.

The *Smart Guide* website provides information about destinations on Cape Cod, organized in locations such as Martha's Vineyard, Nantucket, and Outer Cape Cod where Cape Cod National Seashore is located. Each of these sections of the web site provides links to relevant transportation resources for that destination such as ferry or transit schedules and other more specific planning resources to help find activities and lodging.

Figure 5-4 Cape Cod Smart Guide Website Trip Planning Feature



Source: Cape Code Chamber, "Cape Cod Travel Guide, "www.smartguide.org

Other features of this planning tool are maps and real-time travel tips for travelers. The library of maps detail Car-Free travel including air, transit, boat, and bicycle travel and Car-Smart travel, specifically ride share options, to the Cape. Maps illustrate the various modes that can be used to arrive at each of these destinations as well as maps of the destination to show car-free travel. Website maps are easy to view and easy to print. Travel Tips provide recommendations on when it is best to travel and where to get up to date travel information.

The Smart Guide allows users to plan trips online using all available transportation options, so that visitors can choose which mode(s) best meet(s) their unique needs. The "Plan A Trip" feature allows visitors to select their departure point, destination, and mode of choice. Based on the results of visitors' selections, links to the websites of transportation suppliers are provided so that visitors can easily access the details of the trip, such as scheduling and pricing. Visitors can also save their search results in the "Travel Car" feature and continue to search for other options.

This strategy fully embraces Call to Action's GO DIGITAL action by providing visitors with consolidated transportation planning information in an easy-to-use online system. Through the various features, such as maps and transit schedules, as well as links to more information, the website provides travel planning opportunities that are particular useful for non-local and first time visitors. This tool greatly simplifies the process of learning what transportation options are available across multiple modes and which ones are applicable to each visitor's unique trip. This website reduces the time and effort necessary to gather this potentially confusing information.

5.1.4 Acadia National Park Smartphone Application

Acadia National Park is located primarily on Mount Desert Island off the coast of Maine in Hancock County. As of 2005, Hancock County was home to approximately 54,000 residents, and 38,000 workers. The Park's 47 square miles is host to a wide variety of activities and attractions including Cadillac Mountain (the tallest mountain on the east coast), museums, hiking trails, Bass Harbor Head Lighthouse, and gardens. Other popular activities include bicycling, bird watching, and rock climbing.

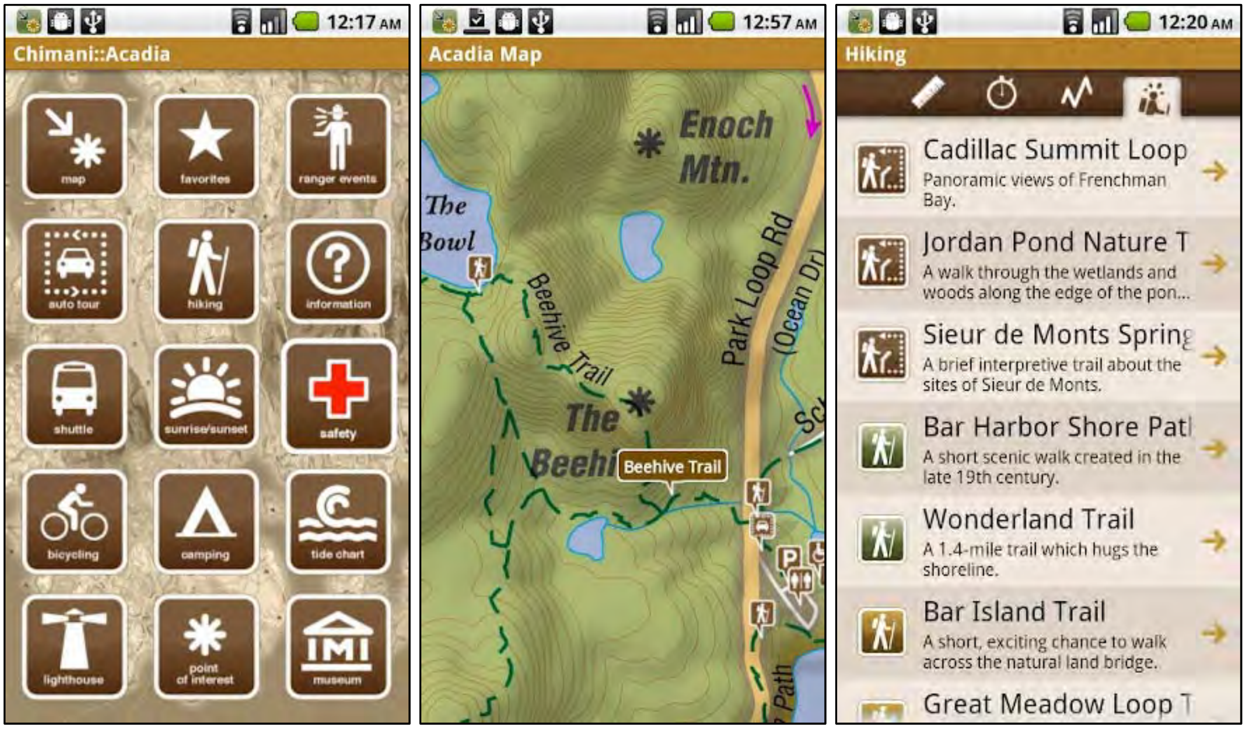
There is vehicular, transit, and ferry access to the park, as well as an extensive trail system for hikers, cyclists, horses, and carriages. Route 3/Bar Harbor Road is the one vehicular access route to the main portion of Acadia National Park. There are several roadways within the Park, however, many are not built to modern specifications and large vehicles (like buses and trucks) are prohibited. Many of these roadways are closed during inclement weather and the entire winter season. Ferry service provides additional access for both passengers and vehicles to and from Bar Harbor and Yarmouth, Nova Scotia in Canada, weather permitting. Intercity bus service between Bangor and Bar Harbor operates during the summer months. Local transit agencies also run daily bus service to Mount Desert Island from neighboring areas.

As smartphones are becoming more prevalent each year and cell phone networks are expanding, Chimani, LLC developed a free smartphone application, the *Chimani Acadia National Park* app, that provides information on how to move within Acadia National Park using various modes, where various points of interest are located, where ADA accessible sites are located, and detailed mapping of these park features. This application can be used to help plan a trip to Acadia National Park and can be used during a trip to Acadia National Park as a quick source of information.

The various features of the app all work together to help visitors plan trips and navigate Acadia National Park during a trip to provide a smooth transportation visitor experience. The convenience of having all of this information in a smart phone reduces the need to juggle various maps, books, and brochures and places the information in an environment where it can easily be compared to help plan trips that fit visitor's individual needs. This app also provides visitors information to help make changes to their trip once they are at the park if they so desire.

Chimani, LLC has developed a total of ten applications related to the National Park Service included one for Cape Cod National Seashore and one general application that provides basic information about all of the national park units. Figure 5-5 shows the Chimani smartphone application for Acadia National Park.

Figure 5-5 Acadia National Park: Chimani Smart Phone App



Source: Google Play Store, “Chimani Acadia National Park,” URL: https://play.google.com/store/apps/details?id=com.chimani.acadia#?t=W251bGwsMSwyLDIxMiwiY29tLmNoaW1hbmkuYWNhZGlhIl0.

Young visitors and first time visitors find these mobile applications particularly engaging and broader application these types of tools in the Northeast Region is expected to help achieve both the *Call to Action*’s *Connecting People to Parks* and *Advancing the NPS Education Mission* goals.

5.2 Access & Mobility “Best Practices”

Examples of transportation access and mobility strategies deployed in the Northeast Region to enhance visitor experiences are presented in the following pages.

5.2.1 Regional Bicycle Shuttle, Acadia National Park

Bicycling is a very popular method of traveling within Acadia National Park and is particularly popular with younger visitors and active families. Acadia has an extensive network of carriage roads open only to pedestrians, equestrians, and bicyclists that offers an attractive recreational experience. Access to the park and its adjacent communities is enhanced by a seasonal public transit service called the Island Explorer.

The Island Explorer buses carry those bicyclists to and from the park, but the popularity of bicycling often exceeds the carrying capacity of the transit buses – disappointing visitors with well planned itineraries that are dependent upon having access to their bicycle. To increase the capacity for carrying bicyclists to the park, the Island Explorer transit system was expanded to include a dedicated bicycle shuttle route – The Bicycle Express. Vans are used to pull trailers capable of carrying 12 bicycles at a time. Fifteen trips per day are made to a trailhead that is at the juncture of two networks of carriage roads.

5.2.2 Parking Management and Shuttle System, Cape Cod National Seashore

Coast Guard Beach is among the most heavily visited of Cape Cod National Seashore's six beaches. Since 1978, when erosion forced the national seashore to abandon a parking area adjacent to Coast Guard Beach, the national seashore has operated a shuttle between the Little Creek parking area and the beach entrance just under a mile away. Though initially established to accommodate the relocation of the parking area and improve access to the beach, the tram has been used as a congestion management tool in recent years.

By the late 1990s, virtually all areas of Coast Guard Beach – including drop-off areas, facilities, and the beach itself – had become overcrowded and congested, and beach visitation was deemed to be beyond capacity. Of particular concern was the large number of vehicles dropping off passengers near the Coast Guard Beach entrance, which caused traffic backups and raised concerns about pedestrian safety. In 2001, the National Seashore sought to address these congestion issues – and to limit the number of beachgoers to the carrying capacity of the physical facilities and lifeguard stands – by prohibiting vehicles from dropping off and picking up passengers at the Coast Guard Beach entrance. Instead, all visitors must park at the Little Creek Parking Area and take the shuttle to the beach entrance. The shuttle is open-air and allows plenty of room for beach-goers to bring their chairs, coolers, umbrellas, etc., all of which enhances visitors' experience with taking the shuttle. There is a $15 daily fee ($45 annual pass) to park at Little Creek during the summer months.

As an alternative to taking the Little Creek shuttle to Coast Guard Beach, visitors can park at the Salt Pond Visitor Center and take the bicycle path (approximately 1.8 miles) to the beach. There is a bicycle rental place near the visitor center and the Coast Guard Beach bicycle path connects to the Cape Cod Rail Trail.

Since the National Seashore began directing visitors to use the Little Creek parking area and shuttle or alternatively accessing the beach by bicycle instead of dropping off passengers at the beach entrance, visitors have acclimated well and visitation has moderated to a level more suited to the beach's carrying capacity.

5.2.3 Limited-access Interpretive Shuttle: Shenandoah National Park

Shenandoah National Park in central Virginia is home to Rapidan Camp, which served as President Herbert Hoover's summer retreat. The camp features the president's cabin, The Brown House, which has been historically refurbished to its 1929 appearance. It opened to the public in 2004.

Since the refurbishment of the site, Rapidan Camp has become a popular destination for park visitors. In an effort to improve visitor experiences and meet expectations for a remote, uncongested experience at the camp and on the narrow dirt road leading to the camp while maintaining access to the site, the park restricted personal automobile access to the camp and established a shuttle service to take visitors from the Byrd Visitor Center at Big Meadows. The service features a 12-passenger bus, driven by a park ranger who provides interpretation along the route and at the camp itself.

The Rapidan Camp tour shuttle runs on a limited daily schedule throughout the summer, with two roundtrips offered on the weekends and Tuesdays, and a single roundtrip offered on all other days. The park uses a reservation system for the Rapidan Camp shuttle, which operates at capacity on nearly all trips.

5.2.4 Interpretive Shuttle: Home of Franklin D. Roosevelt National Historic Site

Top Cottage is a day cottage designed and used by Franklin Roosevelt as a favorite getaway spot and an informal venue to meet with dignitaries. Located about 4 miles from the main home and park unit visitor center it was acquired about 10 years ago. It is an important part of the understanding of President Roosevelt's life in the Hudson Valley.

Top Cottage is open from April to October. Access to Top Cottage is restricted to hikers and three daily NPS shuttle tours. The only road access is through a developed residential neighborhood and the limitation on tour visits is due to agreement with neighbors when the site was purchased.

When President Roosevelt visited Top Cottage he would drive from the main house through his property via Farm Lane, past tree forests that he personally managed. Tailored to non-local and first time users, the 15-minute travel time of the shuttle provides an excellent opportunity to interpret that experience for visitors.

5.2.5 Bicycle and Pedestrian Facilities, Minute Man National Historical Park

Minute Man National Historical Park preserves historic sites, structures, properties and landscapes associated with the opening battle of the Revolutionary War. The park is located in a Suburban Area of Massachusetts outside of Boston. The Battle Road Unit covers the initial section of the 20-mile route of the battle between patriot minute men and British soldiers on April 19, 1775 as the British marched back to Boston from Concord.

By the time the park unit was created, the path of battle became a major regional highway and several residential roads. The roads created significant safety issues, effectively limited access to much of the park unit, and adversely affected the cultural resources. In 1999, the park unit embarked on a six-year, $11 million development and rehabilitation project that included construction of the Battle Road Trail along the historic alignment and landscape of the original Battle Road, and providing access to historical structures, battle sites, and soldier's graves. The project made 80 percent more of the park unit accessible to the public, while also rehabilitating cultural landscapes, stone walls, and historic structures.

In an auto-centric suburban area, the trail creates new park connections open to pedestrians and bicyclists, features interpretive markers along its entire length, and is popular with all types of park users. It is served by six parking lots at various locations along its length. The trail has enhanced safety and visitor experiences, while also providing recreational opportunities and bicycle connections for local residents. It is an excellent example of a project that supports *Call to Action's* PARKS FOR PEOPLE action.

5.2.6 Regional Bicycle Connections, Gateway National Recreation Area: Jamaica Bay Unit

The Jamaica Bay Unit of Gateway National Recreation Area is located in the New York City boroughs of Brooklyn and Queens. The Jamaica Bay Unit contains some of the largest expanses of green space in the city, making it an attractive destination for bicyclists. The largest concentration of bicycle facilities within the Jamaica Bay Unit is located on the Brooklyn side of the Unit, where Floyd Bennett Field features 6.5 miles of runways and paths open for cycling. Multiple bicycle facilities can be found along the Rockaway Peninsula in Queens: the Shore Road, a paved route closed to vehicles, runs for a mile along the beach at Fort Tilden; and a small network of dirt and cinder trails crisscross the coastal woodland in the Back Fort area.

A key to bicycle connectivity within and around the Jamaica Bay Unit is the Rockaway Gateway Greenway, which currently runs through portions of the Unit in both Brooklyn and Queens. The National Park Service, in partnership with the State of New York, has been renovating and expanding the bikeway in recent years, with the long-term goal of creating a complete circuit around Jamaica Bay.

The Rockaway Gateway Greenway provides access to Floyd Bennett Field and Fort Tilden within the Jamaica Bay Unit. It also provides critical connections to local and regional on- and off-street bicycle routes. The Greenway has a direct connection to the Belt Parkway Bikeway, which in turn connects to the Ocean Parkway Bikeway and bicycle lanes on Bedford Avenue. These connections provide access to and from most neighborhoods in Brooklyn, including low-income neighborhoods in the central and northern portion of the borough, as well as access to bicycle trails in Prospect Park. The Greenway also provides access to multiple transit stations in the vicinity of the Jamaica Bay Unit.

Analysis of the communities surrounding Jamaica Bay completed recently by The Volpe Center confirmed that the planned bicycle and pedestrian connections could significantly to advance the IN MY BACKYARD and PARKS FOR THE PEOPLE actions in *Call to Action*. This type of strategy is viewed as widely applicable in other urban, diverse communities adjacent to park units of the Northeast Region.

5.3 Intelligent Transportation Systems "Best Practices"

Intelligent Transportation Systems (ITS) involve the use of advanced communication technologies in transportation infrastructure and in vehicles to improve safety, reduce congestion, and provide dynamic, real-time information that allows people to make informed decisions.[38] The past 15 years have seen a rapid rise in the use of ITS worldwide, and, in that span, the National Park Service has begun to incorporate ITS into its transportation planning and operations. ITS can assist National Park Service personnel in gathering data on park pavement, bridges, traffic, and visitor counts. ITS also can help park visitors make informed travel decisions by:[39]

- Directing visitors to less crowded entrances, attractions, and parking areas;
- Informing visitors of alternative transportation options, including schedules and routes;
- Providing visitors with directions, travel conditions, and hours of operation through electronic variable-message signs, radio advisories, telephone systems, and the Internet; and
- Providing visitors with information on lodging and nearby community attractions.

In addition to the technologies inherent in the traveler information systems previously discussed, several additional ITS applications are being deployed in the Northeast Region to enhance visitor experiences, consistent with *Call to Action* themes, as described below.

[38] Intelligent Transportation Society of America, "About ITS," Web page.
[39] National Park Service, "Intelligent Transportation Systems (ITS) in National Park Units," Fact sheet. 2003.

5.3.1 Parking Management at Cape Cod National Seashore

Cape Cod National Seashore is a popular summer destination. During the peak season, parking can be a challenge for visitors seeking access to beach resources within the park unit. To ease this problem, improve visitor expectations, and prevent congestion, the Cape Cod National Seashore has successfully utilized Variable Message Signs (VMS) for several years along the main access route to the park unit (Route 6) to alert visitors about beach parking availability. Real time parking area status (noting whether a parking lot is open or full) provides visitors with the necessary information (in advance of arriving at the parking facility) to make informed travel plans. This system is effectively relied upon by both local park users and day-trippers to the Cape and is particularly effective for park units that are located in rural and/or outlying areas.

5.3.2 Intelligent Transportation Systems Application, Sandy Hook Unit

The Sandy Hook Unit of the Gateway National Recreation Area has only a single point of entry and has limited parking capacity. The park unit has utilized Intelligent Transportation Systems (ITS) for more than a decade to manage excess demand for parking and congestion at the entrance station. The ITS program began with portable variable-message signs and highway radio advisories.

Consistent with Call to Action's GO DIGITAL and OUT WITH THE OLD actions, a new electronic entry plaza was installed in 2011 that features a dedicated vehicular lane with automated entry for employees and season pass holders. There are four types of variable message signs located at the park unit entry plaza: a lane usage sign to prepare approaching vehicles for the lanes they need to use as they enter the unit; lane status signs above each lane; a parking lot availability sign; and a general purpose message sign. Loop detectors and pedestrian sensors will facilitate visitation data collection that will update in real-time and be used monitor parking availability. This system is primarily focused on local users and is intended to ease congestion and frustration for visitors seeking access to this popular beach destination.

6.0 NEEDS ASSESSMENT AND OPPORTUNITIES

This section of the report explores needs and opportunities, focused on travel planning, mobility and access, as they relate to further enhancing visitor experiences in the Northeast Region.

6.1 Travel Planning Needs and Opportunities

Within the theme of *Advancing the NPS Education Mission*, *Call to Action* states that the NPS *must* use leading-edge technologies and social media to effectively communicate with and capture the interest of the public. As visitor experiences often begin long before a visitor steps foot in a park, dissemination of valuable visitor information -- from early travel planning to engagement along the journey – is a critical component of transportation planning for parks. Today, the use of new communication technologies and intelligent transportation systems are often central to the delivery of this information.

6.1.1 ITS and Being Engaged in the Journey

In 1999, Acadia National Park, in collaboration with the U.S. Departments of Transportation and the Interior, launched an ITS pilot program. Among the ITS components tested in the program were: automated parking lot and entrance monitoring; automated entrance traffic volume recording; automated shuttle passenger boarding and dismount counting; automated enunciator (recorded announcer providing shuttle and stop information), and departure and arrival signs for park shuttle; and shuttle and park ranger locators. In a survey of visitors to Acadia National Park, 80 percent of surveyed visitors said that the availability of real-time information on the electronic departure signs influenced their decision to use the park shuttle.[40]

ITS also can assist in emergency management by providing visitors with advance warning of emergencies or severe weather events, and by providing information to guide vehicles and individuals at NPS resources that may be used as shelters or staging areas in emergencies.

The Internet is another means of providing updated and relevant information to visitors, reaching potential visitors, and streamlining entrance to the park and potentially reducing congestion. The National Park Service already maintains individual websites for each of its resources, with each site containing rich content on getting to and around the resource, cultural and historical resources, activities for families, and nearby lodging and attractions. A number of NPS resources in the Northeast Region require advanced reservations to visit and/or stay. With the increased use of online travel booking websites, National Park Service might partner with those websites to increase visibility of NPS resources, perhaps including entry to an NPS resource as an option in the reservation process.

[40] Federal Highway Administration, "Evaluation of the Acadia National Park ITS Field Operational Test: Final Report," Washington, DC: June 2003. URL: www.itsdocs.fhwa.dot.gov/jpodocs/repts_te/13834.html

Another example of technology enhancing visitor experiences is the use of Global Positioning Satellite (GPS) technology in tours of NPS resources. A private firm, BarZ Adventures, has had considerable success with its GPS Ranger unit, which as an example provides automated interpretation cued by GPS location and allows for up to three hours of customizable video content. GPS Rangers are currently in use in Independence National Historical Park, Shenandoah National Park, Vicksburg National Military Park, and Death Valley National Park, among others.[41] This type of technology does not have to replace ranger-provided interpretation, but gives visitors scheduling flexibility and choice, while allowing NPS personnel to customize tours, provide information about a wider range of attractions, and direct traffic to less crowded areas. These types of systems also offer great promise to promote NPS resources to a broader (and possibly younger) market of prospective park visitors.

In the digital age, technological advancement is rapid, continuous, and widespread. Any plans for reducing congestion in and around parks, improving safety, enhancing visitor experiences, and attracting new visitors must take into account the influences of new technologies and ways to leverage these technologies for the benefit of the National Park Service and park visitors.

6.1.2 Analysis of ITS Needs in the Northeast Region

The Volpe Center conducted studies of Intelligent Transportation Systems in the National Park Service in 2005 and 2011. Table 6-1 presents the status of ITS in the Northeast Region in 2005 and Table 6-2 shows an updated status in 2011. Comparison of the two illustrates not only the increasing use of ITS in the Northeast Region, but also the rapid development of ITS into social media applications. Social media applications are becoming a popular form of real time communication that is portable and therefore very beneficial for travelers. This is a particularly important strategy to re-engage younger visitors who, as previously discussed are less likely to visit national parks, with the vast resources and recreational opportunities within the park units of the Northeast Region.

[41] Kurt Repanshek, “Another Look at those GPS Rangers in the National Parks,” National Parks Traveler. Blog. Posted August 22, 2008.

Table 6-1 Summary of baseline ITS in the Northeast Region of the National Park Service, 2005

Symbol Key:
- ○ Identified Need or System Plan
- ◒ Implementation Planning or Design
- ● Essentially Complete or Complete

		Travel & Traffic Management												Public Transportation Management				Maintenance & Construction Management		General/ Other	
		Automated Entry System	511 System Integration	Highway Advisory Radio	Incident Management System	Parking Management/Availability	Reservation Systems	Traffic Monitoring System	Travel Information–unspecified	Travel Information Kiosks	Trip Planning tools	Variable/Changeable Message Signs	Weather/Road Condition Information	Fleet Management	In-Vehicle Electronic Information	Transit Management	Vehicle Tracking System	Road Construction Information	Work Zone Management	Integrate ITS with state / local DOTs	ITS Needs Assessment
Northeast	Acadia National Park		●	●		●	◒			●	◒	●		●	●	●	●	◒		◒	●
	Allegheny Portage Railroad National Historic Site	○	●																		●
	Blackstone River Valley National Heritage Corridor			●					◒												◒
	Boston Harbor Islands NRA									○											
	Boston National Historical Park									○											
	Cape Cod National Seashore			○		○		○	○	○		◒				◒	◒			◒	●
	Gateway National Recreational Area	◒		●		●						●									●
	Gettysburg National Military Park								○					○							
	National Parks of Massachusetts					○				○	●										
	Shenandoah National Park		○										○							○	○
	Statue of Liberty National Monument									◒											◒

Source: The Volpe Center, "Intelligent Transportation Systems (ITS) in the NPS: 2005 Baseline Inventory and Preliminary Program Assessment," January 2006.

Table 6-2 Traveler Information/Social Media in Federal Public Lands- 2011 Inventory Update

U.S. Public Lands Agency	Agency Region	Public Lands Unit	Travel & Traffic Management				Social Media Application								
			1) Dynamic Message Signs (portable and permanent)	2) 511 System Integration	3) Highway Advisory Radio	4) Trip Planning Tools (Innovative)	Advanced / Automated Reservation Systems	Site Enhancements	Facebook	Twitter	Flickr	YouTube	Podcast / Webcast	Blogs	Other Social Media / Information Outlet
National Park Service	Northeast	Acadia National Park	●	●											
		African Burial Ground National Monument								●					
		Allegheny Portage Raiload National Historic Site		●	●										
		Assateague Island National Seashore								●					
		Blackstone River Valley National Heritage Corridor			●										
		Boston Harbor Islands National Recreation Area				●									
		Cape Cod National Seashore	●		○										
		Chesapeake & Ohio Canal National Historical Park								●					
		Colonial National Historical Park								●					
		Ellis Island NPS								●					
		Federal Hall National Memorial								●					
		Fort Necessity National Battlefield								●					
		Gateway National Recreational Area	●	●	●	●		○	○	●	○		○		○
		General Grant National Memorial								●					
		George Washington Birthplace National Monument								●					
		Gettysburg National Military Park	●				●		●						
		Governors Island National Monument								●					
		Hamilton Grange National Memorial								●					
		Harpers Ferry National Historic Park		○						●					
		Hyde Park National Historic Sites								●					
		Johnstown Flood National Memorial								●					
		Lowell National Historical Park								●					
		Morristown National Historic Park								●					
		National Parks of Massachusetts				●									
		National Parks of New York Harbor (NY Harbor Parks)				○				●					○
		New River Gorge National River		○											
		Niagara Falls State Park								●					
		Richmond National Battlefield Park								●					
		Sagamore Hill National Historic Site								●					
		Shenandoah National Park	○		●					●					
		Statue of Liberty National Monument								●					
		Theodore Roosevelt. Birthplace Nat'l Historic Site								●					
		Thomas Stone National Historic Site								●					
		Valley Forge National Historical Park								●					
		Weir Farm National Historic Site								●					

Legend: ● Essentially Complete or Completed ○ Identified Need or System Plan

Source: The Volpe Center, "Intelligent Transportation Systems in the National Parks and Federal Public Lands- 2011 Update," September 2011.

The 2011 Volpe Center study identified three park units in the Northeast Region, in particular, that have ITS needs: Cape Cod National Seashore, Gateway National Recreational Area, and New River Gorge National River as well as the multi-unit park organization National Parks of New York Harbor.

- Cape Cod National Seashore shows need across all categories of technologies. In the category of Travel & Traffic Management, Cape Cod NS does not have highway advisory radio or an integrated traffic monitoring system. Given congestion during peak summer demand, these could both be very useful tools. Along the same idea, Cape Cod NS is lacking a parking management or availability system. A $1.7 million ITS parking management system to be piloted and implemented in 2013-2015 is among in the Northeast Region's priority list of Alternative Transportation Program projects.

- Gateway National Recreational Area has a number of ITS technologies, likely due to its location in the New York City metropolitan area. Gateway does, however, show weaknesses across the Entry Management category and the Public Transportation Management category.
- New River Gorge National River shows a lack of ITS technologies across all technologies considered as revealed by an ITS Needs Assessment. Specific needs include 511 System integration, Automated Road Weather Information system, Road Surveillance, Work Zone Management, Incident Management, and Operations & Fleet Management.

The Volpe Report noted that ITS needs cannot be identified at a park unit until an ITS Needs Assessment is completed. As more park units go through this process a more complete list of ITS Needs will continue to develop.

As part of on-going transportation planning, the Northeast Region completed a 2010 study to develop a concept of operations for a Traveler Information System (TIS) at the Sandy Hook unit of Gateway National Recreation Area. The intent of a TIS is to systematically collect, integrate, and communicate information that would be helpful to travelers in both advance trip planning and during their trip. This study considered the existing information systems in place at Sandy Hook, data availability for use, data gaps, and what existing technologies could be introduced at Sandy Hook to improve the traveler information and trip planning. Some of the technologies evaluated move beyond the commonly used transportation systems such as dynamic message signs and closed circuit television cameras to newer internet and social media platforms. One of the goals in developing this system would be that Sandy Hook could serve as a pilot in many ways for future potential larger scale TIS applications at Gateway NRA or the National Parks of New York Harbor.

Although this study did not result in the design or implementation of a traveler information system, it did provide observations and recommendations that are value for the development of any TIS. Most importantly it concluded that an effective traveler information system for a park unit ideally goes beyond the traditional elements of access planning and traffic management to include *visitor* information such as information about points of interests and intra-park roadway and parking conditions, park shuttle options, etc.. By doing so, this robust information system could become the "go to", single source of information for all visitor travel needs.

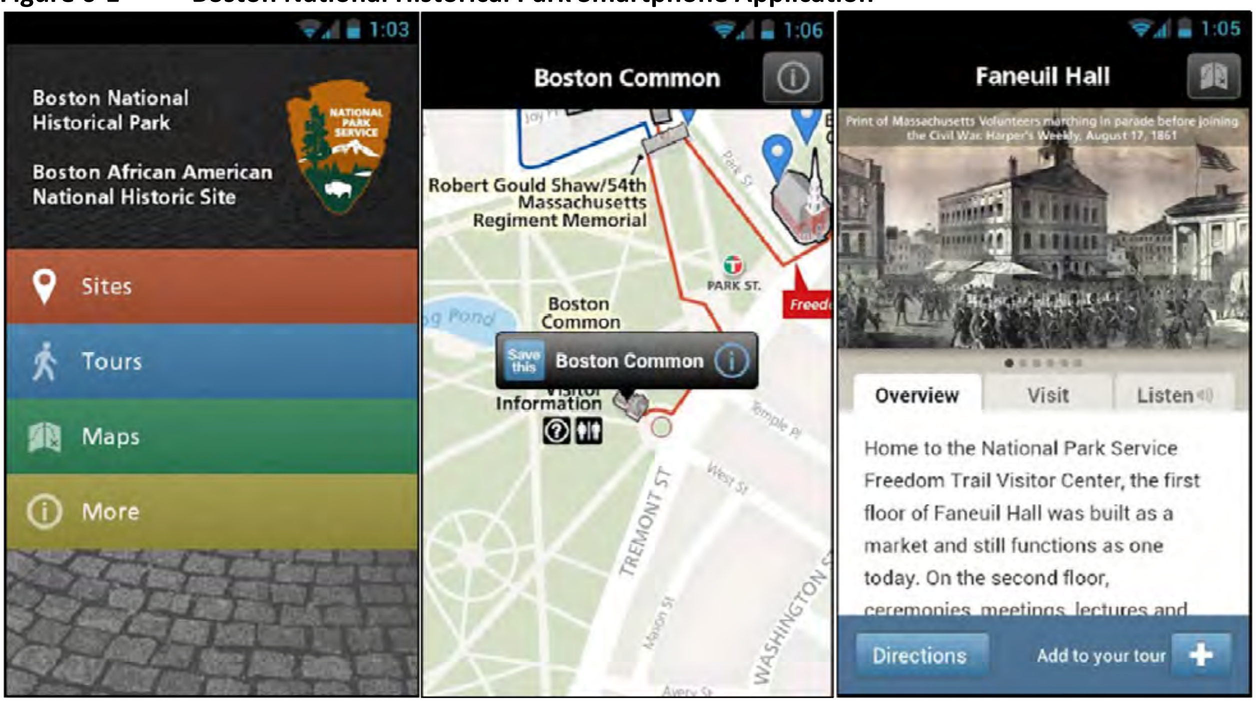
Currently, there are a number of planned visitor experience projects that are geared towards improving travel planning opportunities for visitors. Examples of these projects (largely drawn from PMIS statements) are briefly described below.

6.1.3 Future Opportunities to Enhance Visitor Experiences: Travel Planning and ITS Projects

Boston National Historical Park Traveler Information

The fast growing field of smartphone apps development offers great potential to deliver visitor interpretation that is highly customizable and individualized. In May 2012, a new transportation and visitor information hub opened at Faneuil Hall in Boston, Massachusetts to house the Boston National Historical Park visitor center. Along with the opening of the transportation hub was the release of a smartphone app. This app allows users to retrieve traveler information for all 18 Massachusetts park units. This information includes maps, site descriptions, directions, prepared tours, and custom tours. Figure 6-1 depicts screen shots of the app.

Figure 6-1 Boston National Historical Park Smartphone Application



Source: National Park Service, NPS Boston, smart phone application.
URL: https://play.google.com/store/apps/details?id=com.qozix.nps#?t=W251bGwsMSwxLDIxMiwiY29tLnFveml4Lm5wcyJd

Because the Boston National Historical Park is a park unit made up of a series of sites and attractions throughout the City of Boston, a smart phone application is an ideal solution for guiding visitors through the park unit and providing interpretive information. Also, the City of Boston is a highly urban setting, so concerns about cell phone or GPS service do not apply. Visitors can follow tours or develop custom tours and use a smart phone to guide them through Boston NHP at their own pace. This is a premier smart phone application in the Northeast Region and offers great potential for other park units in the region.

Cape Cod National Seashore Wayside Exhibits to Enhance Trail Safety and Visitor Understanding[42]

The Province Lands Bicycle Trail winds through the outer dunes of Cape Cod, a primary resource of the seashore that is difficult to access in most areas because of the fragile nature of the dunes. The trail crosses coastal heathland and wetland ecosystems containing species of concern. A ride along this trail also reveals astounding views into history, including a monument to the Pilgrim's landing, a lighthouse, and an early life-saving station. This popular trail receives heavy use and is under-going extensive rehabilitation, but does not currently tell the story of the area or encourage resource protection. If visitors leave the trail, they may damage fragile resources and could be exposed to safety hazards such as prevalent poison ivy and tick-borne Lyme Disease.

This project would fund the development and production of six wayside exhibits to interpret dune ecology, wetlands, park unit history, and Native American culture along the rehabilitated Province Lands Bicycle Trail in Cape Cod National Seashore. If installed, the wayside exhibits would provide compelling interpretation of area's unique natural, historical and archeological resources, enhancing visitor enjoyment and understanding. Exhibits would seek to inspire appreciation and stewardship of fragile resources by the public, and to encourage visitors to stay on the trail, thereby reducing the resource damage and potential for exposure of visitors to safety hazards.

Visitor Wayfinding in Gateway National Recreation Area: Fort Hancock District, Sandy Hook Unit[43]

The Fort Hancock Historic District is 380 acres at the center of the Fort Hancock and Sandy Hook Proving Ground National Historic Landmark within the much larger Gateway National Recreation Area. The District includes a complex of roadways and over 100 historic buildings. Today, approximately 500,000 visitors tour the District annually to visit major National Park Service attractions including the Sandy Hook Lighthouse and three public museum buildings. Many of the other former military buildings are used by various National Park Service Education Partners including a high school, college and marine research laboratory. The present highway-standard road markers were installed in the 1970s. Many of these original road markers are missing and intersections are left unmarked. As a result, visitors are frequently lost or disoriented.

This project would fund the purchase and installation of 40 historical replica road markers for road intersections in the Fort Hancock Historic District. It would also fund two building signs, anticipated to include the name and date of construction, for each of nine National Park Service public and operational buildings in the Fort Hancock Historic District. The project also includes design, production and installation of a Historic District Directory sign to be placed at the entrance of the District as a wayfinding aid to visitors. The design and placement of all signs will be in accord with the Cultural Landscape Treatment Plan and Fort Hancock Sign Plan. The new markers would be replicas of those used at the fort during its historic period. Present National Park Service buildings signs also date from the 1970s and 1980s. They are worn and there is no consistency in their design or condition. The design of new building markers would reflect the historic character of the District and also include interpretive

[42] PMIS #131052
[43] PMIS #125335

and visitor information and support the OUT WITH THE OLD action from *A Call to Action*. This project would meet the standards outlined in the 2002 Sign Plan and 2006 Cultural Landscape Treatment Plan for the design and placement for all markers in the Fort Hancock Historic District.

Mobile App for Visitors to Chesapeake Bay National Trails and Parks[44]

A mobile web application would be developed and marketed that will build upon the existing partnership managed website for the Captain John Smith National Historic Trail, previously discussed, to supplement websites of the four National Trails, two National Park Service regions, and National Park units in the Chesapeake Bay watershed. The project partnership would be primarily between the Captain John Smith National Historic Trail and Potomac Heritage National Scenic Trail to develop integrated recreation and interpretation opportunities and offerings at overlapping segments that connect National Park Service and public and non-profit sites, gateways and access points.

The mobile web app would provide geo-located sites and activities on demand for visitors to develop self-guided experiences based on existing information available on national trail and park unit websites. The app would be available on iTunes or an equivalent provider and promoted through related trail and park unit websites, especially the Star-Spangled Banner National Historic Trail website (starspangledtrail.net) and Captain John Smith National Historic Trail website (smithtrail.net). Data would be fed into the app from the meta-database currently under development for the STSP website. This meta-database builds on the existing database used by the Captain John Smith National Historic Trail (smithtrail.net) and Chesapeake Bay Gateways and Water Trails Network (www.baygateways.net) and will be expanded other related data, such as data for Potomac National Heritage Scenic Trail, within the Bay watershed. As described previously, this tool promotes the GO DIGITAL action of *A Call to Action* by enhancing the digital experience in the National Park Service.

Traveler Information Stations for the Booker T. Washington National Monument [45]

Although Booker T. Washington National Monument (BOWA) is a long-established site, only minimal signage exists along the access routes to this park. Current signage does little more than serve to direct visitors to the park. No significant information is imparted on these signs. Beyond the park borders, there are not yet any visitor contact stations, kiosks, or wayside exhibits in the surrounding towns' visitor centers or in areas of high visibility. Even though this park unit is in a rural area, relatively simple information distribution mechanisms can help increase awareness, and therefore visitation, of this important cultural site.

As it stands now, only a small number of brown directional signs points the way for visitors to locate the visitor center. Many visitors find the monument by happenstance and tour the trail as an unguided experience. Increasing visitation at this rural area park unit by improving its visibility is a priority of this planned project. As envisioned, the Traveler's Information Stations would meet and exceed these present shortcomings by explaining ways to visitors to safely make their way to the park and by

[44] PMIS #166118
[45] PMIS #163799

presenting interpretive information, all via a low radio frequency that can be accessed by tuning in on their car or any portable radio. Once these stations are in place, a potential visitor to the park would have access to a repeating stream of information which would encourage them to travel to this small remote park and provide them with the assistance needed to have a safe, quality experience while traveling.

Funding for this project would be used to purchase and install three radio transmitters, referred to as Traveler's Information Stations or InfoMaxs, along Virginia Interstate 220, Virginia 460 and Booker T. Washington Highway. These stations would be used to encourage visitors to travel to the Booker T. Washington National Monument, inform them of the services available at the monument, present information on weather conditions, road construction/detours, interpretation, and, most importantly of all, encourage public safety.

These improvements will promote the OUT WITH THE OLD action of *A Call to Action* by replacing older forms of interpretive media with new technologies that can provide visitors with real-time data.

6.2 Access & Mobility

In 2008 FHWA's Eastern Federal Lands Highway Division and the National Park Service conducted congestion survey of all units in the Northeast Region as an element of the regional LRTP process. Fifty-three of the Northeast Region park units responded to the survey. Additional surveys of some Northeast Region park units were distributed in 2010 as part of a national NPS effort (10 Northeast Region park units responded to the survey). Both sets of surveys identified that the most frequent influence of congestion was on visitor experience. Among the influences of congestion to visitor experience cited were:

- Delays, inconvenience and frustration
- Crowding and noise at scenic vistas, historic buildings, and sacred places
- Parking facilities and roads detracting from the cultural landscape
- Inability to appreciate the cultural and natural experience
- Safety conflicts between vehicles and pedestrians
- Dissuades future visits

6.2.1 Congestion Survey Results

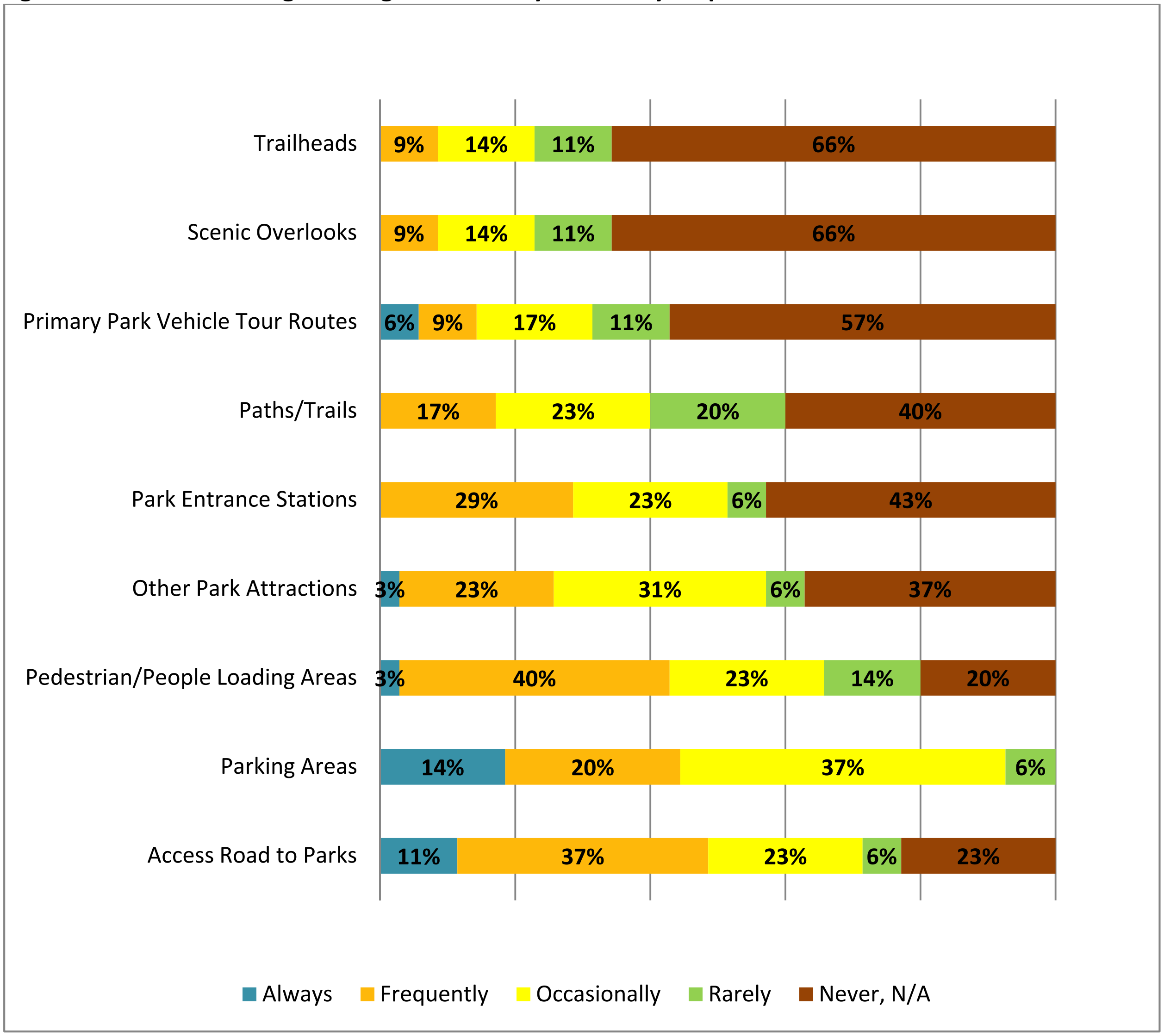
Key findings of the larger region-wide congestion survey are listed below. The findings from the sampling of Northeast Region park units in the national survey are similar.

- Two thirds of the park units in the Northeast Region that responded to the congestion survey indicated that they are experiencing congestion-related issues in or adjacent to their parks
- About 70 percent of respondents indicated that facilities are being used by non-park users

- Of park units experiencing congestion, 40 percent responded that congestion is impacting resources
- Of park units experiencing congestion, 57 percent responded that congestion is influenceing visitor experiences
- Alternative Transportation and Ranger Traffic Management are the two management strategies being deployed most frequently today
- Limited data exist that quantifies congestion

The two congestion surveys expanded beyond the typical roadway traffic focus of state, regional, and municipal congestion surveys. Several congestion “emphasis areas” were evaluated, including park unit access roads, parking areas, entrance stations, trails/paths, and pedestrian loading areas. These emphasis areas provide an organizational framework for the Congestion Management Program (CMP) and the identification of strategies to address congestion within the park units. The most congested locations most frequently reported are along access roads to the park units, at parking areas, and at pedestrian loading/waiting areas. The severity of the congestion for each emphasis area is depicted in Figure 6-2. These data are presented for the 35 park units reporting some form of congestion.

Figure 6-2 Northeast Region Congestion Survey Results by Emphasis Area



6.2.2 Current Congestion Management Strategies

About three quarters of the park units reporting congestion are actively working to manage it through a variety of strategies, as illustrated in Table 6-3. Of those park units that indicated they have congestion within their boundaries, 43 percent are managing congestion with alternative transportation, while 37 percent are using park rangers to manage traffic. All of these park units reported the need to implement more strategies to address congestion.

Table 6-3 Strategies Currently Used by Northeast Region park units to Address Congestion

Strategy Used by Park	Number of Parks Using the Strategy	Percent of Parks Using the Strategy
Alternate. Transportation System (ATS)	15	43%
Traffic Information	7	20%
Park Ranger Traffic Management	13	37%
Reservation System	10	26%
Fast Pass	0	0%
Variable Message Signs	5	14%
Highway Advisory Radio	1	3%
Other	2	6%
Number of Parks Reporting Congestion	35	

"Other" responses include wayfinding signage and overflow parking.

The NER Congestion Management System white paper[46] evaluated and prioritized potential congestion management projects at Northeast Region park units. Some findings about the types of projects include:

- There is often lack of hard data regarding the magnitude and duration of congestion at a park and accordingly it is best to invest first in collecting data before implanting larger, high-cost projects.
- Wayfinding in particular was identified as a relatively simple means of reducing visitor frustration, and it was noted that the lack of wayfinding was in part because wayfinding was typically excluded or a low-priority for available funding programs.
- Most of the congestion is experienced outside of the park units and the park units need to work with the gateway communities and state DOTs to address the problems. Many of the recommended "external" projects involve signage and coordination with state 511 systems.
- Several projects to reduce congestion involve increasing options for non-automobile access to the park units. Several projects for bicycle trails and for coordination with local transit agencies are included in the Northeast Region's current Alternative Transportation Program.
- Several transportation systems are proposed to help manage visitor use. The congestion study highlights the need to first carefully study the influence that these systems would have on visitor experience to determine both how well they might be accepted by visitors and to identify opportunities to enhance those systems with an interpretive experience.

[46] Vanasse Hangen Brustlin, Inc. and Eastern Federal Lands Highway Division, "Congestion Management System Study", White Paper. 2011.

6.2. 3 Future Opportunities to Enhance Visitor Experiences: Access & Mobility

The findings of the NER Congestion Management Study were used by the Northeast Region to develop a prioritized project list based on a constrained funding scenario of $1,500,000 per year. The ITS and signage projects include the following types and amounts.

- Data collection system enabling projects to quantify the magnitude, time and duration of peak parking demand and traffic demands/queuing at entrance stations. These systems are not real-time, but rather less-complex data logging systems that can be used during visitor transportation planning studies. Four projects of each type are budgeted at a total cost of $1.3 million.
- Consistent with *Call to Action* strategies to improve traveler information and visitor engagement through a renewal of out-dated signage and interpretive information, fourteen signage projects, at a total cost of $600,000, are proposed for the Northeast Region. The projects range from modified signage at the Valley Forge NHP visitor center to visitor wayfinding along Route 340 in Front Royal for Shenandoah NP.

Most of the currently planned projects to improve access focus on providing alternative transportation options to or within park units for improved mobility and better community connections.

Enhance Visitor Connection to the Captain John Smith Chesapeake National Historic Trail[47]

In Charles City County, Virginia funding would be used to build a concrete boat ramp 28 feet in width by 50 feet in length with two tending piers; shoreline protection and stabilization with a riprap apron for the ramp and a 120 foot bulkhead; additional parking for 12 boat trailers; and a bio-retention basin for storm water control. The boat ramp would allow water access for individual citizens to the James River. A boat ramp at Lawrence Lewis Jr. Park would allow public access where it does not currently exist to the James River and will enhance visitor connection to the Captain John Smith Chesapeake National Historic Trail (CAJO or Trail). According to recent water trail maps there is no other public boat ramp in this section of the James in Charles City, Prince Georges or Surry counties.

The Captain John Smith Chesapeake National Historic Trail (CAJO) Comprehensive Management Plan (CMP) approved in March, 2011 designates the James River as a “high potential route segment,” following specific criteria described in the CMP and consistent with National Trails System Act definition -- which emphasize scenic value and opportunities to vicariously experience historic routes. Trail management actions place a priority on protecting associated resources and values and enhancing exceptional opportunities for visitors on route segment designated as “high potential.” Importantly, this project would better connect Lawrence Lewis Jr. Park to the Trail and to several National Park Service and Fish & Wildlife Services units including Colonial National Historical Park, Petersburg National Battlefield, Richmond National Battlefield, James River National Wildlife Refuge and Presquile National Wildlife Refuge. All of these sites are along the trail route in the James River segment.

[47] PMIS #182622, 182623

Planning and design of two access points on Cat Point Creek are planned in Richmond County, Virginia. The project would plan and design a canoe/kayak launch and floating dock at the north end of the Menokin shoreline, which provides public access to the water from the land and to the land from the water. The project also plans for the construction of a covered viewing shelter at a second point at the southern end of the shoreline, which allows the public to view the flora and fauna of the creek in a comfortable setting.

The project plans for public access to resources that Captain Smith explored in 1609 and thereby advances the development of the Captain John Smith Chesapeake National Historic Trail (CAJO or Trail). The CAJO CMP (approved in March, 2011) designates the Rappahannock River as a "high potential route segment," following specific criteria described in the CMP and consistent with National Trails System Act definitions. Importantly, this project will help connect Menokin and CAJO to the Rappahannock River Valley NWR and Fredericksburg-Spotsylvania NMP, both along the trail corridor.

Both projects also contribute toward the goal articulated in the Strategy for Protecting and Restoring the Chesapeake Bay Watershed issued under Executive Order 13508 to "increase public access to the Bay and its tributaries by adding 300 new public access sites by 2025."

Regional Visitor Shuttle Study at Delaware Water Gap National Recreation Area[48]

This project will study, test, and implement a regional alternative transportation system (ATS) for Delaware Water Gap National Recreation Area. The ATS will provide access from the area communities, which provide visitor lodging and services, to park resources. The ATS will provide partnership opportunities for adjacent communities, state/local governments, and numerous public and private businesses/groups. The goal of this project is to coordinate and connect existing/new systems to best serve park visitors and reduce traffic/congestion in the park unit. This project is part of a comprehensive effort by the National Park Service to provide multimodal ATS at DEWA.

A second project will make traffic safety improvements on the major roads in the park unit including the consolidation of informal roadside parking into formal trailhead and river access parking areas that will accommodate shuttle bus access. A third project will make improvements to the bicycle and hiking trail system in the park unit.

The Regional Visitor Shuttle and the improvements to bicycle and hiking trails will allow visitors to access the park unit and its most popular activities without the use of private vehicles. Visitors can transfer to river/trail transportation (public or private), utilize segments of both, and return to their vehicle/lodging, all without the use of their private vehicles.

[48] PMIS #144369

7.0 ON-GOING VISITOR EXPERIENCE RESEARCH

A number of other transportation related visitor experience research efforts are currently underway that will continue to refine the policy and frame planning guidance to ensure that transportation systems in the national park system contribute positively to visitor experiences. Examples include:

The National Long Range Transportation Plan has compiled a group of subject matter experts from across the National Park Service to work on the visitor experience subject area team for the National Long Range Transportation Plan. The subject area teams were created to incorporate service-wide views and expectations for transportation into the National Long Range Transportation Plan process and ensure that this final plan broadly considered transportation and its relationship to National Park Service program areas. The visitor experience subject area will, at a national level, address issues related to the needs and experiences of potential and actual visitors to park units as related to travel planning and information, roads and congestion, multi-modal opportunities, range of options, access and accessibility, interpretation, and education.

A contract is underway out of the Washington Administrative Support Office, Park Facility Management Division, Facilities Planning Branch that will explore the relationship between visitor experience and transportation at a regional and park level. Two park units within the Pacific West Region (Mount Rainier National Park and John Day Fossil Beds National Monument) have been identified as pilot case studies that will include compilation, testing, and analysis of data related to visitor experiences with transportation, as well as priority needs identification and recommended best practices. These case studies will be combined with an already completed case study at Golden Gate National Recreation Area (including Muir Woods National Monument and Fort Point National Historic Site). Key trends related to visitor experience and transportation throughout the Pacific West Region will also be analyzed, although the specific factors to be analyzed have yet to be determined.

