Chapter 24

National Highway System

Introduction

This chapter provides a snapshot of the physical conditions, operational performance, finance, and investment requirements of the National Highway System (NHS). The NHS integrates the Interstate System with other routes most critical to national defense, mobility, and commerce. This chapter represents a supplementary analysis to the information presented for all highways and bridges in Chapters 2, 3, 4, 6, 7, and 8.

History of the National Highway System

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) required Congress to establish an NHS by September 30, 1995. ISTEA authorized a NHS of up to 178,250 miles. The purpose of the NHS was to focus Federal resources on roads that are the most important to interstate travel and national defense, that connect with other modes of transportation, and that are essential for international commerce. Until the system was designated, ISTEA prevented future NHS and Interstate Maintenance funds from being released to the States.

Although ISTEA required that certain key routes, such as the Interstate System, be included in the NHS, most of the NHS was not specified. The Federal Highway Administration (FHWA) worked with its State and local partners, public and private interest groups, and other agencies within the Department of Transportation to identify potential NHS routes. The National Highway System Designation Act of 1995, which became law on November 28, 1995, identified a 160,955-mile network. Additions to the NHS have been made since the initial authorization.

The NHS has five components. The **Interstate System**, described in Chapter 23, is the core of the NHS and includes the most-traveled routes. Many **other rural and urban principal arterials**, described in Chapter 2, are also included. The **Strategic Highway Network** (STRAHNET), described in Chapter 12, includes highways important to military mobilization. **STRAHNET connectors**, also described in Chapter 12, provide access between major military installations and routes which are part of the STRAHNET. **Intermodal Connectors** are highways that provide access between major intermodal facilities and the other four subsystems making up the NHS. The NHS Freight Connectors, described in Chapter 25, are a part of this fifth subsystem.

The NHS was designed to be a dynamic system able to change in response to future travel and trade demands. The Secretary of Transportation may approve modifications to the system without Congressional approval. States must cooperate with local and regional officials in proposing modifications. In metropolitan areas, local and regional officials must act through metropolitan planning organizations when proposing modifications.

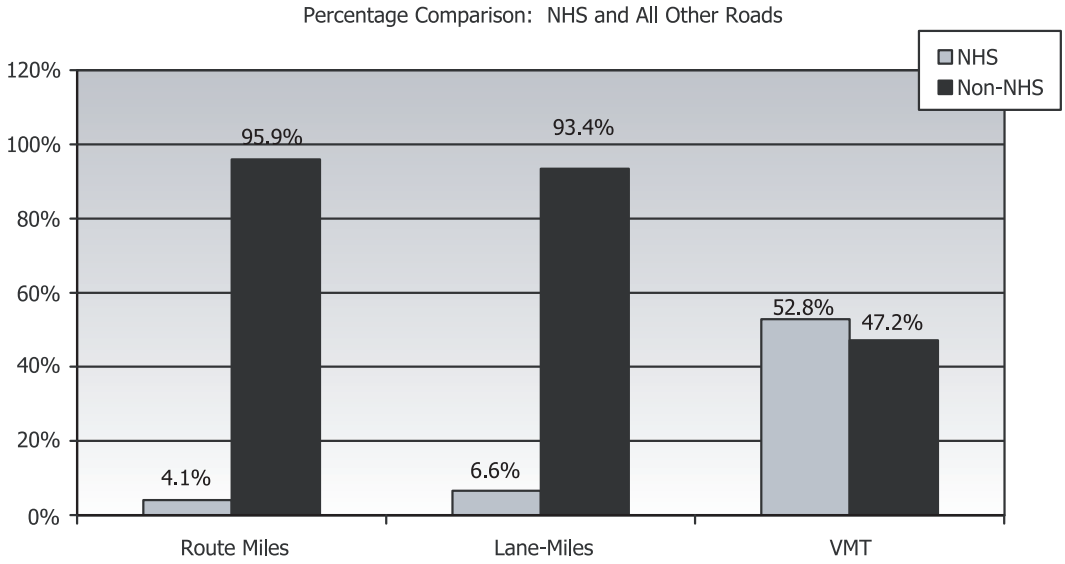
System and Use Characteristics

Exhibit 24-1 summarizes NHS route miles, lane miles, and vehicle miles traveled (VMT). The NHS is overwhelmingly concentrated on higher functional systems. All Interstates are part of the NHS, 84.1 percent of rural other principal arterials are part of the NHS, and 87.8 percent of urban other principal arterials are on the NHS. The NHS is designed to meet nationwide commercial and defense needs, so it is logical to expect that mileage would be concentrated on higher functional systems.