The Long Range Transportation Planning Guidebook is also currently under revision through the Facilities Planning Branch and the Denver Service Center Planning Division. This will include a "toolbox" of resources to assist Long Range Transportation Plan practitioners in incorporating visitor experience into Long Range Transportation Plans. The guidebook and toolbox will build upon the existing draft, as well as lessons learned from other efforts, including those listed above and this effort in the Northeast Region.

Finally, the Northeast Region is engaged in on-going planning to embrace and integrate these themes and actions into their transportation program. For example, The Volpe Center is in the process of analyzing opportunities to better connect urban park units of the region to their adjacent communities drawing on such factors as population densities (both total and under-represented constituents), car ownership, access to transit, and regional trail connections. The next section of this report highlights “Best Practices” and other project opportunities to incorporate new technologies and information systems into the transportation systems of the Northeast Region.

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APPENDIX

- Appendix A
  National Park Service, Public Use Statistics Office, Northeast Region Park Visitation for CY 2011
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Appendix A

- National Park Service, Public Use Statistics Office, Northeast Region Park Visitation for CY 2011

Northeast Region Park Visitation for CY 2011

Park Name	Recreation Visitors	Non-Recreation Visitors	Total Visitors
Acadia National Park	2,374,645	47,100	2,421,745
Adams National Historical Park	219,975	2,475	222,450
African Burial Ground National Monument	108,585		108,585
Allegheny Portage Railroad National Historic Site	118,410	180	118,590
Appomattox Court House National Historical Park	258,917		258,917
Assateague Island National Seashore	2,105,419	3,600	2,109,019
Bluestone National Scenic River	41,670		41,670
Booker T. Washington National Monument	24,030	84	24,114
Boston African American National Historic Site	379,906		379,906
Boston National Historical Park	2,546,156	65,520	2,611,676
Cape Cod National Seashore	4,454,771	29,548	4,484,319
Castle Clinton National Monument	3,985,366	666	3,986,032
Colonial National Historical Park	3,414,577	2,058,516	5,473,093
Delaware Water Gap National Recreation Area	4,986,700	112,277	5,098,977
Edgar Allan Poe National Historic Site	14,711		14,711
Eisenhower National Historic Site	58,022		58,022
Eleanor Roosevelt National Historic Site	50,074		50,074
Federal Hall National Memorial	187,109	2,507	189,616
Fire Island National Seashore	519,173	238,761	757,934
Flight 93 National Memorial	265,246		265,246
Fort McHenry NM and Historic Shrine	641,254	720	641,974
Fort Necessity National Battlefield	193,479	120	193,599
Fort Stanwix National Monument	102,874		102,874
Frederick Law Olmsted National Historic Site	4,022	24	4,046
Fredericksburg & Spotsylvania NMP	908,836	1,161,840	2,070,676
Friendship Hill National Historic Site	30,039		30,039
Gateway National Recreation Area	7,697,727	1,167,719	8,865,446
Gauley River National Recreation Area	109,780		109,780
General Grant National Memorial	104,769	670	105,439
George Washington Birthplace NM	130,647	7,200	137,847
Gettysburg National Military Park	1,124,659	74,400	1,199,059
Governors Island National Monument	402,174		402,174
Hamilton Grange National Memorial	7,817	36	7,853
Hampton National Historic Site	32,165	600	32,765
Home of Franklin D. Roosevelt NHS	125,488		125,488
Hopewell Furnace National Historic Site	44,873	600	45,473
Independence National Historical Park	3,572,770		3,572,770
John F. Kennedy National Historic Site	18,466		18,466
Johnstown Flood National Memorial	105,906	153,613	259,519
Longfellow National Historic Site	46,596		46,596

Northeast Region Park Visitation for CY 2011 (continued)

Park Name	Recreation Visitors	Non-Recreation Visitors	Total Visitors
Lowell National Historical Park	520,452	3,968	524,420
Maggie L. Walker National Historic Site	10,779		10,779
Marsh-Billings-Rockefeller National Historical Park	29,049		29,049
Martin Van Buren National Historic Site	19,287	720	20,007
Minute Man National Historical Park	1,002,833		1,002,833
Morristown National Historical Park	222,395		222,395
New Bedford Whaling National Historical Park	273,862		273,862
New River Gorge National River	1,071,088	2,400	1,073,488
Petersburg National Battlefield	213,261	377,989	591,250
Richmond National Battlefield Park	139,376	147,545	286,921
Roger Williams National Memorial	50,909	71,720	122,629
Sagamore Hill National Historic Site	53,336		53,336
Saint Paul's Church National Historic Site	14,926	557	15,483
Saint-Gaudens National Historic Site	32,695		32,695
Salem Maritime National Historic Site	737,073		737,073
Saratoga National Historical Park	65,043	94,810	159,853
Saugus Iron Works National Historic Site	11,121	45,625	56,746
Shenandoah National Park	1,209,883	10,962	1,220,845
Springfield Armory National Historic Site	16,161		16,161
Statue of Liberty National Monument	3,749,982		3,749,982
Steamtown National Historic Site	111,725	11,592	123,317
Thaddeus Kosciuszko National Memorial	1,949		1,949
Theodore Roosevelt Birthplace NHS	6,537	103	6,640
Theodore Roosevelt Inaugural NHS	17,107		
Thomas Edison National Historical Park	55,284		55,284
Thomas Stone NHS	6,351		6,351
Upper Delaware S&RR	270,390	2130	272,520
Valley Forge NHP	1,303,046		1,303,046
Vanderbilt Mansion NHS	367,680		367,680
Weir Farm NHS	22,415		22,415
Women's Rights NHP	25,426	1344	26,770

Not all parks collect non-recreational visitor counts

Source: National Park Service, Public Use Statistics Office.

Appendix B

- National Park Service, Public Use Statistics Office, Northeast Region 2002-2006 Recreation Visits by park
- National Park Service, Public Use Statistics Office, Northeast Region 2007-2011 Recreation Visits by park

2002 -2006 Calendar Year Recreation Visits by park

Park	2002	2003	2004	2005	2006
Acadia NP	2,558,572	2,431,062	2,207,847	2,051,484	2,083,588
Adams NHP	173944	215659	239504	220467	225318
African Burial Ground NM	0	0	0	0	0
Allegheny Portage Railroad NHS	146484	129995	126441	115357	121009
Appomattox Court House NHP	177,219	155,031	152,453	136,827	145,804
Assateague Island NS	2,117,458	2,020,666	2,048,789	1,996,502	1,932,817
Bluestone NSR	55,115	50,302	39,590	45,146	46,093
Booker T. Washington NM	19,188	17,906	18,513	16,357	18,339
Boston African American NHS	299,958	227,200	236,353	327,921	255,060
Boston NHP	1,801,100	1,617,503	1,897,505	1,992,242	1,944,386
Cape Cod NS	4,455,931	4,066,365	4,106,840	3,712,812	4,487,716
Castle Clinton NM	2,976,795	2,941,250	2,949,231	3,487,307	3,415,397
Colonial NHP	3,324,188	3,329,139	3,327,573	3,338,695	3,344,018
Delaware Water Gap NRA	5,165,415	5,059,410	5,052,264	5,052,264	5,254,216
Edgar Allan Poe NHS	12,314	10,830	11,005	11,879	12,409
Eisenhower NHS	76,518	69,017	72,272	67,669	70,243
Eleanor Roosevelt NHS	71,189	58,843	53,765	52,690	14,493
Federal Hall NMEM	177,146	120,152	156,707	0	12,800
Fire Island NS	763,992	629,858	819,161	670,456	636,030
Flight 93 NMEM	0	0	0	0	0
Fort McHenry NM & HS	673,823	607,357	627,659	620,636	622,419
Fort Necessity NB	89,407	95,957	105,688	102,004	223,111
Fort Stanwix NM	77,863	56,646	68,427	38,237	60,589
Frederick Law Olmsted NHS	7,938	6,906	6,814	2,775	1,559
Fredericksburg & Spotsylvania NMP	464,890	443,634	443,030	534,636	499,324
Friendship Hill NHS	32,854	34,876	30,018	29,188	25,636
Gateway NRA	9,014,438	8,567,769	8,228,573	8,294,353	8,456,456
Gauley River NRA	188,613	148,793	155,183	128,796	116,854
General Grant NMEM	79,548	68,057	83,010	80,046	105,657
George Washington Birthplace NM	138,084	79,541	74,525	59,089	135,870
Gettysburg NMP	1,833,033	1,769,688	1,724,420	1,705,601	1,666,365
Governors Island NM	0	2,507	11,312	11,559	43,135
Hamilton Grange NMEM	13,435	13,378	12,902	15,287	6,369
Hampton NHS	28,226	27,526	28,182	24,407	29,297
Home of Franklin D. Roosevelt NHS	125,949	105,026	103,671	108,611	117,166
Hopewell Furnace NHS	60,733	53,694	50,246	49,980	49,239
Independence NHP	2,972,104	2,712,277	4,087,918	3,951,073	3,532,245
John F. Kennedy NHS	9,417	9,330	11,073	7,616	6,490
Johnstown Flood NMEM	136,135	105,361	115,020	111,987	112,239
Longfellow NHS	20,319	43,329	30,380	36,660	43,108

2002 -2006 Calendar Year Recreation Visits by park (continued)

Park	2002	2003	2004	2005	2006
Lowell NHP	742,016	684,856	677,639	722,458	632,234
Maggie L. Walker NHS	12,323	11,517	10,913	7,968	7,803
Marsh-Billings-Rockefeller NHP	31,940	33,037	29,205	28,660	22,484
Martin Van Buren NHS	16,036	14,594	13,686	10,445	24,735
Minute Man NHP	1,179,317	1,176,283	1,072,149	1,027,033	1,084,041
Morristown NHP	336,509	328,057	310,041	241,897	277,748
New Bedford Whaling NHP	344,563	332,538	343,468	332,935	343,774
New River Gorge NR	1,215,875	1,111,164	1,151,782	1,045,814	1,124,688
Petersburg NB	167,563	162,547	158,167	143,455	152,889
Richmond NBP	106,397	96,014	84,876	68,438	141,151
Roger Williams NMEM	58,243	54,482	50,677	50,668	52,671
Sagamore Hill NHS	42,526	42,396	41,082	38,009	43,719
Saint Paul's Church NHS	14,573	11,473	13,938	13,869	14,431
Saint-Gaudens NHS	34,239	30,907	30,725	26,943	25,858
Salem Maritime NHS	759,402	649,132	782,791	676,216	761,945
Saratoga NHP	142,812	106,862	114,007	98,394	99,581
Saugus Iron Works NHS	17,243	14,001	16,316	14,522	11,153
Shenandoah NP	1,389,244	1,163,950	1,261,000	1,094,912	1,076,150
Springfield Armory NHS	36,680	29,814	33,393	14,389	17,115
Statue of Liberty NM	3,408,560	3,231,247	3,618,053	4,235,595	3,263,585
Steamtown NHS	127,766	114,855	106,433	88,031	61,178
Thaddeus Kosciuszko NMEM	6,390	4,675	4,686	4,107	3,990
Theodore Roosevelt Birthplace NHS	9,376	10,175	11,082	11,158	10,713
Theodore Roosevelt Inaugural NHS	15,634	15,920	13,898	13,032	13,218
Thomas Edison NHP	54,935	3,359	0	0	8,753
Thomas Stone NHS	4,824	4,801	5,940	4,500	5,019
Upper Delaware S&RR	296,095	256,987	225,565	248,953	200,338
Valley Forge NHP	1,158,423	1,132,976	1,088,271	1,293,001	1,340,679
Vanderbilt Mansion NHS	403,016	359,982	405,264	372,517	391,899
Weir Farm NHS	16,113	15,455	11,333	11,129	11,795
Women's Rights NHP	21,880	19,426	19,772	18,239	16,146

Park Units showing 0 (zero) visitation were either not open during the given year or data is missing for that year
Source: National Park Service, Public Use Statistics Office.

2007 -2011 Calendar Year Recreation Visits by park

Park	2007	2008	2009	2010	2011
Acadia NP	2,202,228	2,075,857	2,227,698	2,504,208	2,374,645
Adams NHP	224,880	241,536	253,656	73,339	219,975
African Burial Ground NM	0	0	0	117,113	108,585
Allegheny Portage Railroad NHS	123,215	113,991	118,931	107,363	118,410
Appomattox Court House NHP	149,255	178,748	185,443	216,220	258,917
Assateague Island NS	2,110,918	2,011,438	2,129,658	2,106,090	2,105,419
Bluestone NSR	48,061	46,942	45,904	37,790	41,670
Booker T. Washington NM	19,410	19,990	21,216	21,665	24,030
Boston African American NHS	265,459	280,279	298,519	333,463	379,906
Boston NHP	2,184,889	2,232,495	2,155,026	2,060,497	2,546,156
Cape Cod NS	4,351,609	4,644,235	4,311,949	4,653,706	4,454,771
Castle Clinton NM	3,509,468	3,727,030	4,080,152	4,126,378	3,985,366
Colonial NHP	3,343,910	3,332,039	3,324,751	3,459,965	3,414,577
Delaware Water Gap NRA	4,836,229	5,127,074	5,213,030	5,285,761	4,986,700
Edgar Allan Poe NHS	14,258	12,961	17,463	16,584	14,711
Eisenhower NHS	69,747	70,757	64,212	61,210	58,022
Eleanor Roosevelt NHS	59,846	53,632	54,393	53,067	50,074
Federal Hall NMEM	127,432	212,564	204,880	178,749	187,109
Fire Island NS	616,233	604,577	569,667	613,057	519,173
Flight 93 NMEM	143,725	136,091	149,668	137,837	265,246
Fort McHenry NM & HS	574,924	598,050	605,870	611,582	641,254
Fort Necessity NB	353,296	127,672	197,271	264,450	193,479
Fort Stanwix NM	59,643	71,263	93,170	103,748	102,874
Frederick Law Olmsted NHS	2,010	2,969	5,007	3,285	4,022
Fredericksburg & Spotsylvania NMP	469,920	473,841	906,175	899,936	908,836
Friendship Hill NHS	32,576	30,623	31,454	32,562	30,039
Gateway NRA	8,813,204	9,431,021	9,010,522	8,820,757	7,697,727
Gauley River NRA	118,169	112,262	113,185	107,223	109,780
General Grant NMEM	84,171	91,436	100,874	119,665	104,769
George Washington Birthplace NM	101,844	99,975	113,083	128,158	130,647
Gettysburg NMP	1,647,745	1,455,951	1,013,002	1,031,554	1,124,659
Governors Island NM	69,014	205,010	325,840	409,207	402,174
Hamilton Grange NMEM	0	690	150	0	7,817
Hampton NHS	30,062	35,260	39,334	32,153	32,165
Home of Franklin D. Roosevelt NHS	114,195	124,073	123,033	140,251	125,488
Hopewell Furnace NHS	56,013	49,328	53,186	55,750	44,873
Independence NHP	3,705,538	4,076,638	3,967,694	3,751,007	3,572,770
John F. Kennedy NHS	8,896	10,090	16,333	17,466	18,466
Johnstown Flood NMEM	126,066	135,308	114,350	100,799	105,906
Longfellow NHS	49,246	59,827	39,065	45,684	46,596

2007 -2011 Calendar Year Recreation Visits by park (Continued)

Park	2007	2008	2009	2010	2011
Lowell NHP	519,706	574,410	565,960	540,475	520,452
Maggie L. Walker NHS	8,026	7,367	9,853	12,331	10,779
Marsh-Billings-Rockefeller NHP	32,179	37,121	31,129	31,209	29,049
Martin Van Buren NHS	19,678	21,216	23,216	21,055	19,287
Minute Man NHP	1,107,254	1,067,578	1,096,024	1,073,748	1,002,833
Morristown NHP	296,651	277,203	298,060	278,392	222,395
New Bedford Whaling NHP	327,047	281,512	279,803	277,681	273,862
New River Gorge NR	1,178,012	1,212,854	1,144,318	1,151,213	1,071,088
Petersburg NB	154,619	154,003	162,722	175,553	213,261
Richmond NBP	132,578	120,823	134,634	130,415	139,376
Roger Williams NMEM	49,348	46,154	50,397	51,559	50,909
Sagamore Hill NHS	43,698	53,772	53,800	55,149	53,336
Saint Paul's Church NHS	14,909	14,538	14,432	16,362	14,926
Saint-Gaudens NHS	29,091	29,819	34,558	30,941	32,695
Salem Maritime NHS	843,520	856,935	723,088	806,506	737,073
Saratoga NHP	106,708	88,834	89,366	63,719	65,043
Saugus Iron Works NHS	4,377	12,433	10,529	10,775	11,121
Shenandoah NP	1,107,227	1,075,878	1,120,981	1,253,386	1,209,883
Springfield Armory NHS	13,548	17,358	17,779	16,876	16,161
Statue of Liberty NM	3,380,296	3,555,244	3,829,483	3,833,288	3,749,982
Steamtown NHS	70,726	71,123	65,144	104,855	111,725
Thaddeus Kosciuszko NMEM	4,633	3,918	3,357	2,888	1,949
Theodore Roosevelt Birthplace NHS	13,098	18,590	14,390	15,029	6,537
Theodore Roosevelt Inaugural NHS	14,147	834	11,735	17,491	17,107
Thomas Edison NHP	9,342	8,027	27,061	63,009	55,284
Thomas Stone NHS	4,886	5,720	6,268	6,004	6,351
Upper Delaware S&RR	248,284	284,347	258,311	306,468	270,390
Valley Forge NHP	1,298,161	1,275,871	1,449,228	1,617,511	1,303,046
Vanderbilt Mansion NHS	398,125	360,334	380,460	390,525	367,680
Weir Farm NHS	12,536	18,522	19,386	19,313	22,415
Women's Rights NHP	18,657	23,093	20,620	22,662	25,426

Park Units showing 0 (zero) visitation were either not open during the given year or data is missing for that year

Source: National Park Service, Public Use Statistics Office.

Appendix C

- National Park Service, Public Use Statistics Office, Northeast Region 2002-2011 Seasonal Visitation

Ten Year Analysis of Seasonal Visits by Type of NER Parks

Month of Year	Visits to Cultural Parks				Visits to Recreational Parks			
	Monthly % of Annual Visits ('02 to '06)	Monthly % of Annual Visits ('07 to '11)	Change in Monthly Share of Annual Visits ('02/'06 to '07/'11)	Change in Seasonal Share of Annual Visits ('02/'06 to '07/'11)	Monthly % of Annual Visits ('02 to '06)	Monthly % of Annual Visits ('07 to '11)	Change in Monthly Share of Annual Visits ('02/'06 to '07/'11)	Change in Seasonal Share of Annual Visits ('02/'06 to '07/'11)
January	2.94%	3.18%	8.17%	-1.64%	2.94%	3.06%	3.92%	0.78%
February	3.59%	3.29%	-8.55%	**Winter**	3.06%	3.03%	-1.14%	**Winter**
March	6.23%	5.94%	-4.55%		4.35%	4.33%	-0.55%	
April	8.96%	8.78%	-1.99%	-2.27%	6.44%	6.31%	-2.03%	1.94%
May	10.26%	10.14%	-1.14%	**Spring**	8.48%	9.01%	6.22%	**Spring**
June	11.31%	11.58%	2.45%		11.69%	11.98%	2.46%	
July	15.36%	14.84%	-3.40%	0.00%	17.50%	16.69%	-4.63%	-1.24%
August	12.29%	12.54%	1.98%	**Summer**	16.82%	16.77%	-0.27%	**Summer**
September	8.66%	9.38%	8.38%		11.07%	11.14%	0.67%	
October	9.67%	9.80%	1.36%	3.13%	8.87%	8.82%	-0.57%	0.48%
November	6.06%	5.97%	-1.53%	**Fall**	5.38%	5.48%	1.84%	**Fall**
December	4.67%	4.56%	-2.51%		3.40%	3.39%	-0.20%	

Appendix D

- Area Classifications and Park Type for Northeast Region Parks.

Parks by Area Classification and Trip Purpose

Park	Urban Area	Suburban Area	Rural Area	Outlying Area	Recreation	Cultural/ Historical
Acadia NP			✓		✓	
Adams NHP		✓				✓
African Burial Ground NM	✓					✓
Allegheny Portage Railroad NHS				✓		✓
Appomattox Court House NHP				✓		✓
Assateague Island NS			✓		✓	
Bluestone NSR			✓		✓	
Booker T. Washington NM			✓			✓
Boston African American NHS	✓					✓
Boston NHP	✓					✓
Cape Cod NS			✓		✓	
Castle Clinton NM	✓					✓
Colonial NHP		✓				✓
Delaware Water Gap NRA				✓	✓	
Edgar Allan Poe NHS	✓					✓
Eisenhower NHS				✓		✓
Eleanor Roosevelt NHS				✓		✓
Federal Hall NMEM	✓					✓
Fire Island NS		✓			✓	
Flight 93 NMEM			✓			✓
Fort McHenry NM & HS	✓					✓
Fort Necessity NB			✓			✓
Fort Stanwix NM	✓					✓
Frederick Law Olmsted NHS	✓					✓
Fredericksburg & Spotsylvania NMP				✓		✓
Friendship Hill NHS			✓			✓
Gateway NRA	✓				✓	
Gauley River NRA			✓		✓	
General Grant NMEM	✓					✓
George Washington Birthplace NM			✓			✓
Gettysburg NMP				✓		✓
Governors Island NM	✓					✓
Hamilton Grange NMEM	✓					✓
Hampton NHS		✓				✓
Home of Franklin D. Roosevelt NHS				✓		✓
Hopewell Furnace NHS		✓				✓
Independence NHP	✓					✓
John F. Kennedy NHS	✓					✓
Johnstown Flood NMEM				✓		✓

Parks by Area Classification and Trip Purpose (Continued)

Park	Urban Area	Suburban Area	Rural Area	Outlying Area	Recreation	Cultural/ Historical
Longfellow NHS		✓				✓
Lowell NHP	✓					✓
Maggie L. Walker NHS	✓					✓
Marsh-Billings-Rockefeller NHP			✓			✓
Martin Van Buren NHS				✓		✓
Minute Man NHP		✓				✓
Morristown NHP		✓				✓
New Bedford Whaling NHP	✓					✓
New River Gorge NR			✓		✓	
Petersburg NB	✓					✓
Richmond NBP	✓					✓
Roger Williams NMEM	✓					✓
Sagamore Hill NHS		✓				✓
Saint Croix Island			✓			
Saint Paul's Church NHS		✓				✓
Saint-Gaudens NHS			✓			✓
Salem Maritime NHS		✓				✓
Saratoga NHP				✓		✓
Saugus Iron Works NHS		✓				✓
Shenandoah NP			✓		✓	
Springfield Armory NHS	✓					✓
Statue of Liberty NM	✓					✓
Steamtown NHS	✓					✓
Thaddeus Kosciuszko NMEM	✓					✓
Theodore Roosevelt Birthplace NHS	✓					✓
Theodore Roosevelt Inaugural NHS	✓					✓
Thomas Edison NHP		✓				✓
Thomas Stone NHS				✓		✓
Upper Delaware S&RR				✓	✓	
Valley Forge NHP		✓				✓
Vanderbilt Mansion NHS				✓		✓
Weir Farm NHS			✓			✓
Women's Rights NHP				✓		✓

Appendix E

- Northeast Region Alternative Transportation Systems (2011)

Alternative Transportation Systems in the NER (2011)

		Park	State	ATS Project	Status	Operator
1	ACAD	Acadia	ME	Island Explorer	Existing	Regional Transit
2	ADAM	Adams	MA	Adams Trolley	Existing	NPS Contractor
4	BOHA	Boston Harbor Islands	MA	Island Ferries	Existing	Private
5	BOST	Boston NHP	MA	Charlestown Water Shuttle	Existing	Regional Transit
6	CACO	Cape Cod	MA	Coast Guard Beach Trams	Existing	NPS
	CACO	Cape Cod	MA	Provincetown Shuttle	Existing	Regional Transit
	CACO	Cape Cod	MA	FLEX	Existing	Regional Transit
7	COLO	Colonial	VA	Historic Triangle Shuttle	Pilot	Regional Transit
8	EISE	Eisenhower	PA	Eisenhower Shuttle	Existing	NPS Contractor
9	ELRO	Home of Eleanor Roosevelt	NY	Val-Kill Tram	Existing	NPS Contractor
10	FIIS	Fire Island	NY	Island Ferries	Existing	Private
11	GATE	Gateway	NY	Sandy Hook Ferry	Existing	Private
12	GATE	Gateway	NY	Riis Park Ferry	Existing	Private
13	GETT	Gettysburg	PA	Freedom Shuttle	Pilot	Regional Transit
14	GOIS	Governor's Island	NY	Island Ferry	Existing	State
15	HOFR	Home of FDR	NY	Roosevelt Ride	Existing	NPS Contractor
	HOFR	Home of FDR	NY	FDR Tram	Existing	NPS Contractor
16	JOFL	Johnstown Flood	PA	Lakebed Tours	Existing	NPS
	JOFL	Johnstown Flood	PA	Path of Flood Tours	Proposed	NPS
17	LOWE	Lowell	MA	Electric Trolley	Existing	NPS
18	MABI	Marsh Billings	VT	Full Circle Trolley	Pilot	Regional Transit
19	MIMA	Minute Man	MA	Concord Shuttle	Proposed	NPS Contractor
22	SHEN	Shenandoah	VA	Camp Rapidan Tour	Existing	NPS
23	STEA	Steamtown	PA	Live Steam	Existing	NPS
24	STLI	Statue of Liberty	NY	Liberty Ferries	Existing	NPS Contractor
25	VAFO	Valley Forge	PA	Revolutionary Shuttle	Pilot	NPS Contractor

Transportation Asset Inventory

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White Paper: Identifying the Transportation Asset Inventory for the Northeast Region Long Range Transportation Plan[1]

BOOZ | ALLEN | HAMILTON

BACKGROUND

The National Park Service (NPS) is undertaking long range transportation planning on national, regional, and park unit levels, in accordance with guidance from the Department of the Interior (DOI) and to comply with Department of Transportation (DOT) legislative requirements.

From fall 2011 to spring 2012, the Northeast Region Office (NERO) of the NPS engaged in a process of defining its inventory of transportation-related assets in preparation for developing its Long Range Transportation Plan (LRTP).

To support servicewide asset management, including the documentation of inventory specifications, the NPS maintains a comprehensive database, the Facility Management Software System (FMSS). The FMSS tracks asset value, condition, units of measure, and other important information. The FMSS designates assets into several asset types, such as roads, buildings, and trails. While these asset types sometimes correspond with transportation systems, the FMSS does not currently identify assets by the NPS-defined transportation systems: on-road, non-motorized, water, aviation, and transit.

The NER sought to understand what assets in its portfolio should be considered in long range transportation planning, what transportation systems these assets belong to, and, if the asset has multiple uses, what share of that asset's use can be attributed to transportation.
This document presents the methodology used to develop that inventory and some of the primary findings.

PROBLEM STATEMENT

In order to effectively develop a long-range (20 year) plan for its transportation systems and networks, the NER must as one of the first steps document what assets constitute all of the transportation systems in the region.

METHODOLOGY

The inventory was developed in two stages. First, 15 parks were sampled. The inventory was later expanded to include all parks in the region.

[1] *Version [1.0], Last Update 05/31/2012*

Preliminary Inventory

In the fall of 2011, the NER selected the 15 parks with the highest number of assets listed in the Facility Management Software System (FMSS) in order to gain an initial understanding of its transportation inventory. Each of these parks evaluated its own asset portfolio and designated which assets were transportation-related. The parks were provided limited guidance to determine their transportation inventories.

There were 23 park units[2] comprising the 15 parks included in the preliminary inventory. These units encompassed 8,322 assets.[3] Of these assets:

- 5,788 were reviewed and marked as "Not a Transportation Asset."
- 2,119 were put on a "Culled List," which included:
    - Transportation Assets (1,948)
    - Needs Review (129)
    - Boardwalk (1)
    - Walkway (13)
    - Sidewalk (5)
    - Planned (22)
    - One asset on this list did not have a comment indicating how it was evaluated (Great Meadow Loop (70) Trail at Acadia National Park).
- There were 415 assets that were initially reviewed as transportation assets but were not included in the "Culled List."

Region-wide Inventory

Changes in the Dataset for the 15 Parks

In early 2012, the NER began evaluating the entirety of its asset portfolio to determine the subset of transportation assets. The NER pulled a dataset of assets from the FMSS on 2/13/12 which contained 14,530 location records at 102 park units. Of these, 8,272 assets had been previously evaluated in the preliminary inventory effort.

- 50 assets were included in the preliminary (9/6/11) dataset that did not appear in the dataset pulled for the comprehensive inventory analysis. These assets were removed from the FMSS as a result of either data cleanup (49)[4] or disposition (1).

At the original 15 parks (23 units) evaluated in 2011, there were 8,367 total assets in the FMSS dataset pulled on 2/13/12, a net increase of 45 assets from the original FMSS dataset.

- 95 assets were included in the February 2012 dataset that do not appear in the preliminary list from September 2011. These 95 assets were added to the FMSS between 9/6/11 and 2/13/12, and are either new assets to the park, or appear as the result of data cleanup efforts.

---

[2] Parks included were: ACAD, AFBG, ASIS, BOST, CACL, CACO, DEWA, ELIS, ELRO, FRSP, GATE, GETT, GOIS, HOFR, LOWE, MASI, MIMA, SACR, SHEN, STLI, VAFO, VAMA

[3] The database analyzed was pulled from the FMSS on 9/6/11.

[4] Data cleanup included the removal of zeroes at the beginning of the Location Numbers - there were 49 assets which had zeroes removed, and all were either water or waste water systems, and were not counted as transportation assets.

Methodology for First Draft of a Comprehensive NER Inventory

The NER enhanced the 15 park inventory evaluation methodology by expanding the analysis to all parks in the region. In addition, the NER not only designated whether an asset was a transportation asset, but which of six different transportation systems each transportation asset aligned to: on-road, non-motorized, water, aviation, transit, or multi-modal. In addition, the NER evaluated the portion of each asset that could be considered transportation-related where the asset had multiple uses (such as at visitor centers).

The dataset for all parks in the region constituted 14,530 assets. This list was used to develop a draft list of transportation assets by transportation type. In the first draft the NER used the FMSS Asset Type field to classify "transportation" assets, as shown in Table 1.

Table 1: Asset Types & Location Descriptions Used for First Draft of Inventory

Asset Types	Location Description	Transportation System
• Roads • Parking Lots • Road Bridges • Road Tunnels	• <u>Buildings</u> with “entrance station” in description • <u>Electrical systems</u> with “street light” in description	➡ **On-road**
• Trails • Trail Bridges • Trail Tunnels		➡ **Non-motorized**
• Constructed Waterways • Marinas	• <u>Buildings</u> with “light house” or “ferry terminal” in description • <u>Fleet</u> assets with “boat” in description	➡ **Water**
• Aviation System		➡ **Aviation**
• Railroads		➡ **Transit**

In addition, the NER used several criteria to determine if assets were <u>not</u> transportation-related:

Table 2: Criteria Excluding Assets from Transportation Inventory, First Draft

Preliminary Inventory	Asset Types	Asset Category	Facility Types
If the asset had been determined not t[illegible] a transp[illegible] ass[illegible]e [illegible]nary inventory	Site/A[illegible]	[illegible]	Post Offices
	Water System		
	[illegible]ste Water System		Schools
	Heati[illegible]ling Plant		
	Solid Waste/Re[illegible]		Housing
	Monuments/Memorials		
	Maintained Archeological Sites		Dormitories/Ba[illegible]
	Fortifications		
	Towers/Silos		[illegible]ystems
	[illegible]hitheaters		

If the asset had no asset code

For the remaining assets, including Maintained Landscapes, Boundaries, Buildings, Electrical Systems, Communication Systems, Fuel Systems, Dam/Levee/Dike, and Fleet asset types, the NER used the definitions shown in Figure 1 to guide transportation asset designations.

Figure 1 What are the NPS transportation systems?[5]

- **Transit systems** = bus, trolley, tram, rail transportation; stops; loading areas; routes; maintenance facilities
- **Water systems** = waterways, boat transportation, loading areas, maintenance facilities
- **On-road systems** = roads, bridges, parking lots, lighting, signage, traveler information, entry gates, etc.
- **Aviation** = air transport, runways, maintenance facilities, loading areas, air tour management
- **Non-motorized systems** = trails, pedestrians, bicycles, horses, pack animals, way-finding, etc.

Modifications to Initial Methodology

After developing a first draft transportation inventory, the NER classified each asset depending on the confidence level of the transportation system designation barring input from the parks. The NER developed the following modifications to the methodology:

- All roads should be considered part of the "On-road" system, and should not be counted as part of a "Transit" system due to the negligible O&M impact of transit vehicles
- Need to review trail assets to distinguish those used for access (“transportation trails”) versus those used for recreation
- Internal park vehicles should not be included in a park's transportation assets
  - Public does not use asset
  - Ranger vehicles serve law enforcement function
  - Maintenance equipment is responsibility of the maintenance program, not the transportation program. It is too difficult to distinguish maintenance equipment as those used for transportation systems versus those used for other functions - do NOT count maintenance vehicles / facilities as transportation assets
- There are no animal-driven transportation systems in NER - those that exist are recreational only
- Any assets with status of EXCESS, REMOVED, or DECOMMISSIONED should be excluded from the inventory

Transportation vs. Recreational Trails

[5] Source: Long Range Transportation Planning for the National Park Service, LRTP Webinar Series – 2011, Webinar 2: Asset Management and Long Range Transportation Planning, “Asset Management NPS LRTP v2011Oct24 final.pptx”

In particular, the NER developed several criteria for determining if trails were "transportation trails" or "recreational trails," as shown in the filtering process in Table 3. Trails constitute a large share of the NPS asset portfolio, but not all the NPS's trails serve a transportation function in that they are either destinations in themselves or do not contribute to park circulation via other modes such as personal vehicle or transit.

Table 3: Criteria for Trail Designations

Order Applied	Criteria	Action
1	Location Description contains "sidewalk," "pave," "boardwalk," "walkway," "bike," or "multi use/multiuse path"	Transportation
2	All locations with "nature" or "culvert" in description	Recreational
3	All trails that are Class I or Class II	Recreational
4	All APPA trails (Appalachian Trail)	Recreational
5	LocSpecTemp "Area" field = "Urban"	Transportation
6	Area=Rural, Class IV, TRLWIDTH >= 6, API > 70	Transportation
7	Class IV or V, API > 80	Transportation
8	LocSpecTemp "Area" field = "Backcountry" or "Rural"	Recreational
9	Area=Frontcountry, API < 80, Class III, TRLWIDTH < 8	Recreational
10	Area=Frontcountry, API < 80, TRLWIDTH < 6	Recreational
11	Trail Bridge Width < 6	Recreational
12	API >= 80 but Facility Type is blank (no Trail Class)	Recreational
13	API < 80	Recreational

Application of Revised Methodology

The NER transportation office contacted a few parks, such as Steamtown National Historic Site, with questions about particular assets.

This effort resulted in some changes to the inventory originally identified at the 15 preliminary parks. The net result of these changes was a reduction from 2,119 transportation assets at these parks to 1,991 transportation assets, a reduction of 128 assets.

- A total of 216 assets were removed from the preliminary inventory due to changes in the methodology
- 80 assets that had originally been marked as "not transportation" were changed to "transportation" assets, based on the updated methodology
- 8 new assets were added based on additions to the dataset between 9/6/11 and 2/13/12

The resulting transportation inventory for the NER contains 3,104 assets in the FMSS, out of a total of 14,530 that were included in the entire NER asset portfolio.

Alternative Transportation System Asset Additions

Due to a lack of information regarding transit assets and rolling stock recorded in the FMSS, the NER undertook a separate effort to develop an inventory of Alternative Transportation Systems (ATS) throughout the region. All ATS information was captured in an offline database called the Alternative Transportation Management System (ATMS).

The NER evaluated this list of ATS assets, compared them to the FMSS data available, and identified 47 assets included in the ATMS database that were definitively not recorded in the FMSS.

The NER added these 47 records to the list of FMSS location records in an Excel spreadsheet. While these records did not have all the data recorded for assets in the FMSS, the NER was able to match some information to FMSS data fields: park, current replacement value (CRV), occupant, status, and historic (Y/N).

Final Methodological Tweaks

After reviewing the 50 transportation assets with the highest CRV, the NER transportation office recommended reducing the transportation-related share of some assets such as the Jacob Riis parking lot at Gateway National Recreation Area due to the minimal use for transportation purposes of some of these assets. The NER further suggested that 3 assets of the 50 highest value transportation assets be removed from the inventory.

OBSERVATIONS/ANALYSIS

In the final analysis, the NER identified 3,148 assets within its transportation asset portfolio. These include both NPS and partner owned assets. The NER did not identify any Aviation or Multi-Modal transportation assets as part of its LRTP inventory. The results shown below represent analysis conducted in an Excel spreadsheet entitled “NER_LRTP_Data_Analysis_2012-05-21.xlsx.” In addition, an evaluation of the changes to the inventory’s CRV and deferred maintenance (DM) as a result of the inventory identification process is included as an Appendix.

<u>All Assets Included in the NER Transportation Inventory</u>

Asset Type	Count	% Count	CRV	% CRV	DM	% DM
Transportation Assets	3,148	21.6%	$ 3,114,330,894	10.7%	$ 570,919,302	25.5%
Other Assets	11,429	78.4%	$ 26,116,299,803	89.3%	$ 1,669,607,363	74.5%
All NER Assets	**14,577**	**100.0%**	**$ 29,230,630,697**	**100.0%**	**$ 2,240,526,665**	**100.0%**

Transportation Type	Count	% Count	CRV	% CRV	DM	% DM
On-road	2,686	85.3%	$ 2,632,638,158	84.5%	$ 467,954,424	82.0%
Non-motorized	230	7.3%	$ 155,156,359	5.0%	$ 20,487,456	3.6%
Water	114	3.6%	$ 194,730,198	6.3%	$ 64,539,102	11.3%
Transit	118	3.7%	$ 131,806,178	4.2%	$ 17,938,321	3.1%
All Transportation Assets	**3,148**	**100.0%**	**$ 3,114,330,894**	**100.0%**	**$ 570,919,302**	**100.0%**

The NER’s transportation inventory includes 3,148 assets that are collectively worth over $3.1 billion. The transportation inventory makes up over 20% of its total inventory, but only accounts for 10% of the total portfolio current replacement value (CRV). However, the NER's transportation assets account for 25% of the NER's total DM backlog, indicating that the region's transportation systems are in poorer condition than the rest of the asset portfolio.

When looking at the NER's transportation assets by system type, on-road assets make up over 80% of the inventory, CRV, and DM of the region's total transportation portfolio. Special attention should be paid to the region's water-based transportation systems, which have a disproportionately high DM backlog compared to their value and count.

NPS-owned Assets with an Active[6] Status

Asset Type	Count	% Count	CRV	% CRV	DM	% DM
Transportation Assets	2,898	28.0%	$ 2,773,472,828	11.9%	$ 490,154,916	24.7%
Other Assets	7,451	72.0%	$ 20,438,442,827	88.1%	$ 1,490,715,873	75.3%
All NER Assets	**10,349**	**100.0%**	**$ 23,211,915,656**	**100.0%**	**$ 1,980,870,790**	**100.0%**
Transportation Type	**Count**	**% Count**	**CRV**	**% CRV**	**DM**	**% DM**
On-road	2,529	87.3%	$ 2,428,760,003	87.6%	$ 442,473,182	90.3%
Non-motorized	208	7.2%	$ 146,749,553	5.3%	$ 18,584,174	3.8%
Water	65	2.2%	$ 90,324,896	3.3%	$ 11,457,656	2.3%
Transit	96	3.3%	$ 107,638,375	3.9%	$ 17,639,904	3.6%
All Transportation Assets	**2,898**	**100.0%**	**$ 2,773,472,828**	**100.0%**	**$ 490,154,916**	**100.0%**

When the NER's asset portfolio is filtered to only examine those assets that are NPS-owned and have a status of Operating, Operating/Obsolete, Inactive, and Excess, the results change slightly. The NER's NPS-owned, active transportation inventory consists of 2,898 assets that are collectively worth almost $2.8 billion.

The NPS-owned, active transportation inventory makes up almost 30% of its total inventory, but still only accounts for little more than 10% of the total portfolio current replacement value (CRV). However, the NER's NPS-owned, active transportation assets still account for almost 25% of the NER's total deferred maintenance (DM) backlog, indicating that the region's transportation systems are in poorer condition than the rest of the NPS-owned, active asset portfolio.

The NPS-owned, active water-based transportation assets are in significantly better condition than all water-based transportation assets, representing only 2% of the NPS-owned, active transportation system DM backlog, as compared to 11% of the total transportation system DM backlog.

Recommendations/Next Steps

The process that the NERO transportation program managers followed, as documented in this white paper, was specific to the NER asset portfolio and the NERO's rigorous transportation program management. While draft national LRTP guidance as well as input from the Washington Service Office (WASO) informed this process, the NER developed a specific methodology based on the best available

[6] Active Statuses = OPERATING, OPER/OBSO, INACTIVE, and EXCESS

dataset and through iterative reviews by NERO planners and park staff. In order for the NPS national, regional, and park unit LRTPs to be consistent and comparable, other regional offices and transportation planning teams can use the NER's methodology to inform their own efforts. Likewise, any updates to the NER LRTP should refer back to this methodology.

Resources

The following list of individuals contributed to the development of this White Paper.

Name	Work Group/Company Name	E-mail Address	Date Resource Added
Bob Holzheimer	NPS	Bob_Holzheimer@nps.gov	
Peter Steele	NPS	Peter_Steele@nps.gov	
John Tauscher	NPS	John_Tauscher@nps.gov	
Jeremy Sewall	Booz Allen Hamilton	Sewall_Jeremy@bah.com	
Jason Coccia	Booz Allen Hamilton	Coccia_Jason@bah.com	
Tom Crikelair	Tom Crikelair Associates	tom@crikelair.com	
Ruth Bonsignore	Vanasse Hangen Brustlin	RBonsignore@VHB.com	
William Cranshaw	Vanasse Hangen Brustlin	WCranshaw@VHB.com	

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APPENDIX

<u>Northeast Region Transportation Inventory Process and Resulting Changes to DM & CRV</u>
May 21, 2012

NOTE: For the sake of simplicity, all figures presented in this document include all identified transportation assets, regardless of ownership or status.

From fall 2011 to spring 2012, the Northeast Regional Office (NERO) engaged in a process of defining its inventory of transportation-related assets in preparation for writing its Long Range Transportation Plan. This document presents the process followed and the impacts to the inventory's deferred maintenance (DM) and current replacement value (CRV) at each step.

First 15 Inventory 9/6/11		First 15 Original as of 3/27/12	First 15 Inventory Changes	Apply Transportation Percentage	Added Parks Inventory	Total NER Inventory
DM:	$770,103,418	$841,839,659	$816,427,586	$774,460,848	$94,068,849	$868,529,697
CRV:	$3,788,513,614	$3,954,155,353	$3,640,317,741	$3,539,101,316	$806,466,912	$4,345,568,228

Top 50 Changes:	Final Big 15	Added Parks	Total NER
DM:	$480,994,156	$89,925,146	$570,919,302
CRV:	$2,440,932,981	$624,937,411	$3,065,870,392

1. NER 15 Park Inventory

In the fall of 2011, the NER selected the 15 park management units with the highest number of assets listed in the Facility Management Software System (FMSS) in order to gain an initial understanding of its transportation inventory. This effort was led by WASO Facility Planning Program, who had each park evaluate its own asset portfolio and designate which assets were transportation-related.

There were 23 park units[7] evaluated in the "15" park inventory, encompassing 8,322 assets. The database analyzed was dated 9/6/11.

Of the 8,322 assets:

- 5,788 were reviewed and marked as "Not a Transportation Asset."
- 2,119 were put on a "Culled List," which included:
  - o Transportation Assets (1,948)
  - o Needs Review (129)
  - o Boardwalk (1)
  - o Walkway (13)
  - o Sidewalk (5)
  - o Planned (22)
  - o One asset on this list did not have a comment indicating how it was evaluated (Great Meadow Loop (70) Trail at ACAD).

[7] Parks included were: ACAD, AFBG, ASIS, BOST, CACL, CACO, DEWA, ELIS, ELRO, FRSP, GATE, GETT, GOIS, HOFR, LOWE, MASI, MIMA, SACR, SHEN, STLI, VAFO, VAMA

- There were 415 assets that were initially reviewed as transportation assets but were not included in the "Culled List."

The total DM and CRV of the Culled List as of 9/6/11 was:
- DM = $770 million ($770,103,418)
- CRV = $3.8 billion ($3,788,513,614)

2. Changes as Result of Updates to FMSS

In early 2012, the NER began evaluating the entirety of its asset portfolio to determine the subset of transportation assets. At the original 23 park units evaluated in 2011, there were 8,367 total assets in the dataset pulled on 2/13/12, a net increase of 45 assets from the original dataset.

> 50 assets were included in the 9/6/11 dataset that do not appear in the dataset pulled for the total NER inventory analysis (dated 2/13/12). These assets were removed from the FMSS as a result of either data cleanup (49)[8] or disposition (1).
>
> 95 assets were included in the 2/13/12 dataset that do not appear in the list pulled 9/6/11. These 95 assets were added to the FMSS between 9/6/11 and 2/13/12, and are either new assets to the park, or appear as the result of data cleanup efforts.[2] This does NOT include 30 assets later added to the 15 park NER inventory from Tom Crikelair's list of alternative transportation systems.

Between 9/6/11 and 3/27/12 (when the 2/13/12 dataset was refreshed with the most current DM and CRV values), the DM and CRV of the 2,119 assets on the Culled List changed. On 3/27/12, the DM and CRV of the Culled List were:
- DM = $842 million ($841,839,659)
- CRV = $3.9 billion ($3,954,155,353)

3. Changes to the 15 Park Transportation Inventory

By 3/8/12, the NER had identified a master list of transportation assets. This resulted in some changes to the inventory originally identified at the first set of 15 parks. The net result of these changes was a reduction from 2,119 transportation assets at these parks to 1,991 transportation assets (minus 128 assets).
- A total of 216 assets were removed from the 15 park inventory
- 80 assets that had originally been marked as "not transportation" were changed to “transportation” assets.
- 8 new assets were added based on additions to the dataset between 9/6/11 and 2/13/12

In addition, the master NER inventory effort included a designation of how much of each asset could be attributed to a transportation system as a "transportation percentage."

As a result, the DM and CRV of the transportation assets at the original 15 parks changed:

[8] Data cleanup includes the removal of zeroes at the beginning of the Location Number - there were 49 assets which had zeroes removed, and all were either water or waste water systems, and were not counted as transportation assets

PRIOR to application of "transportation percentage":

- DM = $816 million ($816,427,586)
- CRV = $3.6 billion ($3,640,317,741)

AFTER application of "transportation percentage":

- DM = $774 million ($774,460,848)
- CRV = $3.5 billion ($3,539,101,316)

4. Additions to the NER Transportation Inventory

In the process of identifying transportation assets throughout the NER, the regional inventory increased by 1,113 assets at 47 new parks (not including assets identified by Tom Crikelair).

These 1,113 new assets added the following to the NER's transportation DM and CRV:

- DM = $94 million ($94,068,849)
- CRV = $806 million ($806,466,912)

The total DM and CRV for the NER inventory was:

- DM = $868 million ($868,529,697)
- CRV = $4.3 billion ($4,345,568,228)

5. Final Values for Comparison

Note that after reviewing the 50 highest value assets, VHB suggested removing three from the inventory, and adjusting the transportation percentages at some others.

The resulting values for the 15 parks:

- DM = $481 million ($480,994,156)
- CRV = $2.4 billion ($2,440,932,981)

The final values for the entire inventory:

- DM = $571 million ($570,919,302)
- CRV = $3.1 billion ($3,065,870,392)

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White Paper: Estimating Total Funds Spent for Operations, Maintenance, and Capital Projects on the Northeast Region's Transportation Asset Inventory[1]

BOOZ | ALLEN | HAMILTON

BACKGROUND

From fall 2011 to spring 2012, the Northeast Regional Office (NERO) of the National Park Service (NPS) took steps to define its inventory of transportation-related assets for inclusion in its regional long range transportation plan (LRTP).

The identification of the NER's transportation asset inventory will enable the NER to document estimates about the value, condition, and needs required to keep its transportation systems functioning, an important step in developing the LRTP. One key aspect in preserving these assets is identifying the total amount of funding needed to support these assets in perpetuity. To do so requires developing projections for operations and maintenance (O&M) as well as capital project spending needs.

Developing an estimate of maintenance need can be accomplished by establishing a baseline of past funding in conjunction with developing estimates of future funding required to keep those same assets operating at a high level of service and in good condition.

This white paper addresses the development of the baseline of past funding. It documents estimates of the total amount of funds spent on the NER's transportation inventory from all possible fund sources and programs in fiscal year (FY) 2011.

PROBLEM STATEMENT

As part of its LRTP, the NER needs to include a reliable estimate of past spending, by fund source, for its transportation inventory. It is recognized that parks rely on a variety of fund sources for both O&M and capital requirements to sustain transportation systems. However, identifying the line between what is considered O&M versus capital projects is sometimes subjective. This lack of distinction makes it challenging to say exactly how much and which fund sources are used for O&M versus major repairs, system rehabilitation, and capital improvements. Even so, while not black and white, estimating the amount spent on transportation from each possible NPS fund source will give the NER a better idea of the past total annual investments and support estimates of future funding needs or requirements for its transportation asset portfolio.

[1] *Version [1.0], Last Update 06/18/12*

METHODOLOGY

Calculating funds spent on transportation assets by fund source can be attempted using existing NPS accounting and asset management data. Collecting new or raw data should be kept to a minimum in order to keep the evaluation as simple as possible. Methods were used to first calculate ONPS (base funding) spending on transportation assets, then all funding sources were examined.

A separate white paper documents attempts to estimate the amount of funds spent from the park's base Operations of the National Park Service (ONPS) funds, entitled "Estimating Operations & Maintenance Costs for the Northeast Region's Transportation Asset Inventory." In summary, several methodologies were proposed to estimate the amount of actual ONPS funds spent and the unconstrained amount of O&M funds required to maintain the transportation inventory in good condition. These included:

- **Past Actual Spending:**
    - FMSS work orders
        - Sum the total actual cost of all work orders for the NER's identified transportation assets with a work type of FO and a sub work type of RM or PM for each park.
        - This method does not allow for estimates by funding source, as the source of work order funding is not recorded.
    - Federal Real Property (FRP) Data
        - Total the O&M figures for the NER's identified transportation assets as reported to the Federal Real Property Profile (FRPP).
        - This method solely estimates ONPS funds spent. The methodology for calculating the original O&M figures reported to the FRPP is included as an appendix.
    - Park Asset Management Plans (PAMPs)
        - Match the location records listed in the PAMP optimizer files with the identified transportation inventory and total the planned O&M amounts for all transportation assets.
        - It is assumed that all planned O&M amounts use only ONPS funding. Parks may have recorded lower planned O&M on certain assets for which they anticipated receiving funds from other sources (e.g., Regular Cyclic).
- **Estimate of Future Need / Requirements:**
    - Park Asset Management Plans (PAMPs)
        - Match the location records listed in the PAMP optimizer files with the identified transportation inventory and totaled the required O&M amounts for all transportation assets based on O&M models used during PAMP development for each park.
    - Two Percent of Current Replacement Value (CRV)
        - Use two percent of the transportation percentage adjusted CRV for all its transportation assets.

In order to calculate the amount of funds spent on the NER's identified transportation inventory from all funding sources, a separate effort modeled on the methodologies used to calculate O&M on its transportation assets.

1. Identify total actual spending from each of the following funding sources for a fiscal year (FY), in this case FY 2011:
    a. Actual spending for several fund sources is pulled from AFS III data (park primary work element [PWE] accounts): ONPS, Cyclic, Repair/Rehab, Recreation Fee Program
    b. FLHP program funding uses PTATS data for both FHWA and NPS managed projects. In PTATS, the FHWA funding for projects is the "WASO Approved Amount"; NPS managed project funds are the "AFS Total Obligated Amount".
    c. TRIP funding was found using an internal Excel file provided by NPS Facility Planning Program.
    d. Concession Franchise Fee funding was provided by the NER Budget Office
    e. Transportation Fee Authority funding can be estimated using park provided data; in this case, data from the recent Alternative Transportation System (ATS) Financial Analysis Studies for ACAD and ROVA provide up-to date figures

Funding Program	Source Data
ONPS	PWE accounts: MV*, MW*, MY*, MZ*
Cyclic	PWE accounts: MC*
FLHP Cat I	PTATS, Request year 2011
FLHP Cat III	PTATS, Request year 2011
Repair/Rehab	PWE accounts: MA*, MTL
Recreation Fee Program	PWE accounts: M2*, M8*
TRIP	NPS Facility Planning Program
Concession Franchise Fee	NER Budget Office
Transportation Fee Authority	ATS Financial Study for ACAD & ROVA

2. Determine the portion of the total funding attributed to transportation assets
    a. Assume that all FLHP funding, Transportation Fee Authority, and TRIP funds were spent solely on transportation assets
    b. Cannot achieve greater granularity in Concession Franchise Fee funding without auditing each park's Concession Franchise spending
    c. Distribute funds to transportation assets based on PWE account codes and asset categories. For example, the following accounts are considered to show spending on transportation assets: Roads and Bridges, Trails and Trail Bridges, and Marina/Water Systems.

    Note that although a pro-ration process was used for the initial assessment of O&M spending,[2] this approach was not considered valuable for other funding sources for several reasons:

    1. The proration of PWE funds assumes that parks will distribute funds from each program in the same way that they planned to spend their ONPS budget. In reality, parks may spend a higher or lower share of non-ONPS program funds on transportation. For example, a park might focus its Cyclic program funds on trails and its Repair/Rehabilitation funds on roads.
    2. The proration of the PWE roads, trails, and water cost element funds to specific asset codes assumes that no other PWE cost element funding would go towards those asset

[2] See methodology used to estimate O&M for FRPP reporting described in the attached appendix.

codes. However, PWE cost elements do not tie directly to asset codes, and some PWE cost elements, such as Natural Resources, might be applied to a broad array of asset codes.

3. Any more detailed examination of PWE accounts would require analysis of each line item and still necessitate subjective evaluation of whether spending was on the region's transportation system or not.

Observations/Analysis

The results are shown separately for O&M funding sources and capital project funding sources, and split out by PWE cost element.

Funding Program	Program Purpose	Work Types Applicable for Funds
ONPS	Basic park operating budget	O&M, Capital
Cyclic	Competitive project funding for recurring (cyclic) maintenance needs that do not occur annually	O&M, Capital
FLHP Cat I	Preserving the existing park roads and parkways infrastructure condition	Capital
FLHP Cat III	Supports alternative transportation systems	Capital
Repair/Rehab	Competitive project funding for major repair or rehabilitation needs	Capital
Recreation Fee Program	Enhance recreation & visitor experience	O&M, Capital
TRIP	Supports Alternative Transportation Systems (ATSs)	O&M, Capital
Concession Franchise Fee	Concessioners may use franchise fees collected for a variety of reasons	O&M, Capital
Transportation Fee Authority	May be used to operate the park's Alternative Transportation System (ATS)	O&M, Capital

O&M Funding Sources

Funding Category	O&M Funding			
	ONPS (Base)	Regular Cyclic	Transportation Fee Authority	Total O&M
All Financial (PWE) Accounts	$ 90,179,126	$ 23,397,412	$ 781,563	$ 114,358,102
NER Transportation Accounts	$ 6,534,343	$ 4,825,294	$ 781,563	$ 12,141,201
Roads and Bridges Account	$ 3,835,774	$ 3,496,050		$ 7,331,824
Trail and Trail Bridges Account	$ 1,717,086	$ 1,326,293		$ 3,043,378
Marina/Water Systems Account	$ 981,484	$ 2,952		$ 984,436
All Other Accounts	$ 83,644,783	$ 18,572,118		$ 102,216,901

The NER expended a total of almost $90.2 million in ONPS funding, $23.4 million in Cyclic funding, and less than $1 million in Transportation Fee Authority funds in FY2011. Of the total spent, over $6.5 million (7.2%) in ONPS funding and $4.8 million (20.6%) of Cyclic funding went to the region's Roads, Trails, and Water-based accounts.

All Transportation Fee Authority funds were spent on O&M of the ATSs at ACAD and ROVA.

i. ACAD: most recent actual Transportation Fee Authority revenue from ATS model was $628,000 in FY09
ii. ROVA: most recent actual Transportation Fee Authority revenue from ATS model is $153,563 in FY10

When the three "transportation" PWE accounts are totaled (Roads & Bridges, Trails, and Marina/Water Systems), the NER spent $6.5 million from ONPS and $4.8 million from Cyclic funds.

With the Transportation Fee funds, this total amounts to over $12.1 million spent on O&M of the NER's transportation systems in FY2011, approximately 11% of the total O&M funds expended.

Capital Project Funding Sources

Funding Category	Project Funding						
	FLHP Cat I	FLHP Cat III	Repair / Rehabilitation	Rec Fee (80% and 20%)	TRIP	Concession Franchise Fee*	Total Project
NER Total Asset Portfolio	$ 13,682,451	$ 4,839,462	$ 20,006,175	$ 20,148,260	$ 3,701,198	$ 26,324,939	$ 88,702,485
NER Transportation Asset Categories	$ 13,545,392	$ 4,839,462	$ 1,537,165	$ 3,963,787	$ 3,701,198		$ 27,587,004
Roads and Bridges	$ 13,545,392	$ 2,752,290	$ 210,259	$ 1,454,153	$ 1,324,518		$ 19,286,613
Trail and Trail Bridges	$ -	$ 97,403	$ 1,326,905	$ 2,492,345	$ 1,976,680		$ 5,893,333
Marina/Water Systems	$ -	$ 1,989,769	$ -	$ 17,289	$ 400,000		$ 2,407,058
All Other Asset Categories	$ 137,059	$ -	$ 18,469,011	$ 16,184,473	$ -		$ 34,790,542

**The Concession Franchise Fee funds shown are 80% funds. Concession Fee funds were not broken out by project. As a result, it was not possible to estimate what share went towards transportation projects or maintenance. The 20% Concession Fee fund was considered but not included here because the vast majority of the spending did not relate to transportation systems.*

The NER expended a total of $13.7 million in FLHP Cat I, $4.8 million in FLHP Cat III, $20 million in Repair/Rehabilitation funding, $20.7 million in Recreation Fee funding, $3.7 million in TRIP funds, and $26.3 million in Concession Franchise Fee funds in FY2011.

It was possible to breakout FLHP spending by determining what share of FLHP projects were accounted for in FMSS work orders, by asset code. Only one percent of FLHP Cat I spending went towards assets other than those identified as a transportation asset category. It is assumed that this spending had a transportation purpose. Thus, all FLHP spending can be counted as transportation spending.

Of the other program spending, over $1.5 million (7.7%) in Repair/Rehabilitation funding and $4.0 million (19.7%) of Recreation Fee funding went to the region's Roads, Trails, and Marina/Water-based accounts.

The TRIP program supports park ATSs and other multi-modal projects. It was possible to break out the TRIP program funds by whether they related to on-road ATS systems, multi-modal trail projects, and marina/ferry systems, which are considered ATSs.

It was not possible to break out transportation spending from the total Concession Franchise Fee funds, but it is assumed that some portion of this spending went towards transportation projects or maintenance.

With the FLHP funds, this total amounts to at least $27 million spent on capital projects for the NER's transportation systems in FY2011, approximately 31% of the capital funds expended from these sources.

Limitations

Any application of the figures presented above should recognize several assumptions and limitations of the methodology used to find these estimates.

1. The planned distribution of ONPS funds assumes that the parks only considered ONPS funding in assigning planned figures for O&M spending in their PAMPs
2. This methodology assumes that the same methodology used for distributing ONPS funding in the PAMPs would be applied to assets added since the completion of the PAMPs. In reality, parks will update planned ONPS funding distribution to account for new assets and pending "Re-optimization" process.
3. While these funding sources have been broken out clearly into O&M versus capital project programs, in practice parks may have a more subjective interpretation of whether funds are going towards O&M activities versus capital projects

Recommendations/Next Steps

While the limitations on the methodologies used to estimate the NER's actual transportation spending preclude the region from establishing the actual costs with the desired level of precision down to the individual location record, this methodology at least provides the NER a reasonable estimate of total transportation spending for inclusion in its LRTP as well as an asset by asset category (e.g., roads, trails, and water systems).

Next steps to consider as a result of this analysis:

- Engage parks in a discussion to understand the challenges of using work orders to track actual costs
- Consider the need to indicate fund source in work order spending

Resources

The following list of individuals contributed to the development of this White Paper.

Name	Work Group/Company Name	E-mail Address	Date Resource Added
Bob Holzheimer	NPS	Bob_Holzheimer@nps.gov	
Peter Steele	NPS	Peter_Steele@nps.gov	
John Tauscher	NPS	John_Tauscher@nps.gov	
Tim Mullins	NPS	Tim_Mullins@nps.gov	
Jeremy Sewall	Booz Allen Hamilton	Sewall_Jeremy@bah.com	
Jason Coccia	Booz Allen Hamilton	Coccia_Jason@bah.com	

Last updated: June 1, 2012

APPENDIX

FRPP FY11 - O&M Calculation Process

***Goal*: Report operations & maintenance (O&M) cost for all assets reported to the NPS Federal Real Property Profile (FRPP)**

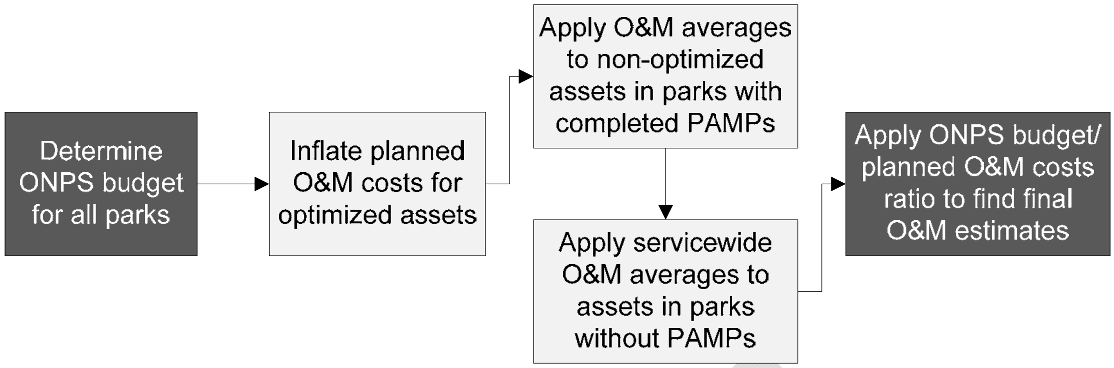
FY11 O&M Calculation Process[3]

1. **Determine ONPS budget for all park units** using AFS III data (park primary work element [PWE] accounts). NPS ran the budget data post-10/01/11 to allow park staff the maximum amount of time to obligate their funding and to ensure that budget data match Green Book data.
    a. This file was obtained from Jonathan Watkins, Budget Analyst, WASO Park Facility Management Division. Contact:
        i. Office: (202) 513-7010
        ii. Jonathan_Watkins@nps.gov
    b. Match park alphas to park PWE "Org" field
    c. Only include records where: Fund = 01
    d. Only include records showing spending from Master Accounts (Job = *)
    e. Add together values for "FFS UDO" and "FFS Expended"
    f. Only included amounts where the first two letters of the PWE codes began with MV, MW, MX, MY, or MZ.
2. **Obtain PAMP data** for all parks that have completed a PAMP.
    a. Master PAMP data file: "PAMP Analysis_032910.xlsx."
        i. Identified and removed duplicate location numbers from compiled PAMP data
        ii. Corrected locations in SACN that were misaligned to SACR
        iii. Added "CLASS" value where it was blank
        iv. Changed CLASS for 3100 locations to "OTHER" if "Land Type" was not "Campground" or "Picnic Area"
        v. Adjusted LOC_Qty and LOC_UM fields to eliminate outliers that would skew estimation of averages
            1. If recent standard location report had updated LOC_Qty and LOC_UM, and UM was correct, used new value
            2. If recent standard location report had updated Asset Code, used new asset code
            3. If asset description indicated different asset code, changed asset code
        vi. Converted values as follows: (e.g., LF --> MI)
            1. 1100: MI = LF/5280
            2. 2100: LF = SF/10
            3. 4100: Used GSF value
            4. 5100 & 5200: Where UM was "EA", changed CLASS to "OTHER"
    b. Parks missing from the master file that did have PAMP data included: AMME, CHSC, PRWI, CEBE, FOVA, GOIS, KALA, LEWI, MASI, NPSA, SACN, SLBE, STLI, & WAPA. Each of these park's optimizer files were copied into the master file in order to perform the analysis.
    c. Identify park sub-units that were included in umbrella park PAMPs, and assign those assets to the umbrella park.

[3] Only assets with a status of operating, oper/obso, excess or inactive were used in this analysis.

    d. Find the year each park completed its PAMP.

3. **Report the planned O&M costs for all optimized assets** using data from parks that have been through the Park Asset Management Plan (PAMP) process: Calculate inflated planned O&M for each asset that had been optimized, using inflation rate of 2.4% per year.
4. **Model the planned O&M costs for assets that had not been optimized**:
    a. Find average inflated planned O&M spending per unit/asset by asset type & optimizer band for each park
        i. Find the average planned O&M spent on industry-standard assets per unit of measure, by asset type & optimizer band, for each park.
        ii. Find the average planned O&M spent on non-industry-standard assets per asset, by optimizer band, for each park.
        iii. Apply inflation rates to park averages based on year of PAMP completion, using inflation rate of 2.4% per year.
        iv. Calculate the same figures for Servicewide averages, using inflated planned O&M costs.
    b. Calculate an average cost for non-optimized assets
        i. Multiply the Location Quantity by the average per unit O&M cost in each park as found above
        ii. Apply the per-asset cost for non-industry-standard asset types.
        iii. Where assets could not be matched to the same asset type and optimizer band in the same park, use the service-wide average for that asset type and optimizer band.
        iv. NB: by following this process, the estimated O&M costs will already be inflated. Do not apply the same inflation factor that is applied to optimized assets in step 3.
5. **Model the planned O&M costs for assets at parks that have not completed PAMPs**.
    a. Assign optimizer band values to assets based on optimizer formula and utilization.
        i. Optimizer band assignment:
            1. Optimizer band 1 assigned where API >= 88 and FCI <= 0.15.
            2. Optimizer band 2 assigned where API >= 75 and FCI <= 0.30.
            3. Optimizer band 3 assigned where API >= 50 and FCI <= 0.75.
            4. Optimizer band 4 assigned where API >= 21 and FCI <= 1.00.
            5. Optimizer band 5 assigned to the remaining assets.
        ii. Utilization adjustments:
            1. All “Non-utilized” assets could not have an optimizer band less than 4.
            2. All “Under-utilized” assets could not have an optimizer band less than 3.
    b. Use system-wide averages for similar asset types & optimizer bands.
6. **Find ratio of assigned O&M costs to park’s appropriated PWE funding**.
    a. Find total modeled/inflated O&M costs by park, and total PWE funding by park
    b. Multiply each park’s assets by ratio of modeled/inflated O&M costs to the park’s PWE budget so the park’s reported O&M cost is equal to the park’s appropriated PWE funding.


Determine ONPS budget for all parks
Inflate planned O&M costs for optimized assets
Apply O&M averages to non-optimized assets in parks with completed PAMPs
Apply servicewide O&M averages to assets in parks without PAMPs
Apply ONPS budget/ planned O&M costs ratio to find final O&M estimates

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White Paper: Estimating Operations & Maintenance Costs for the Northeast Region's Transportation Asset Inventory[1]

BOOZ | ALLEN | HAMILTON

BACKGROUND

From fall 2011 to spring 2012, the Northeast Region (NER) of the National Park Service engaged in a process of defining its inventory of transportation-related assets in preparation for drafting its regional long range transportation plan (LRTP).

The identification of the NER's transportation asset inventory will enable the NER to document estimates about the value, condition, and needs required to keep its transportation systems functioning, an important step in developing the LRTP. One key aspect in preserving these assets is identifying the past actual annual operations and maintenance (O&M) costs as a baseline frame of reference for developing an estimate of required future O&M costs for the NER's transportation systems.

Estimating what the NER is actually spending on operating and maintaining its transportation inventory will give perspective to future O&M requirements. However, evaluating past actual spending provides only a constrained look at need; past funding is restricted by budget limitation. This will not provide the total estimate of need for O&M funding required to preserve the NER's transportation assets in good or optimal condition, which would be the case in a scenario where funding is unlimited. This latter amount represents the unconstrained need. Unconstrained need can be estimated in terms of what the NER should spend on O&M for its transportation inventory using industry standards in a perfect (funding unlimited) world.

This white paper focuses on first evaluating past actual NER O&M spending on transportation systems for inclusion as a baseline reference in the NER LRTP. It then addresses the total future need assuming no funding limitations for O&M. A number of methodologies using existing NPS data and O&M models are needed to complete both analyses. Strengths and weakness of each approach will be highlighted, and recommendations on the best numbers to use in the NER LRTP will be provided.

PROBLEM STATEMENT

In developing its LRTP, the NER needs to determine a reliable estimate of past O&M spending and O&M requirements for the future for its transportation asset portfolio. This requires identifying and using the best cost estimating, financial accounting, and budgeting information available.

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[1] *Version [1.0], Last Update 05/31/2012*

METHODOLOGY

Calculating actual and planned O&M costs can be attempted using existing NPS asset management data. Collecting new or raw data should be kept to a minimum in order to keep the evaluation as simple as possible. Basic approaches are listed in Table 1.

Table 1: Approaches to Calculating Actual & Required O&M Costs

Approach	Description	Pros	Cons
Actuals			
FMSS work orders	Use work orders closed to calculate actual O&M (and capital) spending on transportation assets	- Actual data at the individual asset level	- At present, lack of consistent reporting of actual costs in work orders when work is performed and work order closed
Federal Real Property Data	Use annual O&M data reported to FRP to estimate transportation specific O&M <u>actual</u> costs	- Recent data for all assets in the portfolio - Data updated (reported) annually	- Approximates O&M at the individual asset level based on financial (PWE) account data - PWE account data is not asset specific
Park Asset Management Plans	Use PAMPs for parks in the region to summarize budgeted O&M spending, Component Renewal, and Capital Investment needs	- Actual data exists for all parks	- Actuals not specific to transportation data - PAMPs are dated with some more than 3 years old
Requirements			
Park Asset Management Plans	Use PAMPs for parks in the region to summarize required O&M spending, Component Renewal, and Capital Investment needs	- Projected data exists for all parks	- PAMPs are dated with some more than 3 years old
Two Percent of Current Replacement Value (CRV)	Take two percent of each asset's CRV to determine annual O&M requirements	- CRV data exists for all assets at all parks	- NPS-owned assets have high CRVs due to their unique nature and may overstate the O&M need
Total cost of facility ownership (TCFO) models	Use existing NPS TCFO models to estimate <u>future needs</u> for transportation system component O&M (as well as other life cycle [e.g., non-O&M] costs)	- Existing models - Comprehensive	- Models do not exist for all asset types, especially for transportation related asset types - Structured for use with individual assets, not portfolios

Part of the Federal Real Property Data process requires evaluating the existing PWE accounts used to track maintenance on various transportation assets and determining if the total actual spending in those transportation PWE accounts appears reasonable. Also, closed work orders will be reviewed for the past fiscal year to preliminarily gauge the completeness of that data.

After considering the pros and cons of the approaches listed in Table 1, FMSS work orders, Federal Real Property Data, and Park Asset Management Plans (PAMPs) were used to develop actual O&M estimates, and used PAMPs and two percent of current replacement value (CRV) to develop required O&M costs. The following list breaks down that analysis:

- **Actuals:**
  - FMSS work orders
    - The NER had identified its transportation inventory in a separate effort, and maintains that inventory in an Excel spreadsheet titled "NER_LRTP_Data_Analysis_2012-05-21.xlsx." All work orders closed in Fiscal Year (FY) 2011 tied to these "transportation" location records were pulled from the FMSS.
    - The NER summed the total actual cost of all work orders with a work type of FO and a sub work type of RM or PM for each park.
  - Federal Real Property Data
    - The NER used an FRP Related Information Report from the Asset Management Reporting System (AMRS) dated January 2011 with all location records from the region. Separate fields for Operations and Maintenance are included in the FRP Related Information Report.
    - Totaled the O&M figures for the NER's identified transportation assets as reported to the FRPP.
  - Park Asset Management Plans (PAMPs)
    - The NER used a compilation of all the region's PAMP optimizer files.
    - The NER matched the locations listed in the PAMP optimizer files with the identified transportation inventory and totaled the planned O&M amounts for all transportation assets.
- **Required:**
  - Park Asset Management Plans (PAMPs)
    - The NER used a compilation of all the region's PAMP optimizer files.
    - The NER matched the locations listed in the PAMP optimizer files with the identified transportation inventory and totaled the required O&M amounts for all transportation assets.
  - Two Percent of CRV
    - The NER had previously identified its transportation inventory in an Excel file titled "NER_LRTP_Data_Analysis_2012-05-21.xlsx." This file included CRV for each asset, as well as an adjusted CRV taking into account the asset's "transportation percentage."
    - The NER found two percent of the transportation percentage adjusted CRV for all its transportation assets.

These estimates are summarized collectively for the region for NPS owned and operated assets and separately for NPS and Partner owned and operated assets. The analysis is also broken down by transportation system and park unit in order to provide additional perspective on past spending and projected needs.

Observations/Analysis

The results of applying these methodologies are shown first for NPS-owned assets, split according to (1) an estimate of past actual spending, and (2) an estimate of future annual need. While it is assumed that partners will be responsible for the O&M of their own assets, it is helpful for the NER to understand the magnitude of O&M on the total asset portfolio as well.

NPS-Owned Transportation Asset O&M

Overall, applying these methodologies provide a range of estimated past actual and future needed O&M costs for the NER's transportation assets. At a minimum, the NER is spending $1.4 million in O&M on transportation assets, as indicated by actual costs recorded in FMSS work orders. In contrast, the NER may be spending closer to $7-$10 million per year on O&M for its transportation assets, based on figures from the Federal Real Property reported O&M and the PAMPs.

Regarding future O&M requirements, using two percent of CRV provides a maximum O&M cost of $57.4 million that the NER should consider spending on transportation assets. However, the PAMPs indicate that O&M requirements are closer to $17.4 million, which exceeds what the Federal Real Property and PAMP figures show the NER is actually spending on transportation O&M by about $7 million and $10 million, respectively.

Table 2: NPS-Owned Transportation System O&M Costs and Requirements by Methodology

Transportation O&M Estimates: Methodologies	Operations	Maintenance		Total O&M
	FO	RM	PM	
Actuals				
FMSS Work Orders actual reported O&M	$ 474,070	$ 433,544	$ 515,468	$ 1,423,081
Federal Real Property reported O&M	$ 6,722,043	$3,421,466		$ 10,143,509
PAMP Planned (Inflated)	$ 3,298,424	$ 2,848,361	$ 1,136,567	$ 7,283,351
Requirements				
PAMP Required (Inflated)	$ 7,491,357	$ 6,626,082	$ 3,329,301	$ 17,446,741
2% of CRV	$ 38,256,605	$19,128,303		$ 57,384,908

<u>FMSS Work Orders:</u>

The O&M cost reported in actuals for FMSS work orders is about 14% of the FRP and almost 20% of the PAMP planned amounts. This disparity between what parks planned to spend and what they actually recorded spending seems to indicate that parks are not effectively or completely capturing actual O&M costs through FMSS work orders for their transportation assets.

<u>Federal Real Property vs. PAMP Planned:</u>

The total costs for FRPP reported and PAMP Planned O&M costs are similar, with PAMP Planned costs at over 70% of the FRP reported total. This is expected because FRP reported costs are modeled on PAMP Planned costs.

The total FRPP reported amount is higher because it includes estimated O&M costs for assets that have been added to park asset portfolios since the PAMPs were completed

The Operations and Maintenance amounts are not cross-comparable because the FRPP amounts were estimated in total and then split 2/3 Operations and 1/3 Maintenance.

Total Transportation Asset O&M

When partner-owned assets are included in the analysis, the O&M costs increase slightly, as expected. At a minimum, the NER is spending $1.6 million in O&M on transportation assets, as indicated by actual costs recorded in FMSS work orders. This indicates that the NER is spending at least $200K on operating and maintaining partner-owned assets.

In contrast, the NER may actually spend closer to $8-$11 million per year on O&M for its transportation assets, based on figures from the Federal Real Property reported O&M and the PAMPs.

Regarding future O&M requirements, applying the industry standard of two percent of CRV provides a maximum O&M cost of $62.2 million that the NER may need to spend on transportation assets. However, the PAMPs indicate that O&M requirements are closer to $20.1 million, which exceeds what the Federal Real Property and PAMP figures show the NER is actually spending on transportation O&M by about $9 million and $12 million, respectively.

Table 3: Total Transportation System O&M Costs and Requirements by Methodology

Transportation O&M Estimates: Methodologies	Operations	Maintenance		Total O&M
	FO	RM	PM	
Actuals				
FMSS Work Orders actual reported O&M	$ 491,125	$ 560,437	$ 516,117	$ 1,567,679
Federal Real Property reported O&M	$ 7,031,755	$3,577,988		$ 10,609,742
PAMP Planned (Inflated)	$ 3,511,046	$ 2,969,968	$ 1,234,471	$ 7,715,485
Requirements				
PAMP Required (Inflated)	$ 8,904,002	$ 7,638,133	$ 3,580,433	$ 20,122,569
2% of CRV	$ 41,524,412	$20,762,206		$ 62,286,618

Total Transportation O&M by Transportation System

When breaking out O&M costs by type of transportation asset, it is possible to get a sense for what types of assets have more established management programs. Work orders still appear to under-report actual costs as compared to what parks planned to spend on these assets in their PAMPs. However, it appears that work orders under-report costs to maintain on-road assets more significantly than other asset types.

Actual costs to maintain transit assets appear to be most comprehensive, exceeding what was planned. This is most likely due to over $300,000 in work orders recorded on railroad assets at STEA.

Actual costs recorded for non-motorized transportation assets (trails) are more comprehensive than on-road or water assets, accounting for 32% of the planned O&M. Work order actuals for non-motorized assets exceed those recorded for on-road assets.

In comparing the two ways of estimating required O&M costs, using two percent of CRV generates a requirement three to five times higher than the PAMP-required figure for all transportation types, except non-motorized systems, where the two figures are roughly equal. The NPS O&M Calculator used for trails coincidentally strongly correlates with the two percent CRV assumption, as these models were built up from lengthy studies conducted by trail and facility managers across the service as to the most appropriate work types and costs needed on trails servicewide.

Table 4: Total Transportation O&M Costs and Requirements by Methodology and System

Transportation O&M Estimates: Methodologies	On-road Total O&M	Non-motorized Total O&M	Water Total O&M	Transit Total O&M
Actuals				
FMSS Work Orders actual reported O&M	$ 431,339	$ 470,068	$ 120,437	$ 545,835
Federal Real Property reported O&M	$ 7,310,446	$ 1,686,122	$ 996,239	$ 616,936
PAMP Planned (Inflated)	$ 4,682,444	$ 1,483,166	$ 1,218,181	$ 331,695
Requirements				
PAMP Required (Inflated)	$ 15,438,941	$ 3,006,733	$ 1,017,659	$ 659,236
2% of CRV	$ 52,652,763	$ 3,103,127	$ 3,894,604	$ 2,636,124

There are several limitations in applying these methodologies to estimating O&M.

- **Actuals:**
  - Parks do not record their actual O&M expenses accurately or consistently in the Facility Management Software System (FMSS)
  - Actual park O&M expenses are recorded for Primary Work Element (PWE) accounts, but PWE accounts do not tie to individual assets. The most granular level at which PWE spending can be compared to the asset portfolio is at the park level.
  - When parks completed their asset management plans (PAMPs), they designated what portion of their annual base funding would go to O&M on each asset. PAMPs provide a planned O&M amount, but some of these are dated, do not include the entire present asset portfolio at each park, and do not reflect actual spending patterns at the park.
  - Note that the NPS must report O&M spending for each of its assets to the Federal Real Property Profile (FRPP) on an annual basis. The figures reported to the FRPP, however, are estimates based on a comparison of actual PWE spending by park and the PAMP planned spending amounts that parks assigned to their assets. The aggregate park PWE account spending is distributed among the park's asset portfolio in amounts proportional to what the park planned to spend in its PAMP. Thus, FRPP O&M data would not be able to capture instances in which the park spent more heavily on its transportation assets in one year and less in another.
- **Requirements:**
  - In their PAMPs, parks determined what amount of their base funding to spend on O&M for each asset based on modeled requirements for each asset. These modeled requirements were developed based on NPS-specific calculators for several asset categories, such as O&M spending per square foot for buildings.
  - One rough but industry-accepted method for determining the annual O&M costs of an asset is to take two percent of the asset's current replacement value (CRV). However, applying this method to NPS assets often results in higher than necessary O&M projections because of the outstanding cultural and natural value of many NPS assets, such as scenic landscapes, ancient ruins, and historic fortifications.

RECOMMENDATIONS/NEXT STEPS

While the limitations on the methodologies used to estimate the NER's transportation O&M preclude the region from establishing the actual and required O&M costs with the desired level of precision, these methodologies at least provide the NER a set range of costs for inclusion in its LRTP.

The Federal Real Property Data provides the best approximation of actual O&M spending on transportation assets. This is because the Federal Real Property Data is tied to what parks actually spent, according to the PWE account records. While PWE account information is not available at the individual asset level, it is possible to aggregate it by park. In total, by park, these O&M figures are accurate to the extent that ONPS dollars reported in the operations and maintenance PWE accounts are appropriately reported or categorized. Even though transportation assets at a park are just a subset of all assets, the estimated O&M spending for that subset are considered reasonable, i.e., within the appropriate order of magnitude.

In other words, when planned transportation expenses are aggregated as well and the PWE account spending is pro-rated to transportation assets, the level of granularity achieved is somewhat similar. So while it may be less accurate to say that the Federal Real Property data reflects the true O&M spending on one particular asset, when trying to find the true O&M spending on a group of assets, the Federal Real Property data is a helpful approximation.

Until the FMSS is used consistently and comprehensively to record actual O&M costs, these methods provide the closest approximations of actual and required O&M costs.

The PAMP requirements provide the best approximation of projected O&M needs for transportation assets. This is because the PAMP requirement figures are based on NPS-specific O&M calculators that give a better projection of O&M than two percent of CRV. Based on the PAMP requirements shown above, the NER should shoot for a transportation O&M budget of at least $20 million, realizing that funding limitations may require the region to operate with approximately half of the required budget. One limitation with the PAMP requirement figures is that parks have added assets to their portfolios but have not projected O&M requirements for those assets, so the figures above are missing O&M needs for any new assets that have been added to the park's portfolio since the PAMP was written. Re-optimization would help parks gain a better idea of their O&M requirements.

Next steps to consider as a result of this analysis:

- Engage parks in a discussion to understand the challenges of using work orders to track actual costs
- Evaluate soft (e.g., non-ONPS) funding used on transportation systems for cyclic and other recurring maintenance activities not captured in this analysis of actual annual base funding spending.

RESOURCES

The following list of individuals contributed to the development of this White Paper.

Name	Work Group/Company Name	E-mail Address	Date Resource Added
Bob Holzheimer	NPS	Bob_Holzheimer@nps.gov	
Peter Steele	NPS	Peter_Steele@nps.gov	

John Tauscher	NPS	John_Tauscher@nps.gov	
Tim Mullins	NPS	Tim_Mullins@nps.gov	
Jeremy Sewall	Booz Allen Hamilton	Sewall_Jeremy@bah.com	
Jason Coccia	Booz Allen Hamilton	Coccia_Jason@bah.com	

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Transportation Management System Studies

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Northeast Region of the National Park Service

Alternative Transportation Management System Phase 1 Final Report

WHITE PAPER

September 2011

Prepared by:

Tom Crikelair Associates

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PROJECT PURPOSE

The Northeast Region has developed an Alternative Transportation Management System to assist NPS managers with the oversight, assessment, and management of non-auto transportation projects in the Northeast Region. The ATMS is designed to help answer important questions about bus, ferry, and rail investments in the Northeast Region.

- What are the region's alternative transportation services?
- Who uses these programs and why?
- What are they accomplishing?
- How much do they cost and how are they being paid for?
- Can the NPS afford them?
- What changes are needed?
- What investments are appropriate?

The Alternative Transportation Management System provides a comprehensive inventory of alternative transportation programs in the Northeast Region. It groups programs by type and scope. It ranks them in terms of critical access and overall effectiveness. It provides summary snapshots of ridership, operating costs, and related performance measures. It compares capital and operating costs with partnership and program revenues, and projects future need for financial support. It examines capital and O&M costs for ATS-related assets, and combines these to calculate the Total Cost of ATS Ownership. The ATMS also generates projections for multi-year capital expenditures.

The Alternative Transportation Management System is one element of the Long Range Transportation Plan and as such it shares the LRTP overall goals and objectives – Preserving the NPS Transportation System; Improving Mobility, Access & Connectivity; Improving the Visitor Experience; and Improving Cultural/ Natural Resources and Environmental Conditions. Ultimately, the results of this study will be incorporated into the overall Long Range Transportation Plan for the Northeast Region. In addition, priority investments identified through the ATMS process are likely to be included in the NPS multi-year Transportation Improvement Program.

This study has resulted in the first-of-its-kind region-wide alternative transportation management system for the National Park Service. This report describes how the ATMS was developed, it describes system components and findings, and it summarizes important lessons learned. The study included a comprehensive inventory and evaluation of ATS programs at twenty-five National Park Service units in the Northeast Region.

BACKGROUND INFORMATION

The Alternative Transportation Management System and this accompanying White Paper were developed in part to respond to increasing interest in transportation alternatives at NPS sites throughout the Northeast. This increased interest results from a combination of factors.

- ATS projects like the Island Explorer at Acadia National Park have been highly successful. Visitors ask: "Why doesn't the National Park Service provide this type of service at more parks?"
- There is increasing awareness and interest among the public and at all levels of government in environmental stewardship. This includes concerns about carbon emissions and their impact on global warming.
- The NPS recognizes that alternate transportation systems can play an important role in maintaining diversity among park visitors. These systems can provide car-free access for lower-income populations, for young people who do not drive, for elderly visitors, and for people with special needs. These issues are especially relevant for urban parks in the Northeast Region.
- Parks recognize the negative impacts of traffic congestion and overcrowded parking lots on natural and cultural resources and on visitor experience. Many parks have decided against parking lot expansion as a way to protect natural and cultural landscapes.
- Parks would like to participate in partnerships with state and local governments and with their local business communities. Transit projects provide an opportunity to work with state and regional tourism groups and with gateway communities to ensure economic prosperity, while addressing shared concerns about resource protection, roadway congestion, parking, and overall visitor satisfaction.
- There is some recognition of the role that transit can play in promoting car-free tourism. This is true for some parks, as well as for some state and regional tourism agencies. Car-free tourism may become more important for overall park visitation levels in the future if fuel prices begin to rise significantly.
- Individual parks have expressed increased interest in alternative transportation in part because of capital grant funding that has been made available to national parks through the Federal Transit Administration's TRIP program.

ALTERNATIVE TRANSPORTATION MANAGEMENT SYSTEM OVERVIEW

The Alternative Transportation Management System provides an inventory and assessment of existing and proposed bus, ferry, rail, and tram services in the NPS Northeast Region. The ATMS inventories routes, vehicles, and ridership, and provides measures that address productivity and cost effectiveness. The ATMS examines what services are designed to accomplish, how they are operated, who is using them, and why they are important for individual parks.

The Alternative Transportation Management System includes a seven-part analysis for ATS projects at individual NPS units.

1. Inventory of Existing and Proposed Alternative Transportation Services
2. Project Assessment Using a Transit Evaluation Matrix
3. Comparison of Project Rankings and Costs
4. Review of Marketing and Public Outreach Efforts
5. Overview of Capital and Infrastructure Needs
6. Assessment of ATS Operating Costs and Revenues
7. Analysis of Total Cost of ATS Ownership

The inventory section summarizes key park features, identifies existing and planned routes, describes market groups that benefit from the service, and discusses NPS goals and objectives for the ATS project. The evaluation matrix generates scores for nine evaluation categories, along with raw and weighted cumulative scores. The resulting rankings can be combined with cost measures to help determine the most promising candidates for NPS capital and operating fund investments.

The ATMS assesses financial performance and estimates future needs for operating funding. It calculates the Total Cost of ATS Ownership by adding together annualized capital costs and annual operating and maintenance costs for both NPS and non-NPS ATS assets. It matches Total Costs with Total Revenues by funding source. It identifies anticipated future capital expenditures and funding sources, and provides tools for ranking and prioritizing future capital investments.

The component features of the Alternative Transportation Management System are more fully described in Appendix A. The sixty-three questions included in the Evaluation Matrix are presented in Appendix B.

PROJECT APPROACH

The development process for this Northeast Region ATMS is illustrated in Exhibit 1 and described in more detail in the remainder of this section.

STEP 1 – Develop ATS Inventory Questions

The first step in developing an Alternative Transportation Management System involved gaining a general understanding and overview of ATS projects in the Northeast Region. Staff from the NER Boston office and transit planners from the Volpe Center assisted in this effort. Using this information and insights from past planning work, a set of inventory questions was developed to guide site visits and interviews at individual park units. The resulting ATS Inventory questions are presented in Appendix C.

Exhibit 1

Development of Alternative Transportation Management System for the Northeast Region of the NPS

Step	Process	Outcomes
1	**Develop ATS Inventory Questions** Overview of Northeast ATS projects PMIS statements and Volpe reports Prior knowledge and NPS planning work	ATS inventory questionnaire
2	**Evaluation Matrix and Performance Measures** Develop ATS performance measures Develop, test, and refine an ATS evaluation matrix	Seven ATS performance measures ATS evaluation matrix with 9 categories and 63 questions Matrix scoring system applicable to large and small ATS projects
3	**ATS Inventory Reports for 25 Parks** Review PMIS statments and past studies Site visits and interviews Data collection Evaluation and scoring Document findings and share with parks	Inventory reports for 25 parks Category and weighted scores for ATS projects Cost projections and NPS funding requirements
4	**Methodology for Total Cost of ATS Ownership** Develop an ATS asset database Determine annualized capital and O&M costs Identify anticipated funding sources Develop pivot table reports	ATS asset database Total cost reports for the region Total cost reports for indivdiual parks, projects, asset types, and individual assets
5	**Multi-Year Investment Strategy** Use ATMS findings to evaluate investments Expand database to include tier rankings Develop multi-year pivot table reports	Expanded ATS asset database Analysis of investment choices Multi-year investments for 3 funding tiers
6	**Summarize Findings and Lessons Learned** Prepare charts and supporting text Describe lessons learned	NER ATS White Paper
7	**Identify Next Steps** Evaluate more parks Add ATS trails Enhance database tools	More complete findings Enhanced database ATMS that can be used by NER staff and other NPS regions

STEP 2 – Develop an ATS Evaluation Matrix and Performance Measures

A key challenge in developing the ATMS involved coming up with a scoring system that is easy to use and understand, but that also acknowledges the underlying complexity of the ATS program. Different ATS projects are important for different reasons. The solution was a system that utilizes seven performance measures and nine evaluation categories. The resulting evaluation matrix includes 63 questions, with five possible answers for each question.

The ATMS utilizes the following performance measures:

1. Riders per day
2. Riders per scheduled round trip
3. Daily riders per vehicle
4. Occupancy (riders per round trip / available seats)
5. Annual operating cost (total cost & NPS cost)
6. Cost per rider (total cost per rider & NPS cost per rider)
7. Vehicle miles eliminated

The evaluation matrix addresses the following nine categories:

1. Critical access
2. Resource Protection
3. Safety
4. Visitor Experience
5. Visitor Diversity & Car-Free Travel
6. Regional Economy & Partnerships
7. Recreation & Education
8. Ridership & Productivity
9. Cost Effectiveness

The evaluation system was tested using preliminary findings from five Northeast Region parks. Scoring results were reviewed and adjusted at an all-day work session in Boston with NER and Volpe Center staff. The resulting evaluation matrix is presented in Appendix B. Evaluation questions for Category A: Critical Access and for Category H: Ridership & Productivity are presented in Exhibit 2.

Each of the nine categories can receive a combined total of up to 50 points. Cumulative scores are weighted by doubling the point value for Critical Access and Ridership & Productivity. The maximum number of points possible is 550.

Exhibit 2

ATS Evaluation Matrix Questions for Category A: *Critical Access* and Category H: *Ridership & Productivity*

A. CRITICAL ACCESS	Critical	Very Important	Important	Potential	N/A
Answer only one question in this section.					
1. Does the ATS provide the primary access to the entire park?	50				
2. Does the ATS provide the primary access to a park site?	45				
3. Does the ATS provide access to a site where available parking is consistently filled during the peak season?	40				
4. Does the ATS provide a ride or tour that is itself an important component of the park experience?	45	30	25	15	0
5. Does the ATS provide access to a site where parking is sometimes unavailable?	35	25	15	10	0
6. Does the ATS service serve as a "feeder" route, delivering visitors to a transfer hub where they can board vehicles heading to destinations within the park?	35	25	15	10	0
7. Does the ATS provide access to a site that is difficult to reach by car or on foot?	35	25	15	10	0

H. RIDERSHIP & PRODUCTIVITY	Critical	Very Important	Important	Potential	N/A
Daily riders per route or service	*> 750*	*500-749*	*150-499*	*25-150*	*< 25*
1. Does the ATS serve a large number of NPS visitors?	15	12	9	6	3
Daily riders per bus or ferry	*> 200*	*150-199*	*100-149*	*50-99*	*1-49*
2. Does each vehicle carry a meaningful number of riders each day?	15	12	9	6	3
Percent filled	*> 90%*	*75-89%*	*50-74%*	*25-49%*	*< 25%*
3. How does the average number of riders per round trip compare with the number of available seats per vehicle?	20	15	10	5	0

STEP 3 – Prepare ATS Inventory Reports for 25 Parks in the Northeast Region

Site visits helped ensure an accurate and appropriate understanding of what services are available at individual parks, how they operate, who uses them, and why they are important. Site visits and staff interviews also helped assure local park officials that their programs and concerns are being adequately understood and addressed.

Before scheduling a site visit to a park, it was important first to review PMIS statements and past transportation studies. Transit plans developed by the Volpe Center for several Northeast parks were particularly helpful in presenting and explaining the context within which ATS programs have been developed. PMIS statements document anticipated investments and explain why individual parks view their ATS projects as important.

Another important step was to obtain basic information about service hours, costs, ridership, and performance. The ATMS requires a short and easy-to-assemble list of input data. This information was tracked separately for spring, summer, and fall. This allowed the evaluation matrix to focus ridership and productivity questions on the peak visitor season. The ATMS requires the following performance data:

- Service calendar, including starting and ending dates and service days per season
- Average number of scheduled round trips per day
- Average hours per scheduled round trip
- One-way rides (Following transit industry practice, this is a count of boardings, not people.)
- Operating cost per hour
- Percent of operating costs covered by partner and ticket sale funding
- Average peak vehicle count
- Average number of seats per vehicle
- Average trip length
- Average group size

This short list of inputs can be used to generate the following measures:

- Average daily riders
- Average riders per scheduled round trip
- Daily riders per vehicle
- Service hours per day
- Service hours per season
- Operating cost per season and per year
- Partner and ticket sale funding
- NPS operating cost
- Cost per rider
- NPS cost per rider
- Occupancy (rides per round trip / seating capacity)
- Estimated car miles removed

Exhibit 3

ATS Projects Examined During Development of the Alternative Transportation Management System

		Park	*State*	*ATS Project*	*Status*	*Operator*
1	ACAD	Acadia	ME	Island Explorer	Existing	Regional Transit
2	ADAM	Adams	MA	Adams Trolley	Existing	NPS Contractor
3	ALPO	Allegheny Portage Railroad	PA	Railroad Tours	Proposed	NPS
4	BOHA	Boston Harbor Islands	MA	Island Ferries	Existing	Private
5	BOST	Boston NHP	MA	Charlestown Water Shuttle	Existing	Regional Transit
6	CACO	Cape Cod	MA	Coast Guard Beach Trams	Existing	NPS
	CACO	Cape Cod	MA	Provincetown Shuttle	Existing	Regional Transit
	CACO	Cape Cod	MA	FLEX	Existing	Regional Transit
7	COLO	Colonial	VA	Historic Triangle Shuttle	Pilot	Regional Transit
8	EISE	Eisenhower	PA	Eisenhower Shuttle	Existing	NPS Contractor
9	ELRO	Home of Eleanor Roosevelt	NY	Val-Kill Tram	Existing	NPS Contractor
10	FIIS	Fire Island	NY	Island Ferries	Existing	Private
11	FOMC	Fort McHenry	MD	Charm City Circulator	Proposed	Regional Transit
12	GATE	Gateway	NY	Sandy Hook Ferry	Existing	Private
	GATE	Gateway	NY	Riis Park Ferry	Existing	Private
13	GETT	Gettysburg	PA	Freedom Shuttle	Pilot	Regional Transit
14	GOIS	Governor's Island	NY	Island Ferry	Existing	State
15	HOFR	Home of FDR	NY	Roosevelt Ride	Existing	NPS Contractor
	HOFR	Home of FDR	NY	FDR Tram	Existing	NPS Contractor
16	JOFL	Johnstown Flood	PA	Lakebed Tours	Existing	NPS
	JOFL	Johnstown Flood	PA	Path of Flood Tours	Proposed	NPS
17	LOWE	Lowell	MA	Electric Trolley	Existing	NPS
18	MABI	Marsh Billings	VT	Full Circle Trolley	Pilot	Regional Transit
19	MIMA	Minute Man	MA	Concord Shuttle	Proposed	NPS Contractor
20	ROCA	Campobello	NB	Hiker Shuttle	Proposed	NPS
21	SAMA	Salem Maritime	MA	Baker's Island Tour	Proposed	NPS
22	SHEN	Shenandoah	VA	Camp Rapidan Tour	Existing	NPS
23	STEA	Steamtown	PA	Live Steam	Existing	NPS
24	STLI	Statue of Liberty	NY	Liberty Ferries	Existing	NPS Contractor
25	VAFO	Valley Forge	PA	Revolutionary Shuttle	Pilot	NPS Contractor

The ATS inventory process included an assessment of ATS operating costs and current and future sources of operating funding. It also considered ATS capital assets and the anticipated need for capital investments.

Each ATS project was evaluated using the 63 questions included in the ATS evaluation matrix. The results of this exercise were documented in tables that show how points were awarded for each question, along with supporting comments. This documentation allows officials at individual parks to see how their projects were scored, along with the reasoning behind each scoring decision. This documentation also gave individual parks an opportunity to clarify misunderstood issues and to suggest scoring adjustments for individual questions.

Separate inventory reports were prepared for each park unit. These draft documents were sent to local park units for review and comment. Amended drafts were returned to individual parks for their endorsement.

Outcomes for this ATS inventory process include:

- ATS inventory reports for 25 park units in the Northeast Region
- Category scores and weighted cumulative scores for individual ATS projects
- Operating and capital cost projections and anticipated NPS funding requirements for individual parks

STEP 4 – Develop a Methodology for Calculating Total Cost of ATS Ownership

The first challenge in addressing Total Cost of ATS Ownership was to decide how to address multiple-year capital investments. Instead of adding together amounts spent in individual years, the ATMS focuses on annualized capital investments. Annualized capital costs were obtained by dividing the cost of an asset by its anticipated useful life in years. This approach was selected because ATS projects involve systems of assets with widely varying lifespans.

Another important decision was to include in the Total Cost analysis ATS assets that are not owned by the National Park Service. This was necessary in order to provide a complete picture of the region's ATS program. To understand this decision, consider one of the region's largest ATS programs, the Island Explorer project at Acadia National Park. The NPS owns bus stops and roadways within the park boundary. Most of the remaining assets are owned by the Maine Department of Transportation. This includes the full Island Explorer vehicle fleet and the new bus maintenance facility at the Acadia Gateway Center.

Another key decision was to match Total Costs with Total Revenues. As a result, the analysis shows not only how much is invested in Alternative Transportation, but also who is covering those costs. The ATMS considers not only past capital investments and current O&M funding sources, but also anticipated future sources of capital funding.

The next step was to design an ATS asset database that can be used to generate Total Cost of ATS Ownership reports for individual parks and for the Northeast Region as a whole. This was done using Microsoft Excel. Excel was chosen for two reasons: First, this ensures that the system can be used by a wide variety of users without assistance from a database manager. Second, it takes advantage of the power of Excel pivot tables. Pivot tables allow NPS managers to generate a vast array of instantaneous reports, again without help from a database manager.

The ATS asset database requires the following inputs for each ATS-related asset:

- Park unit
- ATS project name
- Asset name
- Asset type
- Asset owner
- Asset count
- Purchase year
- Useful life in years
- Unit purchase price
- Percent ATS
- Annual O&M cost
- O&M funding sources (distributed by percent)
- Past capital funding sources (distributed by percent)
- Anticipated future capital funding sources (distributed by percent)

The next task was to identify ATS-related assets for each park, and to obtain actual or estimated capital and O&M cost figures for each asset. This task was complicated by the fact that many ATS assets in the Northeast Region are not owned by the NPS. Obtaining cost data was particularly challenging for ferry services owned and operated by private companies, and for docks and piers owned and maintained by state and city governments. Database entries include cell notes that identify the source of the available information. Where estimates are used, they are color-coded to make it easier to find these numbers when more accurate information becomes available.

The resulting ATS asset database generates pivot table reports that show Total Cost of ATS Ownership and matching revenues by park, by project, by asset type, and by asset. The same database generates pivot table reports showing anticipated capital expenditures by year for replacement vehicles and related ATS assets.

Because Total Cost of Ownership calculations address revenues as well as costs, the ATMS can help answer a number of important questions regarding the region's ATS program:

- What critical assets are involved, how much did they cost, and who owns them?
- Who paid to purchase ATS assets and who is paying to operate and maintain them?
- When will assets need to be replaced?
- What future capital investments will be required and how are these likely to be funded?

STEP 5 – Develop Tools for a Multi-year ATS Investment Strategy

In an effort to help develop a multi-year investment strategy, results and findings from the ATS evaluation process were added to the ATS asset database. The asset database was expanded to include cumulative and critical access scores for individual ATS projects. Fields were also added for project status (existing, pilot, and proposed) and project type (critical access, improvement, park feature, special needs).

These database changes allow the system to generate additional pivot table reports to help determine investment priorities. For example, the expanded system generates reports showing high, medium, and low scoring projects – sorted separately for existing, pilot, and proposed ATS programs.

Another database field was added to allow NPS managers to assign individual assets to one of three funding tiers. Pivot table reports can be set to show anticipated annual and multi-year revenues for individual funding sources, or for combinations of funding sources. Tier assignments allow NPS managers to see projected annual Category III and TRIP investment totals for low, medium, and high levels of funding. Tier designations can be adjusted within the database to bring the totals for each tier within anticipated funding ranges.

STEP 6 – Summarize Findings and Lessons Learned

A draft of this White Paper was prepared early in the planning process. As the work progressed, the paper was rewritten and expanded several times to include new developments and findings. A similar process was followed with supporting PowerPoint presentations.

Key findings and lessons learned are described in the remaining sections of this report.

STEP 7 – Identify Next Steps

The final step in this planning process was to identify additional tasks to improve and refine the NER Alternative Transportation System. Next steps include updating inventory reports, replacing estimated asset database entries with more accurate numbers, assessing existing and proposed ATS projects and pilots at additional parks, enhancing the ATMS database tools to make the system easier for NER staff to utilize, and working with WASO and others to make the ATMS suitable for use in other NPS regions.

KEY FINDINGS

Overview of ATS Projects

ATS projects at 25 parks in the Northeast Region provide a total of 12 million one-way rides per year, at a combined direct operating cost of $40.6 million. If ferry service at the Statue of Liberty and Ellis Island is excluded, the total number of one-way trips for the region is 2.8 million, at a direct operating cost of $10.6 million.

ATS projects range in size from ferry service at Liberty and Ellis Islands, with 9.3 million annual boardings and a cost of $30 million, to Camp Rapidan Tours at Shenandoah National Park, with 3,902 annual boardings and a cost of $2,471. Costs, ridership, and weighted scores for existing ATS projects are summarized in Exhibit 4. Charts showing annual ridership and annual costs for existing services are presented in Exhibit 5.