There are currently 161,187 route miles on the NHS. This does not include some sections not open to traffic. The total authorized number of NHS route miles in 2000 was 164,312 miles.

Exhibit 24-1

Highway Route Mileage, Lane Mileage, and Vehicle-Miles Traveled on the National Highway System Compared to All Roads, by Functional System, 2000



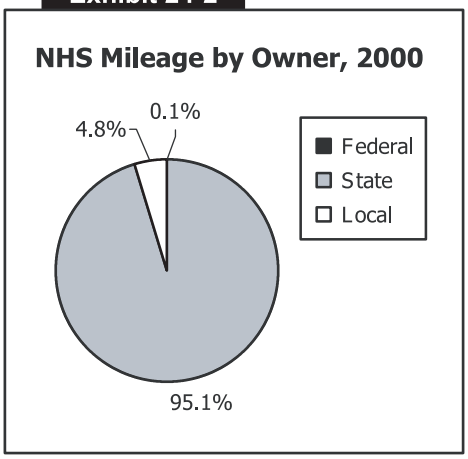
	Route Miles		Lane-Miles		Vehicle-Miles Traveled (Millions)	
	TOTAL ON NHS	PERCENT OF FUNCTIONAL SYSTEM	TOTAL ON NHS	PERCENT OF FUNCTIONAL SYSTEM	TOTAL ON NHS	PERCENT OF FUNCTIONAL SYSTEM
Rural NHS						
Interstate	33,152	100.0%	135,000	100.0%	270,314	100.0%
Other Principal Arterials	83,275	84.1%	217,680	86.0%	218,912	87.9%
Minor Arterial	1,854	1.3%	4,540	1.6%	4,241	2.5%
Major Collector	690	0.2%	1,480	0.2%	1,136	0.5%
Minor Collector	20	0.0%	42	0.0%	16	0.0%
Local	48	0.0%	98	0.0%	35	0.0%
Subtotal Rural NHS	**119,039**	**3.9%**	**358,840**	**5.7%**	**494,654**	**45.4%**
Urban NHS						
Interstate	13,523	100.0%	74,133	100.0%	397,291	100.0%
Other Freeway and Expressway	7,999	87.0%	37,167	89.0%	164,054	92.1%
Other Principal Arterial	19,061	35.6%	69,942	37.6%	162,362	40.5%
Minor Arterial	1,137	1.3%	3,409	1.5%	5,638	1.7%
Collector	301	0.3%	779	0.4%	1,028	0.8%
Local	127	0.0%	252	0.0%	253	0.1%
Subtotal Urban NHS	**42,148**	**4.9%**	**185,682**	**9.7%**	**730,623**	**43.5%**
Total NHS	**161,187**	**4.1%**	**544,522**	**6.6%**	**1,225,277**	**44.3%**

Source: Highway Performance Monitoring System.

While only 4.1 percent of the Nation's total road mileage is on the NHS, these roads carry 44.3 percent of VMT. This represents an increase since 1997, when only 43.5 percent of total vehicle miles traveled were on the NHS.

Exhibit 24-2 describes the ownership of NHS mileage. About 95.1 percent of route miles were State-owned in 2000. Only 4.8 percent were locally-owned, and the remaining 0.1 percent were owned by the Federal Government. By comparison, Exhibit 2-2 in Chapter 2 shows that 19.6 percent of all route miles in the United States were State-owned, 77.4 percent were locally-owned, and 3.0 percent were owned by the Federal Government. Since the NHS is concentrated on higher functional systems, the percentage of locally-owned NHS routes is relatively small.