The Alternative Transportation Management System can group transit projects by operating arrangement, or by type of benefit to the National Park Service. The first approach recognizes four project types:

- Regional transit systems
- Individual contract routes or services
- Services provided with NPS drivers
- NPS transportation features

The second approach groups ATS projects according to five categories:

- Critical Access Systems
- NPS Transportation Features
- NPS Interpretive Tours
- Park Improvements
- Special Needs Systems

Summary descriptions of existing, pilot, and proposed ATS programs are presented in Exhibits 6-10.

Exhibit 4

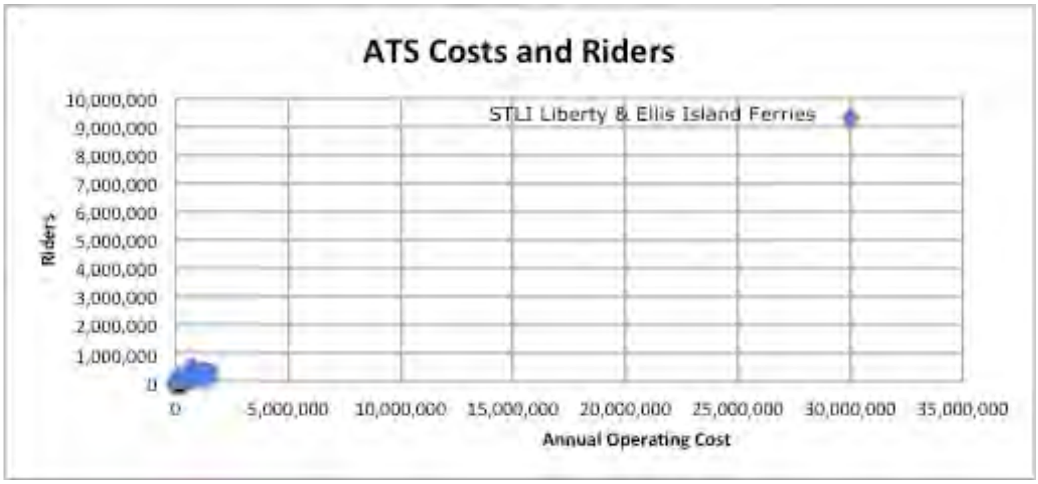
Costs, Ridership, and Cumulative Scores for Existing NER Alternative Transportation Systems

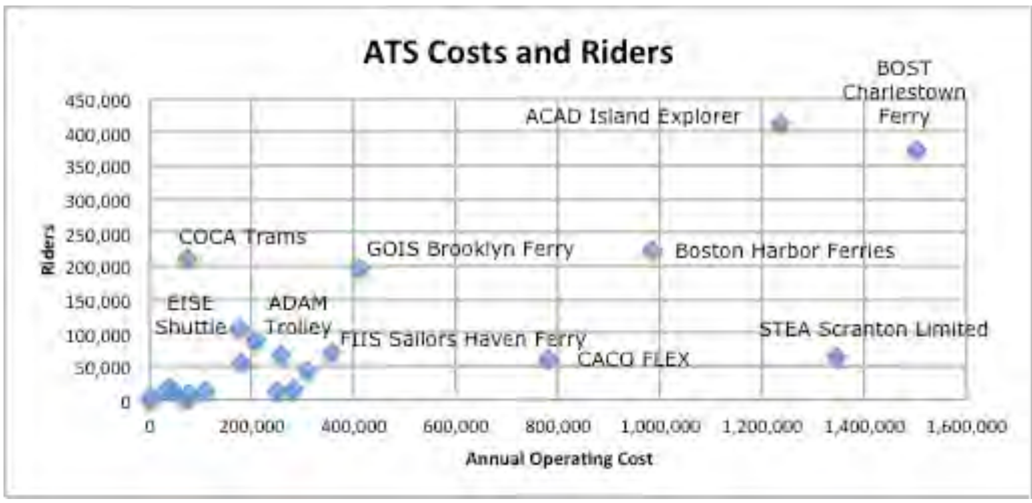
Park	*Route*	*Weighted Score*	*Cost per Rider*	*NPS Cost per Rider*	*Status*	*O&M Cost*	*Riders*
STLI	Liberty & Ellis Island Ferries	478	3.23	0.00	Current	30,000,504	9,301,507
BOHA	BOHA Ferries	474	4.38	0.11	Current	983,513	224,524
BOST	Charlestown Water Shuttle	472	4.00	0.00	Current	1,499,974	374,759
GOIS	Battery Park Ferry	468	1.35	0.00	Current	765,600	566,020
ACAD	Island Explorer	467	3.00	1.92	Current	1,234,765	412,132
GOIS	Brooklyn Ferry	460	2.08	0.00	Current	410,181	196,859
FIIS	Sailors Haven Ferry	455	4.92	0.00	Current	354,240	72,000
CACO	Provincetown Shuttle	449	3.79	0.00	Current	257,495	67,951
ADAM	Adams Trolley	444	2.37	2.37	Current	207,809	87,519
STEA	Rail Excursions	443	17.01	4.17	Current	248,381	14,602
FIIS	Watch Hill Ferry	437	7.18	0.00	Current	308,831	43,000
STEA	Scranton Limited	431	20.77	19.27	Current	1,345,246	64,778
BOHA	Boston Light Tour	430	19.89	0.00	Current	68,376	3,437
BOHA	Thompson Island Ferry	420	7.71	1.79	Current	108,000	14,000
CACO	Coast Guard Beach trams	417	0.35	0.35	Current	73,875	211,042
EISE	Eisenhower Shuttle	410	1.66	1.66	Current	176,414	105,976
CACO	Cape Cod FLEX	379	12.48	0.00	Current	779,051	62,412
GATE	Riis Park Ferry	375	8.75	0.00	Current	78,720	9,000
LOWE	Electric Trolley	365	3.29	3.29	Current	181,314	55,089
GATE	Sandy Hook Ferry	364	16.43	0.00	Current	282,600	17,200
SHEN	Rapidan Tour	350	0.63	0.63	Current	2,458	3,902
ROVA	Roosevelt Ride	347	8.73	8.73	Current	75,072	8,598
GATE	Sandy Hook Bus	335	3.58	0.00	Current	61,572	17,200
COLO	Historic Triangle Shuttle	291	7.07	7.07	Pilot	600,035	84,900
MABI	Full Circle Trolley	281	8.15	3.26	Pilot	44,818	5,500
JOFL	Lakebed Tour	243	1.65	1.40	Current	4,765	2,889
VAFO	Revolutionary Shuttle	221	14.09	14.09	Pilot	169,074	12,000
ELRO	Val-Kill Tram	206	2.09	2.09	Current	33,724	16,159
HOFR	FDR Tram	202	2.62	2.62	Current	40,598	15,481
GETT	Freedom Transit Lincoln Line	169	23.60	7.08	Pilot	182,657	7,740
	Totals					40,579,661	12,078,176
	Subtotals without STLI					10,579,158	2,776,669

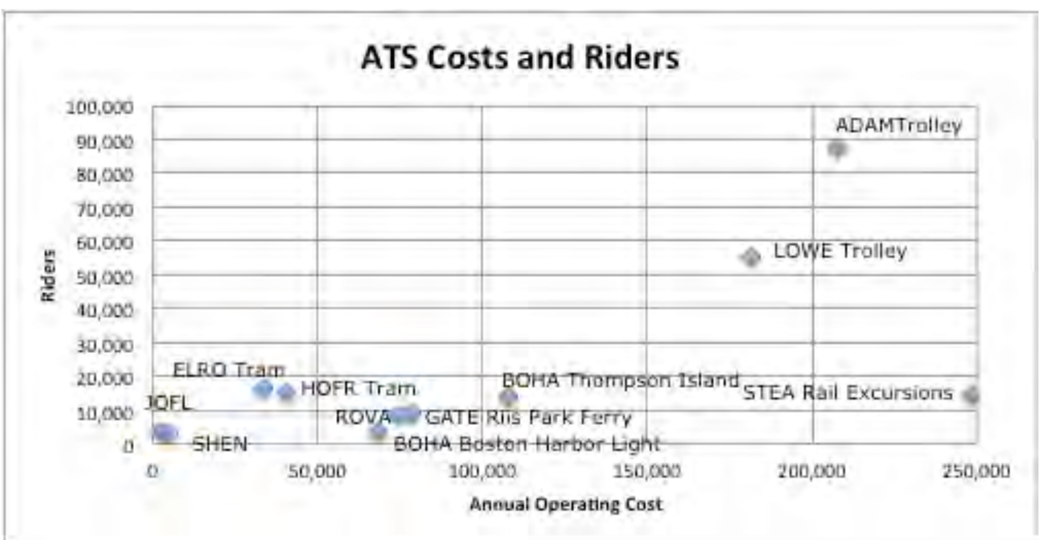
NOTE: Pilot projects are shaded.

Exhibit 5

Annual Ridership and Costs for Existing NER Alternative Transportation Systems







NOTE: These charts do not include pilot projects.

Exhibit 6

Northeast Region ATS Programs Providing Critical Access to NPS Sites

Park	Project	Operating Cost	Riders	Cost per Rider	NPS Cost per Rider	Description
ACAD	Island Explorer	1,234,765	412,132	3.00	1.92	Seasonal transit system providing parking congestion relief and car-free access for Acadia National Park and surrounding towns
ADAM	Adams Trolley	207,809	87,519	2.37	2.37	A single-bus trolley providing the primary access to historic homes
BOHA	BOHA Ferries	983,513	224,524	4.38	0.11	Contract ferries providing the only public access to Boston Harbor Islands
BOHA	Boston Light	68,376	3,437	19.89	0.00	Ferry excursion and lighthouse tour with a $40 per-person fee
BOHA	Thompson Island	108,000	14,000	7.71	1.79	Ferry service operated by the Thompson Island Outward Bound Education Center
BOST	Charlestown	1,499,974	374,759	4.00	0.00	MBTA water shuttle service linking the Boston waterfront and the north end of the Freedom Trail
CACO	Coast Guard Beach Trams	73,875	211,042	0.35	0.35	NPS trams providing the primary beach access from an off-site parking area
CACO	Provincetown	257,495	67,951	3.79	0.00	Seasonal shuttle linking a busy and congested tourist town with NPS beaches
EISE	Eisenhower Shuttle	176,414	105,976	1.66	1.66	A parking lot shuttle providing the only access to the Eisenhower farm
FIIS	Sailors Haven Ferry	354,240	72,000	4.92	0.00	A privately-owned service providing ferry access to the Sailors Haven Visitor Center on Fire Island
FIIS	Watch Hill Ferry	308,831	43,000	7.18	0.00	A privately-owned service providing ferry access to the Watch Hill Visitor Center on Fire Island
GOIS	Brooklyn Ferry	410,181	196,859	2.08	0.00	Ferry service operated for New York City by the Trust for Governors Island
GOIS	Manhattan Ferry	765,600	566,020	1.35	0.00	Ferry service operated for New York City by the Trust for Governors Island
ROVA	Roosevelt Ride	75,072	8,598	8.73	8.73	A single bus providing the primary visitor access to Top Cottage, plus links to a NYC commuter train station
SAMA	Bakers Island	21,172	2,660	7.96	1.59	Proposed ferry tours to Baker’s Island
SHEN	Rapidan Tour	2,471	3,902	0.63	0.63	Ranger-led tours providing the primary visitor access to Camp Rapidan
STLI	STLI Ferries	30,000,504	9,301,507	3.23	0.00	Privately-owned ferry service operating through a concession contract with the NPS

Exhibit 7

Northeast Region NPS Transportation Features

Park	Project	Operating Cost	Riders	Cost per Rider	NPS Cost per Rider	Description
LOWE	Existing Trolley	181,314	55,089	3.29	3.29	Existing historic electric trolley service operated in downtown Lowell by the National Park Service
LOWE	Enhanced Trolley	358,120	95,000	3.77	3.77	Proposed enhancement of the historic electric trolley service in downtown Lowell
STEA	Scranton Limited	1,345,246	64,778	20.77	19.27	Live Steam train rides offered within the Scranton rail yard
STEA	Rail Excursions	248,381	14,602	17.01	4.17	Live Steam rail excursions

Exhibit 8

Northeast Region ATS Park Improvements

Park	Project	Operating Cost	Riders	Cost per Rider	NPS Cost per Rider	Description
CACO	Cape Cod FLEX	779,051	62,412	12.48	0.00	Experimental year-round service linking Cape Cod communities
COLO	Historic Triangle Shuttle	600,035	84,900	7.07	7.07	An earmark-funded shuttle system linking Yorktown, Williamsburg, and Jamestown
COLO	Williamsburg-Jamestown	205,800	43,500	4.73	1.09	Proposed replacement service for the Historic Triangle Shuttle
FOMC	Charm City Circulator Route to Fort McHenry	1,245,563	340,000	3.66	0.99	Proposed addition to a free year-round circulator system operated by the city of Baltimore
GATE	Sandy Hook Ferry	282,600	17,200	16.43	0.00	Privately operated seasonal ferry service between Manhattan and Sandy Hook
GATE	Sandy Hook Bus	61,572	17,200	3.58	0.00	Contractor-operated buses that transport ferry riders to and from the beach
GATE	Riis Park Ferry	78,720	9,000	8.75	0.00	Privately operated seasonal ferry service between Manhattan and Riis Park
GETT	Adams County Transit Lincoln Line bus route	182,657	7,740	23.60	7.08	A pilot project operated by a Gettysburg community transit agency
GETT	Downtown Shuttle	129,250	26,000	4.97	2.44	A proposed single route replacement for an experimental community transit system
MABI	Full Circle Trolley	44,818	5,500	8.15	3.26	A pilot weekend electric trolley bus in Woodstock, VT powered by renewable “cow power”
MIMA	Concord Shuttle	24,223	4,800	5.05	5.05	A proposed seasonal weekend shuttle linking the Concord train station and Minute Man National Park
ROCA	Hiker Shuttle	22,320	4,800	4.65	2.33	A proposed seasonal shuttle service for Roosevelt Campobello International Park
VAFO	Revolutionary Shuttle	169,074	12,000	14.09	14.09	A seasonal pilot shuttle service linking visitor destinations at Valley Forge

Exhibit 9

Northeast Region ATS Tours

Park	Project	Operating Cost	Riders	Cost per Rider	NPS Cost per Rider	Description
ALPO	Railroad Tour	900	720	1.25	1.25	Proposed weekly tours of the Allegheny Portage Railway
JOFL	Path of Flood Tour	1,586	1,057	1.50	1.50	Proposed reinstatement of weekly half-day tours
JOFL	Lakebed Tours	4,765	2,889	1.65	1.40	Existing tours provided four times a day
JOFL	Lakebed Hourly	7,740	5,000	1.55	1.39	Proposed expansion of the existing tour program
MABI	Hiker Tours	1,337	1,130	1.18	1.18	Proposed addition of a small bus or van to facilitate Ranger-led tours
VAFO	Enhanced Tour	204,525	50,000	4.09	2.22	Proposed expansion of Valley Forge trolley tours

NOTE: ATS tours at SHEN, BOHA, SAMA, and HOFR are included under Critical Access programs.

Exhibit 10

NER ATS Programs Designed to Meet Special Needs

Park	Project	Operating Cost	Riders	Cost per Rider	NPS Cost per Rider	Description
HOFR	FDR Tram	40,598	15,481	2.62	2.62	Electric tram that assists elderly and handicapped visitors to Franklin Roosevelt's home
ELRO	Val-Kill Tram	33,724	16,159	2.09	2.09	Electric tram that assists elderly and handicapped visitors to Eleanor Roosevelt's home

Overview of Northeast Region ATS Investments

The ATMS includes an ATS asset database with pivot table reports that analyze Total Cost of ATS Ownership for individual parks and for the region as a whole. ATS investments at 25 Northeast Region parks, not including roadways and buildings, total $160 million. This includes $89 million for docks and piers, $24 million for ferryboats, $12 million for buses and trams, $2.7 million for railroad infrastructure, and $27 million for waterway investments (dredging, seawalls, breakwaters, etc.).

Of this $160 million total, the National Park Service owns $33.8, or 21%. State and local governments own $95 million, or 60%. Private ownership accounts for 14%, and regional transit authorities hold title to 5%. Much of the state and municipal ownership involves docks and piers in New York and Boston harbors. Most of the private ownership involves ferryboats.

Exhibit 11

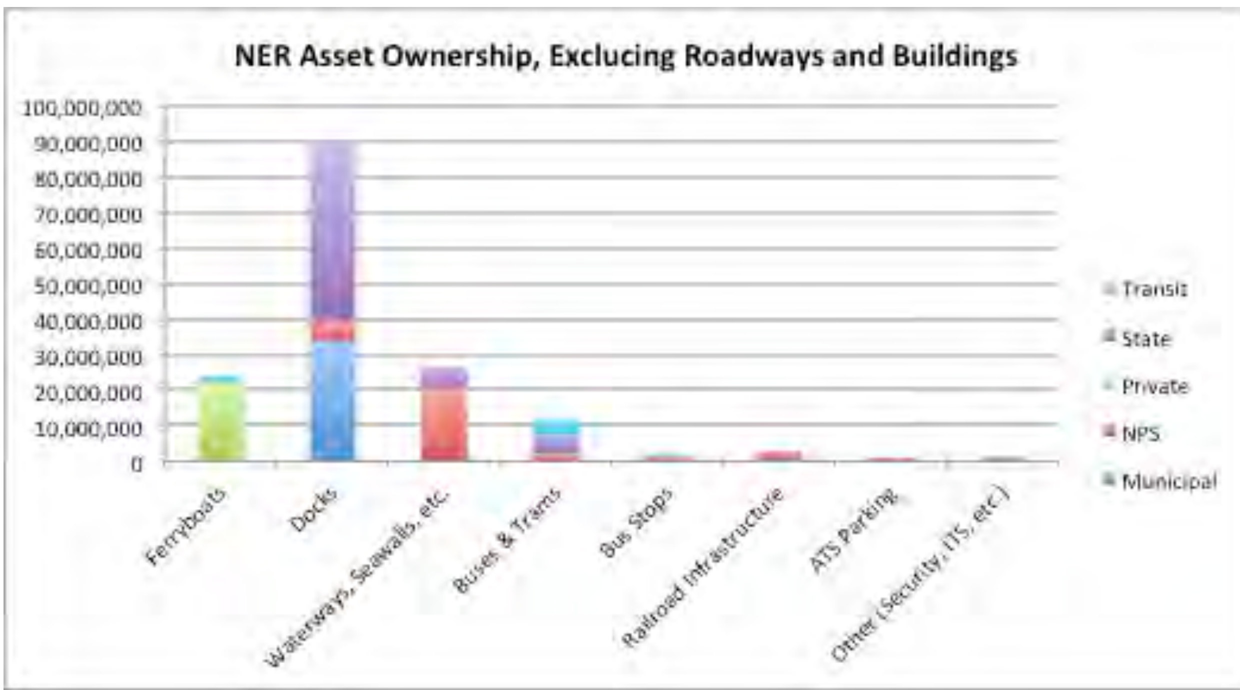
NER ATS Asset Ownership, Excluding Roadways and Buildings

ATS ASSET OWNERSHIP, EXCLUDING ROADWAYS AND BUILDINGS

OWNER	Municipal	NPS	Private	State	Transit	Total
Ferryboats	0	0	22,099,999	0	2,000,000	24,099,999
Docks	34,000,000	5,516,616	0	49,855,990	0	89,372,606
Waterways, Seawalls, etc.	0	20,804,337	0	6,000,000	0	26,804,337
Buses & Trams	0	2,012,414	160,000	5,411,681	4,615,400	12,199,495
Bus Stops	3,300	1,201,251	150,000	0	750,000	2,104,551
Railroad Infrastructure	0	2,811,519	0	0	0	2,811,519
ATS Parking	0	990,062	0	0	0	990,062
Other (Security, ITS, etc.)	0	481,000	0	0	1,120,000	1,601,000
Total	34,003,300	33,817,199	22,409,999	61,267,671	8,485,400	159,983,569

Exhibit 12

NER ATS Asset Ownership, Excluding Roadways and Buildings



The ATS asset database includes $12 million worth of buses and trams. The NPS owns $2 million, or 16%. State DOT's own 44% of the bus and tram fleet, regional transit agencies own 38%, and private companies own 1%. The NPS holds title to buses at ADAM, LOWE, ROVA, and SHEN, and it owns trams at CACO and ROVA. The Maine DOT holds title to $5.4 million worth of Island Explorer buses that serve ACAD. Transit authorities own buses at COLO, MABI, CACO, and GETT. Buses at EISE are privately owned.

Regional assets include $141 million worth of buildings that are relevant for ATS programs. The largest investment is the privately owned $103 million GETT Visitor Center. The Gettysburg Foundation estimates that 0.16% of this investment is utilized by the Eisenhower Shuttle. Major NPS-owned buildings include the $6.2 million BOHA Harbor Park Pavilion (40% ATS) and the $5.8 million FIIS Patchogue Ferry Terminal (100% ATS). The Maine DOT holds title to the $12 million Island Explorer maintenance facility near ACAD (100% ATS). The city of New York owns the $14 million Batter Maritime Building used by GOIS ferries (21% ATS).

Overview of Northeast Region Total Cost of ATS Ownership

It is instructive to examine Total Costs for the region without including the ferry service at the Statue of Liberty and without the Live Steam program at Steamtown. STLI ferry service distorts total figures for the region because these ferries generate an unusually large amount of ticket sale revenue. The STEA Live Steam program is unusual, because it uses a fairly large amount of regular NPS funding (ONPS, Cyclic, Repair/Rehab) to cover day-to-day operating costs.

Without these two outliers, the ATS program at 23 NER parks has a total annual cost of $13.8 million. This includes $3.7 million in annualized capital investment, and $10 million in annual operating and maintenance expenses. Annual O&M costs include $4.9 million for ferry operations, and $3.5 million per year for bus and tram operations.

Exhibit 13

Total Cost of ATS Ownership at 23 Northeast Parks, Excluding STLI and STEA

TOTAL COST OF ATS OWNERSHIP AT 23 NER PARKS

	Annual Capital	Annual O&M	TCFO
Ferryboats	75,000	4,905,343	4,980,343
Docks	1,505,641	656,121	2,161,762
Waterways, Seawalls, etc.	110,378	18,801	129,179
Buses & Trams	1,136,519	3,491,009	4,627,529
Bus Stops	89,412	35,296	124,708
Railroad Infrastructure	59,238	458,000	517,238
ATS Parking	49,503	7,202	56,705
Buildings	514,206	504,659	1,018,865
Roadways	10,264	2,381	12,645
Other (Security, ITS, etc.)	122,600	65,595	188,195
Total	3,672,761	10,144,408	13,817,169

TOTAL ATS REVENUES AT 23 NORTHEAST PARKS

	Annual Capital	Annual O&M	TCFO
ATS Fee	0	1,025,789	1,025,789
Cat 3	899,609	0	899,609
Concession	3,010	0	3,010
FLREA	0	164,007	164,007
FTA 5311	0	252,668	252,668
FTA Other	887,241	528,598	1,415,839
ITS	85,000	0	85,000
Municipal	221,451	2,148,710	2,370,160
NPS Base	7,648	1,211,996	1,219,644
NPS Other	125,750	0	125,750
Other	0	1,475	1,475
Other Federal	17,856	0	17,856
Private	46,621	606,922	653,544
Riders	16,000	2,935,524	2,951,524
State	649,079	1,268,718	1,917,797
TRIP	713,497	0	713,497
Total	3,672,761	10,144,408	13,817,169

Exhibit 14

Total Cost of ATS Ownership at 25 Northeast Parks, Including STLI and STEA

TOTAL COST OF ATS OWNERSHIP AT 25 NER PARKS

	Annual Capital	Annual O&M	TCFO
Ferryboats	1,211,765	31,258,578	32,470,343
Docks	1,624,391	5,153,621	6,778,012
Waterways, Seawalls, etc.	729,128	18,801	747,929
Buses & Trams	1,136,519	3,491,009	4,627,529
Bus Stops	89,412	35,296	124,708
Railroad Infrastructure	101,033	2,319,548	2,420,581
ATS Parking	49,503	7,202	56,705
Buildings	516,106	509,409	1,025,515
Roadways	10,264	2,381	12,645
Other (Security, ITS, etc.)	167,600	3,635,595	3,803,195
Total	5,635,721	46,431,441	52,067,162

TOTAL ATS REVENUES AT 25 NORTHEAST PARKS

	Annual Capital	Annual O&M	TCFO
ATS Fee	0	1,025,789	1,025,789
Cat 3	941,405	0	941,405
Concession	3,010	0	3,010
FLREA	0	164,007	164,007
FTA 5311	0	252,668	252,668
FTA Other	887,241	528,598	1,415,839
ITS	85,000	0	85,000
Municipal	221,451	2,148,710	2,370,160
NPS Base	7,648	2,225,604	2,233,251
NPS Other	125,750	565,003	690,753
Other	18,750	1,475	20,225
Other Federal	17,856	0	17,856
Private	46,621	606,922	653,544
Riders	1,918,415	37,643,946	39,562,361
State	649,079	1,268,718	1,917,797
TRIP	713,497	0	713,497
Total	5,635,721	46,431,441	52,067,162

Excluding the Statue of Liberty, NPS dollars accounted for 3% of annualized ATS capital investments. USDOT funding sources (Category III, TRIP, ARRA, Ferryboat Discretionary, FTA Other) accounted for 71% of the total. Another 24% came from state and municipal governments, while 1% came from private sources. ONPS funds cover 12% of ATS operating and maintenance costs. Ticket sales and visitor fees pay for 41% of O&M expenses. State and municipal governments pay 34%, private sources pay 6%, and Federal Transit Administration subsidies cover the remaining 8%.

When STLI and STEA are added to the picture, the annualized capital cost increases from $3.7 million to $5.6 million. Annual O&M costs increase from $10 million to $46 million. Ticket sales for STLI ferries cover $36 million of annual capital and O&M costs. O&M costs at STEA are covered by $283K in ticket sales, $1 million in ONPS funding, and half a million dollars of cyclic and repair/rehab funding.

If STLI and STEA are included, rider and visitor fees cover 34% of annualized ATS capital investments. NPS dollars account for 2%, USDOT funding sources account for 15%, and state and municipal governments cover 15%. If STLI and STEA are included, ONPS funds cover 5% of ATS operating and maintenance costs, with 1% paid for by other NPS dollars. Ticket sales and visitor fees cover 84% of combined O&M expenses. State and municipal governments pay 7%, private sources pay 1%, and Federal Transit Administration subsidies cover the remaining 2%.

Exhibit 15

Distribution of ATS Revenues at 25 Northeast Parks

ATS REVENUE DISTRIBUTION, EXCLUDING STLI AND STEA

	Annual Capital	Annual O&M	TCFO
Riders and visitor fees	0%	41%	30%
ONPS	0%	12%	9%
NPS other	3%	0%	1%
State & municipal governments	24%	34%	31%
Private	1%	6%	5%
USDOT	71%	8%	24%
Total	100%	100%	100%

ATS REVENUE DISTRIBUTION, INCLUDING STLI AND STEA

	Annual Capital	Annual O&M	TCFO
Riders and visitor fees	34%	84%	78%
ONPS	0%	5%	4%
NPS Other	2%	1%	1%
State & municipal government:	15%	7%	8%
Private	1%	1%	1%
USDOT	47%	2%	7%
Total	100%	100%	100%

Exhibit 16

Parks in the Northeast Region with Critical Access ATS Projects

ATS Projects that Provide Critical Access to NER Parks

Critical Access is one of the categories addressed by the ATMS evaluation matrix. Among the twenty-five Northeast Region parks addressed in this study, eleven have ATS systems that play a critical role in providing visitors with access to a park or to park destinations.

- Five parks have ATS programs that provide the only visitor access to the entire park: BOHA, EISE, FIIS, GOIS, and STLI.
- Four ATS programs provide the only access to a park site for nearly all visitors: CACO (Coast Guard Beach), ROVA (Top Cottage), SAMA (Baker's Island), and SHEN (Camp Rapidan).
- Three ATS programs provide access to parks where parking is consistently filled during the peak season: ACAD, ADAM, and CACO (Provincetown Shuttle)

Other ATS systems play an important, but more limited role in providing visitor access.

- Six parks rely on their ATS program for interpretive programs: ALPO, JOFL, LOWE, MABI, SHEN, and STEA.
- Six ATS programs serve locations that are difficult to reach by car or walking: BOST, GATE, GETT, ALPO, MABI, and ROVA.

ATS Projects and Recommended Actions

The ATMS evaluation process identified ATS systems at three parks where improvements are needed. At several other parks, it evaluated possible service enhancements and additions. In some cases, service concepts were evaluated without being included as candidates for implementation. ATS services and recommended actions are shown in Exhibits 17 and 18. Proposed ATS replacement projects are shown in Exhibit 19.

Three programs were identified as candidates for major overhaul or replacement: the Historic Triangle Shuttle at COLO, the Revolutionary Shuttle at VAFO, and the Freedom Transit *Lincoln Line 1* at GETT.

- While providing important benefits at COLO, the current program is funded by a Congressional earmark that is due to expire. There is not sufficient funding available to sustain the project at its past level. The ATMS was used to evaluate possible replacement services, including a scaled back shuttle route linking Colonial Williamsburg and Historic Jamestown.
- A pilot shuttle program at VAFO has generated limited ridership. Because of low scores for the existing project, the ATMS was used to evaluate an alternative strategy: possible expansion of a successful VAFO trolley tour program. This would involve more trolley buses, more frequent service, lower fares, and a modified interpretive program for the park.
- Past studies have identified a need for a shuttle link between the GETT Visitor Center and downtown Gettysburg. Adams County Transit implemented an extensive network of community bus routes, but failed to highlight and promote the service component that is most relevant for the NPS and its visitors. The ATMS evaluates a replacement strategy that includes more frequent, fare-free service targeted and promoted for NPS visitors.

Recommended program enhancements were assessed for two parks, LOWE and JOFL.

- Enhancements for the historic electric trolley service at LOWE would allow a consistent schedule to be operated throughout the day, allowing more visitors to take advantage of the service.
- At JOFL, Lakebed Tours could be expanded from three times a day to hourly to benefit more visitors.

Possible new services include a new downtown Baltimore circulator route for FOMC, reinstatement of weekly half-day Path of the Flood tours at JOFL, introduction of Baker's Island tours at SAMA, a new train station shuttle at MIMA, and a new Hiker Shuttle at ROCA.

Exhibit 17

Northeast Region ATS Projects and Possible Actions

Park	*Route*	*Weighted*	*Cost per Rider*	*NPS Cost per*	*Action*
STLI	STLI Ferries	478	3.23	0.00	Continue
BOHA	BOHA Ferries	474	4.38	0.11	Continue
BOST	Charlestown Water Shuttle	472	4.00	0.00	Continue
GOIS	Manhattan Ferry	468	1.35	0.00	Continue
ACAD	Island Explorer	467	3.00	1.92	Continue
GOIS	Brooklyn Ferry	460	2.08	0.00	Continue
FIIS	Sailors Haven Ferry	455	4.92	0.00	Continue
CACO	Provincetown Shuttle	449	3.79	0.00	Continue
ADAM	Adams Trolley	444	2.37	2.37	Continue
STEA	Rail Excursions	443	17.01	4.17	Continue
FIIS	Watch Hill Ferry	437	7.18	0.00	Continue
STEA	Scranton Limited	431	20.77	19.27	Continue
BOHA	Boston Light Tours	430	19.89	0.00	Continue
BOHA	Thompson Island Ferry	420	7.71	1.79	Continue
CACO	Coast Guard Beach Trams	417	0.35	0.35	Continue
EISE	Eisenhower Shuttle	410	1.66	1.66	Continue
LOWE	Enhanced Trolley	401	3.77	3.77	Add
VAFO	Enhanced Tour	385	4.09	2.22	Add
FOMC	Charm City Circulator	382	3.66	0.99	Add
CACO	FLEX	379	12.48	0.00	Continue
GATE	Riis Park Ferry	375	8.75	0.00	Continue
SAMA	Baker's Island Tours	367	7.96	1.59	Add
LOWE	Existing Trolley	365	3.29	3.29	Replace
GATE	Sandy Hook Ferry	364	16.43	0.00	Continue
SHEN	Rapidan Tour	350	0.63	0.63	Continue
ROVA	Roosevelt Ride	347	8.73	8.73	Continue
JOFL	JOFL Path of Flood Tours	342	1.50	1.50	Add
GATE	Sandy Hook Bus	335	3.58	0.00	Continue
COLO	Williamsburg-Jamestown	327	4.73	3.31	Add
ROCA	Hiker Shuttle	319	4.65	2.33	Add
GETT	Downtown Shuttle	301	4.97	2.44	Add
ALPO	ALPO Weekly Tours	295	1.25	1.25	Add
MIMA	Concord Weekend Shuttle	294	5.05	5.05	Add
COLO	Historic Triangle Shuttle	291	7.07	7.07	Replace
MABI	Full Circle Trolley	281	8.15	3.26	Continue
MABI	Hiker Tours	258	1.18	1.18	Add
JOFL	Hourly Lakebed Tours	250	1.55	1.39	Add
JOFL	Limited Lakebed Tours	243	1.65	1.40	Replace
VAFO	Revolutionary Shuttle	221	14.09	14.09	Replace
ROVA	Val-Kill Tram	206	2.09	2.09	Continue
ROVA	FDR Tram	202	2.62	2.62	Continue
GETT	Freedom Transit Bus Route	169	23.60	7.08	Replace

Note: Cost per ride figures for VAFO, GETT, and COLO reflect estimated costs to the NPS to continue these pilot projects. The NPS is not currently providing operating funds for these projects.

Exhibit 18

Northeast Region ATS Projects by Possible Actions

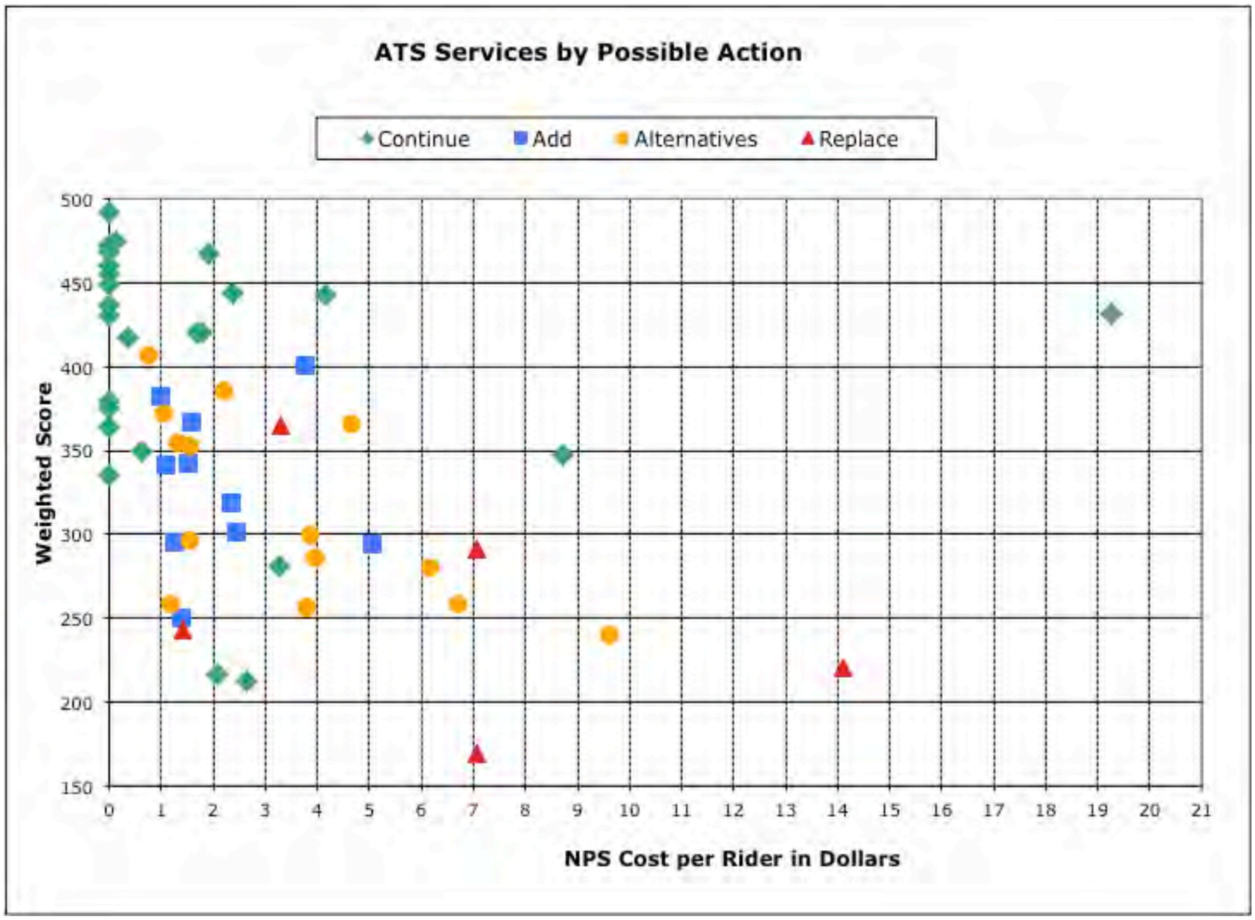
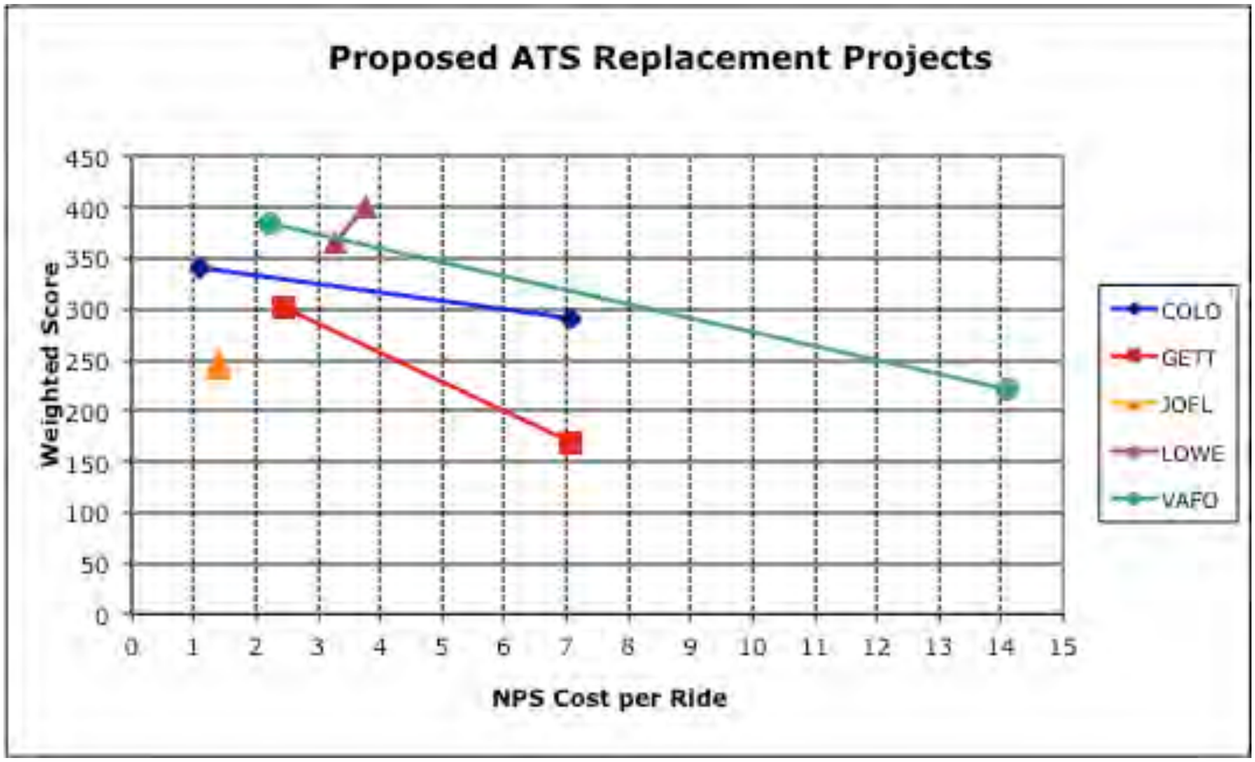


Exhibit 19

Northeast Region Proposed ATS Replacement Projects



Note: Cost per ride figures for VAFO, GETT, and COLO reflect estimated costs to the NPS to continue these pilot projects. The NPS is not currently providing operating funds for these projects.

Category Scores for 25 Northeast Parks

Different ATS projects are important for different reasons. This is reflected in category scores generated by the ATMS evaluation matrix. Category scores for Northeast ATS projects are presented in Exhibits 20 through 24.

Exhibit 20

Category Scores for NER ATS Programs that Provide Critical Access to NPS Sites

Park	*Project*	*Critical Access*	*Resource Protection*	*Safety*	*Visitor Experience*	*Visitor Diversity*	*Partner-ships*	*Recreation & Education*	*Ridership & Productivity*	*Cost Effectiveness*
ACAD	Island Explorer	40	43	42	40	34	48	50	47	36
ADAM	Adams Trolley	40	35	42	34	48	31	50	44	36
BOHA	BOHA Ferries	50	32	42	42	48	38	36	47	42
BOHA	Boston Light Tour	50	32	42	36	33	27	50	35	40
BOHA	Thompson Island Ferry	50	32	42	34	44	30	50	22	38
BOST	Charlestown Water Shuttle	35	41	41	44	50	46	36	50	44
CACO	Coast Guard Beach Trams	45	46	26	32	20	15	48	50	40
CACO	Provincetown Shuttle	40	39	44	44	44	46	40	34	44
EISE	Eisenhower Shuttle	50	32	16	38	25	21	50	44	50
FIIS	Sailors Haven Ferry	50	36	34	34	44	47	40	40	40
FIIS	Watch Hill Ferry	50	36	34	34	48	47	40	29	40
GOIS	Brooklyn Ferry	50	24	34	42	48	44	40	40	48
GOIS	Manhattan Ferry	50	24	34	42	48	50	40	40	50
ROVA	Roosevelt Ride	45	41	29	32	42	25	34	17	20
SAMA	Baker's Island Tour	45	21	26	36	31	27	40	29	38
SHEN	Rapidan Tour	45	34	35	28	13	2	50	29	40
STLI	Liberty & Ellis Island Ferries	50	35	40	36	44	41	50	50	46

Exhibit 21

Category Scores for NER Transportation Features

Park	*Project*	*Critical Access*	*Resource Protection*	*Safety*	*Visitor Experience*	*Visitor Diversity*	*Partner-ships*	*Recreation & Education*	*Ridership & Productivity*	*Cost Effectiveness*
LOWE	Existing Trolley	45	26	32	34	40	23	36	26	32
LOWE	Enhanced Trolley	45	32	50	36	40	29	36	32	24
STEA	Scranton Limited	45	30	44	36	38	29	50	47	20
STEA	Rail Excursions	45	32	46	40	28	35	50	47	28

Exhibit 22

Category Scores for NER ATS Tours

Park	*Project*	*Critical Access*	*Resource Protection*	*Safety*	*Visitor Experience*	*Visitor Diversity*	*Partner-ships*	*Recreation & Education*	*Ridership & Productivity*	*Cost Effectiveness*
ALPO	Railroad Tours	25	20	24	30	11	12	50	29	40
JOFL	Path of Flood Tours	25	16	25	30	38	29	50	32	40
JOFL	Lakebed Tours	15	18	8	26	8	13	38	29	44
JOFL	Lakebed Hourly	15	18	8	28	8	12	38	32	44
MABI	Hiker Tours	15	23	23	28	6	6	50	26	40
VAFO	Enhanced VAFO Tour	30	34	40	30	32	27	46	41	34

Exhibit 23

Category Scores for NER ATS Improvements

Park	*Project*	*Critical Access*	*Resource Protection*	*Safety*	*Visitor Experience*	*Visitor Diversity*	*Partner-ships*	*Recreation & Education*	*Ridership & Productivity*	*Cost Effectiveness*
CACO	Cape Cod FLEX	25	32	42	28	48	38	33	35	38
COLO	Historic Triangle Shuttle	25	39	31	36	34	31	30	20	0
COLO	Williamsburg-Jamestown	25	37	29	36	34	33	24	28	42
FOMC	Charm City Circulator	25	42	40	34	50	47	25	35	24
GATE	Sandy Hook Ferry	25	36	46	32	32	32	38	29	40
GATE	Sandy Hook Bus	25	28	26	34	32	26	37	28	46
GATE	Riis Park Ferry	25	30	40	28	32	29	38	44	40
GETT	Downtown Shuttle	35	18	22	28	31	38	16	20	38
GETT	Freedom Transit Lincoln Line	15	14	14	15	27	31	12	9	8
MABI	Full Circle Trolley	30	28	19	32	11	31	28	20	32
MIMA	Concord Shuttle	15	18	27	36	48	25	30	30	20
ROCA	Campobello Hiker Shuttle	25	23	11	36	20	27	50	32	38
VAFO	Revolutionary Shuttle	15	25	34	20	30	26	22	17	0

Exhibit 24

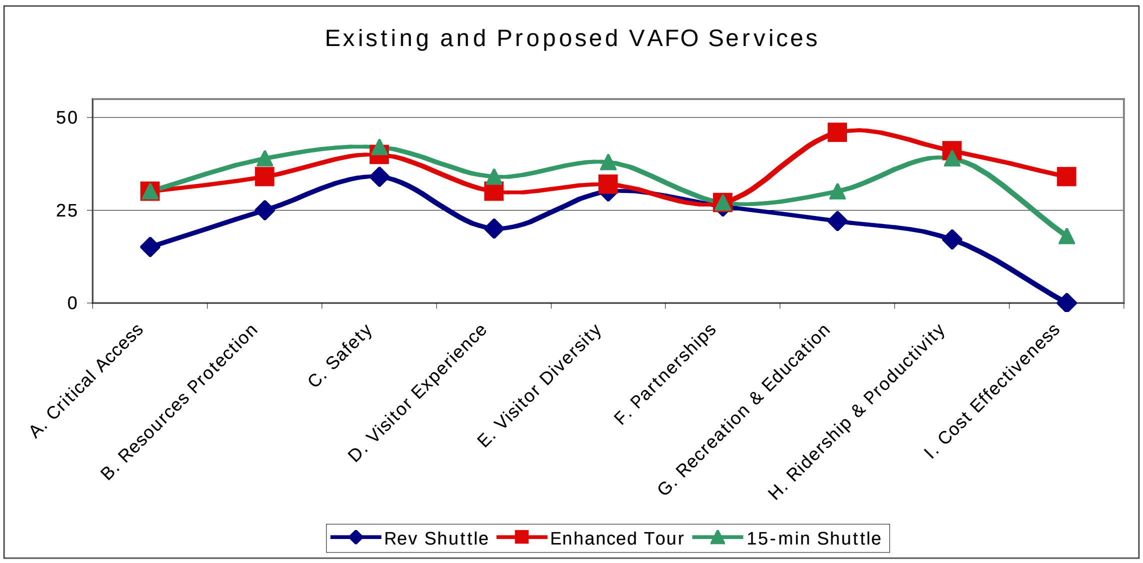
Category Scores for NER Special Needs Projects

Park	*Project*	*Critical Access*	*Resource Protection*	*Safety*	*Visitor Experience*	*Visitor Diversity*	*Partner-ships*	*Recreation & Education*	*Ridership & Productivity*	*Cost Effectivenes s*
ROVA	FDR Tram	25	20	14	12	22	4	10	22	36
ROVA	Val-Kill Tram	25	16	14	14	22	4	10	25	36

String charts can be used to display the relative strengths of ATS services. This is illustrated in Exhibit 25. Category scores for service options at Valley Forge were generated for the existing *Revolutionary Shuttle*, and for two possible replacement services. The existing service generated low scores for *Critical Access* and *Ridership & Productivity,* and zero points for *Cost Effectiveness*. Enhanced trolley tours received the highest overall score. The category score chart shows that fifteen-minute shuttle service, while stronger in some respects, generates fewer points for *Recreation & Education*, and a low score for *Cost Effectiveness*.

Exhibit 25

Category Scores for Existing and Proposed VAFO Services



A category score chart for ACAD shows high scores in all categories for the Island Explorer system, and lower scores for a Schoodic bus route and possible Cadillac Mountain service.

Despite a relatively low overall score, the Schoodic bus continues to operate because it is relatively inexpensive and because it provides critical support for a privately operated ferry between Bar Harbor and the Schoodic Peninsula. Despite relatively high scores for *Resource Protection* and *Safety*, the Cadillac Mountain service has not been implemented, in part because there is no funding source available to pay for this service.

Exhibit 26

Category Scores for Existing and Proposed ACAD Services

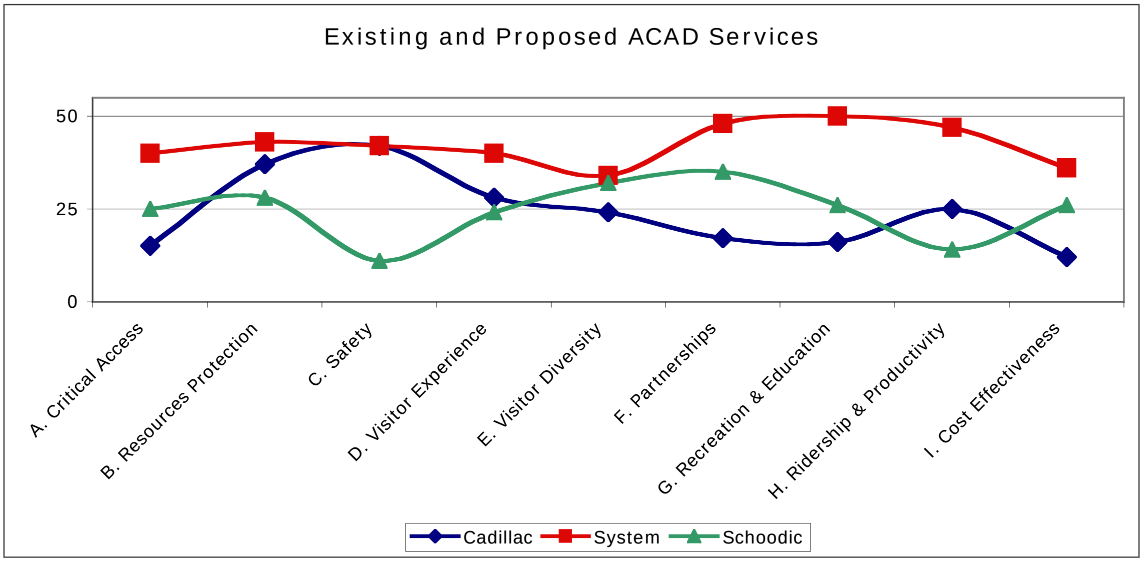
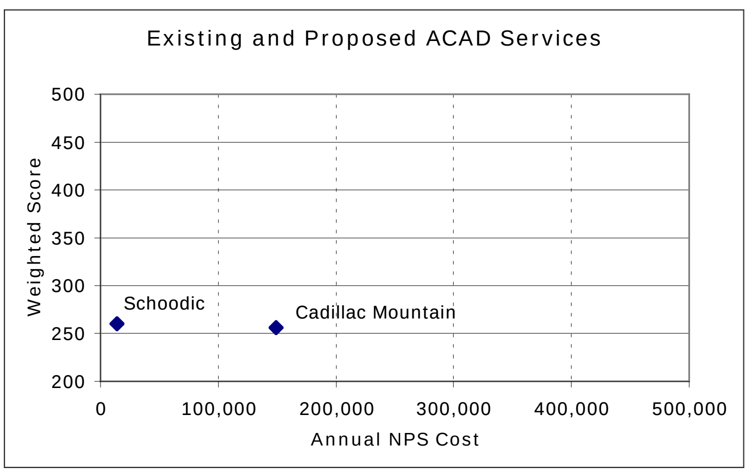


Exhibit 27

Cumulative Scores and NPS Costs for Existing and Proposed ACAD Services



Comparison of ATS Scores for Individual Evaluation Categories

Evaluation scores can be used to identify ATS programs that are particularly import for individual evaluation categories. For example, category scores can be sorted to identify ATS programs that make significant contributions to Resource Protection or to Visitor Experience. Similarly, this can be done to show ATS projects important for ensuring Visitor Diversity.

It is also possible to compare ATS projects in terms of individual performance measures. Exhibit 28 ranks Northeast ATS projects according to the estimated number of vehicle miles eliminated by alternative transportation programs.

Operating Fund Requirements

The ATMS includes an assessment of ATS operating costs, ATS program revenue, partner funding, and the anticipated requirement for NPS operating fund support. Exhibit 29 shows operating fund requirements for existing ATS projects at 25 Northeast parks, excluding pilot projects at COLO, VAFO, and GETT. Exhibit 30 shows operating fund requirements for existing and proposed ATS projects at the same 25 parks.

STEA utilizes a combination of ONPS and other NPS funding to pay for the park's Live Steam program ($1.3 million). Other existing ATS services, excluding STEA, utilize a combined total of $446,217 of ONPS funding for ATS operations. Most of this ONPS amount involves ADAM trolley service ($207,809) and LOWE electric trollies ($181,314).

If proposed ATS expansions and additions are included, the total ONPS funding requirement increases to a combined total of $2.8 million. $1.8 million of this is currently funded, which means that Northeast Region faces a projected future operating fund shortfall of $1 million per year.

Exhibit 28

Estimated Vehicle Miles Removed by NER ATS Projects

Park	Route	Car Miles Eliminated	Status	Weighted Score
ACAD	Island Explorer	1,221,132	Existing	467
BOST	Charlestown Water Shuttle	551,471	Existing	472
CACO	Cape Cod FLEX	542,713	Existing	379
GATE	Sandy Hook Ferry	498,800	Existing	364
FOMC	Charm City Circulator	443,478	Proposed	382
COLO	Historic Triangle Shuttle	310,070	Pilot	291
COLO	Williamsburg-Jamestown	226,957	Proposed	341
EISE	Eisenhower Shuttle	161,268	Existing	420
STEA	Live Steam Excursions	126,974	Existing	443
CACO	Provincetown Shuttle	118,176	Existing	449
CACO	Coast Guard Beach Trams	110,109	Existing	417
VAFO	VAFO Enhanced Tour	65,217	Proposed	385
GATE	Riis Park Ferry	62,609	Existing	375
STEA	Scranton Limited	42,247	Existing	431
ADAM	Adams Trolley	38,052	Existing	444
GETT	GETT Downtown Shuttle	33,913	Proposed	301
MIMA	Concord Weekend Shuttle	29,217	Proposed	294
ROVA	Roosevelt Ride	21,495	Existing	347
LOWE	LOWE Enhanced Trolley	20,652	Proposed	401
SHEN	Rapidan Tour	16,965	Existing	350
VAFO	Revolutionary Shuttle	15,652	Pilot	221
GETT	Freedom Transit Lincoln Line	15,480	Pilot	169
LOWE	LOWE Existing Trolley	11,976	Existing	365
GATE	Sandy Hook Bus	11,217	Existing	335
ALPO	Railroad Tour	9,720	Existing	295
ROCA	Campobello Hiker Shuttle	8,348	Proposed	319
MABI	Full Circle Trolley	8,148	Pilot	281
JOFL	Path of Flood Tour	2,114	Proposed	342
ROVA	Val-Kill Tram	2,020	Existing	216
MABI	Hiker Tours	1,965	Proposed	258
ROVA	FDR Tram	1,935	Existing	212
JOIFL	Lakebed Hourly	1,852	Proposed	250
JOFL	Lakebed	1,070	Existing	243
STLI	Liberty & Ellis Island Ferries	0	Existing	492
BOHA	BOHA Ferries	0	Existing	474
GOIS	Manhattan Ferry	0	Existing	468
GOIS	Brooklyn Ferry	0	Existing	460
FIIS	Sailors Haven Ferry	0	Existing	455
FIIS	Watch Hill Ferry	0	Existing	437
BOHA	Boston Light Tour	0	Existing	430
BOHA	Thompson Island Ferry	0	Existing	420
SAMA	Baker's Island Tour	0	Existing	367

Exhibit 29

Operating Fund Requirements for Existing ATS Services (excluding pilots)

		Weighted Score	Operating Cost	Ticket Sale & Partner Funding	NPS Fee Revenue	ONPS & Other NPS Funding	Unfunded Shortfall
CRITICAL ACCESS							
STLI Ferries	STLI	492	30,000,504	30,000,504	0	0	0
BOHA Ferries	BOHA	474	983,513	957,941	0	25,571	0
Charlestown Water Shuttle	BOST	472	1,499,974	1,499,974	0	0	0
Manhattan Ferry	GOIS	468	765,600	765,600	0	0	0
Island Explorer	ACAD	467	1,234,765	444,515	790,249	0	0
Brooklyn Ferry	GOIS	460	410,181	410,181	0	0	0
Sailors Haven Ferry	FIIS	455	354,240	354,240	0	0	0
Provincetown Shuttle	CACO	449	257,495	257,495	0	0	0
Adams Trolley	ADAM	444	207,809	0	0	207,809	0
Watch Hill Ferry	FIIS	437	308,831	308,831	0	0	0
Boston Light Tours	BOHA	430	68,376	68,376	0	0	0
Eisenhower Shuttle	EISE	420	176,414	176,414	0	0	0
Thompson Island Ferry	BOHA	420	108,000	82,998	0	25,002	0
Coast Guard Beach Trams	CACO	417	73,875	0	73,875	0	0
Rapidan Tour	SHEN	350	2,471	0	0	2,471	0
Roosevelt Ride	ROVA	347	75,072	0	75,072	0	0
NPS FEATURES							
Rail Excursions	STEA	443	248,381	187,528	0	60,853	0
Scranton Limited	STEA	431	1,345,246	97,127	0	1,248,119	0
Existing Trolley	LOWE	365	181,314	0	0	181,314	0
IMPROVEMENTS							
Cape Cod FLEX	CACO	379	779,051	779,051	0	0	0
Riis Park Ferry	GATE	375	78,720	78,720	0	0	0
Sandy Hook Ferry	GATE	364	282,600	282,600	0	0	0
Sandy Hook Bus	GATE	335	61,572	61,572	0	0	0
TOURS							
Lakebed Tours	JOFL	243	4,765	715	0	4,050	0
SPECIAL NEEDS							
Val-Kill Tram	ROVA	216	33,724	0	33,724	0	0
FDR Tram	ROVA	212	40,598	0	40,598	0	0
TOTAL			39,583,090	36,814,382	1,013,519	1,755,189	0
Without STLI & STEA			7,988,960	6,529,224	1,013,519	446,217	0

Exhibit 30

Operating Fund Requirements for Existing and Proposed ATS Services

		Weighted Score	Operating Cost	Ticket Sale & Partner Funding	NPS Fee Revenue	ONPS & Other NPS Funding	Unfunded Shortfall
CRITICAL ACCESS							
STLI Ferries	STLI	492	30,000,504	30,000,504	0	0	0
BOHA Ferries	BOHA	474	983,513	957,941	0	25,571	0
Charlestown Water Shuttle	BOST	472	1,499,974	1,499,974	0	0	0
Manhattan Ferry	GOIS	468	765,600	765,600	0	0	0
Island Explorer	ACAD	467	1,234,765	444,515	790,249	0	0
Island Explorer AGC	ACAD	467	250,000	0	0	0	250,000
Brooklyn Ferry	GOIS	460	410,181	410,181	0	0	0
Sailors Haven Ferry	FIIS	455	354,240	354,240	0	0	0
Provincetown Shuttle	CACO	449	257,495	257,495	0	0	0
Adams Trolley	ADAM	444	207,809	0	0	207,809	0
Watch Hill Ferry	FIIS	437	308,831	308,831	0	0	0
Boston Light Tours	BOHA	430	68,376	68,376	0	0	0
Eisenhower Shuttle	EISE	420	176,414	176,414	0	0	0
Thompson Island Ferry	BOHA	420	108,000	82,998	0	25,002	0
Coast Guard Beach Trams	CACO	417	73,875	0	73,875	0	0
Baker's Island Tours	SAMA	367	21,172	16,938	0	0	4,234
Rapidan Tour	SHEN	350	2,471	0	0	2,471	0
Roosevelt Ride	ROVA	347	75,072	0	75,072	0	0
NPS FEATURES							
Rail Excursions	STEA	443	248,381	187,528	0	60,853	0
Scranton Limited	STEA	431	1,345,246	97,127	0	1,248,119	0
Enhanced Trolley	LOWE	401	358,120	0	0	181,314	176,806
IMPROVEMENTS							
Charm City Circulator	FOMC	382	1,245,563	909,261	0	0	336,302
Cape Cod FLEX	CACO	379	779,051	779,051	0	0	0
Riis Park Ferry	GATE	375	78,720	78,720	0	0	0
Sandy Hook Ferry	GATE	364	282,600	282,600	0	0	0
Jamestown-Williamsbrg	COLO	341	205,800	158,466	0	0	47,334
Sandy Hook Bus	GATE	335	61,572	61,572	0	0	0
Campobello Shuttle	ROCA	319	22,320	11,160	0	0	11,160
Downtown Shuttle	GETT	301	129,250	65,918	0	0	63,333
Concord Shuttle	MIMA	294	24,223	0	0	0	24,223
Full Circle Trolley	MABI	281	44,818	26,891	0	17,927	0

Exhibit 30 (continued)

Operating Fund Requirements for Existing and Proposed ATS Services

		Weighted Score	Operating Cost	Ticket Sale & Partner Funding	NPS Fee Revenue	ONPS & Other NPS Funding	Unfunded Shortfall
TOURS							
Enhanced VAFO Tours	VAFO	385	204,525	93,750	0	0	110,775
Path of Flood Tours	JOFL	342	1,586	0	0	1,586	0
Railroad Tours	ALPO	295	900	0	0	900	0
MABI Hiker Tours	MABI	258	1,337	0	0	1,337	0
Lakebed Hourly Tours	JOFL	250	7,740	774	0	6,966	0
SPECIAL NEEDS							
Val-Kill Tram	ROVA	216	33,724	0	33,724	0	0
FDR Tram	ROVA	212	40,598	0	40,598	0	0
TOTALS (existing & proposed)			41,914,364	38,096,824	1,013,519	1,779,855	1,024,166
Without STLI & STEA			10,320,234	7,811,666	1,013,519	470,883	1,024,166

6 parks account for most of the anticipated use of NPS dollars for ATS operations:

- ADAM uses $208K of ONPS to provide shuttle access to presidential homes.
- STEA uses $1.3 million to support Live Steam rides.
- LOWE uses $181K for electric trolley operations, with plans to increase this by another $177K.
- ACAD needs to add $250K to serve a proposed Acadia Gateway Center.
- A proposed ATS project at FOMC might require $330K per year in NPS operating subsidy.

Other ATS operating fund requirements are limited.

- Pilot project parks appear to need between $50K and $150K per year to support future operations.
- Parks with Ranger-led ATS tours typically spend less than $25K per year of base funding for ATS operations.
- Many parks have no net NPS operating costs.
- Two parks (BOST and GOIS) benefit from ATS services without any NPS capital or operating investments.

The combined requirement for ONPS funding, including proposed new projects, the Live Steam program at STEA, and other projects currently funded with NPS dollars, is projected to be $2.8 million per year. Without Steamtown, the combined total is $1.5 million.

Multi-Year Investment Strategy

The Alternative Transportation Management System generates pivot table reports showing future capital expenditures for new ATS assets and for replacement equipment. These reports can be screened for existing projects, pilot projects, and proposed projects. They can also be screened in terms of high, medium, and low weighted scores from the ATMS evaluation matrix. The results of this analysis were utilized to assign individual ATS assets to different funding tiers.

- Tier 1 investments would be made under a highly constrained funding environment.
- Tier 2 investments are anticipated under a moderately constrained funding environment.
- Tier 3 projects provide important benefits to the NPS, but require a higher level of available funding.

Pivot table reports from the ATMS allow projected expenditures to be displayed by year, by park, by asset type, and by individual asset. Changes to tier assignments may be needed to make expenditure levels match anticipated funding scenarios.

Classification of individual investments by tier is ongoing. Preliminary findings suggest that an average of $3 million per year of combined Category III and TRIP funding will be needed for Tier 1 investments. Tier 1 and 2 projects will require a combined total of $3.5 million per year. Tier 1, 2, and 3 projects together will require an estimated $4.5 million per year.

These estimates include just the transit programs evaluated at 25 Northeast parks. They do not include any ATS bicycle or multi-use trails, nor do they include ATS pilots and proposals at any of the remaining parks in the region. These estimates also assume an additional $2 million per year in other USDOT capital grants for Tier 1 & 2 projects, and a combined $4 million per year in other USDOT capital grants for Tier 1, 2, & 3 projects.

Exhibit 31 shows 10-Year anticipated expenditures for replacement buses, trams, and vans. This table includes total expenditures or all funding sources, and for all three funding tiers. The 10-year total is $11,354,224, with an average of approximately $1.1 million per year.

LESSONS LEARNED

The Alternative Transportation Management System for the Northeast Region provides the National Park Service with new tools for understanding, evaluating, and overseeing investments in non-automotive transportation. It combines a comprehensive inventory and assessment of existing and planned services with financial analysis of current and anticipated investments in programs and supporting assets.

This section highlights some of the lessons learned during the development of the ATMS.

Exhibit 31

10-Year Anticipated Cost of Replacement Buses, Trams, and Vans – All Funding Sources, Tier 1, Tier 2, and Tier 3

Park	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Grand Total
ACAD					1,389,186	1,938,716	1,389,186	694,593			5,411,681
ADAM					315,000						315,000
CACO	694,500						1,625,000		449,484		2,768,984
COLO					359,700						359,700
EISE			60,000				820,000				880,000
GETT							270,000				270,000
LOWE									185,000		185,000
MABI		373,000									373,000
ROCA							93,959				93,959
ROVA		31,000								355,900	386,900
JOFL	175,000										175,000
MIMA		75,000									75,000
SHEN									60,000		60,000
VAFO							0				0
Total	869,500	479,000	60,000	0	2,063,886	1,938,716	4,198,145	694,593	694,484	355,900	11,354,224

Lessons Learned: ATS Inventory and Evaluation Matrix

1. The Evaluation Matrix shows the relative importance and effectiveness of a diverse set of ATS programs.
2. The Evaluation Matrix can be used to evaluate proposed ATS service concepts, as well as existing services. This requires assumptions and projections regarding service hours, ridership, and costs.
3. Different ATS projects are important for different reasons. This is reflected in an Evaluation Matrix scoring system that addresses multiple evaluation categories.
4. The *Critical Access* category deserves special attention. Several ATS projects provide the only way that most visitors gain access to park sites.
5. When using matrix scores, it is important to recognize the relative scale of different projects. The ATMS accomplishes this with charts that show *Weighted Scores* on the vertical axis and *Total NPS Cost* on the horizontal axis.
6. Several parks with "pilot projects" show unfunded operating deficits for future years.
7. Some pilot projects need improvements to increase their effectiveness. It may be necessary to cancel some underperforming pilots.

Lessons Learned: Total Cost of ATS Ownership

8. Many assets that are critical for NPS ATS programs are not owned by the NPS. The state of Maine owns buses and buildings at ACAD, Massachusetts owns docks and piers at BOHA, regional transit authorities own buses at CACO, private operators own ferryboats at STLI, BOHA, and FIIS.
9. Important ATS assets were funded by special capital grants from the U.S. Department of Transportation.
10. Vehicle replacement is a key area where ongoing financial support will be needed. Most ATS projects do not generate enough revenue to pay for replacement vehicles. New shuttle programs are likely to create ongoing demands for replacement capital.
11. Decisions about TRIP funding should be made with the assumption that vehicles purchased will need to be replaced, and that future TRIP dollars (or other FTA dollars) will be needed for this purpose. One-time capital grants for vehicles will only set the stage for future problems.
12. In the Northeast Region, the NPS makes extensive investments in docks, piers, and related waterway improvements. NPS waterfront facilities are typically used by concession contractors (STLI , BOHA) or by independent ferry operators (FIIS, GATE).
13. Because new intermodal transportation centers also function as visitor welcome centers, they require appropriate interpretive staffing. These interpretive functions are only partially related to the ATS programs that utilize these facilities.
14. With some exceptions, use of NPS base funding for operation and maintenance of ATS-related assets appears to be minimal. The major exceptions are LOWE, ADAM, and STEA, where ATS programs are funded primarily by base budgets. At ACAD, only incidental bus stop maintenance is paid for with base dollars. Use of ACAD ONPS funding is expected to expand in the future to include staffing and maintenance costs for a new intermodal welcome center.
15. Excluding STEA, about $450,000 per year of NPS base funding is currently used for ATS operations. Most of this is spent at two parks, ADAM and LOWE.
16. The Northeast Region could use $2.8 million per year in ATS operating funding. Most of this money would be used to support ATS programs at five parks: STEA, LOWE, ACAD, ADAM, and FOMC. This includes $250K for expanded Island Explorer service at ACAD, and $336K to support a downtown Baltimore circulator route at FOMC.
17. Pilot project parks appear to need between $50K and $150K per year to support future operations
18. Parks with Ranger-led ATS tours typically spend less than $25K per year of base funding for ATS operations
19. Many parks have no net NPS operating costs. Two parks (BOST and GOIS) benefit from ATS services without any NPS capital or operating investments.

20. Initial use of the ATMS for multi-year capital investment planning suggests that a combined minimum of $3 million per year of Category III and TRIP funding is needed for high priority Tier 1 transit programs at 25 Northeast parks. The analysis suggests that $3.5 million per year is needed for Tier 1 & 2 projects, and that $4.5 million is needed for Tier 1, 2, and 3 projects. These estimates do not include ATS trails, nor do they include ATS pilots and proposals at additional parks in the region. They assume that an additional $2 million per year in other USDOT capital grants for Tier 1 & 2 projects, and a combined $4 million per year in other USDOT capital grants for Tier 1, 2, & 3 projects.

NEXT STEPS

Next steps in the development of a Northeast Region Alternative Transportation Management System include:

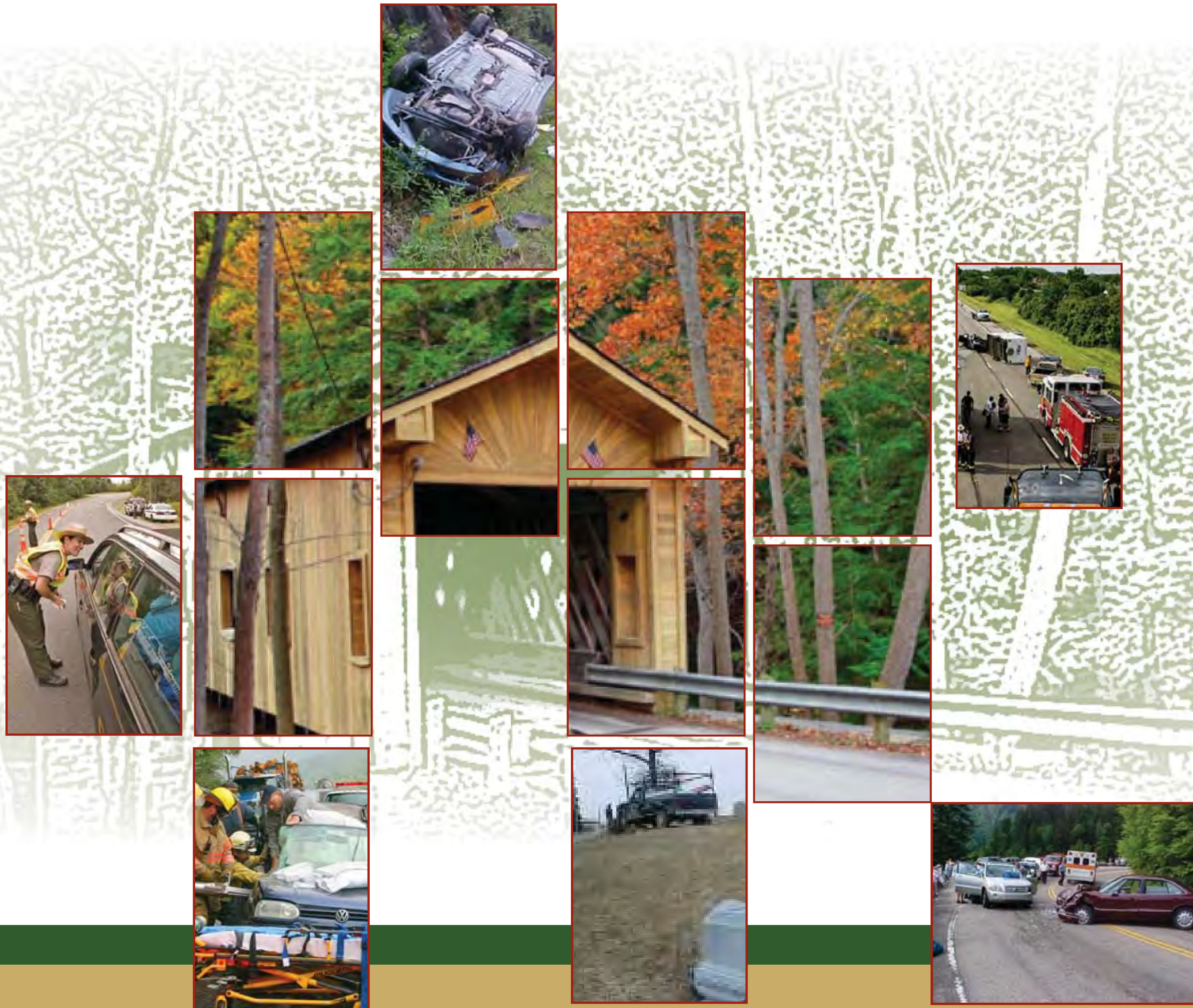
- Updating and refining data already in the ATMS database (for example, replacing dock and pier estimates with more accurate information)
- Addressing existing and proposed pilot ATS projects at additional Northeast parks
- Expanding the ATMS to include ATS trails

This should result in more accurate financial data and reports, and a more complete picture of ATS investments in the Northeast Region.

A related effort will be to improve and enhance ATMS database. This will include:

- Improvements to the database structure
- Enhanced input screens
- Discussions with WASO about possible adjustments to the ATMS to meet the needs of other NPS regions
- Facilitating and controlling access to the system by multiple users
- Improving pivot table reports to address additional questions and concerns

The result will be a management system that can be readily and easily used by Northeast Region staff, as well as by managers and planners from other National Park Service regions.



Northeast Region Transportation Safety Management System - Summary Report

Prepared for

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Gateway National Recreation Area

Melissa Axtman/Facility Manager
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Jennifer Flynn/Deputy Superintendent
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Gordon Olson/Chief of Natural & Cultural Resources
Ann Kain/Cultural Resources Program Manager

Valley Forge National Historical Park

Deirdre Gibson/Chief of Planning and Resource Management
Gregg Tinkham/Acting Chief Ranger
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Gordon Sassman/Park Ranger

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Barbara Burke/Central Federal Lands Highway Division
Isbel Ramos-Reyes/Eastern Federal Lands Highway Division
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Scott Whittemore/Eastern Federal Lands Highway

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N *Gateway National Recreation Area Traffic Safety Management Plan –Recommended Countermeasures*, Jan. 2011

O *Gettysburg National Military Park Traffic Safety Management Plan –Recommended Countermeasures*, Jan. 2011

P *Shenandoah National Park Traffic Safety Management Plan –Recommended Countermeasures*, Jan. 2011

Q *Valley Forge National Historical Park Traffic Safety Management Plan –Recommended Countermeasures*, Dec. 2010

R *Northeast Region Hot Spot Analysis* Technical Memorandum, Sept. 21, 2010

S *FY2011 Recommended Program for Safety Improvements* Technical Memorandum, Apr. 15, 2011

T *Incorporation of DEWA Safety Countermeasures into the NER LRTP Prioritization and Programming Process* Technical Memorandum, Oct. 17, 2011

U *Recommended Monitoring Plan for Safety Improvements* Technical Memorandum, Nov. 10, 2011

V *Recommended Metrics for Prioritizing Safety Countermeasures and Projects* Technical Memorandum, Dec. 9, 2011

Acronyms and Abbreviations

4Es	engineering, enforcement, education, and emergency medical services
100MVMT	100 million vehicle miles traveled
AASHTO	American Association of State Highway and Transportation Officials
ACAD	Acadia National Park
ASIS	Assateague Island National Seashore
CACO	Cape Cod National Seashore
CFR	*Code of Federal Regulations*
COLO	Colonial National Historical Park
CMF	crash modification factor
CSS	Context Sensitive Solutions
DEWA	Delaware Water Gap National Recreation Area
DOT	department of transportation
EB	Empirical Bayes
EFLHD	Eastern Federal Lands Highway Division
EMS	emergency medical services
FHWA	Federal Highway Administration
FLH	Federal Lands Highways
FMSS	Facilities Management Software System
FRSP	Fredericksburg and Spotsylvania National Military Park
FY	fiscal year
GATE	Gateway National Recreation Area
GETT	Gettysburg National Military Park
GIS	geographic information system
GPS	global positioning system
IMARS	Incident Management Analysis and Reporting System
LRTP	Long-Range Transportation Plan
N/A	not applicable
NER	Northeast Region

NHTSA	National Highway Traffic Safety Administration
NPS	National Park Service
NPS-LETC	National Park Service Law Enforcement Training Center
NPV	Net Present Value
PAMP	Park Asset Management Plan
PDO	property damage only
PII	Personally Identifiable Information
PMIS	Project Management Information System
RIP	Roadway Inventory Program
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SEA	Safety Emphasis Area
SHEN	Shenandoah National Park
SMS	Safety Management System
STARS	Servicewide Traffic Accident Reporting System
TO	Task Order
TRB	Transportation Research Board
TSMS	Transportation Safety Management System
USDOT	U.S. Department of Transportation
VAFO	Valley Forge National Historical Park
VMT	vehicle miles traveled
WASO	Washington Area Service Office

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CHAPTER 1

Background and Introduction

The purpose of this summary report is to present the conclusions and recommendations developed to date resulting from the traffic safety analyses and studies conducted in individual parks. These conclusions and recommendations will help to form key elements of a regional Transportation Safety Management System (TSMS) for the Northeast Region (NER) of the National Park Service (NPS).

It is anticipated that these study processes can be duplicated or modified by other regions (or servicewide) as appropriate to support development of a TSMS and assist in the determination of safety needs and funding. Information in this report can also be used to assist the NPS and Federal Highway Administration (FHWA) Federal Lands Highway (FLH) management to identify and prioritize resources to pursue traffic safety improvements throughout the NPS.

The main body of the report presents the conclusions and recommendations related to the development of the Northeast Region TSMS. The appendices provide, in chronological order, all previously submitted technical memoranda and reports. However, please note that not all appendices are referenced in the content of this report.

Background

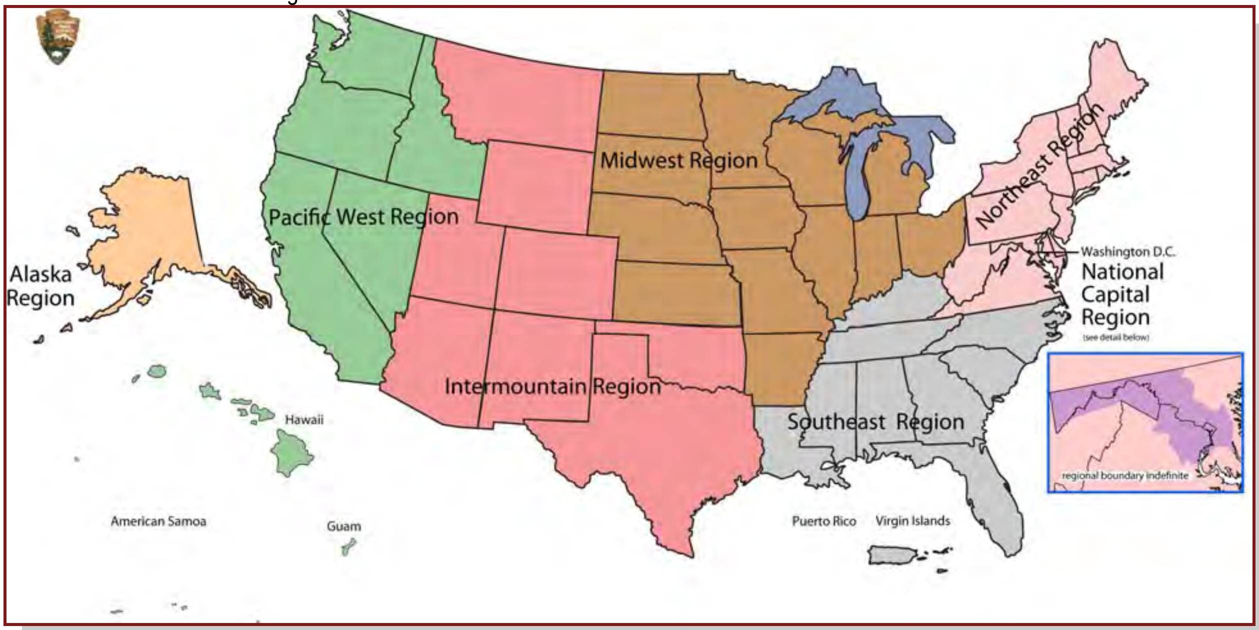
The National Park Service, which manages 391 park units in 49 states, the District of Columbia, and several United States Territories, serves as a worldwide model for the parks and preservation community. The NPS is divided into seven administrative regions (Figure 1-1).

The NPS was established by the National Park Service Organic Act on August 25, 1916, as the steward of our national parks. Specifically, the NPS was established to achieve the following goal, which has remained unchanged for more than 90 years:

> *To conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.*

Visitor enjoyment of these national treasures and resources is facilitated by the roadway and transportation infrastructure offered for vehicles, pedestrians, cyclists, and other modes of transportation. In some parks, the roadway experience itself is the resource that draws visitors. NPS roadways are distinctive in many ways and encompass a broad range of facility types, including historic two-lane rural roads and heavily traveled parkways. They also serve a range of user needs, from recreational access to commuter routes. NPS roads traverse some of the most scenic and environmentally sensitive lands in the United States. Thus, the primary purpose of many of the roadways is to promote and complement an exceptional park experience and not necessarily to facilitate user mobility and traffic safety. The NPS is concerned about the safety of visitors and employees and the impacts to wildlife, but this concern must be considered in the context of the core mission of the NPS.

FIGURE 1-1
The Seven Administrative Regions of the National Park Service



Transportation Safety Management System

In recognition of the current national emphasis among federal and state agencies toward improving traffic safety and saving lives, the NPS with support by the FHWA FLH has initiated a joint effort toward developing a Transportation Safety Management System for use in managing traffic safety in the NPS Park Roads and Parkways Program. Requirements for the TSMS are defined in the *Code of Federal Regulations* (23 CFR Part 970.212) for the NPS, which states:

> *Federal lands safety management system (SMS) means a systematic process used by the NPS, the [U.S. Fish and Wildlife Service] and the [U.S. Forest Service] with the goal of reducing the number and severity of traffic accidents by ensuring that all opportunities to improve roadway safety are identified, considered, implemented, and evaluated, as appropriate, during all phases of highway planning, design, construction, operation and maintenance, by providing information for selecting and implementing effective highway safety strategies and projects.*

To address these requirements and follow the lead of current state practices, the NPS Washington Area Service Office (WASO) initiated several efforts to provide for an organized approach that will incrementally define and develop a Transportation Safety Management System. From the onset of the effort to study and evaluate the safety of the park roadway facilities, the NPS has made a conscious effort to gain a fundamental knowledge of safety issues and make assessments within the context of the sensitive and unique conditions that exist in almost all parks. The NPS is taking a series of steps to establish what the WASO characterizes as a TSMS to balance transportation safety needs with the NPS' core mission of preserving park resources for the American people. For purposes of this report, a TSMS is the same as an SMS.

Northeast Region Transportation Safety Management System

The NER is the first of the seven NPS regions to study traffic safety issues in depth with the intent to develop a TSMS for the region. The Northeast Region encompasses approximately 87 park units in 14 states (Figure 1-2).

FIGURE 1-2
Northeast Region of the National Park Service

The NER is developing a TSMS that fits into the region's process towards a Long-Range Transportation Plan (LRTP). A regional traffic safety goal has been established that focuses on reducing severe crashes (the combination of fatal and injury crashes). Establishing an explicit goal for reducing crashes helps provide an impetus for action, supports the achievement of results, and helps provide a basis for safety programs and associated funding. To focus the traffic-safety improvement efforts and provide a measureable quantitative goal that is challenging, the NER adopted a safety improvement goal to reduce severe vehicle crashes by 20 percent. This goal is comparable to those established by other agencies across the country. Given the limitations imposed by the Organic Act mandate and funding resources, the NER deemed a 20-percent reduction in crashes to be a reasonable and achievable goal. However, it may be desirable that the specific goal be reviewed in the future, given available resources and as projects are implemented and studied for effectiveness.

The NER has conducted a series of studies using a data-driven process to identify prominent crash patterns at those sites that have the greater proportion of crashes in the parks. This step in the development of the TSMS leads to identifying traffic safety improvements that will efficiently help to achieve the regional goal of a 20-percent reduction in severe crashes, which will also reduce total crashes in the region. The conclusions and recommendations from these studies provide input to estimate the project and safety funding needs for the NER multi-year program. The results of the crash analyses were used to identify regional and park strategies to address safety issues; estimate regional level safety needs in terms of costs; and help set a path for NER safety investments and programming of projects. The evaluations of the implemented improvements can focus future safety funding allocations toward safety strategies that effectively reduce crashes and contribute to the regional traffic safety goal.

The studies conducted to date have identified systematic safety improvement strategies, standalone safety projects, and strategies to incorporate into programmed projects for 10 select parks. A data-driven process was used in these first studies to analyze crash data to determine patterns and trends on regional, park, and route levels. The first step in the regional crash analysis (which ultimately evolved into the NER LRTP safety effort) was to conduct a review of the region-wide crash statistics to identify parks with the highest frequency of crashes and identify overall region-wide contributing factors to crashes. Next, Safety Emphasis Areas (SEAs) were developed, including potential region-wide strategies for safety improvements. A second major step was the study of select routes and locations in nine of the 10 parks to determine if a more focused study is an effective means to identify safety improvement needs in the parks.

Parallel to the studies for the nine parks, a park-wide safety study was conducted for one of the 10 parks (Delaware Water Gap National Recreation Area) to gain insights into detailed safety issues at a park level and at a route/intersection level. From this study, insights were gained as to what types of safety studies might be performed at a detailed level of analysis for a given park.

The findings and conclusions from these studies form the Safety component (management system) of the NER LRTP. When complete, the LRTP will guide the process to identify regional transportation needs, recommend solutions, and program projects within allocated budgets. The LRTP incorporates the following NER management systems:

- Alternative Transportation
- Bridge
- Congestion
- Pavement
- Safety

The NER TSMS is being developed parallel with the other four NER management systems (Alternative Transportation, Bridge, Congestion, and Pavement). The intent is that identified needs and projects developed from these management systems would be considered together. This represents a comprehensive, holistic approach to considering the various management systems as one entity for managing region-wide transportation assets. In this asset-management-based approach, integrating safety improvements into projects for the other management systems should result in a more cost-effective outcome than implementing projects for each management system independently.

A key goal of the NER TSMS is to provide a focused, efficient approach to reducing crashes in the parks and a method to incorporate traffic safety data and findings in the project selection, planning, and design processes. The NER TSMS will include a variety of means to implement safety recommendations and uses different funding initiatives/strategies to improve traffic safety in the region. Following are examples of the some of the implementation approaches:

- Parks implement safety recommendations with their own staff
- Develop standalone safety projects
- Safety strategies to be incorporated into programmed paving and bridge projects
- Coordinate with non-NPS agency to implement safety countermeasures

As part of the focused, efficient approach to reducing crashes, the NER TSMS includes an evaluation component. In addition to fulfilling a CFR requirement (refer to SMS definition on page 1-2), evaluating implemented safety improvements helps to determine their viability for implementation in other parks. The evaluation process also provides input to help determine if safety funding was efficiently invested and the progress the NER made toward achieving the region safety goal.

Crash Statistics for the Northeast Region – Prior Studies

This section provides an overview of the historical crash data for the entire region that was developed as part of the servicewide *NPS Traffic Safety Overview* (Task Order 38).

Reviewing historical traffic crash data was the first step toward developing the NER TSMS. This examination of the data provided a general overview of the current trends related to the state of traffic safety in the NER's parks and a comparison between regions of the NPS.

NPS crash data were evaluated at a conceptual level as part of the servicewide effort and served as a starting point for the analysis of all NPS regions. Of the total crashes reported servicewide in the NPS from 1990 to 2005, nearly 9 percent occurred in the Northeast Region. Severe crashes represented 18 percent of the total NER crashes, which is close to the NPS national average of 20 percent (severe crashes are defined as those crashes resulting in a human fatality or injury). During the study period, the number of severe crashes per year remained relatively constant. The number of property damage only (PDO) crashes fluctuated from year to year.

Crash rates for parks having traffic volume data were estimated by comparing crashes with traffic volume data, which provides a measure for evaluating traffic safety based on the magnitude of traffic. Of the five regions included in the NPS servicewide study, the Northeast Region had the highest total and severe crash rates from 2001 to 2005 (Table 1-1).

TABLE 1-1
Crashes and Estimated Regional Crash Rates for those Parks with Traffic Data (2001 to 2005)

Region	Average Total Crashes per Year	Average Severe Crashes per Year	Annual VMT	Average Total Crash Rate (Total Crashes per 100MVMT)	Average Severe Crash Rate (Severe Crashes per 100MVMT)
Intermountain	588.4	119.4	378,006,000	155.7	31.6
National Capital*	1,136	311	1,218,000	92.4	25.3
Northeast	**363**	**78.6**	**135,810,000**	**267.3**	**57.9**
Pacific West	359.8	90.2	170,861,000	210.6	52.8
Southeast	367.2	128.4	523,141,000	70.2	24.5

Notes:

* The National Capital Region data have been updated as of November 2011 (CH2M HILL, *Task Order 12, Task 6 – National Capital Region Crash Data Summary* technical memorandum, Nov. 29, 2011, revised Dec. 13, 2011)

MVMT = million vehicle miles traveled
VMT = vehicle miles traveled

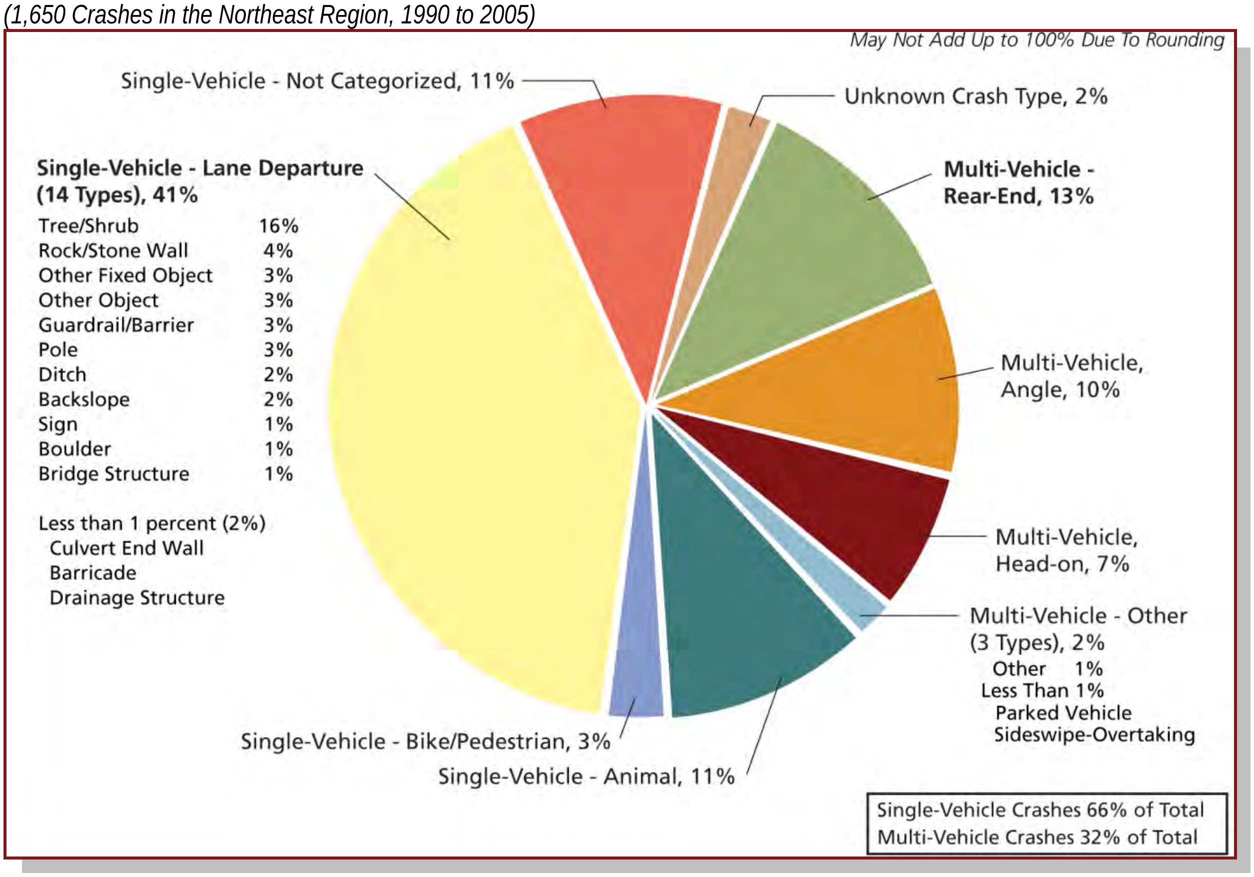
Severe Crashes

The most common cause of severe crashes (both fatal and injury) was lane departure, which predominantly involve a vehicle unintentionally leaving its travel lane and crashing with another vehicle, rolling over, or hitting a fixed object. Figure 1-3 illustrates the following statistics for severe crashes that were reported in the NER from 1990 to 2005:

- Almost two-thirds (66 percent) of the severe crashes in the region involved a single vehicle.
  - The most common single-vehicle crash type was lane departure (run-off-the-road), accounting for 41 percent of the severe crashes. The most common crash was collision with a tree/ shrub at 16 percent, accounting for 44 percent of fatal crashes. There were 13 other lane-departure crash types.
  - Collisions with an animal resulted in 11 percent of the severe crashes.
  - Single-vehicle crashes that were not categorized in reports accounted for 11 percent of the total.
  - Pedestrian and bicycle severe crashes were 3 percent of the total

- Multiple-vehicle crashes comprised 32 percent of the severe crashes.
  - The most common multiple-vehicle crash type was rear-end at 13 percent.
  - Angle crashes represented 10 percent of severe crashes.
  - Head-on crashes accounted for 7 percent of severe crashes.

FIGURE 1-3
Severe Crashes by Type of Collision
(1,650 Crashes in the Northeast Region, 1990 to 2005)



Total Crashes

Total crashes include those crashes resulting in property damage only as well as those crashes resulting injuries and/or fatalities. Figure 1-4 illustrates the following prominent statistics for total crashes from 1990 to 2005, including those in parking areas:

- More than 9,300 total crashes occurred in the region.
- Single-vehicle crashes comprised 66 percent of the total crashes.
  - The most common type of single-vehicle crash was lane departure, accounting for 32 percent. The most common lane-departure crash was a collision with a tree/shrub at 8 percent. There were 13 other lane-departure crash types.
  - Collisions with an animal represented 29 percent of the total crashes. This proportion is the highest of any NPS region.
- Multiple-vehicle crashes comprised 31 percent of the total crashes.
  - The most frequent multiple-vehicle crash was a rear-end collision at 11 percent of all crashes.
  - Multiple-vehicle angle collisions represented 7 percent of total crashes.
- Of the total crashes, 10 percent occurred in parking lots. This includes various parking-related crash types specifically identified such as multiple-vehicle parked vehicle crashes (5 percent) and single-vehicle crash categories called out as parking-related (5 percent) in Figure 1-4.

Crash Rates for Individual Parks

As part of the servicewide study (Task Order 38), crash rates were estimated for those parks where traffic vehicle miles traveled (VMT) data were available. In addition, crash rates were compared to applicable state data. The crash rates range from 110 to 700 crashes per 100 million vehicle miles traveled (100MVMT). The Northeast Region had the widest range of crash rates of all the NPS regions. Table 1-2 lists the crash rates for select parks within the Northeast Region.

FIGURE 1-4
Total Crashes, Including Parking Lots, by Type of Collisions
(9,380 Crashes in Northeast Region, 1990 to 2005)

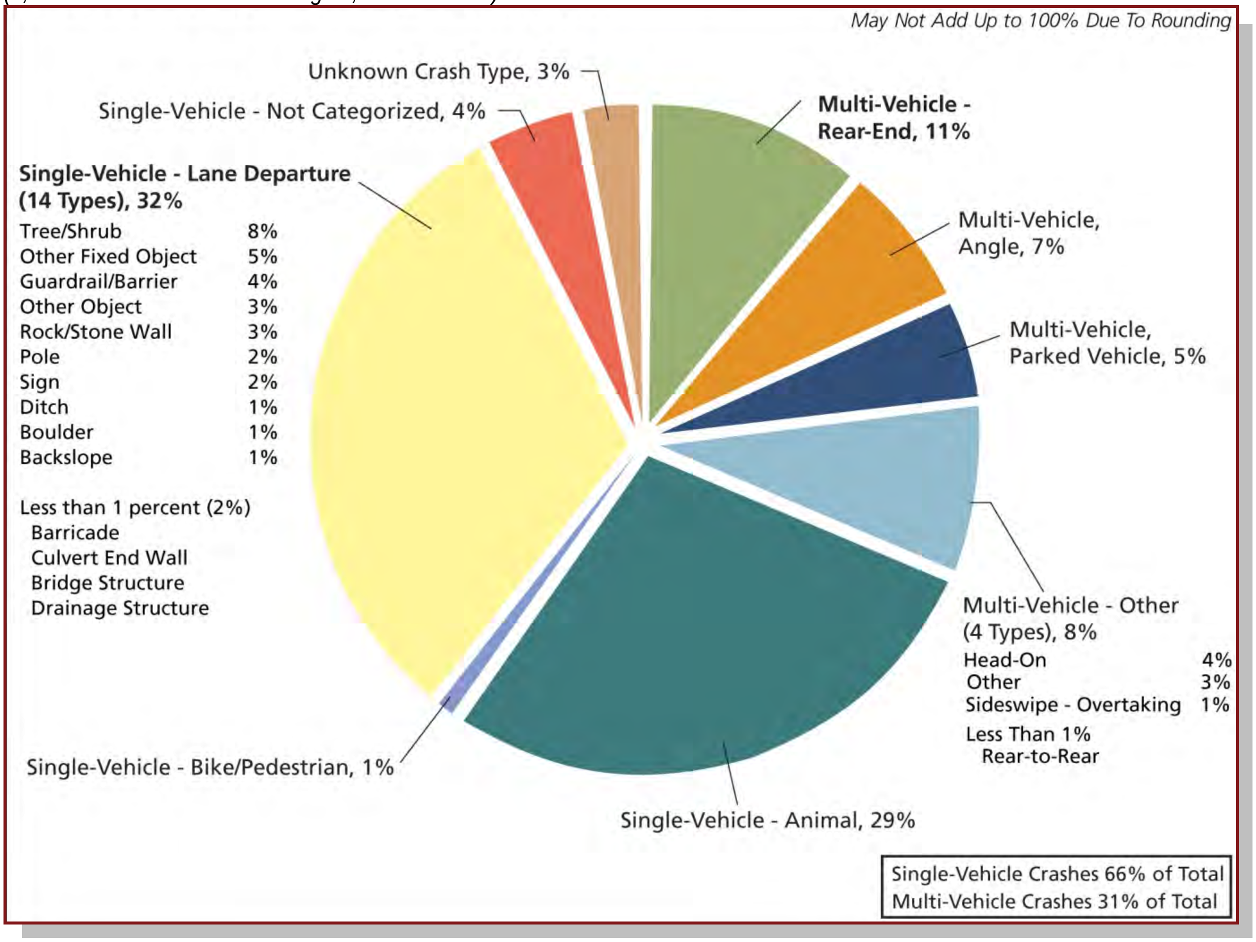


TABLE 1-2
Select Northeast Region Park Crash Rates Compared to State Crash Rates (2001 to 2005)

State[1]	Statewide Crash Rates: Rural Two-Lane Total Crash Rate (per 100MVMT)[2]	Statewide Crash Rates: Rural Two-Lane Fatal Crash Rate (per 100MVMT)[2]	Park Code and Name	Park Crash Rates: 2001-2005 Average Total Crash Rate (per 100MVMT)	Park Crash Rates: 2001-2005 Average Fatal Crash Rate (per 100MVMT)	Park Crash Rates: 2001-2005 Average Severe Crash Rate (per 100MVMT)
Maine	175.0	1.2	ACAD – Acadia National Park	**200.0**	2.4	36.0
New York	366.0[3]	N/A[3]	GATE – Gateway National Recreation Area	110.0	0.0	37.1
Pennsylvania[4]	13.0	3.0	DEWA – Delaware Water Gap National Recreation Area	**260.0**	1.7	63.5
	227.0	4.8	GETT – Gettysburg National Military Park	**700.0**	0.0	112.4
	172.0[3]	1.3[3]	VAFO – Valley Forge National Historical Park	**500.0**	0.0	102.7
Virginia	86.0	1.4	COLO – Colonial National Historical Park	**150.0**	3.0	32.8
			SHEN – Shenandoah National Park	**220.0**	0.0	44.2

[1] Primary state location of national park.
[2] Most recent year available; rates used range from 2000 to 2005.
[3] Corresponding park(s) are located in an urban area; comparable urban roadway rate used instead of two-lane rural highway rate.
[4] Different crash rates are shown due to different state data for comparable state routes.
N/A = not available
BOLD = Crash rate for specific park is greater than the state crash rate from state department of transportation (DOT).
MVMT = million vehicle miles traveled

CHAPTER 2

Findings

This report is intended to outline the safety activities or steps that have occurred to develop the safety component of the NER LRTP and the resulting Transportation Safety Management System. These activities form a defined framework for the study and planning process leading to a program of safety initiatives.

To accomplish the LRTP effort for the NER, the following general steps have been detailed and followed. This step-by-step process also functions to describe the key tasks for a regional TSMS for the NER.

NER Safety Management System and Program – Key Steps to Date

The following are key steps to date in the NER Transportation Safety Management System and Program. Each of these steps is described in the following subsections:

1. Use WASO Efforts to Date, Identify and Implement FHWA/TRB/AASHTO Best Practices
2. Identify Safety Program Elements that Comprise the NER TSMS
3. Collect Data and Analyze Traffic Safety in the NER
4. Identify the Priority Parks, Routes, and Hot Spots
5. Develop Preliminary Safety Emphasis Areas and Countermeasures
6. Field Reviews and Stakeholder Input
7. Quantify Safety Benefits and Costs
8. Develop and Prioritize Projects
9. Integrate with Other NER Management Systems and Develop Multi-Year Program
10. Develop PMIS Information for Multi-Year Program
11. Develop Performance Monitoring and Evaluation Element
12. Complete Other Safety Management Program Elements and White Paper

1. Use WASO Efforts to Date, Identify, and Implement FHWA / TRB / AASHTO Best Practices

Prior to the initiation of the NER traffic safety efforts, WASO conducted a servicewide analysis of traffic crash data. The information that was gathered and used from the WASO safety efforts was presented in Chapter 1. This information and subsequent findings served as a basis for the NER LRTP safety efforts. The effort to develop the NER TSMS also incorporated national best practices from the FHWA, Transportation Research Board (TRB), and American Association of State Highway and Transportation Officials (AASHTO). Using national best practices is important, because this information represents industry best practices that can guide the NER TSMS efforts. In addition, this practice is consistent with the CFR requirements for an SMS.

2. Identify Safety Program Elements that Comprise the NER TSMS

As part of this effort, the NER has given significant attention to the issue of what program components should be considered in the NER TSMS and LRTP. To date, the NER has identified the following components of the NER TSMS safety program (frequently referred to by regional staff as the "Legs of the NER Safety Stool"):

A. Standalone safety projects (Task Order 2)
B. Safety countermeasures[1] to be incorporated into programmed paving and bridge projects (Task Order 2, Task Order 33)
C. Safety sign retroreflectivity compliance (Task Order 19)
D. Safety countermeasures for Alternative Transportation Systems (Task Order 33)
E. Safety initiatives related to Multi-Use Trails (Task Order 33)

For this task order and the LRTP effort, components A and B are explicitly addressed and will be the focus of discussion in this Summary Report. The remaining components are addressed in other efforts and are either completed or are underway. The task orders associated with each program component are shown in parentheses.