Exhibit 24-2



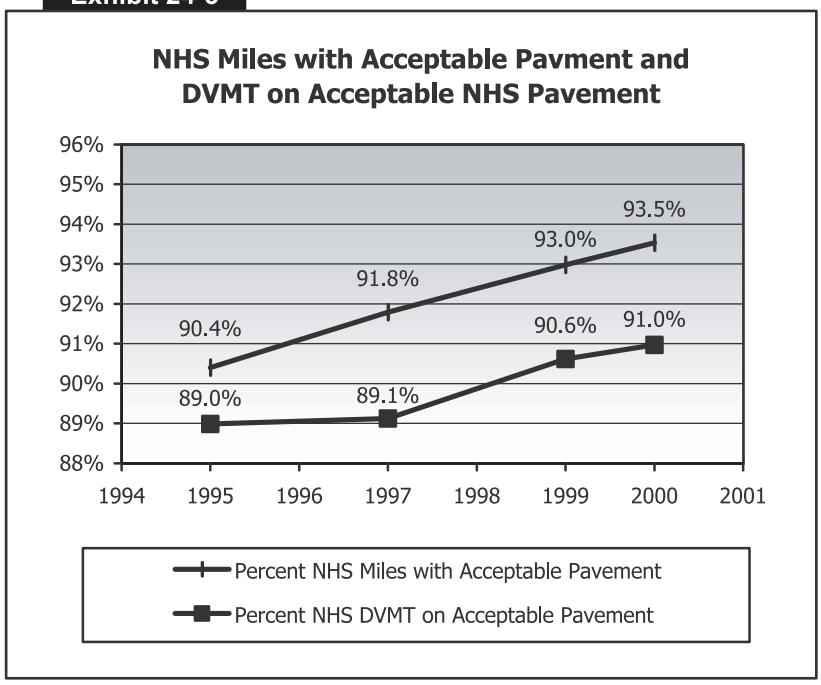
Source: Highway Performance Monitoring System.

Physical Conditions

The FHWA's 1998 National Strategic Plan introduced a new measure of pavement condition: "acceptable ride quality." This measure is described more comprehensively in Chapter 3. The National Strategic Plan stated that by 2008, 93 percent of NHS mileage should meet pavement standards for "acceptable ride quality." This goal was achieved in 1999.

The FHWA has adopted a new metric based on the percent of vehicle miles traveled (VMT) on "acceptable" pavement, also described in Chapter 3. By adopting this metric, FHWA has broadened its emphasis to include the benefits of good surface quality to the user. In its FY 2003 Performance Plan, FHWA aimed to have 92.5 percent of VMT on NHS be on pavements rated "acceptable" or better by 2003. In 2000, 90.9 percent of the VMT on the NHS were on pavements with "acceptable" ride quality. This is an increase of 0.4 percent over 1999.

Exhibit 24-3



Source: Highway Performance Monitoring System.

Rural NHS routes tend to have better pavement conditions than urban NHS routes, which is consistent with the results reported for all roads in Chapter 3. The percent of VMT on pavement with "Good" ride quality for rural NHS routes is 63.6 percent, compared to 37.9 percent for urban areas. The Interstate component of the NHS tends to have better ride quality than the non-Interstate component. The VMT on NHS pavements with "Acceptable" ride quality improved between 1999 and 2000, as described in Exhibit 24-3. The VMT on NHS pavements with "Good" ride quality increased in both rural and urban areas. Also, VMT on NHS pavements with "acceptable"

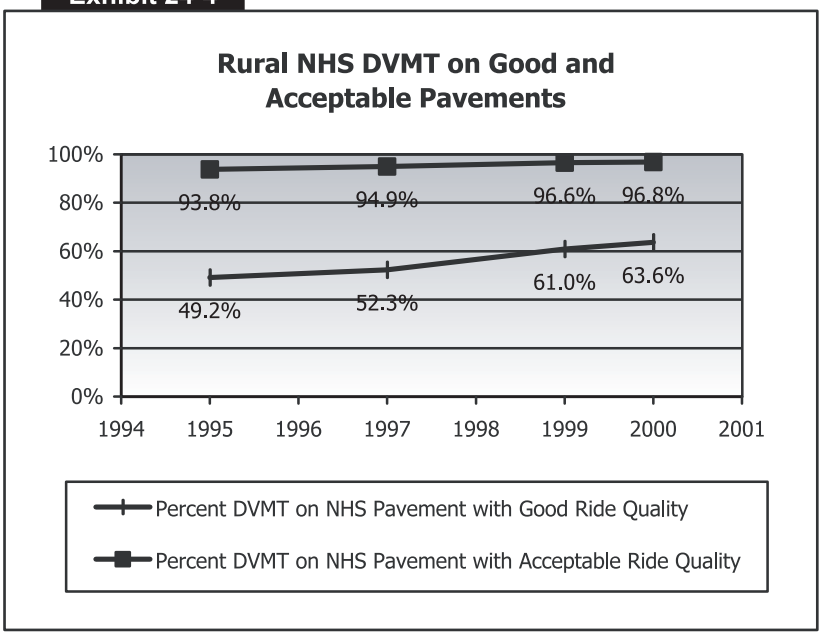
ride quality increased in both areas. (See Exhibits 24-4 and 24-5.)