The effort to identify specific components of the NER program has helped provide guidance in identifying and classifying safety needs in a logical manner. It also allows for the integration of other regional management systems into the project development and planning process in a very efficient and comprehensive manner. This effort goes beyond the CFR requirements, and represents a new and innovative effort in the implementation of traffic safety initiatives and the role of a TSMS.

3. Collect Data and Analyze Traffic Safety in the NER

The effort to collect and analyze data consisted of a careful and comprehensive review of the traffic crash data reported in the NER. The earlier findings helped shape the direction of subsequent studies. These findings are presented in this chapter in chronological order of the safety study efforts. They will be useful for developing TSMSs for other NPS regions or servicewide.

The Servicewide Traffic Accident Reporting System (STARS) database was the primary source of data for traffic crashes reported in the NER parks. Park staffs transmit crash records (Accident Report Form 10-413) to WASO for inclusion in the STARS database. In addition, law enforcement personnel from other agencies may prepare reports on crashes within the parks if the subject roadway is not under NPS jurisdiction. These non-NPS crash reports may not be included in the STARS database if the agencies do not provide copies of the reports to the park staff.

For the park-wide DEWA traffic safety study (Appendix F), the data collection and analysis effort included collecting other available data pertinent to crashes; traffic volumes; vehicle

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[1] Safety countermeasures, strategies, and treatments are all terms used by various agencies in the highway safety industry. These terms mean essentially the same: improvements to enhance traffic safety. This report uses "safety countermeasures."

classifications; crash rates for comparable facilities; roadway geometry; roadside environments; proposed roadway and traffic control improvements; and any other information that could be useful in assessing crash patterns and proposing safety countermeasures. Including these additional datasets required reformatting of the data, to match the related fields in the STARS database, as well as cross-checking to verify the records were not duplicated in the STARS dataset. For the other nine NER parks, crash records in the STARS database were used for the data collection and analysis effort.

Summary Crash Data for the NER

Table 2-1 summarizes the crash data collected for the parks in the NER, indicating the parks that have submitted data (crash records) to the STARS database. This information was used to identify those parks that should be studied in more depth.

TABLE 2-1
Total Number of Crashes in the NER by Park with Crash Data (1990 to2005)

Park Code	Fatal Crashes	Injury Crashes	Property Damage Only Crashes	Total Number of Crash Records in STARS Database (1990 to 2005)
ACAD	2	102	637	741
ALPO	0	3	17	20
APCO	0	0	1	1
ASIS	0	18	125	143
BOST	0	3	55	58
BOWA	0	1	11	12
CACO	1	30	248	279
COLO	7	119	628	754
DEWA	11	446	1,850	2,307
EISE	0	2	7	9
FIIS	0	2	19	21
FOMC	0	0	1	1
FONE	0	4	17	21
FRHI	0	0	4	4
FRSP	1	32	97	130
GATE	2	98	485	585
GETT	1	85	418	504
GEWA	0	0	3	3
HAMP	0	0	1	1
HOFU	0	3	3	6
INDE	0	3	57	60
JOFL	0	3	5	8
LOWE	0	1	2	3
MIMA	0	1	19	20
PETE	0	2	31	33
RICH	1	4	37	42
ROVA	0	0	17	17
SAIR	0	0	1	1

TABLE 2-1
Total Number of Crashes in the NER by Park with Crash Data (1990 to2005)

Park Code	Fatal Crashes	Injury Crashes	Property Damage Only Crashes	Total Number of Crash Records in STARS Database (1990 to 2005)
SAMA	0	0	1	1
SARA	0	0	9	9
SHEN	5	234	1,103	1,342
STEA	0	1	44	45
UPDE	0	5	22	27
VAFO	3	416	1,754	2,173
VAMA	0	0	1	1
35 Parks	**34**	**1618**	**7,730**	**9,382**

4. Identify the Priority Parks, Routes, and Hot Spots

In order to identify a manageable and representative sample for additional study, the crash history for each park and route in the NER was reviewed. Hot spots (select locations with a high number of crashes) were also reviewed.

Park Selection

Based on the data review, it was determined that 10 NER parks, termed the 10 Highest Parks, should be studied in more depth. This identification effort is a good example of the advantages of using a data-driven process. When the NER parks with crash data are ordered from highest number of crashes to lowest, there is a clear distinction between the tenth park and the eleventh park in terms of the number of severe and total crashes. Since the 10 Highest Parks represented the majority of the NER crashes, it was assumed that focusing efforts on those 10 parks would yield an efficient and cost-effective means to address a very large share of the crashes occurring in the NER.

Selecting parks based on the frequency of crashes (either total or severe) ensures the parks that reported large numbers of crashes are targeted. This selection method allows the NPS to apply safety countermeasures to locations with the highest. The 10 Highest Parks are as follows:

- Acadia National Park (ACAD)
- Assateague Island National Seashore (ASIS)
- Cape Cod National Seashore (CACO)
- Colonial National Historical Park (COLO)
- Delaware Water Gap National Recreation Area (DEWA)
- Fredericksburg and Spotsylvania National Military Park (FRSP)
- Gateway National Recreation Area (GATE)
- Gettysburg National Military Park (GETT)
- Shenandoah National Park (SHEN)
- Valley Forge National Historical Park (VAFO)

Table 2-2 shows that the selected 10 parks include a very high proportion of the crashes in the NER. For all crash types, 95 percent or more of the crashes are represented.

TABLE 2-2
Summary Crash Data – 10 Highest Parks

Type of Crash	Number of Crashes in the NER	Number of Crashes in the 10 Highest Parks	Percentage of NER Crashes
Fatal	34	33	97%
Injury	1,618	1,580	98%
Severe (Fatal + Injury)	1,652	1,613	98%
Property Damage Only	7,730	7,345	95%
Total Crashes	9,382	8,958	95%

Route Selection for Park Initiatives

To further develop the subset of parks to study as part of the region-wide, safety-need identification, three to five routes in each park were initially identified based on the frequency of eligible crashes. (Appendix D provides detailed information about the crashes on the five routes identified for each park.) Eligible crashes represent the total crashes (fatal, injury, and property damage only), excluding parking lot crashes. Parking lot crashes were removed from consideration because they happen in a location separate from the facility type selected for mitigation (either a roadway segment or an intersection). Of these three to five routes in each park, one to three routes were recommended for further investigation in the route and select locations study. Table 2-3 shows the number of crashes along the resulting 16 routes (from the 10 Highest Parks).

Route and Hot Spot Study:

Between 1990 and 2005, there were 4,286 crashes along the 14 routes and at the 36 hot spots (select locations) in nine NER parks:

- 807 severe (fatal and injury) and 3,479 property damage crashes
- 65 percent of the total crashes (56 percent on routes and 9 percent at hot spots)
- 70 percent of the severe crashes (60 percent on routes and 10 percent at hot spots)

Table 2-3 shows that a very high proportion of the crashes in the NER were reported along the 16 identified routes: 74 percent of the fatal crashes and 64 percent of the severe crashes. Because of the high percentage of crashes represented by these routes, they are the most likely routes in the NER to benefit from safety-related countermeasures. Focusing on them will achieve the greatest effect on reducing crashes and accomplishing the NER's safety goal. In addition to identifying the 16 routes, a number of hot spots were also identified. Hot spots are sites that have a relatively high number of crashes and that were not located on the 16 routes. These additional sites are important to review to assist with improving traffic safety and achieving the NER safety goal.

Figures 2-1 through 2-3 show three of the top 16 routes: Route 300 – Park Loop Road in Acadia National Park; Route 10 – Skyline Drive in Shenandoah National Park; and Route 18 – West Confederate Avenue in Gettysburg National Military Park.

TABLE 2-3
Summary Crash Data – Top 16 Routes

Type of Crash	Number of Crashes in the NER	Number of Crashes on the Top 16 Routes*	Percentage of NER Crashes
Fatal	34	25	74%
Injury	1,618	1,034	64%
Severe (Fatal + Injury)	1,652	1,059	64%
Property Damage Only	7,730	4,416	57%
Total Crashes	9,382	5,475	58%
Note: * ACAD Route 12; ACAD Route 300; ASIS Route 13; CACO Route 10; COLO Route 1; DEWA Route 14; DEWA Route 105; FRSP Route 10; GATE Route 30; GATE Route 200; GATE Route 403; GETT Route 13; GETT Route 18; SHEN Route 10; VAFO Route 23; and VAFO Route 252			

FIGURE 2-1
Route 300 – Park Loop Road in Acadia National Park
This one-way segment of Park Loop Road in Acadia National Park follows the alignment of an original carriage road and is itself considered a park resource. The route provides access to popular visitation sites and scenic vistas. This portion of the two-lane road serves several traffic modes as it provides access to the water for pedestrians, a through traffic lane, and a bus parking lane.

FIGURE 2-2

Route 10 – Skyline Drive in Shenandoah National Park

Skyline Drive is a feature in Shenandoah National Park. Improvements for traffic safety must be implemented within park context to preserve the scenic viewsheds and the retaining walls built by the Civilian Conservation Corps.

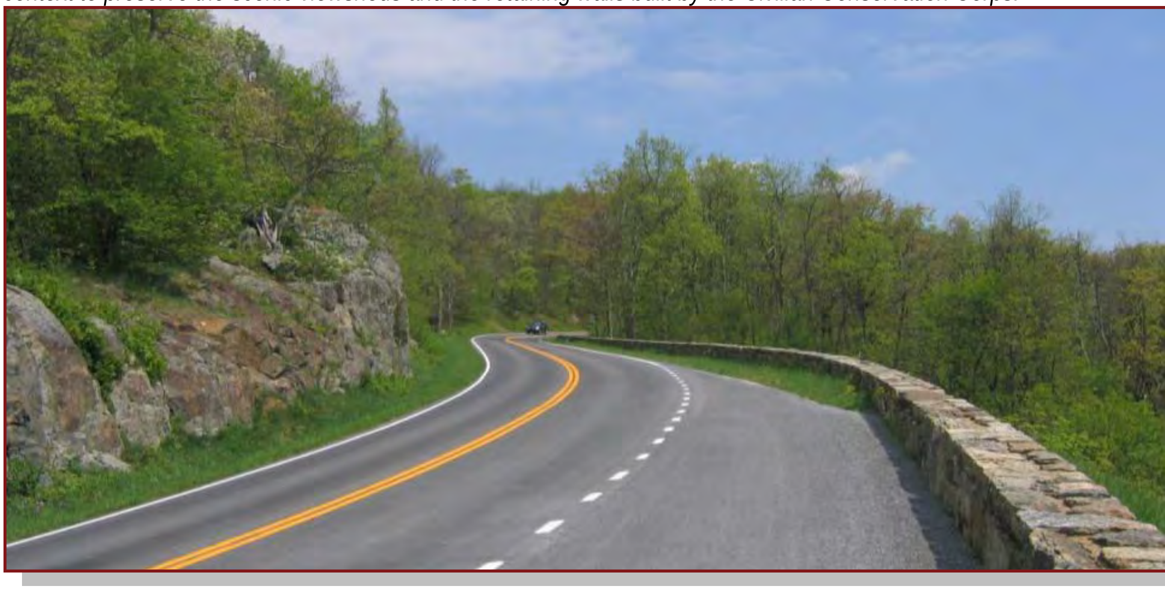

FIGURE 2-3

Route 18 – West Confederate Avenue in Gettysburg National Military Park

With a curvilinear alignment, lack of shoulders, and trees immediately adjacent to the roadway, West Confederate Avenue in Gettysburg National Military Park is typical of many roads in the NER parks. Some of the more typical traffic safety improvements for two-lane roadways do not fit within the context of the park setting. Working with park stakeholders to determine which improvements are appropriate for park context is important for maintaining the NPS mandate to preserve and protect the park resources.

Delaware Water Gap National Recreation Area Traffic Safety Study

DEWA was chosen as the pilot park for the park-wide traffic safety study because, as shown in Table 2-1, the park had the highest number of reported traffic crashes in the NER during the years 1990 through 2005, and is one of the 10 Highest Parks. As part of an organized approach to incrementally define and develop a TSMS for the NER, the DEWA pilot study was conducted by the NPS and FHWA FLH to provide information and a basis for the NER to make park improvements and to provide guidelines for performing similar studies at other parks. In addition, the guidelines, findings, and benefits of performing traffic safety studies based on the results from the DEWA pilot project were presented to other regions and parks.

> **DEWA Crashes:**
>
> Between 2001 and 2007, 1,220 crashes were reported in DEWA:
>
> - 11 fatal crashes resulted in 12 fatalities
> - 336 injury (non-fatal) crashes resulted in 520 injuries
> - 873 property damage only crashes resulted in property damage to vehicles or objects along the road

The *Delaware Water Gap National Recreation Area Traffic Safety Study Report* (Appendix F) provides a comprehensive picture of traffic safety issues within the park by reviewing and summarizing the available traffic crash data from 2001 to 2007 and describing crash trends identified in the data. The report presented crash trends for DEWA in terms of both total (fatal, injury, and property damage only) crashes and severe (fatal and injury) crashes. Figure 2-4 shows the roadway geometry and sight distance concerns at a typical intersection in DEWA.

FIGURE 2-4
Intersection of Hidden Lake Drive and Route 105 – River Road in Delaware Water Gap National Recreation Area
The second-highest frequency of crashes in DEWA occurs on River Road. The vertical and horizontal curvature, lack of shoulders, and limited sight distance at intersections such as this one with Hidden Lake Drive contribute to the crashes that occur on this route.

Key components of the report include a detailed description of the stakeholder involvement process and a discussion summarizing the findings presented and recommendations offered for NPS management's consideration. Information in the report also assisted the NPS and FHWA in identifying and prioritizing resources to pursue the recommended safety improvements.

The study process developed for DEWA was useful for developing traffic safety studies for the other NER parks. Because the DEWA crashes were concentrated on a few routes and at hot spots, it was determined that focusing on similar sites in other parks would be more efficient in future park studies and reduce the costs of the studies. This finding led to a streamlined version of the park-wide, traffic-safety study guidelines and focused subsequent studies on select routes and locations (hot spots) as an alternative to an in-depth park-wide study.

Since the DEWA study was a separate study effort, the findings and recommendations were added to the results from the other nine parks.

5. Develop Preliminary Safety Emphasis Areas and Countermeasures

As part of Task Order 42 Work Request #1 (Appendix A) and Task Order 38 related to the Transportation Reauthorization Request to Congress, Safety Emphasis Areas (SEAs) were developed for the Northeast Region. These SEAs were developed using data from the STARS database to identify crash patterns (including contributing factors) with significant crash frequencies (by crash severity and/or total crashes). The idea was that identifying and then looking at the larger groups of crashes allows the recommendation of target areas that have the most significant impacts on improving safety. These candidate groups are also known in the industry as Critical Emphasis Areas and typically focus on areas where "engineering" and other 4Es (engineering, enforcement, education, and emergency medical services) approaches can be used to improve traffic safety. This approach is the one currently used by Federal Highway Administration/National Highway Traffic Safety Administration (FHWA/ NHTSA) and by state department of transportation (DOT) programs, as per the current federal legislation under the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU).

Recommended Regional Safety Emphasis Areas

Since the NPS is divided into hundreds of units in seven distinct regions, it is important to maintain consistency of safety goals and objectives, where appropriate, while considering the unique attributes of each park unit and region. The NER crash analysis to identify SEAs duplicated the data-driven methodology used to identify the NPS SEAs from the 2007 Reauthorization effort. As the NER SEAs were identified, they were compared to the servicewide SEAs to determine similarities. The *Northeast Region Highway Safety Plan – Identification of Candidate Safety Emphasis Areas* technical memorandum (Appendix A) identified the following seven SEAs to provide a focused selection of countermeasures to address crash patterns in the Northeast Region parks:

> **Recommended Regional Safety Emphasis Areas:**
>
> The NER SEAs focus on infrastructure and human factors concerns that contribute to crashes.

- SEA 1 – Keeping Vehicles on the Roadway and Minimizing the Consequences of Leaving the Road
- SEA 2 – Improving the Design and Operation of Highway Intersections
- SEA 3 – Reducing Head-on and Across-Median Crashes

- SEA 4 – Reducing Driveway Access Crashes
- SEA 5 – Reducing Parking Lot Crashes
- SEA 6 – Reducing Animal Crashes
- SEA 7 – Reducing Crashes Resulting from Human Factors (aggressive driving, impaired driving, and inattentive driving)

All of the identified NER SEAs overlap with the NPS servicewide SEAs, with the exception of NER SEA 7. The first six SEAs are focused on infrastructure (roadways, intersections, and parking lots). SEA 7, Reducing Crashes Resulting from Human Factors, is a combination of several emphasis areas and is focused on driver behavior. These emphasis areas include "curbing aggressive driving," "reducing impaired driving," "keeping drivers alert," and "increasing seatbelt usage." These driver behavior factors represent a large portion of the cost to society for the NER, warranting their inclusion in the analysis and future efforts. (Note that for the 2007 Reauthorization effort, non-engineering SEAs had not been developed, so the human factors SEA (NER SEA 7) was not included as a servicewide SEA.)

The *Northeast Region Highway Safety Plan – Identification of 10 Highest Parks Based on Candidate Safety Emphasis Areas* technical memorandum (Task Order 42, Work Request #9) (Appendix D) contains detailed information about the data analysis, including the crash totals and resultant ranking among the 10 Highest Parks for each SEA.

Recommended Countermeasures for Each Safety Emphasis Area

Countermeasures, also known as strategies, are safety improvements that can be implemented to reduce the severity and/or the total number of crashes. Countermeasures can also be implemented to improve existing conditions, even if there is no documented crash issue associated with the countermeasure. Applicable countermeasures were developed for each of the SEAs, and serve as the initial step in identifying countermeasures to address traffic safety issues at specific sites. The recommended safety countermeasures include elements from the 4Es to provide a comprehensive approach to crash reduction.

> **Recommended Countermeasures:**
>
> Not every safety countermeasure is applicable in all park settings.

The countermeasures for the NER were developed using a Context Sensitive Solutions (CSS) approach to maintain the integrity of a park's cultural and natural resources. However, some of the countermeasures will not be applicable in every park because they may not fit the particular context appropriately. Ideally, the process to identify countermeasures should be conducted with park stakeholders who can provide information about the park context. The *Northeast Region Highway Safety Plan – Strategies for the Safety Emphasis Areas* technical memorandum (Task Order 42, Work Request #9) (Appendix E) details the process to select the countermeasures for each SEA and presents them in a series of seven tables. The following subsections describe some of the numerous countermeasures developed for the NER.

SEA 1 – Keeping Vehicles on the Roadway and Minimizing the Consequences of Leaving the Road

To mitigate lane-departure crashes, the focus is typically to either keep vehicles in their lane or minimize the consequences if a vehicle leaves its travel lane. Countermeasures that keep vehicles in the travel lane are much more in the context of parks rather than countermeasures related to fixed object mitigation, and are frequently more cost effective and easier to implement. Proposed countermeasures to keep drivers in their lane (in order of greatest to least potential to reduce crashes based on crash reduction factors from the FHWA *Crash Modification Factors Clearinghouse* website) include the following:

- **Install Edge Line Pavement Markings**: Edge lines could be enhanced (wider and more reflective markings, profiled markings, etc.) to more effectively delineate travel lanes and at the same time designate paved shoulders where they exist. This visual guidance should help drivers stay in their lanes. Edge line markings improve the driver's ability to see the edge of the road and improve guidance during low-light and nighttime driving conditions. A field review can determine appropriate locations for the installation or enhancement of edge line markings.

- **Install Shoulder Rumble Strips/Stripes**: Rumble strips or stripes make a noise and cause the vehicle to vibrate when the vehicle's tires travel across them. When installed along the edge of the travel lane, a driver of a vehicle that crosses a rumble strip is alerted that they are veering out of the travel lane and the driver can redirect the vehicle prior to running off the road.

- **Install Horizontal Curve Warnings and Delineation:** Providing better notice of an upcoming horizontal curve (either on level or on grade) warns drivers to decrease their speed prior to entering a curve. Warning signs can include Chevrons, Large Arrow signs, Curve signs with advisory speed plaques, and delineators placed along a curve. Pavement markings can include warning arrows on the pavement in advance of curves and optical speed bars that give the appearance that the pavement is narrowing and cause drivers to reduce their speed. Transverse rumble strips that are perpendicular to the travel lane can help slow vehicles on approaches to sharp curves. Targeted speed enforcement can help reduce vehicle speeds on horizontal curves. In addition, decreasing their speed when entering a curve may allow drivers to stop in time to avoid colliding with an animal in the curve.

- **Delineate Roadside Objects:** Delineating roadside obstructions within the clear zone, such as an object marker on signposts and reflector tabs on guardrails is a low-cost way of potentially reducing crashes.

SEA 2 – Improving the Design and Operation of Highway Intersections

Typical intersection crash types are rear-end (particularly on a curve), angle, and collision with a fixed object. Depending on the need, intersection improvements may focus on low-cost countermeasures that can be easily implemented and consistently applied along routes to improve information for drivers. Such improvements include the following:

- **Enhance Advance Regulatory and Guide Signs:** This countermeasure includes upgrading older signs with new signs that have better nighttime reflective capability; using larger signs; and adding INTERSECTION AHEAD (with supplemental plaques to indicate the name of the upcoming cross street) and STOP AHEAD signs. Updating lane-usage and guide signs may help drivers at intersections with non-typical geometry. A review of the existing signs may be beneficial to verify that all existing signs are necessary and placed appropriately.

- **Improve or Add Advance Pavement Marking Messages:** Pavement markings and messages can be used to help distinguish the intersection from the roadway segments. Examples include adding warning messages (such as STOP AHEAD, INTERSECTION AHEAD, and/or ENTERING TRAFFIC AHEAD, etc.), and stop bars and centerlines on the cross streets.
- **Relocate STOP Sign and/or Stop Bars:** Relocating a STOP sign and the associated stop bar to a more advantageous location may improve visibility of the traffic flow along the intersecting roadway.
- **Improve Intersection Sight Distance:** Rear-end collisions may occur at intersections where drivers have limited ability to see traffic approaching from a side street because of roadway geometry and sight obstructions (vegetation along the road and/or improperly placed signs). Extensive roadway improvements are not context appropriate and are likely not cost effective. The intent of this countermeasure is to perform minor tasks that will not require environmental clearance-mitigation measures and be sensitive to the context of the park.
- **Trim Existing Vegetation.** Vegetation growth may restrict sight distance from a cross street to the intersecting roadway or it may cover traffic signs. Trimming bushes or overhanging tree branches can remove these restrictions and improve visibility.
- **Relocate Existing Signs:** Existing signs may potentially block the view from a side street. Relocating these signs or removing any unnecessary signs can decrease visual clutter and improve drivers' sight distance at intersections.

SEA 3 – Reducing Head-on and Across-Median Crashes

Head-on and across-median (sideswipe-opposing) crashes happen when vehicles veer from their travel lane across the roadway centerline. Countermeasures to keep drivers from crossing the centerline are similar to those designed to keep vehicles from departing the roadway. One countermeasure to keep drivers in their lane is as follows:

- **Install Centerline Rumble Strips/Stripes:** Rumble strips or stripes make a noise and cause the vehicle to vibrate when the vehicle's tires cross them. When installed along the roadway centerline, the driver of a vehicle that crosses the rumble strips is alerted that they are veering out of the travel lane and the driver can redirect the vehicle prior to entering the opposing lane.

SEA 4 – Reducing Driveway Access Crashes

Typical driveway crash types are angle and rear-end crashes. Driveway improvements should focus on low-cost countermeasures that can be easily implemented and consistently applied along the route to improve signage/pavement markings and sight distances for drivers. Such improvements include the following:

- **Review Driveway Sight Distance at Selected Locations:** The improvement of driveway sight distance is a low-cost, easy countermeasure to consider, particularly if vegetation growth and/or signs restrict sight distance.

SEA 5 – Reducing Parking Lot Crashes

The typical parking lot crash type is rear-end. Depending on the need, parking lot improvements may focus on low-cost countermeasures that can be easily implemented and consistently applied to improve information for drivers. Such improvements include the following:

- **Install or Upgrade Signs:** Signs should help drivers navigate unfamiliar parking lots. This countermeasure includes upgrading older signs with new signs that have better nighttime reflective capability and using larger signs for better visibility.
- **Install or Upgrade Pavement Markings:** Pavement markings and messages can be used to help drivers navigate unfamiliar parking lots. Examples include adding stop bars and centerlines on aisles. Upgrading pavement markings also provides the opportunity to increase the width or length of parking stalls, as necessary.

SEA 6 – Reducing Animal Crashes

To address collisions with animals, more investigation may need to be done to identify if there are specific locations or times where the collisions are happening or if these collisions are occurring along the entire length of the parkway. Countermeasures to reduce crashes involving animals include the following:

- **Implement an Education Campaign for Park Visitors:** Provide public information and education materials that instruct visitors about the dense presence of animals and the high risk of crashes involving animals. If this countermeasure is acceptable to the park, it is important to advise drivers not to veer to avoid the animals. Other possible options include adding reminders on other material printed for the park (for example, maps and brochures) and providing more specific information on the park's website. In certain parks, many of the parkway's visitors are commuters. Therefore, park staff may wish to consider a local media campaign to provide similar information.
- **Enhance Routine Park Ranger Patrols:** Allocate added resources to allow park rangers to enhance patrols in the park, especially if a group of large animals (such as deer or horses) is near the roads. In cases where the park rangers deem it necessary, they should have the authority to give fines to park visitors that are interacting with the wild animals. This potential to be fined should also be included in the education campaign materials and other printed materials.
- **Direct Animals Away from Roads:** If groups of large animals are known to be near the roadside, allow park rangers to herd the animals to a safe distance from the road – an appropriate distance should be determined by park wildlife experts.
- **Implement Animal Detection and Warning Systems:** If animal migration or travel patterns frequently result in animal crossings at specific locations, install animal detection and warning systems (for example, activated flashers on warning signs). These systems alert drivers when animals are either in the road or along the roadside. A prototype could be installed and before/after data reviewed to determine effectiveness prior to installing additional systems.

SEA 7 – Reducing Crashes Resulting from Human Factors (aggressive driving, impaired driving, and inattentive driving)

To modify driver behaviors (aggressive driving, impaired driving, and inattentive driving) to prevent or reduce the severity of crashes, the focus is typically on increasing or enhancing traffic safety enforcement and educating drivers on the traffic and driving safety issues they may encounter. Enforcement and education countermeasures to reduce crashes attributed to driver behavior include the following:

- **Enhance Enforcement Patrols:** Encourage park rangers to enhance routine patrols on park roads by increased enforcement of violations related to driver-behavior issues. While the leading recorded driver behavior contributing to crashes is inattentive driving, visible patrols can increase driver awareness, discourage aggressive driving, reduce impaired driving violations, and encourage regular seatbelt use. Enforcement efforts can be enhanced by partnering with other law enforcement agencies to provide targeted speed and aggressive driving enforcement.
- **Distribute Driver Safety Public Information and Education Materials:** Distribute driver educational safety brochures at visitor centers, during camping check-in, during traffic stops, etc. Educational materials could be developed specifically for each park or could be part of an NER initiative to provide parks with material suitable for more than one location. Regardless, the material should remind motorists that, particularly in national parks, driving is a complex task and requires their full attention.
- **Promote Alternative Transportation:** As appropriate for the park, an initiative to promote alternative transportation (such as tour buses or nonmotorized vehicles) may help to ease the demand for roadside parking, and thus reduce the potential for collisions with parked motor vehicles due to inattentive driving.

There are a variety of engineering-related countermeasures that can also help to focus the attention of drivers and reduce the chance of a crash and its severity. Examples include the following:

- Shoulder rumble strips
- Advance intersection warnings

Performance Measures for Each Safety Emphasis Area

Performance measures can be used to assess the effectiveness of countermeasures within each SEA to determine if targeting the particular SEA is an effective way to accomplish the safety goal of reducing crashes. Monitoring performance also determines if the SEA approach is an effective use of NER funds. The following are examples of quantifiable measures for each SEA to assess effectiveness:

- **NER SEA 1 – Keeping Vehicles on the Roadway and Minimizing the Consequences of Leaving the Road**: frequency and/or severity of the specific type of traffic crash related to the improvement
- **NER SEA 2 – Improving the Design and Operation of Highway Intersections:** frequency and/or severity of the specific type of traffic crash related to the improvement

- **NER SEA 3 – Reducing Head-On and Across-Median Crashes**: frequency and/or severity of the specific type of traffic crash related to the improvement
- **NER SEA 4 – Reducing Driveway Access Crashes**: frequency and/or severity of the specific type of traffic crash related to the improvement
- **NER SEA 5 – Reducing Parking Lot Crashes**: frequency and/or severity of the specific type of traffic crash related to the improvement
- **NER SEA 6 – Reducing Animal Crashes**: number of related total and severe crashes reduced
- **NER SEA 7 – Reducing Crashes Resulting from Human Factors (aggressive driving, impaired driving, and inattentive driving)**: vehicle speeds and number of driver citations issued for offenses related to speed, operating under the influence, and offenses related to safety countermeasures

6. Field Reviews and Stakeholder Input

In addition to completing the park-wide study at DEWA, the traffic safety issues and needs for the other nine of the 10 Highest Parks were studied by focusing on specific routes and select locations. Crashes along an entire park route or portions thereof were reviewed. In addition, specific locations (identified concentrations of crashes, such as at an intersection, horizontal curve, or overlook) were reviewed. The specific locations (hot spots) included all fatal crash locations within these nine parks. The purpose of analyzing selected routes and locations was to identify appropriate safety countermeasures for the parks based on this focused analysis and to determine what safety improvements for this subset of the roadway networks in these nine parks can measurably contribute to a reduction in crashes to meet the regional goal. NER regional staff and park staff served as stakeholders for this study to provide input and direction to the study team.

Appendices I through R contain the park reports produced to document the data analyses, field visits, and recommended countermeasures, and the technical memorandum that documents the process to identify the select locations (hot spots). The following summarizes the crash statistics for the nine parks (14 routes and 36 specific locations) for the 1990-to-2005 study period:

- 4,286 total crashes (807 severe and 3,479 property damage only crashes)
- 65 percent (56 percent on routes and 9 percent at select locations) of the total crashes
- 70 percent (60 percent on routes and 10 percent at select locations) of the severe crashes

The primary focus of the route and specific locations study, as well as the LRTP safety effort in general, is to develop "reactive" safety countermeasures. Identification of these countermeasures is based on historical crash data, thus the term reactive. This approach assumes that the past safety performance at crash locations will continue at a similar trend and safety countermeasures that are implemented would affect this trend and reduce crashes. The study also considered safety countermeasures for sites or corridors that do not have significant historical crashes and selected sites where crashes may not have been reported or the frequency of crashes may have been underreported. The recommended safety countermeasures not supported by specific or substantive crash data are referred to as "proactive" countermeasures.

To create a more comprehensive safety program that could implement safety improvements through a variety of means, this effort evolved one step further than the DEWA park-wide study. Whereas the DEWA study identified individual countermeasures to address traffic safety issues, this study effort identified countermeasures to reduce the frequency and/or severity of traffic crashes in these nine parks and provided recommendations for the means to implement them. This study identified four means designed to use existing resources and to maximize the potential to implement the recommended countermeasures in a cost-effective manner. In addition, some of the recommended countermeasures will need to be implemented by a non-NPS agency (such as a state DOT) that owns or has jurisdiction over a roadway within a park. It is anticipated that for these countermeasures, park staff will coordinate with the appropriate agency to request implementation or further study by the agency, as appropriate. The four implementation means are as follows:

- **Implement safety countermeasures using park staff and resources.** These safety countermeasures are implemented by parks, with their concurrence, using their own resources. These countermeasures are typically low cost and very easy to implement. Since funding is not required from the LRTP safety program, these countermeasures are not included in the prioritization process.
- **Incorporate safety countermeasures into programmed NPS repaving or bridge improvement projects.** These recommended safety countermeasures are included in existing projects in the NER LRTP. To be included, the countermeasures need to be within the project limits of defined projects and be feasible to implement consistent with their schedule and scope of work. As the safety countermeasures are incorporated in existing projects, they are not included in the prioritization process.
- **Develop standalone safety projects to implement the safety countermeasures.** For standalone projects, similar countermeasures may be grouped to form logical projects appropriate for contracting purposes. Park staff provided input for grouping the safety countermeasures into projects during the park scan tours. These projects are funded from the LRTP safety program and are included in the prioritization process.
- **Coordinate with non-NPS agency to implement safety countermeasures.** If, after approval by a non-NPS agency, and park or region funds are subsequently used to fund the efforts, these improvements may be placed in one of the previous categories. It is assumed that no funding is required from the LRTP safety program for these countermeasures since coordination efforts are to be done with existing staff resources. Therefore, these countermeasures are not included in the prioritization process.

A key finding from this route and select locations study is that it is possible to achieve the NER crash-reduction goal by focusing on the routes with the highest crash frequencies and specific locations (hot spots). If they are deemed effective, the countermeasures recommended for the identified routes and hot spots in a particular park can potentially be implemented in other locations within the park. This study process can be more cost effective than a park-wide study.

7. Quantify Safety Benefits and Costs

Quantifying the safety benefits and costs is useful to perform an economic appraisal that compares the expected benefit of a crash countermeasure to its implementation cost. The economic appraisal is necessary to prioritize projects based on their Net Present Value (Step 8). The cost estimates are used to estimate the NER safety funding need and are part of the information developed for use in creating projects in the Project Management Information System (PMIS) (Step 10).

Safety Benefits

Safety benefits are estimated by quantifying the societal benefit gained by the crash reduction expected from implementing a countermeasure. The societal benefit is expressed as a dollar value that includes crash costs associated with loss of life, injury, vehicular damage, loss of income, legal fees, etc. The expected crash reduction is multiplied by the cost per fatality, injury, or property damage to determine the societal benefit of implementing a countermeasure.

The potential of a countermeasure to reduce crashes is estimated by multiplying the average annual number of crashes by a crash reduction factor to estimate the number of crashes reduced on an annual basis. This process is repeated for fatalities, injuries, and people involved in a fatal or injury crash that are not killed or physically injured. The crash modification factors are from a variety of sources including the FHWA Crash Modification Factors Clearinghouse, the DEWA traffic safety study, various research reports, and estimates based on the collective knowledge of the NER LRTP team.

The societal costs for fatalities, injuries, and property damage are based on the following information from FHWA and the National Highway Traffic Safety Administration (NHTSA):

- **Fatality:** The value of a statistical life (cost of a fatality) is $6 million. This value is from a 2009 U.S. Department of Transportation (USDOT) memorandum to Secretarial Officers and Modal Administrators.
- **Injury:** The cost of an injury is $23,000. This value is based on an aggregate cost for all the injury severity levels calculated in 2000 dollars, increased to year 2010 costs using the Inflation Calculator on the Bureau of Labor Statistics website. The aggregate injury cost of $17,800 (in 2000 dollars) was calculated by weighting the cost per injury severity level by the percent of injuries represented by the corresponding severity level category. The injury percentages are from the NHTSA's *Economic Impact of Motor Vehicle Crashes 2000*.
- **Property Damage:** The cost of property damage is $3,200. This value is based on the $2,500 property damage cost in 2000 dollars from the NHTSA documentation, increased to 2010 costs using the Inflation Calculator on the Bureau of Labor Statistics website.

Safety Costs

Class C-level costs were estimated for the implementation of each countermeasure recommended for the 10 Highest Parks. Unit costs for the various items required to implement the countermeasure (for example, linear feet for pavement marking, labor hours for enforcement personnel, and each speed feedback trailer) were multiplied by estimated quantities to obtain costs for the countermeasures. The unit costs were obtained from a variety of sources including bid tabulations from previous FHWA FLH and state DOT projects. The *NER LRTP Traffic Safety Study Unit Cost Sources* technical memorandum (Appendix H) documents the process followed to establish unit costs for construction and enforcement items. Project costs were estimated by summing the costs of the individual countermeasures that comprise the projects and adding contingencies for construction traffic control and contractor mobilization. The cost estimates are at Class C-level because the quantities are based on information gathered during the field reviews (Step 6) rather than design or construction documents. The estimated costs do not include maintenance costs.

Annual maintenance costs are typically added to the implementation cost to obtain the total project cost. However, there is no cost assumed for maintenance related to the implementation of these particular countermeasures recommended for the 10 Highest Parks. Discussions with the Chiefs of Maintenance for Gettysburg National Military Park and Fredericksburg and Spotsylvania National Military Park suggest there is little to no maintenance involved over the service life of the particular countermeasures recommended for the parks. If a sign or guardrail is damaged in a crash, the park staff typically recovers the costs to replace the item from the driver's insurance company.

8. Develop and Prioritize Projects

> **Prioritizing Projects:**
>
> The prioritization process includes quantitative and qualitative assessments in the form of metrics.

Funding for the safety projects and programmed paving projects would be identified in the NER LRTP and provided from the NER safety budget. Due to funding constraints, it is necessary to prioritize the order of implementation for the safety projects. The prioritization process is primarily based on an assessment of the quantitative and qualitative benefits of a countermeasure or safety project, the associated costs for implementation, and available funding. Metrics were developed and recommended for prioritizing projects. The *Recommended Metrics for Prioritizing Safety Countermeasures and Projects* technical memorandum (Appendix V) details the attributes of the metrics, ranking process, and results from this process (prioritization). This step briefly summarizes the ranking process.

The ranking process is proposed to occur in two phases, or levels. The first-level ranking considers economic attributes and metrics that can be quantified to compare the safety benefits of a countermeasure to its associated cost for the reactive projects. The proactive projects are quantified based on project cost alone since there is no documented crash history for which to quantify a benefit.

It is important to emphasize that other factors are also considered in the selection and evaluation of safety projects or countermeasures. These factors are more difficult to quantify and are generally considered "non-monetary" or qualitative in nature. As part of the park scan tours conducted in 2010, there was a significant effort to address these issues by obtaining input from the park staff, as well as their concurrence with the recommended countermeasures. The second-level ranking is qualitative to address these non-monetary factors for reactive and proactive projects.

First-Level Ranking – Quantitative Methods

The initial step in the first-level ranking process is to calculate the Net Present Value (NPV) for each reactive project using the projected societal benefit from the reduced crashes and Class C-level project cost estimates. Then, the projects are ordered from highest to lowest NPV. The second step in the first-level quantitative ranking process is to estimate the Class C-level costs for the proactive projects and order them from lowest to highest cost.

Second-Level Ranking Evaluation Criteria – Qualitative Methods

The starting point of the second-level ranking in the prioritization process is identifying subjective criteria that address significant non-monetary issues associated with implementing proposed reactive and proactive safety projects. The criteria identified for the NER was based on items identified to be important to the region. The criteria can be modified to reflect the priorities, goals, challenges, geographies, etc., of a particular region performing the ranking process. Once the criteria are established, metrics (high, medium, and low) are identified to evaluate the ease of implementing the project.

The second-level ranking is typically performed with a group of stakeholders. This could include staff at various levels within NPS (park, region, WASO) to provide different viewpoints and perspectives in the scoring process. The reactive and proactive projects are screened separately to permit relative comparisons among the projects within each list.

Prioritize and Rank Projects

To finalize the project lists, the stakeholder group reviews and compares the findings and collectively decides if the ranking order of projects produced in the first-level quantitative ranking should change based on the project scoring determined in the second-level qualitative ranking. If there is a tie between projects based on the results of one ranking process, then the ranking order of the projects in the other ranking process determines which project ranks higher. The process is separate for the reactive and proactive projects. The two lists are not combined because the quantitative metrics in the first-level ranking process are different for each.

9. Integrate with Other NER Management Systems and Develop Multi-Year Program

Countermeasure Implementation

The findings from the DEWA park-wide study and the route and select locations study were combined to produce an implementation plan for the recommended safety countermeasures. The implementation plan presents a set of recommendations for which safety projects and programmed paving projects to implement in each year of the current NER multi-year funding cycle. This set of recommendations is termed the “multi-year program.” The countermeasures that are part of the programmed paving projects are by necessity implemented in the programmed year. These recommendations with respect to projects are part of the NER TSMS program component. Below is the format and elements of that program. Ultimately, this program is designed to integrate with the other NER management system programs.

FY2012-through-FY2018 Multi-Year Program for Proposed Safety Improvements

Once the prioritization process was complete, the next step was to develop funding recommendations to implement the proposed projects and countermeasures (the multi-year program). The proposed safety program for the next multi-year funding cycle considered the reactive and proactive projects included in the ranking process along with the countermeasures to be incorporated into planned paving projects. This program also includes 14 projects

> **Implementing the Proposed Safety Improvements:**
>
> The estimated safety funding need to implement the multi-year program for the NER is $19 million.

that were proposed for implementation in fiscal year (FY) 2011, but were not funded. The *FY2011 Recommended Program for Safety Projects* technical memorandum (Appendix U) details the process followed to recommend the FY2011 projects. Two programs were proposed – one with an annual budget of $500,000 and one with an annual budget of $1.5 million – to meet the estimated $19 million NER safety funding need identified to date.

For each fiscal year in the multi-year program, budget to cover the estimated cost for the countermeasures to be incorporated into that year's programmed paving projects was set aside first. The standalone safety projects were then funded from the remaining budget. For the standalone safety projects, the following items were considered for the programming of projects into the various years:

- Rank order in the project lists
- Place studies 1 to 2 years prior to implementation year for related project
- Link proactive projects to reactive projects
- Projects were allocated among the 10 participating parks to achieve a reasonable distribution
- Program lower-cost projects as necessary in a particular year to reach the yearly funding limit

The proposed multi-year programs are presented in Chapter 3, Conclusions. Neither funding level was sufficient to implement all of the recommended safety projects. All of the countermeasures recommended for inclusion in programmed paving projects were proposed for funding in the current multi-year program.

The final task in this step to integrate traffic safety with other NER management systems is to finalize the proposed multi-year safety program. The multi-year program that is carried forward in the safety component of the LRTP represents the final set of recommendations for standalone safety projects and identified countermeasures to incorporate into programmed paving and bridge projects. The safety funds to be allocated should be identified prior to finalizing the multi-year program. Once funding levels are identified a fiscally constrained program of safety projects and countermeasures can be developed. Any subsequent changes to the annual amounts of funding from what is initially programmed during the further refinement or implementation of the program would necessitate modifications and potentially adjustments to the timing of implementation.

10. Develop PMIS Information for Multi-Year Program

Implementing the multi-year program includes developing information for use in creating projects and in the NPS PMIS. Creating projects in the PMIS is the mechanism to fund and implement the proposed safety improvements.

Implementing NPS Projects:

Creating projects in the PMIS is the mechanism to fund and implement the proposed safety improvements.

The information used to create PMIS projects consisted of a project description and justification statement, along with the data necessary to create work orders (project location, cost, work breakdown structure codes, and identification number of the related paving project, if applicable). The information for each project included the implementation year as proposed in the multi-year program. The format and content of the PMIS information was developed with input from park personnel who were experienced in creating projects in the PMIS. The information was provided to park staff, who then used the information to create the PMIS projects in the NPS system. A key finding from this effort is that providing input to the park staff was helpful to move forward from recommendations in a report to implementation of the projects. It is also important that park staff use this information in a timely manner to fund improvements in the year recommended in the multi-year program. Providing this input reduced the amount of time required by park staff to create the projects in PMIS.

11. Develop Performance Monitoring and Evaluation Element

The *Recommended Monitoring Plan for Safety Improvements* technical memorandum (Appendix U) provides a detailed explanation of the recommended monitoring plan to evaluate countermeasures implemented to reduce the frequency and/or severity of crashes. The discussion in this step provides an overview of the recommended plan. Several monitoring methods can be used to evaluate the effectiveness of countermeasures and projects on safety performance. The performance measure selected to quantify safety performance, type of countermeasure, number and type of sites, and availability of data should all be a factor in and will affect the method selected. The recommended performance measures vary by the type of safety countermeasure implemented and the data available.

Performance Monitoring and Evaluation:

Monitoring the effectiveness of implemented safety countermeasures provides input to the ongoing NER LRTP safety programming process. The crash reduction related to the countermeasures identifies progress made toward achieving the region's safety goal.

Table 2-4 summarizes the performance measures for each type of safety countermeasure recommended for implementation. Assessing the safety impact of engineering countermeasures is fairly straightforward. For example, the performance measure for engineering-related countermeasures is the reduction in crashes, using a comparison in crash data before and after the implementation of the safety countermeasure as an indicator of its effectiveness.

TABLE 2-4
Performance Measures for Each Type of Countermeasure

Type of Countermeasure	Performance Measures
Engineering	• Frequency and/or severity of the specific type of traffic crash related to the improvement
Enforcement	• Citations issued for offenses related to driver speed • Citations issued for offenses related to operating under the influence • Citations issued for driver behavior offenses that are related to safety countermeasures • Driver speeds
Education	• Frequency of specific crash types and contributing factors • Response to educational material distributed
Emergency Medical Services (EMS)	• Response time to crash sites for law enforcement and EMS personnel • Interface capability with global positioning system (GPS) location data • Crash reports with follow-up between hospital and law enforcement rangers (refers to follow-up protocols related to crashes such as serious injury and operating-under-the-influence crashes)
Technology	• Crash reports with GPS data to identify crash location • GPS units purchased • Crash reports that are complete and accurately reflect the information related to the crash and effectiveness of response and post-crash capabilities

Assessing the safety impact of non-engineering countermeasures is more complex. After careful evaluation of available approaches and NER-specific considerations, it is recommended that surrogate safety performance measures be used rather than crash data. These surrogate performance measures include change in operating speed; reduction in emergency services response times to crash locations; and reduction in crashes where particular driver behaviors (such as aggression and inattention) were recorded as the primary contributing factor.

An "observational (simple) before/after" study method is recommended to monitor the implemented countermeasures, using the performance measures listed in Table 2-4. This study type is *observational* in nature in that the countermeasures are being implemented specifically to improve traffic safety, as opposed to being implemented solely to monitor effectiveness in experimental designs. The recommended approach is termed *simple* in that it does not have a minimum requirement for sample size (frequency of crashes) and that comparison sites (other locations where safety improvements were not implemented) are not included in the evaluation. *Before/after* refers to a comparison of the performance measure data for a period before and after safety improvements have been implemented. A 3-year, before-implementation period and a 3-year, after-implementation period are recommended. The comparison between these periods would indicate the effect of the countermeasure(s) on safety performance.

Engineering Countermeasures

Historically, before/after studies did not account for all factors that might affect crash frequency and severity (such as changes in traffic volume, roadway geometry, or driver behavior).

Before/after studies that use Empirical Bayes (EB) methods[2] are becoming more commonplace in the evaluation of engineering countermeasures. The EB method uses safety performance functions (SPFs) that can account for site characteristics (such as roadway geometry and traffic volumes) and crash history to estimate the anticipated crash frequency without the safety improvements. This value can then be compared to the number of crashes observed after the countermeasure implementation. The advantage of the EB method is that it accounts for the fact that the number of crashes varies at a site over time and that crashes over a 3- or even 5-year period can potentially represent an artificial high or low. In the EB method, the long-term safety performance is calculated and used rather than using the observed crashes, which can overestimate the benefit of a safety improvement. This is commonly known as the regression-to-the-mean effect.

The EB method study is more robust statistically and provides higher statistical reliability of the extent to which an engineering countermeasure affected safety performance at a site. For this reason, where possible, it is recommended as the preferred evaluation method for the NER's engineering-related safety countermeasures. However, EB method studies require a larger effort and are more data intensive than other approaches (expenditure of more resources to collect data and perform the comparison). In cases where geometric or volume data are not available for a location that is being monitored, then the simple before/after study method is recommended to assess impact of the particular engineering countermeasure(s) on safety effectiveness (performance).

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[2] Used as data-analysis tools, Empirical Bayes methods are procedures for statistical inference in which the prior distribution is estimated from the data.

Enforcement, Education, Emergency Medical Services, and Technology Countermeasures

The recommended monitoring method to assess the performance outcome of the non-engineering (enforcement, education, emergency medical services, and technology) countermeasures is a simple before/after study. In this method, surrogate data are collected that relate directly to the particular countermeasure. For example, if the countermeasure is speed enforcement, then the surrogate measure would be the change in the 85th-percentile operating speed. Therefore, the monitoring of these measures does not require using the EB method.

Data Collection

Data collection is the first part of the monitoring process. Monitoring the change in safety performance requires data collection in the before period (prior to implementation of the countermeasure) and in the after period (after implementation). The collected data provide the information required to conduct the before/after study of the countermeasure's effectiveness. Data is collected in two phases over the 3-year period before implementation of the countermeasure and the 3-year period after implementation (or after completion of construction for engineering countermeasures).

Countermeasure Assessment

The second part of the monitoring process is to assess the impact of the countermeasure(s) on the safety performance of the route or hot spot. In other words, assess whether or not these measures support the traffic safety goals of the NER. Ideally, the monitoring process will report on quantitative and qualitative findings. Quantitative findings focus on the analysis of the data collected for the assessment. Qualitative findings, for example, can report input from park staff relating to the effectiveness of the countermeasures and general changes in driver behaviors. Several proactive countermeasures will be implemented as part of the NER LRTP safety programming process. These countermeasures require a qualitative assessment since a quantitative assessment based on existing crash data cannot be performed for these proactive countermeasures because of the lack of a documented crash history from which to determine a crash reduction. The conclusions should be specific to the crash type or improvement targeted by the countermeasure.

Input into the Safety Programming Process

The monitoring process is intended to provide input into the ongoing NER LRTP safety programming process. The information will assist with decisions about continuing the implementation of countermeasures in other parks with similar safety performance characteristics. The primary measure used for assessment is the number and severity of crashes, which indicate how well the countermeasure(s) and projects supported the region's safety-related goals.

Ideally, staff at each park can monitor the countermeasures implemented at their park and report the results to the Northeast Region Transportation Office. The results would include the quantitative conclusions based on the before/after assessment described in this technical memorandum and qualitative observations about the countermeasure implementation and effectiveness. The conclusions should be specific to the crash type or improvement targeted by the countermeasure.

After the park-level results are transmitted to the Northeast Region Transportation Office, the region can aggregate the results and determine the impact of the countermeasures on achieving the region's crash-reduction goals. The aggregate data from the 10 parks may provide a sample size that is large enough to provide a statistically reliable estimate of a countermeasure's effectiveness, but this needs to be assessed in more detail. (The statistical reliability of the sample size would need to be estimated by the NER review team when the aggregate crash data is available.) If the NER determines that a particular countermeasure reduces crashes and improves traffic operations, then it could be considered for implementation at other parks with similar potential for safety improvement. Where a countermeasure proves to have a negative effect (has little or no impact on safety performance), be too costly for the results achieved, or is difficult to implement, further implementation of the countermeasure(s) should be reconsidered or replaced by a countermeasure(s) more likely to support the NER's safety goals in a context-sensitive manner.

12. Complete Other Safety Management Program Elements and White Paper

As outlined in Steps 1 through 11, there are other TSMS program elements under consideration in the NER TSMS and LRTP. The current program components were identified in Step 2. As the other efforts are completed, they can be added to the TSMS.

The white paper is to be completed as part of Task Order 33. The intent of this effort is to prepare a report ("white paper") that documents and summarizes the steps taken to analyze all the TSMS elements in the NER through the performance of all task orders. This includes Task Order 43 (the safety study at DEWA), Task Order 02 (LRTP evaluation for the NPS NER), Task Order 19 (Retroreflectivity Study for the NPS NER), and Task Order 33 (Continuation of NER LRTP with Alternative Transportation Systems).