Q. How do NHS pavement conditions compare with pavement conditions on other roads?

A. The percentage of DVMT on pavement with "Good" ride quality in rural areas on the NHS is 63.6 percent, compared to 55.6 percent for all rural highways. The percentage of DVMT on pavement with "Good" ride quality in urban areas on the NHS is 37.9 percent, compared to 35.5 percent for all urban highways. The percentage of DVMT on pavement with "Acceptable" ride quality in rural areas on the NHS is 96.8 percent, compared to 93.8 percent for all rural highways. The percentage of DVMT on pavement with "Acceptable" ride quality in urban areas on the NHS is 87.0 percent, compared to 80.4 percent for all urban highways.

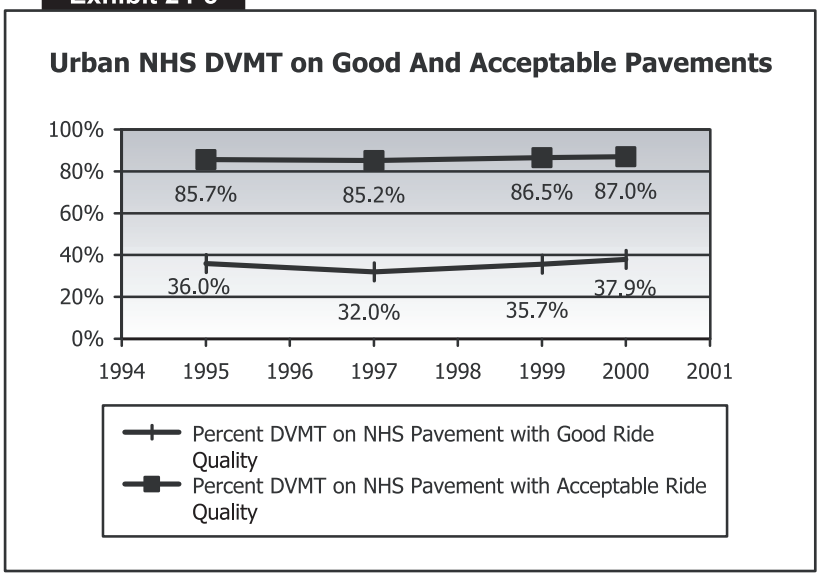
Exhibits 24-6 and 24-7 describe bridge condition using two measures from the FHWA FY 2003 Performance Plan. Both measures describe improving NHS bridge conditions. Exhibit 24-6 examines the percentage of NHS bridges rated deficient, which decreased from 25.8 percent in 1996 to 21.5 percent in 2000. Exhibit 24-7 examines the percentage of deck area on NHS bridges rated deficient, which declined from 35.9 percent in 1996 to 30.8 percent in 2000.

Exhibit 24-4



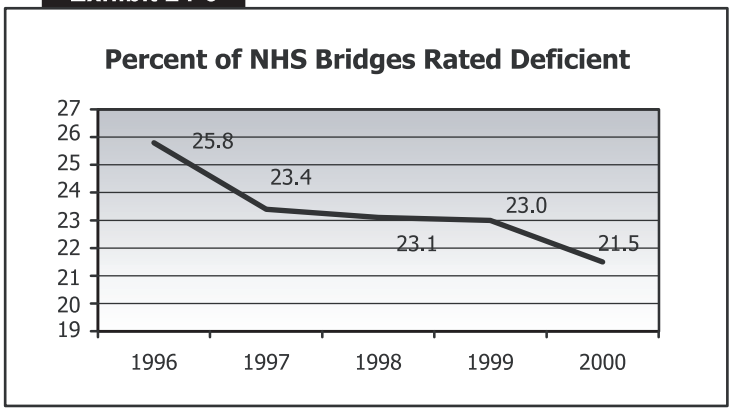
Source: Highway Performance Monitoring System.

Exhibit 24-5



Source: Highway Performance Monitoring System.