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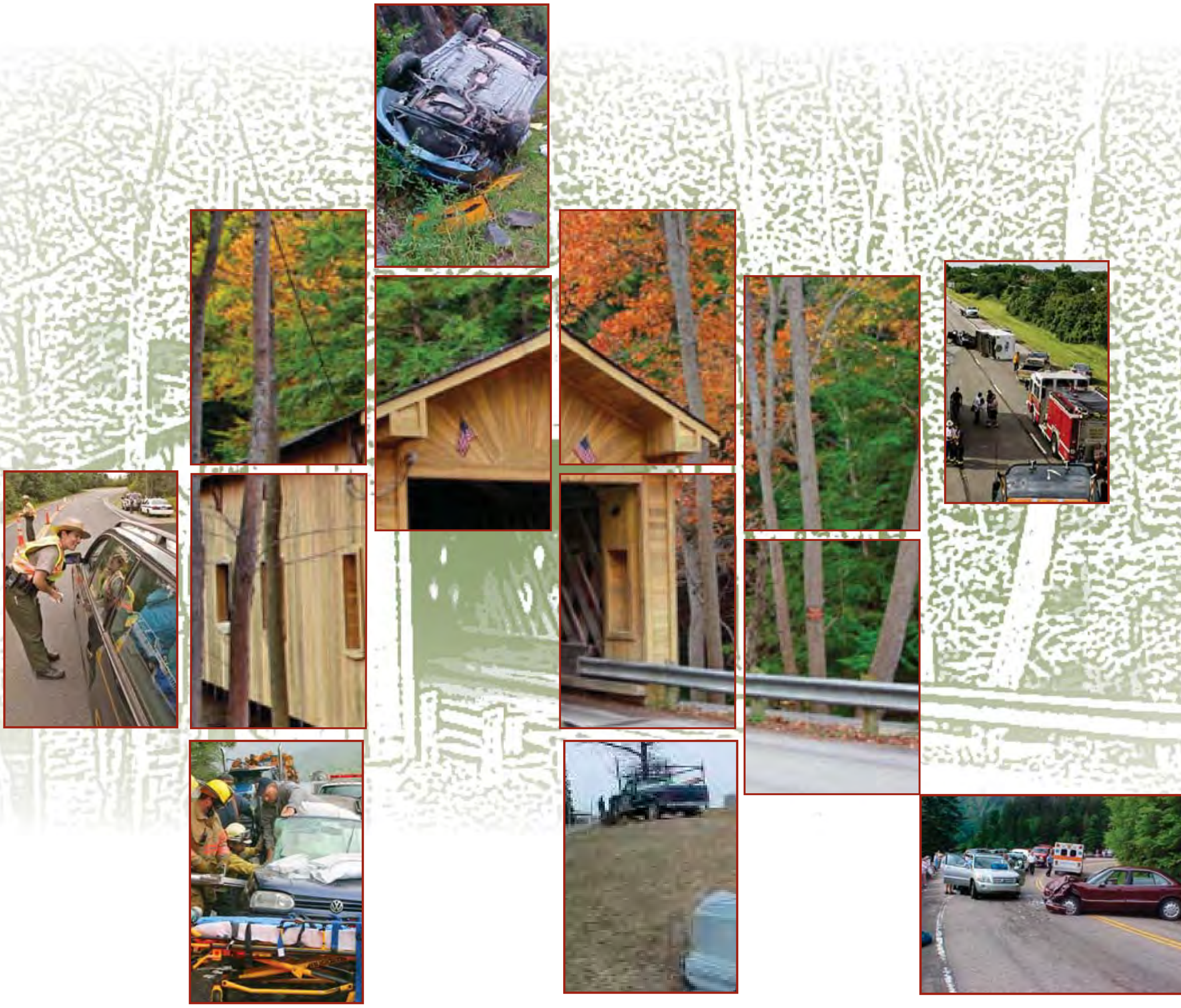

CHAPTER 3

Conclusions

The conclusions developed for the NER LRTP effort and NER TSMS are based on outputs from the work products and insights from efforts conducted as part of Task Orders 2, 19, 42, and 43. The conclusions are organized by task or by issues that were identified during the conduct of each study. The following list gives a sense of the organization of these conclusions and the items considered:

1. Estimated NER Traffic Safety Needs – Funding Considerations and Implementation Considerations
2. Proposed Multi-Year Programs – FY2012 through FY2018
3. Effectiveness of Proposed Improvements to Meet the NER TSMS Safety Goal
4. Safety Improvement Funding Need by Implementation Category
5. Selection of Safety Study Type and Effectiveness of Park Study Approach vs. Park-Wide Study
6. Stakeholder Considerations
7. Inclusion of a TSMS in the NER LRTP

1. Estimated NER Traffic Safety Needs – Funding Considerations and Implementation Considerations

Based on the efforts conducted to date for Task Orders 2, 19, and 43, the estimated cost of traffic safety needs or projects for the NER is approximately $21 million.

This estimated cost is derived from study efforts and recommended safety countermeasures and projects for the 10 Highest Parks (Task Orders 2 and 43) and for study and construction costs associated for the Safety Sign Retroreflectivity Program (Task Order 19). This estimate does not include safety projects or safety countermeasures for alternative transportation systems; paving and bridge projects for the other NER parks not studied as part of the 10 Highest Parks; or for any Multi-Use Trail safety initiatives.

Estimated NER Traffic Safety Project Funding Needs

The comprehensive traffic safety component of the NER LRTP includes the following elements of the transportation system:

- Roads
- Bridges
- Sign Retroreflectivity
- Alternative Transportation Systems
- Multi-Use Trails

The estimated funding need for the sign-retroreflectivity compliance effort is $3 million. The estimated cost of the countermeasures and projects for the 10 Highest Parks is $18 million. However, since the countermeasures proposed to be implemented by park staff or by another agency in coordination with NPS will not be funded from NER safety funding sources, the estimated safety funding needed to implement the standalone safety projects and the countermeasures to be incorporated into paving and bridge projects is reduced to $16 million

($14 million for reactive projects and $2 million for proactive projects). Therefore, the total NER safety funding need identified to date is approximately $19 million ($16 million plus $3 million for the retroreflectivity compliance effort).

The range of recommended safety improvements is comprehensive in nature in that it includes major NER roadway infrastructure systems in a variety of ways. The following components of the NER transportation system are recommended as ways to implement safety projects or countermeasures:

- Roads and Bridges
  - Standalone safety projects
  - Countermeasures to be incorporated into programmed paving and bridge projects
  - Countermeasures to be implemented by park staff
  - Countermeasures to be implemented by another agency with coordination from the NPS
- Safety sign retroreflectivity projects and studies
- Safety initiatives for Alternative Transportation Systems (under development)
- Safety initiatives related to Multi-Use Trails (under development)

2. Proposed Multi-Year Programs – FY2012 through FY2018

The proposed multi-year funding cycle includes fiscal years (FY) 2012 through 2018. Two multi-year programs funding scenarios were produced for two potential annual safety-funding levels: $500,000 and $1.5 million. The programs include funding recommendations for implementing proposed projects and countermeasures in the 10 Highest Parks. For the Safety Sign Retroreflectivity Program, the $500,000 program includes only planning and data collection, whereas the $1.5-million program also includes sign upgrades and replacements. Appendix V contains two spreadsheets that provide detailed information about the two proposed funding scenarios, including recommendations for the projects to implement in each year of the funding cycle. Table 3-1 summarizes the proposed 6-year, $500,000 program and Table 3-2 summarizes the proposed 6-year, $1.5-million program.

For the 10 Highest Parks, a total of 52 standalone projects and four studies were identified through the park-wide and route/specific (select) location studies. The majority of the standalone projects are reactive, which is indicative of the data-driven analysis process followed to identify issues and potential solutions. The proactive projects are recommended to improve traffic operations and anecdotal safety issues noted during field visits to the parks. Countermeasures are proposed for inclusion in 21 paving projects programmed for the current funding cycle.

TABLE 3-1
$500,000 Annual Budget – FY2012-through-FY2018 Multi-Year Safety Program Summary

Fiscal Year	Reactive Projects/ Total Cost	Proactive Projects/ Total Cost	Studies/ Total Cost	Programmed Paving Projects with Countermeasures Added / Total Cost	Estimated Total Program Cost	Estimated Number of Crashes Reduced*		
						Severe (Fatal plus Injury)	Property Damage Only	Total
2012	1 / $6,000	1 / $6,000	1 / $298,000	8 / $173,000	$483,000	8	16	24
2013	6 / $117,000	1 / $9,000	1 / $100,000 (partial funding for DEWA study)	4 / $270,000	$496,000	9	18	27
2014	5 / $262,000	3 / $46,000	2 / $175,000 (partial funding for DEWA study)	6 / $36,000	$519,000	3	3	6
2015	7 / $199,000	2 / $32,000	1 / $50,000	1 / $220,000	$501,000	3	3	6
2016	4 / $433,000	2 / $27,000	0	2 / $41,000	$501,000	9	20	29
2017	2 / $500,000	0	0	0	$500,000	9	20	29
2018	2 / $475,000	0	0	0	$475,000	0	0	0
Total Funded Improvements**	24 / $1,992,000	9 / $120,000	4 / $623,000	21 / $740,000	$3,475,000	41	80	121
Unfunded Projects**	14 / $11,949,000	6 / $903,000	N/A	N/A	$12,852,000	42	98	140

* The estimated number of crashes reduced over a 10-year period following implementation of the project. The law enforcement countermeasures assume a 2-year period of funding and reduced crashes. The estimated number of crashes reduced for projects in which the implementation and cost are split into multiple years is shown in the first year of implementation.

** The DEWA H project is only partially funded in the FY2012-through-FY2018 funding cycle. Therefore, the project is tallied once in the Total Funded Improvements and once in the Unfunded Projects.

TABLE 3-2
$1.5-million Annual Budget – FY2012-through-FY2018 Multi-Year Safety Program Summary

Fiscal Year	Reactive Projects/ Total Cost	Proactive Projects/ Total Cost	Studies/ Total Cost	Programmed Paving Projects with Countermeasures Added / Total Cost	Sign Replacements Total Cost	Estimated Total Program Cost	Estimated Number of Crashes Reduced*		
							Severe (Fatal plus Injury)	Property Damage Only	Total
2012	21 / $763,000	6 / $48,000	2 / $498,000	8 / $173,000	0	$1,482,000	24	54	78
2013	4 / $314,000	1 / $23,000	1 / $75,000	4 / $270,000	$835,000	$1,517,000	16	23	39
2014	3 / $506,000	1 / $29,000	1 / $50,000	6 / $36,000	$865,000	$1,486,000	1	1	2
2015	2 / $440,000	0	0	1 / $220,000	$850,000	$1,510,000	6	12	18
2016	4 / $1,430,000	2 / $27,000	0	2 / $41,000	0	$1,498,000	33	73	106
2017	5 / $1,356,000	3 / $146,000	0	0	0	$1,502,000	1	4	5
2018	2 / $1,098,000	0	0	0	0	$1,098,000	1	1	2
Total Funded Improvements**	34 / $5,907,000	13 / $273,000	4 / $623,000	21 / $740,000	1 / $2,550,000	$10,093,000	82	168	250
Unfunded Projects**	3 / $8,034,000	2 / $750,000	N/A	N/A	N/A	$8,784,000	1	10	11

* The estimated number of crashes reduced over a 10-year period following implementation of the project. The law enforcement countermeasures assume a 2-year period of funding and reduced crashes. The estimated number of crashes reduced for projects in which the implementation and cost are split into multiple years is shown in the first year of implementation.

** The DEWA H project is only partially funded in the FY2012-through-FY2018 funding cycle. Therefore, the project is tallied once in the Total Funded Improvements and once in the Unfunded Projects.

As shown in Tables 3-1 and 3-2, neither funding level is sufficient to implement all the recommended safety projects in the current FY2012-through-FY2018 funding cycle. All the countermeasures recommended for inclusion in programmed paving and bridge projects are proposed for funding in the current multi-year program. Note that the number of standalone safety projects varies between the two funding levels because the $500,000 annual funding level necessitates one project to be partially funded during the current funding cycle and partially funded in the next funding cycle, so it appears as two projects in Table 3-1.

For the current FY2012-through-FY2018 funding cycle, the $1.5-million funding level is sufficient to implement approximately 90 percent of the proposed reactive and proactive standalone safety projects, whereas the annual $500,000 funding level can provide for the implementation of only 62 percent of them. Furthermore, the $1.5-million funding level also provides funding to replace traffic signs to comply with national retroreflectivity guidelines. The $1.5-million annual funding provides for an estimated annual crash reduction that is nearly double that of the $500,000 annual funding in the 10-year period following implementation of the projects and countermeasures in the FY2012-through-FY2018 funding cycle

3. Effectiveness of Proposed Improvements to Meet the NER TSMS Safety Goal

> **Effectiveness of Proposed Improvements to Meet the NER Safety Goal**
>
> The potential crash reduction doubles if projects are funded at the $1.5-million annual level rather than the $500,000 funding level.

The traffic safety improvements identified to date will enable the NER to progress toward achieving the safety goal of a 20-percent annual reduction in severe (fatal and injury) and total crashes throughout the region. However, these improvements (including the projects implemented in FY2011, projects to be implemented by park staff or another agency through separate funding sources, and the 73 projects to be funded through the multi-year funding programs), if completely funded, do not reduce the number of potential crashes enough to reach the NER's goal. This is due to the carefully designed process followed to vet and select the safety countermeasures ultimately recommended. The improvements were identified through an interactive context sensitive solutions (CSS) approach, which included significant input and ultimate approval by park stakeholders in order for a project or countermeasure to move forward. Several countermeasures that might have a higher potential to reduce crashes are not acceptable in the context of most of the 10 Highest Parks (for example, installing centerline and shoulder rumble strips).

As discussed in Chapter 2, Findings, the effectiveness of each countermeasure and project was estimated in terms of the annual number of crashes reduced. Table 3-3 shows the estimated annual crash reduction by implementation method. The multi-year program comprises a significant portion of the safety-related improvements identified to date and provides a high potential for crash reduction. Also, the current US 209 design/build project in DEWA (which includes new guardrails, enhanced pavement markings, and curve delineation) will contribute to a sizeable annual crash reduction on this route. (US 209 has the highest frequency of crashes compared to all the routes in the NER.) The sum of the individual estimated reductions by implementation method provides the anticipated annual crash reduction for the TSMS improvements identified to date. Note that these crash reduction estimates do not include potential crash reductions as a result of sign replacements to comply with retroreflectivity guidelines, since there is limited data to provide estimates of the quantitative safety effectiveness of this effort.

The effectiveness of the TSMS improvements toward reaching the NER safety goal (20 percent annual reduction in severe and total crashes) was calculated with the crash reduction estimates shown in Table 3-3 and the historical number of severe and total crashes. Table 3-4 summarizes the potential of all improvements to be implemented under the NER TSMS to reduce the number of severe and total crashes in the NER (based on the number of historical crashes). The identified improvements could potentially reduce the number of severe crashes in the NER by 16 percent per year and total crashes by 11 percent per year. By specifically focusing on the top 17 routes and the hot spots, the proposed TSMS improvements could potentially reduce the number of severe crashes on the routes and select locations studied by 25 percent per year and the number of total crashes by 18 percent per year.

Table 3-5 shows a comparison of the potential annual reduction in the number of crashes and the corresponding crash reduction percentage that could be achieved by implementing the projects under both annual budget scenarios in the current multi-year program. The potential crash reduction doubles if the projects can be implemented in the current 6-year funding period at the $1.5-million annual budget level, as compared to the projects being funded at the $500,000 annual budget level. As previously noted, the $1.5-million annual funding level is sufficient to implement most of the projects in the current multi-year program funding cycle, so the crash reduction estimates shown in Table 3-5 nearly equal the estimates for all the projects identified for implementation through the multi-year funding programs (Table 3-3). If funded at $1.5 million annually, the projects in the FY2012-through-FY2018 multi-year program provide nearly half of the potential crash reduction for the TSMS (potentially 25.0 total crashes [Table 3-5] of the estimated annual total crashes [62.6 total crashes in Table 3-3] using all implementation methods).

These estimates represent only some of the components of the NER TSMS. Potentially, more crashes could be reduced after implementing the sign replacements to achieve compliance with the retroreflectivity guidelines and implementing improvements identified for routes in the other parks not included among the 10 Highest Parks (to be identified in Task Order 33). Other components of the comprehensive approach to reducing crashes are safety and operational improvements to the alternative transportation systems and multi-use trails (to be identified in Task Order 33). In addition, more integration with the other safety Es (enforcement, education, and emergency medical services) could lead to projects or operational modifications that reduce traffic crashes or the severity of crashes. As envisioned at the beginning of the development process for the NER TSMS, a comprehensive approach to crash reduction and traffic safety improvements will be necessary to achieve the region's traffic safety goal.

TABLE 3-3
Estimated Annual Crash Reduction by Implementation Method for the NER TSMS

Crash Type	Estimated Annual Crash Reduction by Implementation Method (number of crashes)				Total Estimated Annual Crash Reduction (number of crashes)
	FY2011 Program and US 209 Design/Build	Park Staff	Another Agency	Multi-Year Program Projects	
Severe (Fatal and Injury)	5.6	1.5	0.1	9.3	16.5
Total (Fatal, Injury, and Property Damage Only)	20.2	12.8	0.2	29.4	62.6

TABLE 3-4
NER TSMS Progress toward Reaching the NER Safety Goal

Crash Type	Historical Number of Crashes (1990 – 2005)	Average Annual Number of Crashes (1990 – 2005)	Potential Annual Crash Reduction Due to TSMS Improvements (number of crashes)	Effectiveness of Safety Improvements (crash reduction percentage)
NER – Region-wide				
Severe (Fatal and Injury)	1,652	103	16.5	16%
Total (Fatal, Injury, and Property Damage Only)	9,382	586	62.6	11%
10 Highest Parks – Selected Routes (17) and Locations (Hot Spots)				
Severe (Fatal and Injury)	1,072	67	16.5	25%
Total (Fatal, Injury, and Property Damage Only)	5,506	344	62.6	18%

TABLE 3-5
Comparison of the Safety Effectiveness of the Proposed Funding Levels for the Multi-Year Program

Crash Type	Historical Number of Crashes (1990 – 2005)	Average Annual Number of Crashes (1990 – 2005)	Potential Annual Crash Reduction from Improvements Funded through the Current Multi-Year Cycle (number of crashes)		Effectiveness of Safety Improvements from Improvements Funded through the Current Multi-Year Cycle (crash reduction percentage)	
			$500,000 Annual Budget	$1.5-million Annual Budget	$500,000 Annual Budget	$1.5-million Annual Budget
NER – Region-wide						
Severe (Fatal and Injury)	1,652	103	4.1	8.2	4%	8%
Total (Fatal, Injury, and Property Damage Only)	9,382	586	12.1	25.0	2%	4%
10 Highest Parks – Selected Routes (17) and Locations (Hot Spots)						
Severe (Fatal and Injury)	1,072	67	4.1	8.2	6%	12%
Total (Fatal, Injury, and Property Damage Only)	5,506	344	12.1	25.0	4%	7%

4. Safety Improvement Funding Need by Implementation Category

Table 3-6 shows the estimated funding need ($1.5-million annual funding level) by safety implementation category – engineering, enforcement, education, emergency medical services (EMS), and technology (management). The engineering countermeasures represent 83 percent of the safety-improvement need identified for the FY2012–through-FY2018 funding cycle. The traffic safety studies are allocated to the engineering category because the issues to be studied will likely result in recommendations for engineering-related or operations improvements. Enforcement efforts were recommended for most of the 10 Highest Parks and represent nearly one-third of the recommended reactive projects.

Funding Needs for Safety Countermeasure Categories

The comprehensive approach to reducing crashes includes countermeasures in the following categories:

- Engineering
- Enforcement
- Education
- Emergency medical services
- Technology

The education, emergency medical services, and management (technology) countermeasures represent a small portion of the recommended projects. These projects were identified for DEWA, which was the pilot park for the park-wide study. The in-depth study effort for DEWA provided the opportunity to explore traffic safety issues and park experience with all 4Es (engineering, education, enforcement, and emergency medical services), as well as the technology component of crash response and reporting in a park. The limited time spent with staff at the other nine parks was sufficient only to focus on the engineering and enforcement countermeasures.

TABLE 3-6
Estimated Funding Need by Safety Implementation Category
$1.5-million Annual Budget – FY2012-through-FY2018 Multi-Year Safety Program

Implementation Category	Reactive Projects/ Total Cost	Proactive Projects/ Total Cost	Studies/ Total Cost	Programmed Paving Projects with Countermeasures Added/ Total Cost	Sign Replacements Total Cost	Estimated Total Program Cost
Engineering	20 / $4,201,000	13 / $273,000	4 / $623,000	21 / $740,000	$2,550,000	$8,387,000
Enforcement	10 / $1,471,000	0	0	0	0	$1,471,000
Education	1 / $30,000	0	0	0	0	$30,000
Emergency Medical Services	1 / $15,000	0	0	0	0	$15,000
Technology (Management)	2 / $190,000	0	0	0	0	$190,000
Total Funded Improvements	34 / $5,907,000	13 / $273,000	4 / $623,000	21 / $740,000	1 / $2,550,000	$10,093,000
Unfunded Projects	3 / $8,034,000	2 / $750,000	N/A	N/A	N/A	$8,784,000

5. Selection of Safety Study Type and Effectiveness of Park Safety Approach vs. Park-Wide Study

After conducting a traffic safety study for an entire park (DEWA) and nine park scan studies that focused on select routes and locations (hot spots), it is recommended that future safety studies focus on select routes and hot spots in a format similar to the park scan study approach. A park-wide study is recommended only for those parks that have unique traffic safety issues or require a more extensive stakeholder involvement process due to context sensitivity issues. A focused study is more cost effective than conducting a park-wide study and achieves similar results.

> **Selecting the Type of Study**
>
> A route and select location study is recommended for future traffic safety studies, unless an unusual circumstance requires an in-depth park-wide study to identify traffic safety issues and solutions.

In terms of safety effectiveness, the DEWA (parkwide) study identified projects that could potentially reduce the severe crashes by 12 percent and the total crashes by 7 percent per year in the NER. The projects identified for the other nine parks could potentially reduce the severe crashes by 3.8 percent and the total crashes by 3.5 percent per year in the NER. Conducting the park-wide study did identify recommendations that could achieve a higher crash reduction percentage, and reach the DEWA-specific goal of reducing the number of total crashes by 20 percent per year. However, the difference does not seem to be significant enough to reach the regional goal and is likely more attributable to the particular countermeasures the park staff is willing to implement in DEWA. In addition, DEWA had the largest proportion of crashes in the NER, and having larger numbers of crashes to consider may be a factor as there is a potential for achieving a higher reduction in crashes simply due to larger frequencies. In DEWA, it seemed that it was possible to implement some countermeasures with a higher crash reduction potential because the context sensitivity of these measures was less of an issue compared to many other parks.

The in-depth, parkwide study conducted for DEWA provided the opportunity to analyze traffic safety issues in more detail (such as crash reporting practices and law enforcement/ranger coordination with EMS personnel) and to have more intense stakeholder discussions, neither of which can be readily derived from a data-driven analysis. This effort identified traffic-safety improvement projects in all 4Es countermeasure categories, as well as technology (management) countermeasures. However, based on current published research findings, the potential for education-, EMS-, and technology-related projects to reduce crashes is sometimes less than the potential for engineering- and enforcement-related projects—in addition to cost considerations of project implementation. The safety benefit (effectiveness of safety improvements in terms of the number of crashes reduced to reach the NER safety goal) gained by including education-, EMS-, and technology-related projects in the NER TSMS is small compared to the additional resources required to conduct a park-wide study, instead of focusing on engineering and enforcement countermeasures for a few routes and select locations in a park.

6. Stakeholder Considerations

Including park stakeholders in the process of identifying traffic safety issues and potential countermeasures is essential and effective in the planning and project development process of a TSMS, particularly when industry best practices—such as a CSS approach—is used to select potential improvements. Using a CSS approach, park stakeholders can comment on, modify, suggest new approaches, or eliminate any countermeasures that are not acceptable in the park context early in the study process. They can also help to identify proactive countermeasures based on their observations of locations where traffic operations are not optimal or where "near misses" occur, and where there is minimal or no documentation of crashes. Figure 3-1 shows a meeting at Delaware Water Gap National Recreation Area between park staff and other stakeholders.

FIGURE 3-1
DEWA Stakeholder Meeting
Working with park stakeholders is useful to identify improvements that will address traffic safety issues and fit within park context. Two public meetings were held as part of the park-wide Delaware Water Gap National Recreation Area Traffic Safety Study. Superintendent John Donahue discusses potential improvements with a stakeholder.

7. Inclusion of a TSMS in the NER LRTP

The process discussed in Chapter 2, Findings, outlines a robust and efficient approach that resulted in the inclusion of safety considerations in the NER LRTP (regional) planning process. Also included in the process, in a practical manner, are the key elements needed to have a data-driven TSMS process and incorporates the following conceptual elements:

- Data collection
- Goal and program development
- Data analysis
- Categorization of safety issues and countermeasures
- Field review and stakeholder involvement
- Countermeasure assessment and development
- Project development and planning considerations
- Safety program design
- Integration with other management systems and the NPS programming process
- Performance measures and evaluation
- Formal documentation of the TSMS in a white paper

The proposed process outlined above and discussed in this summary report for a TSMS is consistent with federal guidance and regulations for a TSMS, and includes updated considerations and techniques from national safety best practices. For example, the integration of the TSMS with other NER management systems is an advanced evolutionary step beyond current safety best practices followed by almost all other agencies. The use of CSS best practices in the safety-project development process is a relatively new concept for national safety-related efforts. CSS best practices were successfully used in the NPS context for the NER, successfully supporting the stakeholder input process. Using a CSS approach likely led to a more efficient and practical set of recommendations, as well as a more efficient time line for project development.

Considerations for a Successful NER TSMS Development Process

In overview, the NER deserves a great deal of credit for the successes realized in developing a TSMS. The regional staff was very proactive in discussions, was amenable to the consideration of new approaches in safety and planning efforts, and was willing to provide insights into the "inner workings" of how the NPS regional team functions, as well as the inner workings of the parks. The park stakeholders were very cooperative and provided significant insights into safety issues that a data-driven process cannot readily provide. A well-designed process and good communication with stakeholders from the beginning of the task order helped to facilitate these efforts.

Most of these conclusions are not quantifiable, but when assessed in a qualitative manner are important aspects of a successful planning and management process and are important considerations beyond data and analysis issues.

Finally, it is important to recognize that the process should be considered dynamic and comprehensive in nature, since regional needs will change, funding levels will change, and the knowledge base in the safety field continues to advance.

CHAPTER 4

Recommendations

The process of performing studies and participating in discussions with stakeholders while developing the NER TSMS has identified the following recommendations. These recommendations were developed to address the key findings and conclusions of the traffic safety efforts and provide enhanced ways in which NER can work toward meeting its traffic safety goal and continue the multi-year programming efforts in the future. Altogether, the recommendations provide guidance for continuing the development of the NER LRTP and TSMS. The recommendations are likely applicable for other NPS regions and servicewide.

Next Steps to Complete NER TSMS Development

The remaining steps consist of completing the remaining identified elements of the NER TSMS. From these efforts, it is anticipated there will be more findings, conclusions, and recommendations that can be added to those contained in this chapter. It is planned these will be included in the white paper for Task Order 33.

Future Multi-Year Programming Efforts

The key steps provide a robust process for the NER to identify and prioritize safety improvement projects for the 10 NER parks with the highest crash frequencies (10 Highest Parks). The lessons learned while developing this process have led to the following recommendations for modifying this process and continuing the safety programming activities beyond this initial effort to identify projects and the years in which to implement them:

- **Implement currently unfunded projects**: As noted in Tables 3-1 and 3-2, several projects identified through this NER LRTP study effort cannot be funded nor implemented in the current FY2012-through-FY2018 funding cycle. Future 6-year funding cycles should include these projects, until they have all been funded and implemented. However, they should be compared to any new improvements identified to determine their relative priority.
- **Update crash data:** The current safety programming effort used the data currently available in the STARS database, which includes reported crash data for the years 1990 through 2005. The NER should discuss with WASO the potential for updating the STARS database (or the future Incident Management, Analysis, and Reporting System [IMARS] database) to include crash records between 2005 and the current year. The STARS database, or replacement database, should be updated and maintained annually to effectively support analyses and the assessment of progress toward the regional safety goal.
- **Identify additional safety projects and update safety program**: Based on DOT experiences and practices, the programming of safety projects should be considered a dynamic process. As projects identified in the current NER LRTP planning effort are funded and implemented, it is desirable to follow the process developed in this study to review the safety program on a periodic basis. For example, the safety management program could be reviewed every 2 to 3 years. Updates could be made using more current crash data to

identify other safety-related improvements, and propose new projects and revised costs for subsequent funding years.

- **Develop a single ranking process**: Future efforts might be considered to examine methods to combine the reactive and proactive projects into one ranking process. Another consideration for future efforts is to investigate a method to estimate the crash reduction potential of the countermeasures proposed for the proactive projects based on possible future crashes that might be avoided if a safety countermeasure were implemented. Currently, new research in the area of systemic highway safety approaches may provide insights that are useful for the NPS context. If future crash reductions can be estimated for these proactive projects, then benefits can be estimated and NPV analyses performed similar to that proposed for the reactive projects. The need to create and rank two separate lists of projects would then be less necessary since it would be possible to rank and prioritize projects and countermeasures on a common basis.

Countermeasure Monitoring Process

As part of the NER TSMS development process, conduct a monitoring process that uses data and observations to assess if the crash patterns and frequency/severity of crashes are changing due to the improvements and/or due to external influences, such as development. Use these findings to consider modifications to future safety initiatives. The following are recommendations for a monitoring process that will enhance the analysis process and support a scientific, but practical, assessment of the effectiveness (impact) of countermeasures in achieving the region's safety goals:

- **Traffic volume data for before-implementation period:** Collect traffic volume data during the project scoping or design phase as recommended in the evaluation component of the TSMS key steps (see Appendix U). This traffic count data will represent the volumes in the before period prior to starting construction of the engineering countermeasures. The data collection cost could be included in the project development costs.

- **Traffic volume data for after-implementation period:** Collect traffic volume data midway through the after-implementation period of the monitoring process as recommended in the evaluation component of the current TSMS recommended practices (see Appendix U). Ideally, traffic volume data is collected every year to strictly follow the EB method. However, in many instances, collecting traffic volume data every year is not practical due to limited resources. To develop yearly volumes for use in the assessments, assume a uniform percent change per year between the count data collected in the before-implementation and after-implementation periods.

- **Resurfaced or reconstructed routes:** Maintain records and perform analyses for sections of routes that were resurfaced or reconstructed. This provides the opportunity to estimate the effects of resurfacing on crash reductions with the countermeasures implemented.

- **Monitoring spreadsheet:** Submit monitoring spreadsheets and associated documentation to Northeast Region Transportation Office on an annual basis so progress can be tracked for the monitoring efforts.

- **Park staff input:** Document and use input from park staff to the maximum extent possible (qualitative assessment of the countermeasures) along with the quantitative results of the evaluation to report on the value of the countermeasure(s) to the regional office.

General Recommendations

The traffic safety studies for the 10 parks brought to light several recommendations useful for continuing the development of the TSMS. These recommendations are primarily related to collecting and managing data and performing data analysis for future traffic-safety study efforts by the NPS. Improved data analysis can lead to more accurate identification of traffic safety issues and the countermeasures to address those issues. Most of these recommendations stem from the DEWA park-wide study. The additional time and resources available for conducting the park-wide study allowed for more in-depth analysis and discussion between the project team and park staff. Following are the general recommendations:

- **Countermeasures for SEA 7:** Implement countermeasures for SEA 7 – Reducing Crashes Resulting from Human Factors (aggressive driving, impaired driving, and inattentive driving). Crashes related to "driver behavior factors" represent a large portion of the cost to society for the NER, warranting consideration for more emphasis in future efforts. The NPS should consider these programs for specific parks, or even on a regional basis. For example, these efforts might be combined with existing state programs, likely with other education programs (such as aggressive-driving awareness campaigns [Figure 4-1]).
- **Cost of animal crashes:** The cost of animal crashes is currently the loss associated with the vehicle and driver/passengers. To estimate the total cost, include the cost to the park resources affected by the crash. Park resources include costs related to the loss due to the animal death; damage to park resources such as signs or trees that result from the crash; law enforcement and emergency personnel cost to respond to the incident; and clean-up and repair of the crash site.
- **Comprehensive management system databases:** Investigate the potential of adding traffic volume and crash data collected during traffic safety studies into NPS system management databases, such as the IMARS or Roadway Inventory Program (RIP), if not already done or planned.
- **Crash data storage:** Standardize crash data storage and improve accessibility for users at the WASO, regional, and park levels. Data storage and access should follow NPS protocols.
- **Traffic volume information:** Add traffic volume information when collected to the appropriate transportation database.
- **Interagency communication:** Improve communication with other police agencies for reporting crashes in the national parks. When investigating or reporting crashes in the parks, these non-NPS agencies should use the NPS crash form (Accident Report Form 10-413). This information should then be incorporated into the NPS crash database.
- **Crash location methodology:** Replace the current method of locating crashes using the link/node method with latitude/longitude coordinates to improve crash analysis. Develop guidelines for converting historical crash data using a link/node locator into latitude/ longitude coordinates for use in a GIS to make data analysis and crash locating more

accurate. If this approach is not consistent with NPS needs or it is not possible to access GIS, then consider the use of a milepost location system.

- **Crash coordinate data:** Investigate state DOTs protocols/best practices used for collecting latitude/longitude crash coordinate data by law enforcement. Develop NPS specific protocols/guidelines, in collaboration with NPS law enforcement, modeling the best practices from state DOTs.
- **GPS units:** Purchase hand-held GPS units and laptop computers for law enforcement to enable electronic crash locating and incident reporting at the crash scene. Develop training for law enforcement on equipment use and protocols. Consider incorporating the training into training courses provided by National Park Service Law Enforcement Training Center (NPS-LETC).
- **STARS database refinements – crash coordinate data:** If still used, refine the STARS database to include a field for storing latitude/longitude coordinates.
- **STARS database refinements – additional crash types:** Refine the STARS data to include more crash types in the Accident Class field (such as, rollover) and reduce the number of crashes coded as "Non-Collision" or "Not Applicable."

FIGURE 4-1
Vehicle Checkpoint
Educational material with tips about driving in national parks (including aggressive-driving awareness) can be handed out at vehicle checkpoints and/or park entrances.

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CHAPTER 5

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Northeast Region of the National Park Service Long-Range Transportation Planning

Congestion Management System Study

WHITE PAPER

Final Report

This White Paper presents one of a series of studies prepared in support of the first Long-Range Transportation Plan for the Northeast Region. The efforts described in this report involve both the process to conceptualize a Congestion Management System for the Northeast Region, as well as the documentation of the actual system and its recommendations. This final report presents the findings and recommendations as of Spring 2011. Specific project recommendations continue to be refined as part of the annual transportation project planning process of the Northeast Region.

This White Paper was authored by staff of Vanasse Hangen Brustlin, Inc. and the Eastern Federal Lands Highway Division of the Federal Highway Administration. They were assisted in the project by staff of the Volpe National Transportation Systems Center, National Park Service WASO staff, National Park Service Northeast Region staff, and many National Park Service staff among the two dozen representative NPS units included in the study.

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PROJECT PURPOSE

Most of the parks in the Northeast Region of the National Park Service are experiencing some level of congestion. These issues range from a lack of parking at a favorite trailhead in Acadia to 10-mile traffic backups heading to the beaches at Sandy Hook. Congestion issues are not related solely to vehicles, as evidenced by long security queues at the Statue of Liberty. In addition, many of the parks in the Northeast Region are located in densely populated and urbanized areas where oftentimes the most frequently cited congestion issue involves the access roads to the park. In the future, development of land near parks and general population growth will likely continue to worsen the congestion issues facing the Northeast Region.

Congestion issues within the parks are related to everything from the effects of non-park users, such as commuters and commercial traffic, to a lack of carrying capacity at a popular destination. The Northeast Region has some visitor transportation systems to help mitigate congestion issues, but even some of those visitor transportation systems have operational and capacity constraints that are themselves viewed by park visitors and park staff as a congestion issue.

The overall goals of this Congestion Management System (CMS) planning process were:

- To define the extent and nature of congestion in the Northeast Region;
- To broaden the understanding of the nuances of congestion management in a national park context;
- To develop a candidate process for addressing congestion at Northeast Region parks and to test that process through the conduct of a series of limited case studies; and,
- To define a strategy for moving forward in the region.

The Congestion Management System is one element of the Northeast Region's Long Range Transportation Plan (LRTP) and as such it shares the LRTP's overall goals and objectives -- Preserving the Transportation System; Improving Mobility, Access & Connectivity; Improving the Visitor Experience through Transportation; and Improving Cultural/ Natural Resources and Environmental Conditions. Ultimately, the results of this study will be incorporated into the overall Long Range Transportation Plan for the Northeast Region. Projects identified through the CMS process are also envisioned to be programmed through the traditional six-year Transportation Improvement Program.

This study process sought to develop the first of its kind region-wide congestion management system for the National Park Service. The efforts described in this report involve both the process to conceptualize the CMS as well as the documentation of the actual system and its recommendations. The study includes a comprehensive assessment of congestion mitigation needs at two dozen representative National Park Service units in the Northeast Region.

PROJECT APPROACH

The Congestion Management System was developed by understanding the required elements of the CMS, collecting information on a broad range of congestion-related issues affecting the parks in the Northeast Region, using an analytical assessment of possible solutions to those problems to determine a prioritized list of projects, and identifying performance monitoring methods and metrics to assess the success of the projects and programs moving forward.

The project approach to develop this CMS for the Northeast Region consisted of the process and outcomes that are illustrated in Exhibit 1 and described in more detail through this document.

Exhibit 1: Development of Congestion Management System for the Northeast Region

Step	Process	Outcomes
1	**Review of National CMS State-of-the Practice** ■ Federal Highway Guidelines ■ Congestion management plans from other agencies	➤ Lessons learned ➤ Candidate congestion strategies ➤ Candidate performance measures ➤ Unique aspects of NPS CMS planning
2	**Assessment of Existing Conditions in Northeast Region** ■ Congestion survey of the parks ■ Data-driven Needs Assessment	➤ Extent of congestion issues affecting parks ➤ Emphasis areas for congestion management strategies
3	**Prioritize NER Parks for Including in CMS Development** ■ Screening of survey data and needs assessment ■ Consultation with NER staff on priority parks	➤ Priority parks for CMS development ("Case Studies")
4	**Develop Toolbox of Strategies and Costs** ■ Development of NPS "Emphasis Areas" for CMS ■ Range of potential strategies by emphasis areas ■ Scan of current NPS NER congestion management activities	➤ Toolbox of CMS Strategies ➤ "Best Practices" in the Northeast Region
5	**Development of Congestion Management Plan for Priority Parks** ■ Conduct outreach to all priority parks ■ Complete site visits ■ Review past and ongoing park-specific studies, PMIS Statements, grant applications ■ Review regional transportation plans ■ Apply toolbox strategies to identified needs	➤ Comprehensive list of potential congestion-related projects by Park
6	**Develop CMS Recommendations/Priorities** ■ Develop CMS project screening process and criteria ■ Screen potential projects ■ Refine analysis of most promising candidate projects ■ Complete additional outreach to the parks ■ Develop Recommendations	➤ Screened list of near and long-term projects ➤ Additional outreach to parks ➤ Refined recommendations ➤ Work orders and PMIS statements for prioritized near-term projects. ➤ Findings/lessons learned
7	**Develop Performance Monitoring/Updating** ■ Develop performance monitoring methods and metrics to track CMS progress ■ Document process to update CMS ■ Document CMS and program	➤ Congestion Management System for the Northeast Region of the National Park Service

STEP 1 - STATE-OF-THE-PRACTICE REVIEW OF CONGESTION MANAGEMENT

The first step in developing the Congestion Management System for the Northeast Region involved gaining an understanding of the legislative requirements and state-of-the-practice for Congestion Management Process implementation, based on a review of Federal Highway Administration guidelines and reports available from multiple regional planning organizations. A summary of this literature and process review is included in Technical Appendix A to this report.

Research of the topic indicates that a variety of congestion management programs have been implemented in different regions in the United States. On the most basic level, congestion management programs are designed by a local or regional planning organization to accomplish the following goals:

- Define and identify congestion within a region, corridor, activity center, or project area;
- Develop strategies to address congestion deficiencies;
- Prioritize implementation of strategies according to evaluation of existing and future operations; and
- Monitor future operations to assess progress and consider new strategies.

While this basic process could be applied to a variety of study areas in any number of ways, both federal and state governments have come to apply specific and legally binding definitions to very similar programs containing the term “congestion management”. The Congestion Management Process is a formal term, as defined by the U.S. Department of Transportation, which refers to a specific evaluation and implementation procedure required of Metropolitan Planning Organizations to identify regional deficiencies and track congestion-related improvements.

Federal Highway Administration Guidelines

As described in planning guidance provided by the U.S. Department of Transportation, a Congestion Management Process (CMP) presents a systematic process for managing traffic congestion and provides information on transportation system performance. As mandated by the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) legislation, a CMP is a required planning document for metropolitan areas with population exceeding 200,000 people, known as Transportation Management Areas (TMAs). In TMAs designated as ozone or carbon monoxide non-attainment areas, the CMP takes on greater significance. Federal guidelines prohibit completion of roadway projects that increase capacity for single occupant vehicles unless the project comes from a CMP. Federal requirements also state that in all TMAs, the CMP shall be developed and implemented as part of the metropolitan planning process.

Each region's CMP is intended to provide an analytical process by which Metropolitan Planning Organizations (MPO), which were established to oversee transportation planning in the TMAs, can define and identify congestion within a region, corridor, activity center or project area, and develop appropriate strategies to reduce congestion or mitigate the impacts of congestion. According to the FHWA, any CMP should be prepared according to the following general eight-step procedure:

1. Develop Congestion Management Objectives
2. Identify Area of Application
3. Define System or Network of Interest
4. Develop Performance Measures
5. Institute System Performance Monitoring Plan
6. Identify and Evaluate Strategies
7. Implement Selected Strategies and Manage Transportation System
8. Monitor Strategy Effectiveness

Through this process, a CMP provides an outline for a comprehensive congestion-reduction and mobility-enhancement program, integrated in a region's larger transportation planning process, through implementation of a data collection and monitoring system, a range of strategies for addressing congestion, performance measures or criteria for identifying when action is needed, and a system for prioritizing which congestion management strategies would be most effective. The FHWA identifies several common characteristics which should be included in a "state-of-the-practice" congestion management process:

- Links to operations objectives, driven by the goals expressed in the region's Long-range Transportation Plan;
- Considers congestion, its causes, and possible remedies in a holistic way, encompassing a broad range of multimodal transportation operational, demand management, land use, and new capacity strategies;
- Defines implementation schedules or timetables for delivery of strategies; and,
- Defines systematic methods to monitor and evaluate system performance.

FHWA planning guidelines provide an important framework for a successful congestion management system for the Northeast Region; however, they do not address the unique aspects of congestion planning for the National Park Service. The mission of the National Park Service is "…to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such a manner and by such a means as will leave them unimpaired for the enjoyment of future generations". This implies that Americans have an intrinsic right to access the parks and that the visitor experience and protection of resources are central to the NPS mission.

STEP 2 – ASSESSMENT OF EXISTING CONDITIONS IN THE NORTHEAST REGION

To better understand and define the issues of congestion in the context of the parks of the Northeast Region, the study team undertook a research and outreach effort as Step 2 of the study. The initial assessment of existing conditions at all the park units in the Northeast Region was primarily compiled from the following sources:

- 2007 – Northeast Region conducted an informal survey of parks and mapped findings to help determine the need for and scope of congestion study efforts;
- Fall 2008 – FHWA's Eastern Federal Lands Highway Division and the NPS implemented a more formal congestion survey of all units in the Northeast Region as an element of the regional LRTP process;
- 2009 – The study team analyzed other data from the LRTP efforts; and,
- Fall 2009 to Summer 2010 – The study team conducted scan tours and outreach to a representative group of parks.

2008 Congestion Management Survey

The Northeast Region, through the Eastern Federal Lands Highway Division, conducted a congestion survey of national park service units in the Northeast Region during the Fall of 2008. The detailed results are presented in Technical Appendix B and key findings are summarized below.

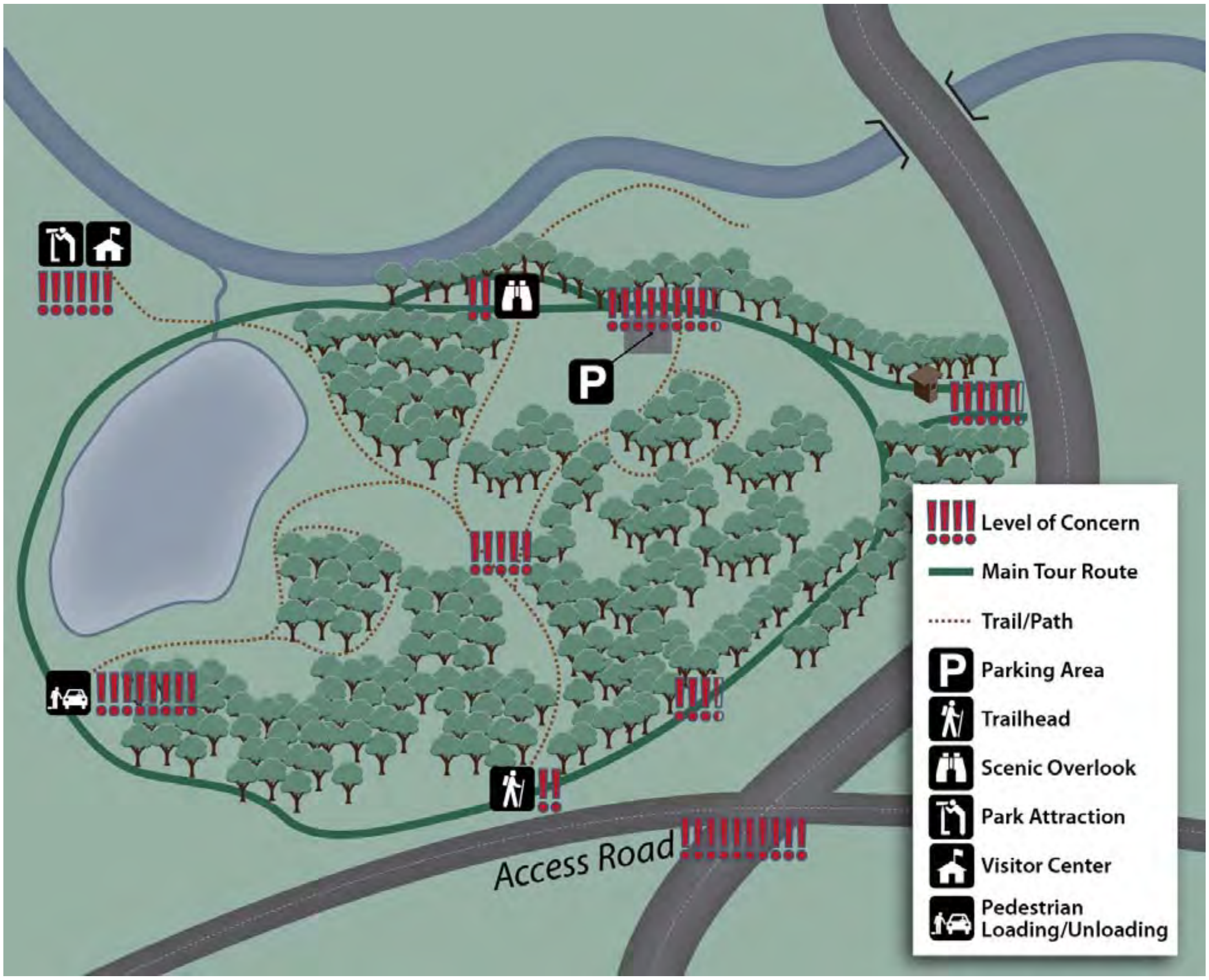
While many congestion surveys focus solely on traffic, this survey also considered how congestion affects visitors who use alternative transportation. Several congestion "emphasis areas" were evaluated, including park access roads, parking areas, entrance stations, trails/paths, and pedestrian loading areas. These emphasis areas provide an organizational framework for the CMP and the identification of strategies to address congestion within the parks.

Fifty-three park units (of 84 surveys sent) responded. Of those, 35 parks (two-thirds of the 53 respondents) indicated that congestion is present within their boundaries and 33 indicated congestion is present within two miles of park boundaries. With this many parks in the Northeast Region negatively impacted, congestion represents a serious challenge to the core mission of resource protection and creating a positive visitor experience.

Traffic Congestion in downtown Gettysburg, PA.
VHB Photo

Locations cited as the most frequent source of operational problems within the parks are illustrated as Exhibit 2. The most congested locations most frequently reported are along access roads to the parks, at parking areas, and at pedestrian loading/waiting areas.

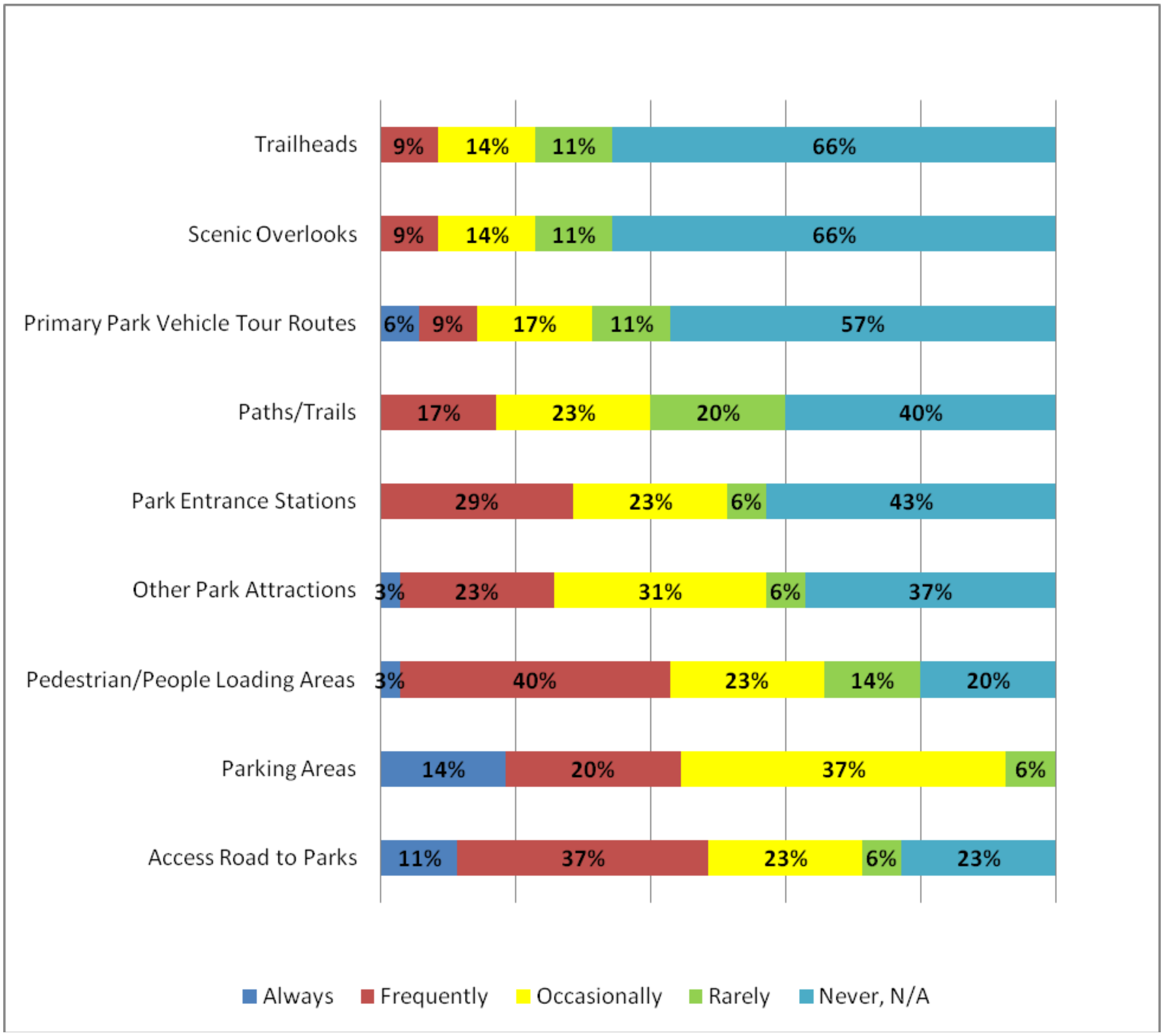
Exhibit 2: Most Congested Locations Reported by Northeast Region Parks



Another factor contributing to congestion is that park resources are often being used by non-park users, including commuters and commercial traffic. Overall, approximately 70 percent of park supervisors reported that park public road corridors are being used by non-park users. In areas that are experiencing significant growth or have unmitigated congestion, this trend will likely worsen in the future.

The severity of the congestion for each emphasis area is depicted in Exhibit 3. These data are presented for the 35 parks reporting some form of congestion. All of the parks reported some level of parking-related congestion. Of these, 14% (5 parks) reported parking-related congestion "always" occurred, 20% (8 parks) "frequently" occurred, 37% (20 parks) "occasionally" occurred, and 6% (2 parks) "rarely" occurred.

Exhibit 3: Survey Results by Emphasis Area



About three quarters of the parks reporting congestion are actively working to manage it through a variety of strategies, as illustrated in Exhibit 4 (see also "Best Practices" discussion later in this document). Of those parks that indicated they have congestion within their boundaries, 43 percent are managing congestion with alternative transportation, while 37 percent are using park rangers to manage traffic. All of these parks reported the need to implement more strategies to address congestion.

Exhibit 4: Strategies Used by Northeast Region Parks to Address Congestion

Strategy Used by Park	Number of Parks Using the Strategy	Percent of Parks Using the Strategy
Alternate. Transportation System (ATS)	15	43%
Traffic Information	7	20%
Park Ranger Traffic Management	13	37%
Reservation System	10	26%
Fast Pass	0	0%
Variable Message Signs	5	14%
Highway Advisory Radio	1	3%
Other	2	6%
Number of Parks Reporting Congestion	35	

"Other" responses include wayfinding signage and overflow parking.

Survey Results: Key Findings

- Two thirds of the park units in the Northeast Region that responded to the congestion survey indicated that they are experiencing congestion-related issues in or adjacent to their parks
- About 70 percent of respondents indicated that facilities are being used by non-park users
- Of parks experiencing congestion, 40 percent responded that congestion is impacting resources
- Of parks experiencing congestions, 57 percent responded that congestion is impacting the visitor experience
- Alternative Transportation and Ranger Traffic Management are the two management strategies being deployed most frequently today
- Limited data exist that quantifies congestion

Queuing for the Statue of Liberty ferry, Castle Clinton, NPNH *Google Earth Image*

Congestion Planning for the National Park Service

Congestion management considerations for developing a CMS for the Northeast Region are summarized in Exhibit 5 and described in the following sections. These are important considerations that need to be integrated in the screening of individual congestion management strategies and, as practicable, monitored more fully to understand how the overall CMS performs in the long-term.

Exhibit 5: Congestion Management Considerations within National Park Context

Effects on Visitor Experience	Effects on Resource Protection
• Delays, inconvenience and frustration • Crowding and noise at scenic vistas, historic buildings, and sacred places • Parking facilities and roads detracting from the cultural landscape • Inability to appreciate the cultural and natural experience • Safety conflicts between vehicles and pedestrians • Dissuades future visits	• Physical imprint of facilities • Unmanaged access, unsanctioned parking, informal trails • Destruction of flora and fauna • Storm water runoff • Air quality • Greenhouse gases • Noise • Wildlife kills and disturbance
Livability	**Sustainability**
• Park's function within community/region • Recreational access • Unmanaged growth or land use threats near park boundaries • Regional congestion	• Contribution to energy use reductions • Alternative modes/fuels • Climate benefits/GHG reductions • Financial

Visitor Experience

It is generally recognized that unmitigated congestion at the parks can impact the visitor experience. Congestion can limit the access to or enjoyment of park resources simply by the sheer number of people trying to access those resources. Visitor expectations can vary widely depending on the context of the park and purpose of the visit (recreational, cultural, historic, scenic, wilderness, etc.). For example, visitors may expect larger crowds and longer wait times at Independence Hall in downtown Philadelphia and are less likely to feel that their visit was negatively impacted by the typical congestion of its urban setting. Conversely, if visitors seek a remote hike through a wilderness area and encounter overcrowding along the trail, the visitor experience falls short of expectation. Some congestion issues may create safety problems, for example, when increased vehicle traffic limits the visitor's ability to cross a road or access a park resource. The delays, inconvenience, and frustration caused by congestion can dissuade people from ever visiting the parks, or at least visiting them as much as they would like.

Resource Protection

Congestion can also degrade the parks' natural and cultural resources. Unsanctioned parking can destroy the area where the cars are parked and create farther reaching issues from storm water runoff and uncontrolled pollutants. General unmanaged use in crowded walking or bicycling areas can lead to damage of vulnerable native habitat or disturbance of wildlife. Crowding and noise at a park's scenic vistas, historic resources and sacred places may have no obvious physical impacts but simply degrades the quality of the experience of those places. Vehicle traffic contributes to air quality and greenhouse gas emissions, as well as to the more visible wildlife collisions. Furthermore, and in many cases, unmanaged access can overload the carrying capacity of a resource impacting both the resource and the visitor experience.

Livability

Park resources are critically important to their host communities and contribute to local and regional quality of life. The treasured natural, cultural and historic resources inherent in these parks are intrinsically linked to the identity and fabric of the community that surrounds them and contributes to the economic vitality of the state and region where they reside. In addition, these resources often provide valued recreational and educational opportunities for local citizens and visitors alike. Congestion, particularly in the densely populated northeast region of the US, can also be caused by external factors such as the setting of the park resource (urban versus rural), cut-through traffic, and development near the park boundaries.

Sustainability

A fourth important aspect of managing congestion in the parks is consideration of recent NPS policy directives to manage and operate the park system in a more sustainable manner. Sustainability does not define congestion in the parks today but helps shape the toolbox of congestion mitigation strategies and priorities in the future.

Goals of the Congestion Management System

Congestion within the national park context is defined here as ***a limitation on the access to or enjoyment of park resources -- impaired by the number of people trying to access the resource, their mode of travel, or the carrying capacity of the transportation infrastructure or the park resource itself.***

The relationship of congestion to the visitor experience, resource protection, livability, and sustainability shape the goals and objectives of the congestion management system for the region. The Congestion Management System for the Northeast Region seeks to manage access to and around its parks in a way that:

- Improves mobility, safety, and community connections;
- Protects/improves the visitor experience of the park;
- Preserves the natural, historic, and cultural resources;
- Acknowledges and protects park resources with carrying capacity limitations;
- Expands the role and partnerships with host communities to preserve parks' value and access for future generations; and
- Rationalizes how to invest in strategies to address congestion needs on a regular basis.

The overall Congestion Management System, as well as each individual project or strategy advanced through the CMS, needs to be evaluated and assessed against these objectives, as further discussed in subsequent chapters of this report.

STEP 3 – PRIORITIZING NORTHEAST REGION PARKS FOR INCLUSION IN CONGESTION MANAGEMENT SYSTEM

It became clear during the assessment of existing congestion conditions in the Northeast Region that to fully understand the nuances of congestion as defined by park staff and the potential range and efficiency of management strategies, one needs to examine congestion at the local level. It was also found that not all parks are experiencing congestion and/or are managing it sufficiently. Therefore, the study process elected to focus on approximately two dozen park units that encompass the vast majority of visitor activity and congestion-related issues in the Northeast Region.

Selection of Representative Parks

The selection of representative parks was made using the results of the congestion survey, the findings of the needs analysis, and consultation with Northeast Region staff.

The congestion survey identified several dozen parks with pervasive, year-round congestion issues or seasonal congestion issues. However, the congestion survey was not completed by all parks nor did it provide any prioritization metrics such as visitation magnitude and growth potential. A “needs” assessment supplemented the survey data and examined all of the parks. This helped identify a core set of “high priority” parks for consideration in the CMS development. Lastly, the list was supplemented with a few additional parks due such factors as their history of highly-ranked congestion-related Alternative Transportation Program projects currently being considered or unique characteristics not covered in the initial list of priority parks. Exhibit 6 lists the representative parks selected for inclusion in the CMS and the factors that contributed to their selection.

Exhibit 6: Selection Method of Representative Parks

	Park	Congestion Survey	Needs Assessment	NER Staff
ACAD	Acadia National Park	*	✓	✓
MABI	Marsh-Billings-Rockefeller National Historical Park	✓		✓
SAMA	Salem Maritime National Historic Site	*	✓	✓
BOST	Boston National Historical Park	✓	✓	
BOHA	Boston Harbor Islands National Recreation Area	✓	✓	
ADAM	Adams National Historical Park	✓	✓	
CACO	Cape Cod National Seashore	*	✓	✓
LOWE	Lowell National Historical Park	✓	✓	
MIMA	Minute Man National Historical Park	✓	✓	
ROVA	Roosevelt-Vanderbilt national historic sites	*	✓	✓
	VAMA Vanderbilt Mansion National Historic Site			
	HOFR Home of Franklin D. Roosevelt National Historic Site			
	ELRO Eleanor Roosevelt National Historic Site			
FIIS	Fire Island National Seashore	*	✓	✓
NPNH	National Parks of New York Harbor	✓	✓	✓
	GATE Gateway National Recreation Area			
	GOIS Governors Island National Monument			
	STLI Statue of Liberty National Monument			
	AFBG African Burial Ground National Monument			
	MASI Manhattan Site			
	CACL Castle Clinton National Monument			
	FEHA Federal Hall National Memorial			
	HAGR Hamilton Grange NMEM			
	SAPA Saint Paul's Church National Historic Site			
	THRB Theodore Roosevelt Birthplace National Historic Site			
INDE	Independence National Historical Park	✓	✓	
VAFO	Valley Forge National Historical Park	✓	✓	
GETT	Gettysburg National Military Park	✓	✓	
FOMC	Fort McHenry National Monument & Historic Shrine	*	✓	✓
DEWA	Delaware Water Gap National Recreation Area	✓	✓	
ASIS	Assateague Island National Seashore	✓	✓	
SHEN	Shenandoah National Park		✓	✓
FRSP	Fredericksburg & Spotsylvania National Military Park	✓	✓	
COLO	Colonial National Historical Park	✓	✓	
PETE	Petersburg National Battlefield	✓	✓	
NERI	New River Gorge National River	✓	✓	

* Did not complete congestion survey

STEP 4 - CONGESTION MANAGEMENT TOOLBOX AND BEST PRACTICES

The team's understanding of congestion that evolved through prior tasks and park outreach efforts were used to develop a Congestion Mitigation Toolbox and documentation of current "Best Practices" to assist in managing the range of congestion issues being faced by the region. The toolbox provides a range of potential solutions targeted to the emphasis area issues identified by the parks in the Northeast Region.

Congestion Management Toolbox

A schematic representation of the tool box is presented in Exhibit 7. The toolbox categorizes congestion issues and projects according to congestion emphasis areas, which are physical or geographic in nature, as well as by the type of strategy. The congestion emphasis areas are closely tied to those included in the congestion management survey.

Within these congestion emphasis areas, congestion issues and strategies are further categorized by the type of strategy, as follows:

- *Demand Management:* These strategies are "demand side" strategies that strive to address congestion issues by controlling the demand on the park's transportation system. Rather than adding infrastructure, these strategies would better manage the demand on the system so that it can be better accommodated with existing infrastructure.

- *Operational Improvements:* Operational improvements could be considered either "supply side" or "demand side" strategies. They serve to improve park operations, thus allowing for a more streamlined and efficient processing of visitors. These strategies often employ the use of technology to improve operations.

- *Additional Capacity:* These strategies are essentially "supply side" strategies, and would address congestion by increasing the park's capacity to process visitors. These strategies allow the park to handle more visitors, primarily by adding or improving infrastructure.

The information in the toolbox serves to provide park staff with a general tool for identifying possible solutions to congestion issues. Once a strategy from this toolbox is identified, the project would then need to be further developed into a concept plan and cost estimates would be prepared. More information about the toolbox is provided in Technical Appendix D.

Exhibit 7: Congestion Management Toolbox

	Mitigation Strategy	Targeted Modes	EMPHASIS AREA: Entrance Station	Parking Lots	Main Tour Routes	Pedestrian Areas	Gateway Community
Demand Management	Reservation System	PV	●	●	●	●	●
	Vehicle Cap	PV		●	●		
	Parking Fees	PV	●	●	●	●	●
	Off-peak Incentives	PV	●	●	●	●	●
	Auto-use Prohibitions	PV	●	●	●	●	
	Employee Vanpools/Carpools	PV		●			
	Transit Stops & Stations Enhancements	T	●	●	●	●	●
	Coordinating/Linking Park Transit System with Community Transit System	T	●	●	●	●	●
	Trip Itinerary Planning	T	●	●	●	●	●
	Non-motorized Connections to Transit, Park & Ride Lots, and Regional Paths	P/C	●	●	●	●	●
Operational Improvements	Providing Park Information Prior to Entrance Station	PV	●				
	EZ Pass Style Fee Collection	PV	●				
	Parking Lot Management	PV		●			
	Minor Roadway Geometric Improvements	PV	●	●	●	●	●
	Intersection Improvements	PV			●	●	●
	Signal Retiming/Optimization	PV			●		●
	One-way Routes	PV			●	●	●
	Incident Management	PV	●	●	●	●	●
	Intelligent Transportation Systems (ITS)	PV	●	●	●	●	●
Additional Capacity	Roadway Pulloffs	PV			●		
	Additional Roadway Lanes	PV			●		
	Parking Lot Expansion	PV		●			
	Voluntary Transit Service	T	●	●	●	●	●
	Mandatory Transit Service	T	●	●	●	●	●
	Additional Entrance Station and Lane	T	●				

C=Cyclist | P=Pedestrian | PV=Private Vehicle | T=Transit

Best Practice Examples

As part of the assessment of existing conditions, information was gathered on congestion management strategies currently in place at Northeast Region park units. Management programs or strategies that have been successfully implemented to address congestion issues in the Northeast Region include:

Regional Bicycle Shuttle, Acadia National Park

Bicycling is a very popular method of traveling within Acadia National Park. Acadia has an extensive network of carriage roads open only to pedestrians, equestrians, and bicyclists that offers an attractive recreational experience. Access to the park and its adjacent communities is enhanced by a seasonal public transit service called the Island Explorer.

Bicycle trailer at Acadia National Park
VHB Photo

The Island Explorer buses carry bicyclists to and from the park, but the popularity of bicycling often exceeds the capacity of the bicycle racks on the transit buses. To increase the capacity for carrying bicyclists to the park, the Island Explorer transit system was expanded to include a dedicated bicycle shuttle route – The Bicycle Express. Vans and trailers capable of carrying a dozen bicycles at a time are used to transport cyclists to a trailhead that is at the juncture of two networks of carriage roads.

Parking Management and Shuttle System, Cape Cod National Seashore

Coast Guard Beach is among the most heavily visited of Cape Cod National Seashore's six beaches. Since 1978, when erosion forced the national seashore to abandon a parking area adjacent to Coast Guard Beach, the national seashore has operated a shuttle between the Little Creek parking area and the beach entrance just under a mile away. Though initially established to accommodate the relocation of the parking area and improve access to the beach, the tram has been used as a congestion management tool in recent years.

Parking shuttle tram at Cape Cod National Seashore *VHB Photo*

By the late 1990s, virtually all areas of Coast Guard Beach – including drop-off areas, facilities, and the beach itself – had become overcrowded and congested, and beach visitation was deemed to be beyond capacity. Of particular concern was the large number of vehicles dropping off passengers near the Coast Guard Beach entrance, which caused traffic backups and raised concerns about pedestrian safety. In 2001, the National Seashore sought to address these congestion issues – and to limit the number of beachgoers to the carrying capacity of the physical facilities and lifeguard stands – by prohibiting vehicles from dropping off and picking up passengers at the Coast Guard Beach entrance. Instead, all visitors must park at the Little Creek Parking Area and take the shuttle to the beach entrance. There is a $15 daily fee to park at Little Creek during the summer months. Since the National Seashore began directing visitors to use the Little Creek parking area and shuttle instead of dropping off passengers at the beach entrance, visitation has moderated to a level more suited to the beach's carrying capacity.

Limited-access Interpretive Shuttles, Shenandoah National Park and Home of Franklin D. Roosevelt National Historic Site

Shenandoah National Park

Shenandoah National Park in central Virginia is home to Rapidan Camp, which served as President Herbert Hoover's summer retreat. The camp features the president's cabin, The Brown House, which has been historically refurbished to its 1929 appearance. It opened to the public in 2004.

Since the refurbishment of the site, Rapidan Camp has become a popular destination for park visitors. In an effort to avoid vehicle congestion on the narrow dirt road leading to the camp while maintaining access to the site, the park established a shuttle service to take visitors from the Byrd Visitor Center at Big Meadows to the camp. The service features a 12-passenger bus, driven by a park ranger who provides interpretation along the route and at the camp itself.

The Rapidan Camp tour shuttle runs on a limited daily schedule throughout the summer, with two roundtrips offered on the weekends and Tuesdays, and a single roundtrip offered on all other days. The park uses a reservation system for the Rapidan Camp shuttle, which operates at capacity on nearly all trips.

Rapidan Camp, Shenandoah National Park
NPS Photo

Home of Franklin D. Roosevelt National Historic Site

Top Cottage is a day cottage designed and used by Franklin Roosevelt as a favorite getaway spot and an informal venue to meet with dignitaries. Located about four miles from the main home and park visitor center it was acquired about 10 years ago. It is an important interpretive experience for understanding President Roosevelt's life in the Hudson Valley.

Top Cottage, Home of Franklin D. Roosevelt National Historic Site *VHB Photo*

Top Cottage is open from April to October. Access to Top Cottage is restricted to hikers and three daily NPS shuttle tours. The only road access is through a developed residential neighborhood and the limitation on tour visits is due to an agreement with neighbors when the site was purchased.

When President Roosevelt visited Top Cottage he would drive from the main house through his property via Farm Lane, past tree forests that he personally managed. The 15-minute travel time of the shuttle provides an opportunity to interpret that experience for visitors.

Intelligent Transportation Systems Application, Sandy Hook Unit

The Sandy Hook Unit of the Gateway National Recreation Area has only a single point of entry and has limited parking capacity. The park has utilized Intelligent Transportation Systems (ITS) for more than a decade to manage excess demand for parking and congestion at the entrance station. The ITS program began with portable variable-message signs and highway radio advisories. A new entrance plaza at the unit, opened in 2011, is the latest ITS program.

The new entry plaza ITS features a dedicated vehicular lane with automated entry for employees and season pass holders. There are four types of variable message signs located at the park entry plaza: a lane usage sign to prepare approaching vehicles for the lanes they need to use as they enter the park; lane status signs above each lane; a parking lot availability sign; and a general purpose message sign. Loop detectors and pedestrian sensors facilitate visitation data collection that updates in real-time and are used to monitor parking availability.

Entrance plaza, Sandy Hook, Gateway National Recreation Area
NPS Photo

Bicycle and Pedestrian Facilities, Minute Man National Historical Park

Minute Man National Historical Park preserves historic sites, structures, properties and landscapes associated with the opening battle of the Revolutionary War. The Battle Road Unit covers the initial section of the 20-mile route of the battle between patriot minute men and British soldiers on April 19, 1775 as the British marched back to Boston from Concord.

By the time the park was created the path of battle had become a major regional highway and several residential roads. The roads created significant safety issues, effectively limited access to much of the park, and adversely affected the cultural resources. In 1999, the park embarked on a six-year, $11 million development and rehabilitation project that included construction of the Battle Road Trail. The project made 80 percent more of the park accessible to the public, while also rehabilitating cultural landscapes, stone walls, and historic structures.

Battle Road Trail, Minute Man National Historical Park *VHB Photo*

The trail not only reflects the historic alignment and landscape of the Battle Road, it provides access to historical structures, battle sites, and soldier's graves. The trail is open to pedestrians and bicyclists, and features interpretive markers along its entire length. It is served by six parking lots at various locations along its length. The trail has enhanced safety and the visitor experience, while also providing recreational opportunities and bike connections for local residents.

Reservation Systems, Independence National Historical Park

Independence Hall, site of the signing of the Declaration of Independence and the Constitution, is open to the public year-round. Free 30-minute Ranger-guided tours take place every 15 minutes between 9 a.m. and 5 p.m., with a limit of 80 people per tour. Demand for the guided tour far outstrips capacity. To mitigate congestion around the Independence Hall entrance and improve the visitor experience, the park instituted a reservation system during the months of March through December. Tickets are distributed daily on a first-come, first-served basis. Visitors can also reserve tour tickets in advance, either by phone or through the National Park Service's online reservation system at Recreation.gov.

Ticket line, Independence National Historical Park *VHB Photo*

Since 2009, the park has been offering express tours of Independence Hall between 5 p.m. and 6 p.m. on Saturdays and Sundays. No tickets are required for express tours; instead, visitors line up at the south entrance of Independence Hall, and are admitted in groups of 85 for a 10- to 15-minute express tour of the first floor of Independence Hall.

Regional Bicycle Connections, Gateway National Recreation Area: Jamaica Bay Unit

The Jamaica Bay Unit of Gateway National Recreation Area is located in the New York City boroughs of Brooklyn and Queens. The Jamaica Bay Unit contains some of the largest expanses of green space in the city, making it an attractive destination for bicyclists. The largest concentration of bike facilities within the Jamaica Bay Unit is located on the Brooklyn side of the Unit, where Floyd Bennett Field features 6.5 miles of runways and paths open for cycling. Multiple bike facilities can be found along the Rockaway Peninsula in Queens: the Shore Road, a paved route closed to vehicles, runs for a mile along the beach at Fort Tilden; and a small network of dirt and cinder trails crisscross the coastal woodland in the Back Fort area.

Bicycle racing at Floyd Bennett Field, Gateway National Recreation Area *VHB Photo*

A key to bike connectivity within and around the Jamaica Bay Unit is the Rockaway Gateway Greenway, which currently runs through portions of the Unit in both Brooklyn and Queens. The National Park Service, in partnership with the State of New York, has been renovating and expanding the bikeway in recent years, with the long-term goal of creating a complete circuit around Jamaica Bay.

The Rockaway Gateway Greenway provides access to Floyd Bennett Field and Fort Tilden within the Jamaica Bay Unit. It also provides critical connections to local and regional on- and off-street bike routes. The Greenway has a direct connection to the Belt Parkway Bikeway, which in turn connects to the Ocean Parkway Bikeway and bike lanes on Bedford Avenue. These connections provide access to and from most neighborhoods in Brooklyn, including low-income neighborhoods in the central and northern portion of the borough, as well as access to bike trails in Prospect Park. The Greenway also provides access to multiple transit stations in the vicinity of the Jamaica Bay Unit.

Overflow Parking Facilities, Minute Man National Historical Park

There is an 80-space parking lot at the visitor center in the Battle Road unit of Minute Man National Historical Park. The Battle Road unit features the five-mile Battle Road trail that is very popular among local residents for recreational walking and bicycling. As a result, the parking lot often experiences overflow conditions on weekends and holidays.

Due to the dearth of paved parking spaces in the visitor center parking lot, many visitors began using a median in the lot for overflow parking. This led to increased need for maintenance at the parking lot, and at times the median became unusable for parking due to muddy conditions. Park staff also had concerns over runoff from the informal overflow parking area, as the parking lot lies adjacent to wetlands.

Minute Man NHP ultimately addressed these issues by replacing the grass in the parking lot median with stabilized turf, which features grass overlaid on a reinforced base. The use of stabilized turf provides support for vehicle weight while allowing infiltration of storm water through the grass, topsoil, and base. The installation of the stabilized turf has allowed the park to formally convert the visitor center parking lot median to overflow parking, while reducing maintenance issues in the lot and keeping runoff to a minimum.

Stabilized-turf overflow parking area, Battle Road Visitor Center. Minute Man National Historical Park *VHB Photo*

STEP 5 - DEVELOPMENT OF CONGESTION MANAGEMENT PLAN FOR PRIORITY PARKS

Step 5 of the process was to compile a comprehensive list of potential congestion management projects for each of the representative parks.

Preliminary List of Candidate Project Ideas

The first stage of this process was to compile a preliminary listing of congestion-related projects at each of the parks through a review of available sources. These sources included:

- Park suggestions from the 2008 Congestion Management Survey;
- Strategies already defined through the Project Management Information System (PMIS);
- Funding applications for projects under the Alternative Transportation Program (ATP) and the Transportation in Parks Program (TRIP);
- A list of Alternative Transportation Needs compiled by Northeast Region staff;
- Park conducted studies addressing specific congestion issues and proposed solutions; and
- State and regional transportation plan projects.

Park Outreach

An important part of the assessment of existing conditions and the development of candidate congestion management strategies involved site visits and/or phone interviews of park staff. In all, site visits were conducted at 20 of the representative parks. The site visits and phone interviews provided updates of the status of the various planned and implemented congestion projects, and helped identify additional potential congestion projects. In general, these outreach meetings involved reviewing the nature of congestion being experienced by the park, a discussion of ideas or solutions that might be deployed to address identified issues, and field review of problem spots. The majority of these meetings were scheduled during the peak activity months of July and August of 2010.

The findings of the outreach meetings, and the review of past study results, project proposals and regional plans, were compiled in a matrix that characterized the nature of the congestion problem and candidate solutions.

Refinement of the Project List

The process of compiling the list of projects highlighted that the list was dynamic. For example, some projects were implemented when funding became available. Other projects, particularly congestion-related alternative transportation projects, were modified based on preliminary findings from a separate alternative transportation program task (conducted by others). In addition, the project list was refined as the congestion-related issues of a candidate project were better defined. For example, some transportation projects, such as the electric trolley at Marsh-Billings-Rockefeller NHP were identified as park "features" rather than a congestion mitigation effort. The "snapshot" listing of congestion projects evaluated for this study is provided in Technical Appendix E.

STEP 6 – DEVELOPMENT OF CMS PRIORITIES AND RECOMMENDATIONS

At the conclusion of Step 5, the Northeast Region congestion management team had compiled a list of over 100 project concepts to address a wide variety of congestion-related “needs”. The total estimated cost to implement the projects identified through this process exceeded $70 million. The next step was to develop a methodology to assess, screen, and prioritize these concepts towards the development of a recommended set of actions for implementation within a financially-constrained, multi-year transportation improvement program.

Evaluation Framework

The fundamental framework for the evaluation and screening of project concepts is that each project should be assessed on the degree or importance of the congestion-related need that it is intended to address (Project Need) and the effectiveness by which it addresses that need (Project Effectiveness). Simply put, the Overall Project Value can be expressed as follows:

Criteria Development and Refinement

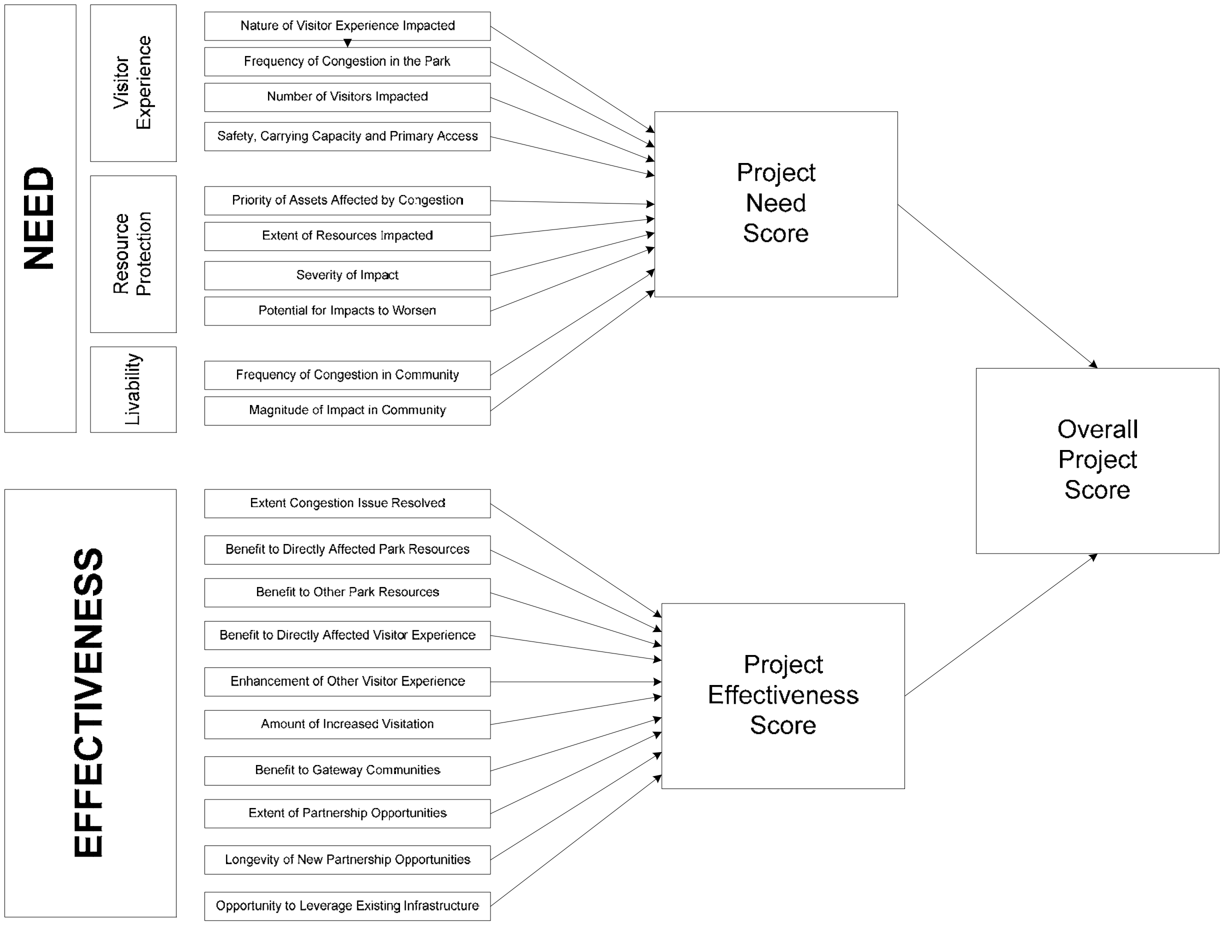
A broad set of evaluation criteria were developed to assess “Need” and “Effectiveness”. These criteria, as summarized in Exhibit 8, were developed and refined through a series of internal team meetings and review sessions with FHWA-EFLHD and Northeast Region staff. This process included dividing the criteria in the Need category into the three primary subcategories —Visitor Experience, Resource Protection, and Livability — to capture congestion’s potential effect in these key areas.

Ultimately, the project team developed a set of 20 criteria intended to answer the two overarching questions:

- How serious is the congestion issue that a candidate project seeks to address?
- How effectively does a candidate project mitigate impacts of the specific congestion issue it is intended to address?

A complete description of the screening criteria scoring system and the analysis results are presented in Technical Appendix F to this report.

Exhibit 8: Project Screening Criteria and Scoring Process



Project Value Scoring Process

Once the criteria were refined and finalized, a scoring system was developed to establish a range of numeric values for each criterion. Each of the candidate projects was then scored against the criteria (see Technical Appendix F for details of the criterion scores).

Each candidate project received a numeric score for each of the 20 criteria, and the criteria were summed separately for the "need" category and the "effectiveness" category. With both categories assigned equal weight, the scores of the two were multiplied to calculate the overall Project Value Score for each project.

The end result of this evaluation and scoring process was a ranked list of project concepts by project value score, as detailed in Technical Appendix G to this report.

Consideration of Costs

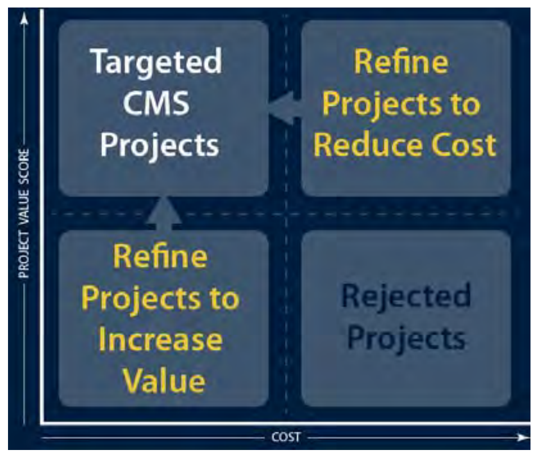
The next step in the project evaluation and screening process was to consider the lifecycle costs of each project concept. Ten-year conceptual estimates of NPS capital and operating costs were developed for each project. These costs were then compared to the project value scores to understand the relative benefit to costs relationship of the various candidate projects. Two screening processes were conducted:

1. Plotting the Project Value Score against the project cost, and
2. Calculating a ranking of the Project Value Score divided by the project cost

Plotting Project Value Score versus Cost

From this analysis, the candidate congestion management projects can be screened into categories of targeted near-term CMS projects (high value, low cost), longer-term CMS projects (high value, high cost or low value, low cost that require refinement before moving towards implementation) and rejected projects (which were projects found to be both ineffective and high cost), as illustrated in Exhibit 9.

Exhibit 9: Congestion Management System Projects Screening Matrix



Through the screening process that plotted project value score versus total cost, it was found that:

- Cost saving projects are always in the “targeted” quadrant;
- Medium to large scale, low cost projects also tend to be in the targeted quadrant;
- Small, low cost projects – that one would generally characterize as “good ideas” – tend to fall below the targeted quadrant due to the scale of their effectiveness in addressing significant congestion issues; and,
- Alternative transportation system solutions tend to fall to the right of the targeted quadrant in that they were most times found to be of high value but also carried high costs.

Project Value Score divided by project cost

The screening process of plotting the Project Value Score against the project cost works well for identifying many worthwhile projects, but not for some of the very small, low-cost "good idea" projects. To help assess the other potentially worthwhile projects, candidate projects were also screened by a second method that considered the total project value score divided by NPS cost.

This screening method is summarized in Technical Appendix H and yielded a ranked project value per unit cost. Two shifts in the project rank order resulted from this method:

- Small, low cost (e.g., safety and wayfinding) projects ranked higher; and
- Projects with extensive federal, state, or local government and /or private financial partnerships ranked higher.

Lessons learned from the project screening process

With both screening methods, cost-saving projects ranked high and ineffective projects ranked low. The prioritization of the better projects differed somewhat between the two screening methods, but the combined result is a strong list of beneficial congestion mitigation projects.

Since the congestion management system program is in its infancy, there are several caveats to the prioritization of the congestion projects. These arise from several important findings revealed from the CMS project analysis and screening process.

- Many of the potential CMS projects overlap with other safety-related, pavement management and alternative transportation systems efforts.
- Some high value projects, particularly those related to alternative transportation systems and safety, need further study to determine whether they warrant implementation in the future.
- Projects outside park boundaries need to be considered on a case by case basis due to the extreme variation in implementation requirements and partnership opportunities.
- Available data are often not sufficient to comparatively rank the most promising projects.
- Similarly, system-wide data are not sufficient to adequately monitor the performance of this system post-implementation. This issue needs to be fundamentally addressed as a recommendation of this study.

CMS Program Recommendations

This study process and its findings have been used to develop near-term recommendations to initiate the implementation of a Congestion Management System for the Northeast Region. A preliminary list of FY11-FY17 projects, based on an anticipated funding level of $1.5 million annually ($10.5 million total), has been prepared. The list was developed by considering the best ranked projects among the screening processes, with consideration of the following factors.

- In the initial stages of the CMS, some “umbrella” projects first need to be implemented to provide consistent data to help validate larger projects before significant and often long-term funding commitments can be made, and to provide the means of monitoring the effectiveness of projects that are implemented.
- Implement several low-cost projects that have obvious benefits.
- Implement some of the higher-ranking projects with somewhat more expensive costs, as funding scenarios permit.
- Provide for some planning level studies to advance some potential projects that are highly ranked in the scoring process, but which are not developed in sufficient detail to warrant large funding commitments at this time.
- Address “external” projects, those that require action by non-NPS agencies, separately from “internal” projects for which decision making and implementation is primarily under NPS control.
- To avoid duplication in the near-term recommendations, exclude from consideration any projects already listed in the Safety Management Program study, and exclude from consideration alternative transportation implementation projects. The ATS projects are currently being evaluated in a separate study.

List of FY11-FY17 projects

The near-term action plan includes three fundamental elements:

- **Enabling Projects** – largely projects that provide the planning data and systems to track performance and progress related to managing congestion in the region;
- **Congestion-related Projects** – funding and implementing those projects that were shown to have low cost/high value returns; and,
- **Planning Activities** – further studies and regional engagement activities to ferret out the benefits and costs of larger scale projects – both on and off park properties – identified through the process.

Exhibit 10 summarizes the Enabling Projects recommended for implementation in the Northeast Region. These data collection projects are intended to provide the means of evaluating and vetting current congestion issues, monitoring key congestion emphasis areas so that proactive congestion mitigation can be implemented before visitor experience and park resources are adversely impacted, and assessing the effectiveness of congestion projects that were implemented.

The recommended enabling projects include pilot projects for parking data collection, queue monitoring at entrance stations, and trail visitation data collection. The systems are intended to be simple and practical to implement and maintain – focused on collecting the data for later analysis rather than real time monitoring. After the pilot programs are complete, the projects would be expanded to other locations and parks, as funding permits.

Exhibit 10: Recommended Enabling Projects, FY11 – FY17

Park	Project	Project Cost
VAFO	Pilot project to implement parking data collection system to track parking activity and occupancy patterns	$ 165,000
SHEN	Pilot project to install queue monitoring system at Front Royal Entrance Station	$ 115,000
MABI	Pilot project to implement a trail counter equipment to monitor density on carriage trails	$ 32,000
ALL	Implement Parking Data Collection System at other parks, based on results of pilot project at VAFO	$ 480,000
ALL	Implement Entrance Station Monitoring System at other parks, based on results of pilot project at SHEN	$ 330,000
ALL	Implement trail counter system at other parks, based on results of pilot project at MABI	$ 125,000

Exhibit 11 presents the recommended near-term congestion-related projects for programming and implementation. Most of the projects are the smaller high priority projects. Higher cost, high priority projects were limited by funding constraints and the fact that some required further study before substantial funding should be committed. In the long term, the completion of enabling projects and the smaller high priority projects will free up funding for the larger projects.

It should also be noted that over half a million dollars worth of “external” projects are included. These are high priority projects that are located outside of NPS lands. The recommended funding allocation is for assisting the responsible external agencies in implementing the project, but not covering the entire cost of the project. Because the projects are under the control of others, these types of projects will need to be considered as they develop.

Exhibit 11: Recommended Congestion-Related Projects, FY11 – FY17

Park	Project	Project Cost
MASI	Move security screening from CACL to ELIS to reduce congestion at CACL and make rangers available for interpretive purposes	$ 15,000
SHEN	Improved wayfinding to Wildcat Ridge (as an alternative parking area to Rip Rap) would reduce congestion and resource impacts	$ 20,000
FIIS	Improve wayfinding signs throughout the park, particularly to/from the William Floyd Estate	$ 25,000
VAFO	Revise wayfinding around Visitor Center to reduce confusion and congestion	$ 25,000
GETT	More clearly segregated bus and car parking, improved signage, and additional parking spaces at Little Round Top parking area	$ 50,000
SAMA	Add wayfinding signage along Route 114 access route in downtown Salem	$ 150,000
GETT	Extend pedestrian walkway to create a loop trail connection (VC, PA Memorial)	$ 31,000
FIIS	Implement Patchogue Ferry Parking Management system to discourage users of other services from parking for free	$ 25,000
DEWA	Install wayfinding on CR 560, just east of Dingmans Ferry crossing (NJ)	$ 15,000
INDE	Install East-West wayfinding signage in the vicinity of Independence Hall to direct visitors to the east side of the park and lessen visitation imbalance	$ 25,000
BOST	Rehab Freedom Trail to restore/replace signage, provide accessibility, and replace damaged sidewalks	$ 1,000,000
BOST	Repair/replace Freedom Trail signage along the route as necessary	$ 100,000
VAFO	Establish a new trailhead for Yellow Springs Trail and create a paved parking lot with facilities	$ 1,802,000
CACO	Install proper bike network wayfinding to orient visitors to destinations, transfer points, amenities, and safe routes	$ 186,000
MIMA	Construct a pedestrian crossing of Route 2A at Brooks Tavern to link Brooks Corner buildings, battle markers, and parking areas	$ 650,000
VAFO	Move the Valley Creek Trailhead and create a larger, safer parking lot to reduce congestion and protect historical resources	$ 255,000
MIMA	Realign bypass road (Route 2A/Lexington Street) to dissuade cut-through traffic on Route 2A and create gateway entrance to park	$ 850,000
All	Reserved for future projects	$ 1,025,000
DEWA	Real-time Twitter Feed (Summer) to provide visitors with real-time information on traffic conditions and parking lot closures	$ 8,000
ALL	Real-time Twitter Feed (Summer) to provide visitors with real-time information on traffic conditions and parking lot closures (10)	$ 55,000
SHEN	Pedestrian Crossing Improvements including crosswalks and advanced signage at 5 locations along Skyline Drive	$ 225,000
ALL	Pedestrian Crossing Improvements	$ 400,000
External Projects		
GETT	Add a left turn phase at Washington & Middle Street to improve queuing on northbound Washington Street	$ 25,000
SHEN	Install additional wayfinding on US 340 in Front Royal to reduce confusion for visitors traveling through the gateway community	$ 20,000
DEWA	Install signage on WB I-80 to inform visitors of Turtle Beach as an alternative to Smithfield	$ 15,000
PETE	Revise City Point wayfinding to use Broad Street and Main Street	$ 25,000
ASIS	Advance signage on Route 611 to provide visitors with wayfinding and fee information	$ 15,000
DEWA	Adjustments to signal timing, phasing, and coordination at critical intersections along US 209	$ 50,000
COLO	Traffic Control Improvements at 5 Points Intersection including realigning Zweybrucken Road	$ 75,000
INDE	Provide a midblock crossing across Arch Street to accommodate pedestrian desire lines and reduce vehicular conflicts at busy adjacent intersections	$ 159,000
ALL	Reserved for future projects	$ 150,000

Exhibit 12 depicts the planning studies and activities associated with refining the longer term congestion management system recommendations. One large category involves road safety audits at locations where pedestrians cross heavily traveled roadways. It is recommended that these first be conducted for some locations along Skyline Drive in Shenandoah NP and then later at other locations as the need is identified. The largest allocation, $500,000, is for undefined studies that may be identified over the course of the multiyear funding program.

Exhibit 12: Recommended Planning Activities, FY11 – FY17

Park	Project	Project Cost
ASIS	Undertake a mainland bike rental marketing survey to determine the benefits of opening a facility on the mainland side of the bridge	$ 25,000
GEGR	Complete an ATS pre-study to investigate the feasibility of ferry shuttle service from lower Manhattan to the 125th Street dock near GEGR	$ 25,000
DEWA	Undertake a pre-study for a visitor shuttle on US 209 and River Rd, particularly for use by area hotels	$ 10,000
ASIS	Undertake a pre-study to determine the feasibility of implementing a shuttle from mainland parking lot	$ 10,000
ALL	Reserved for future studies	$ 500,000
SHEN	Complete a (pedestrian) Road Safety Audits at 5 locations along Skyline Drive	$ 75,000
ALL	Pedestrian Road Safety Audits	$ 225,000
External Projects		
FRSP	Complete a traffic study to determine the benefits of peak hour turn restrictions at Lee Dr/Lansdowne Rd	$ 50,000
SHEN	Partner with 511 Virginia to provide sufficient information on entrance stations, attractions, and traffic conditions in and around the park	$ 10,000

STEP 7- PERFORMANCE MONITORING MEASURES

Successful congestion management plans include more than the strategies and an implementation plan to address existing congestion issues. They also include an evaluation component to assess progress of the strategies and consider new strategies. This chapter describes the recommended method to monitor and evaluate system performance. The recommendations include the following three elements.

- Define performance measures to monitor and evaluate congestion and congestion management strategies;
- Define a program of data collection and management to track progress; and
- Define procedures for periodic review of the effectiveness of strategies selected for implementation, as well as to update the CMS.

Performance Measures

The overall performance goals and objectives of the Congestion Management System for the Northeast Region should be consistent with the goals and objectives of the Long Range Transportation Plan. As such, the goals of the CMP are to:

- Preserve the Transportation System
- Improve Mobility, Access & Connectivity
- Improve the Visitor Experience through Transportation, and
- Protect/Improve Resources and Sustainability

Use of a robust set of performance measures tied to these goals would require significantly more transportation operational data collection than is currently being implemented. Investing in more data collection and analysis activities in the near-term, however, would provide a better understanding of the effectiveness of the overall CMS over time, as well as provide a stronger foundation for the comparative assessment of congestion-related programs and projects in conjunction with future planning efforts. The team's approach to this conundrum is to identify a reasonable set of performance measures (involving a mix of data already collected, new data collection, and periodic surveys) to initiate this process. As the CMS matures, and technology evolves, this performance monitoring system should be reviewed and refined.

Exhibit 13 includes a candidate listing of performance measures that could be considered in each of the goal categories in order to evaluate the effectiveness of congestion management projects.

Exhibit 13: Candidate Performance Measures for Evaluating Congestion Management Projects

CMP Goal	Potential Performance Measures
Preserve the Transportation System	• Condition of congestion element of transportation facilities (e.g. shuttles, traffic control, wayfinding signage, etc.)
Improve Mobility, Access & Connectivity	• Daily and peak period traffic counts • Roadway Level-of-Service • Person delay at entrance stations, ATS access points and major attractions • Reduction in the number of congestion “hot spots” • Reduction in the number of safety “hot spots” • Level of coordination/connection with area transit services • Connections with regional trail/bike path systems • Reduction in the number of ADA barriers
Improve the Visitor Experience	• Reduction in number of parks reporting congestion (as measured through surveys) • Visitor satisfaction index (as measured through visitor surveys) • Number of visitors processed by park • Parking levels / availability • Penetration of traveler information systems
Protect /Improve Resources and Sustainability	• Mode Share (private vehicle vs. alternative transportation) • Transit/ATS ridership • Number of resource enhancements: o Storm water/water quality improvements o Habitat restoration o Wildlife crossings implemented o air quality improvements o noise reduction improvements • Progress toward sustainability o GHG Emissions reductions o Alternative fuel usage

Several of these measures require investment in new data collection systems, as referenced in the previous chapter under "Enabling Projects.” These three pilot system projects are intended to provide temporal use statistics on a routine basis for the primary transportation infrastructure in the region and include:

Parking Data Collection System

Several parking lots at VAFO were identified as regularly experiencing congestion, due in large part to recreational visitors parking private vehicles in the lots and then using the extensive trail system in and around the park. Quantitative data about the situation is required before investing in potentially expensive improvements that could affect both visitor experience and resource protection. The pilot project at VAFO would use a standard parking management software package to collect data on the parking activity and occupancy patterns for the most heavily used parking lots. The system would provide data in hourly increments for vehicle entries and exits, and calculate hourly parking occupancy counts. The data would be compiled automatically by wireless communication or downloaded in the field, as applicable to the particular parking area. The data would not be monitored in real time.

The purpose of the pilot program is to identify the most cost-effective and practical means of collecting parking data so that the frequency and duration of any parking congestion can be quantified. For locations where existing congestion is identified, the data will be used to evaluate the most cost-effective means of addressing the parking congestion. For locations where parking congestion is not found to be significant, the system data will be used to monitor trends in parking utilization year-to-year in order to identify when proactive measures should be implemented before significant congestion is realized. The data collection system will also provide the means of measuring the success of any parking congestion project that is implemented.

The FY11-FY17 funding covers parking data collection systems at other parks once the pilot project at VAFO is complete and a practical means of collecting and evaluating parking data has been determined. It is anticipated that the future projects locations would be chosen based on parking-related congestion issues recognized as part of the ongoing congestion management program.

Entrance Station Monitoring System

The Front Royal Entrance Station is the most heavily used of SHEN's four entrance stations, and experiences severe congestion and long queues during peak visitation, particularly on fall weekends. Currently, there are no accurate data available on the frequency of congestion, the extent of queuing or the duration of visitor delay. The pilot program would implement a monitoring system that collects data on vehicle volumes, speeds and queuing. The data would be used to ensure that any mitigation investment is proportional to the extent of the problem, and provide the means of monitoring the effectiveness of any congestion mitigation project. The pilot program would also identify a cost-effective means of collecting and evaluating such data at entrance stations elsewhere in SHEN or the Northeast Region.

The system would use standard traffic monitoring count equipment such as inductive loops or microwave sensors to collect the data. The objectives of the system are to provide data for quantifying the congestion problems and to provide metrics for assessments of mitigation problems. The data would be collected and processed afterward, rather than monitored in real time.

Once the pilot program at SHEN is complete, the lessons learned will be applied to installing the entrance station monitoring system at other parks. Since congestion at park entrance stations is one of the most visible and frequently cited congestion issues at parks, the goal is to install such systems at major entrance stations, even those where congestion is not currently considered a problem. The system would provide the means of monitoring the potential growth of congestion at those locations and allow proactive mitigation efforts to be implemented.

Trail Count System

The vast majority of visitors to Marsh-Billings-Rockefeller NHP access the parks trail network through a single area. This creates some congestion on those trail links close to the visitor center and leaves much of the trail network farthest from the visitor center underutilized and underappreciated. The trail counter system would provide the means of monitoring the use of the trails, assessing the relative congestion on particular trails, and gauging the success of programs intended to encourage use of other trailheads.

The intent of the pilot program at MABI is to provide the park with a reliable, cost-effective, and practical means of collecting and evaluating the trail activity data. The system would build upon experience at ROVA and elsewhere, with the intent of developing a standard of equipment and use at any park in the Northeast Region where trail and trailhead count data are useful for congestion planning efforts. The preliminary FY11-FY17 funding program includes funding for installing trail count systems at other parks.

Other Data

One important set of congestion data is traffic counts on major park roads. Hourly and daily traffic counts are required to quantify roadway congestion metrics. EFLHD is currently working to upgrade the traffic count system currently in place in many parks across the country and make that data more reliable, useful, and usable.

Additional data, such as ridership counts on shuttles and ferries, routine surveys, and scheduled reporting of project activities in the parks, will need to be completed and compiled annually to round out the data needed to adequately assess the performance of the CMS over time and to provide improved project planning data.

LESSONS LEARNED / NEXT STEPS

The Congestion Management System for the Northeast Region of the National Park Service has broken some new ground in defining congestion within the context of the park system; linking congestion to NPS mission-critical objectives such as visitor experience, resource protection, and livability; and identifying a structured planning process to develop, program, and monitor congestion mitigation strategies to address existing and forecasted park needs. The development of this CMS was supported by extensive technical analyses, review of available transportation data and reports, and input from stakeholders. It has defined a systematic approach to addressing congestion related issues at the regional level.

Lessons Learned

During the course of this planning process there were a number of key lessons learned, that include:

- Congestion in the parks today does impair the visitor experience, puts cultural and natural resources at risk, and presents challenges to the livability goals and objectives that are central to the NPS mission:
    - Congestion can limit the access to or enjoyment of park resources simply by the sheer number of people trying to access those resources. Visitor expectations on the level of “acceptable” congestion can vary widely depending on the context of the park and purpose of the visit (recreational, cultural, historic, scenic, wilderness, etc.).
    - Congestion can degrade the parks’ natural and cultural resources through unsanctioned parking, unmanaged use of walking or bicycling areas, and noise or air quality impacts to a park’s scenic vistas, historic resources and sacred places.
    - Park resources are critically important to their host communities and contribute to local and regional quality of life. Congestion, particularly in the densely populated northeast region of the US, can also be caused by external factors such as cut-through traffic, and development near the park boundaries.
- Solutions to manage congestion in the parks can and should contribute to the recent NPS policy directives to manage and operate the park system in a more sustainable manner.
- Congestion at “emphasis areas”, such as delays at entrance stations or inadequate parking, offer an organizational framework to consider congestion mitigation strategies; however, congestion-related problems found in the Northeast Region are highly diverse in nature and contextually very different, each from the next.
- System-wide or "umbrella-type” congestion management solutions are often difficult to define; thus, driving this study effort to address congestion at the more tangible park and project level.

- The method of focusing on case studies at key parks was found to be effective in capturing and addressing the vast majority of congestion related issues in the Northeast Region.

Next Steps

A number of planning and implementation activities which will need to follow this study effort that include:

- Completing outreach with the parks to educate them on the CMS and its recommendations;
- Gaining consensus with affected parks on the high-priority recommendations in this study;
- Further refining the first year of congestion related projects, including the Enabling Projects, for programming and implementation; and
- Benchmarking the desired measures for performance monitoring and analysis of the CMS and reporting moving forward.

CMS Review and Update Process

For this study effort to be truly worthwhile, the Congestion Management System process defined herein must become part of the on-going transportation planning activities of the region. The benefits of an active CMS for the Northeast Region include:

- Guide a process to achieve the mobility goals of the Long-range Transportation Plan for the Northeast Region;
- Advance strategies that improve the visitor experience traveling to and within the parks;
- Provide information and data to strengthen decision-making and priority setting across all transportation investments;
- Improve the understanding of “best practices” in the overall operation and management of the transportation facilities in the park;
- Promulgate the most successful strategies across the region (and potentially nationally); and
- Increase partnerships and collaborative opportunities to address regional transportation issues affecting both the park and the gateway community.