Exhibit 24-6



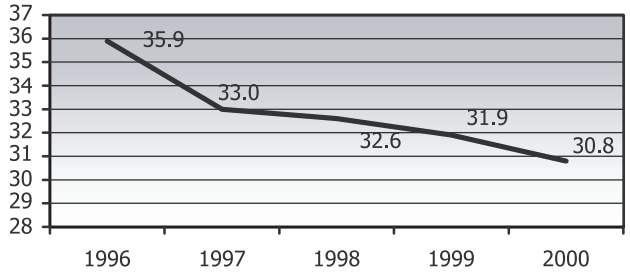
Source: FY 2003 FHWA Performance Plan.

Operational Performance

Since 1997, use of the NHS has increased more rapidly than its capacity has been expanded. From 1997 to 2000, DVMT per lane-mile on the NHS increased by 7.8 percent. The rate of increase during that period was greater in rural areas, 8.9 percent, than in urban areas, 6.8 percent. However, DVMT per lane mile on the NHS in urban areas is still almost three times larger than in rural areas.

Exhibit 24-7

Percent of Deck Area on NHS Bridges Rated Deficient



Source: FY 2003 FHWA Performance Plan.

Measures of the three FHWA operational performance indicators (introduced in Chapter 4) are not separately available for the NHS. However, Chapter 4 contains the values of these indicators for principal arterials in urbanized areas, and Chapter 23 includes the values for Interstates, a key component of the NHS, in urbanized areas.

In the urban environment, 72.0 percent of principal arterials are on the NHS. As presented in Chapter 4 of this report, the operational performance of the urban principal arterial system is deteriorating. Exhibit 4-3 in Chapter 4 shows the Percent Additional Travel Time for the average commuter has increased 10 percentage points since 1995 for Urban Areas. Exhibit 4-5 shows an increase of 5.9 hours in Annual Hours of Traveler Delay since 1995, and Exhibit 4-8 shows the Percent of Travel Under Congested Conditions has increased from 31.5 percent in 1995 to 33.1 percent in 2000.

Finance

Exhibit 24-8 describes highway capital outlay on the NHS by functional system in 2000. Approximately $12.1 billion was invested on rural arterials and collectors in 2000, and another $18.5 billion was invested on urban arterials and collectors. Reported State government spending on NHS routes functionally classified as rural local or urban local was negligible in the year 2000. It is not currently possible to identify spending by local governments on these routes, which would mainly consist of intermodal connectors and STRAHNET connectors. NHS intermodal freight connectors are discussed in Chapter 25.

Exhibit 24-8

Highway Capital Outlay on the NHS by Functional System, 2000

FUNCTIONAL CLASS	TOTAL ($BILLIONS)
Rural Arterials and Collectors	
Interstate	$4.5
Other Principal Arterial	$7.0
Minor Arterial	$0.5
Major Collector	$0.2
Minor Collector	$0.0
Subtotal	**$12.1**
Urban Arterials and Collectors	
Interstate	$9.6
Other Freeway & Expressway	$3.6
Other Principal Arterial	$4.9
Minor Arterial	$0.3
Collector	$0.1
Subtotal	**$18.5**
Subtotal, Rural and Urban	**$30.6**
Rural and Urban Local	**$0.0**
Total, All Systems	**$30.6**

Source: Highway Statistics 2000 and unpublished FHWA data.

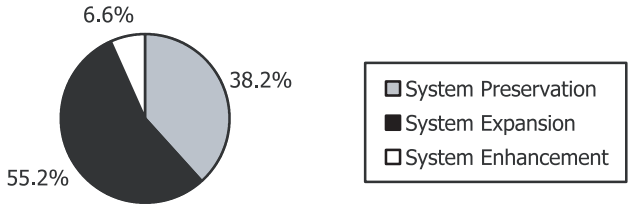
Investment Requirements

Of the $106.9 billion average annual Cost to Improve Highways and Bridges introduced in Chapter 7, approximately $47.4 billion, or 44.4 percent, is for the NHS. At this level of investment, all cost-beneficial highway improvements would be made and the backlog of deficient bridges would be eliminated. Exhibit 24-9 breaks down these totals into separate system preservation, system expansion, and system enhancement components for rural and urban NHS routes.

Exhibit 24-9

NHS Component of Cost to Improve Highways and Bridges (Billions of 2000 Dollars)

Distribution by Improvement Type



	System Preservation					
	HIGHWAY	BRIDGE	TOTAL	SYSTEM EXPANSION	SYSTEM ENHANCE-MENT	TOTAL
Rural	$5.8	$1.1	$6.9	$3.6	$0.9	$11.4
Urban	$9.1	$2.0	$11.2	$22.7	$2.2	$36.1
Total	**$15.0**	**$3.2**	**$18.1**	**$26.2**	**$3.1**	**$47.4**

Of the $75.9 billion average annual Cost to Maintain Highways and Bridges discussed in Chapter 7, about $37.0 billion, or 48.7 percent, is for the roads on the NHS. At this level of investment, average highway user costs would be maintained at current levels and the current backlog of deficient bridges would be maintained. Note that this scenario attempts to maintain the conditions and performance of the overall system rather than individual functional classes or the NHS. Average NHS user costs or the bridge backlog on the NHS could increase or decline under this scenario, if they are matched by offsetting declines and increases for roads off the NHS.

Q. **Is the NHS component of the Cost to Maintain and Cost to Improve different than the results that would be obtained if only NHS sections were analyzed?**

A. The NHS component of the Cost to Improve Highways and Bridges would be identical to the results that would be obtained by analyzing NHS sections alone. This scenario does not involve any tradeoffs; all cost-beneficial improvements are made on each sample highway section without any degree of competition with other sections.

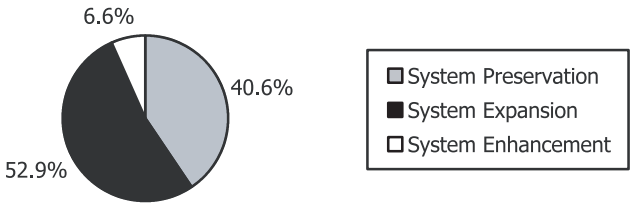
The NHS component of the Cost to Maintain Highways and Bridges can be different, since this scenario is designed to maintain average user costs for all roads combined; the analysis doesn't maintain average user costs specifically on the NHS. However, in this edition of the C&P report, it turns out that the Cost to Maintain analysis for all roads combined results in maintaining average user costs on both NHS and non-NHS roads. This was not the case in the 1999 C&P report, and may not be the case in the future editions.

Exhibit 24-10 breaks down the NHS component of the Cost to Maintain Highways and Bridges into separate system preservation, system expansion, and system enhancement components.

Exhibit 24-10

NHS Component of Cost to Maintain Highways and Bridges (Billions of 2000 Dollars)

Distribution by Improvement Type



	System Preservation					
	HIGHWAY	BRIDGE	TOTAL	SYSTEM EXPANSION	SYSTEM ENHANCE-MENT	TOTAL
Rural	$4.4	$0.9	$5.3	$2.6	$0.7	$8.6
Urban	$8.1	$1.6	$9.7	$16.9	$1.7	$28.4
Total	**$12.5**	**$2.6**	**$15.0**	**$19.6**	**$2.4**	**$37.0**

Comparison of Spending and Investment Requirements

Investment by all levels of government on the NHS would need to increase by approximately $6.4 billion above the 2000 level of $30.6 billion to reach the level of NHS component of the Cost to Maintain Highways and Bridges. This represents a 20.9 percent increase. NHS investment would need to rise by approximately 54.9 percent to reach the Cost to Improve Highways and Bridges.

As shown in Exhibit 24-11, while the relative increase in spending required to close the "gap" between current spending and the Cost to Improve is smaller for the NHS than for other roads, the relative increase in spending required to close the "gap" between spending and the Cost to Maintain is larger. This suggests that a larger share of future funding increases should be utilized on the NHS up to a point, but that there is also a large amount of cost-beneficial investment off the NHS that should be implemented if unlimited funding were available.

Exhibit 24-11

Average Annual Investment Required to Maintain and Improve Highways and Bridges Versus 2000 Capital Outlay on and off the NHS

	COST TO MAINTAIN HIGHWAYS AND BRIDGES			COST TO IMPROVE HIGHWAYS AND BRIDGES		
	ON NHS	OFF NHS	TOTAL	ON NHS	OFF NHS	TOTAL
Average Annual Investment Requirements (Billions of $2000)	$37.0	$38.9	$75.9	$47.4	$59.5	$106.9
2000 Capital Outlay	$30.6	$34.1	$64.6	$30.6	$34.1	$64.6
Percent Difference	20.9%	14.3%	17.5%	54.9%	74.6%	65.3%