2014 PAVEMENT CONDITION ANNUAL REPORT

March 2015

MnDOT
Office of Materials and Road Research

Pavement Management Unit

We all have a stake in A to B

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INTRODUCTION

This report is prepared annually by the Minnesota Department of Transportation (MnDOT) Pavement Management Unit to provide information concerning trunk highway pavement performance. It discusses statewide performance trends compared with established targets and compares performance between the eight Area Transportation Partnerships (ATPs).

BACKGROUND

MnDOT's trunk highway system consists of approximately 12,000 centerline miles of pavement. This system consists of bituminous, concrete, and composite pavement with a wide range of condition, age, and performance. Each year, the Pavement Management Unit collects pavement roughness and digital image data on the entire trunk highway system, in both directions, and calculates surface distress quantities on approximately 60% of the system. Condition data has been collected on the trunk highway network since the late 1960s.

DATA COLLECTION

The pavement roughness and surface distress data are collected using a sophisticated digital inspection vehicle (shown below). The van is driven over all trunk highways annually, in both directions. This van is equipped with two cameras to collect digital front/side images of the roadway. For pavement distress and rutting measurements, a 3D laser/camera system is used to provide images of the pavement surface, from which the type, severity, and amount of cracking can be determined. The van is also equipped with laser height sensors that measure the longitudinal pavement profile, from which pavement roughness is calculated.

Pavement condition data is used to monitor the performance of the system, to aid in project selection, and to identify future pavement maintenance or rehabilitation needs.

INDICES AND MEASURES

MnDOT's pavement condition data is reduced to several indices for reporting the statewide pavement performance measures in MnDOT's 20-year Transportation Plan: Ride Quality Index (RQI), Surface Rating (SR), Pavement Quality Index (PQI), and Remaining Service Life (RSL). Each index captures a different aspect of the pavement's health and can be used to rank pavement sections and predict the need for future maintenance and rehabilitation. They are each briefly described below.

RQI: Ride Quality Index

The RQI is MnDOT's ride, or smoothness, index. It uses a zero to five rating scale, rounded to the nearest tenth. The higher the RQI, the smoother the road is. The RQI is intended to represent the rating that a typical road user would give to the pavement's smoothness as felt while driving his/her vehicle. Most new construction projects have an initial RQI above 4.0. Pavements are normally designed for a terminal RQI value of 2.5. When a road has reached the terminal RQI value it does not mean the road can't be driven on, but rather that it has deteriorated to the point where most people feel it is slightly uncomfortable and rehabilitation is likely needed.

The RQI is calculated from the pavement's longitudinal profile, measured by the front mounted lasers on the digital inspection vehicle. A mathematical simulation, called the International Roughness Index (IRI), is then run to estimate the amount of vertical movement a standard vehicle would experience if driven down the road. The IRI is the roughness index used by every state DOT in the U.S., as well as most countries in the world. In the past, MnDOT has taken a rating panel of 30 to 40 people out into the field and driven them over hundreds of test sections to get their perception of the smoothness of various pavement sections. Following right behind them was the digital inspection vehicle. This provides us with a direct correlation between the IRI, as measured by the van, and the perceived roughness, as felt by the rating panel.

SR: Surface Rating

Pavement distresses are those defects visible on the pavement surface. They are symptoms, indicating some problem or phenomenon of pavement deterioration such as cracks, patches and ruts. The type and severity of distress a pavement has can provide great insight into what its future maintenance and/or rehabilitation needs will be.

MnDOT uses the SR to quantify pavement distress. The distress identification procedure used to determine the SR is done using computer workstations in the Pavement Management Unit of the Office of Materials and Road Research, located in Maplewood, MN. The workstations allow the user to view and analyze the digital images captured by the van. The van captures several images that are shown on monitors simultaneously. The front, side and down views are used to determine the type, severity, and amount of each defect.

Because of the time involved determining the SR, MnDOT does not conduct continuous distress surveys. Instead, the first 500 feet of each mile and section are rated (≈10% sample). On undivided roadways, only the outside lane in the increasing direction (northbound or eastbound) is rated when the SR is measured. On divided routes, the outside lane in both directions is rated.

The percentage of each distress in the 500-foot sample is determined and multiplied by a weighting factor to get a weighted distress value. The weighting factors are greater for higher severity levels of the same distress and also for distress types that indicate more serious problems exist in the roadway such as alligator cracking and broken panels. The weighted distresses are then combined to determine the SR. The SR ranges from 0.0 to 4.0, and is reported to the nearest tenth. A higher SR means better condition. A road with no defects is rated at 4.0. A road in need of major rehabilitation or reconstruction will generally have an SR near or below 2.5.

PQI: Pavement Quality Index

The PQI is a composite index, equal to the square root of the product of RQI and SR. As such, it gives an overall indication of the condition of the pavement, taking into account both the pavement smoothness and cracking. The PQI is the index used to determine if the state highway system is meeting performance thresholds established for the Government Accounting Standards Board, Standard 34 (GASB 34).

RSL: Remaining Service Life

The RSL is an estimate, in years, until the RQI will reach a value of 2.5, which is generally considered the end of a pavement's design life. Most pavements will need some type of major rehabilitation when the RQI has reached this value. The RSL is determined from pavement deterioration curves. A regression curve is fit through the historical RQI data for each pavement section and the year the RQI will reach 2.5 is estimated. If there is insufficient historical data to make this calculation, default models, based on statewide pavement performance, are used. Rehabilitation activities with long service lives will add a considerable number of years to the RSL of a pavement. Short-term fixes, such as patching, may increase the pavement smoothness for a short time, but do not result in many additional years of RSL.

Each year, the RSL is calculated for all highway segments. From these values, a length-weighted Average Remaining Service Life (ARSL) is calculated for the entire trunk highway system as well as for each ATP. Service life is added when some type of maintenance or rehabilitation is done on a pavement section. Service life is lost when the condition of a pavement section deteriorates due to aging. The ARSL of the highway system increases if the projects being done add more life to the system than the sum of the deterioration of all the other sections.

PERFORMANCE CATEGORIES

MnDOT currently categorizes pavement condition, as measured by the RQI, into five equal categories as shown in Table 1. When reporting performance measures, the top two and bottom two categories are combined and referred to as "Good" and "Poor," respectively. These terms will be used for the remainder of this report.

Table 1. Ride Quality Index (RQI) Performance Categories

Descriptive Category	RQI Range	Performance Measure Category
Very Good	5.0 – 4.1	Good
Good	4.0 – 3.1	
Fair	3.0 – 2.1	Fair
Poor	2.0 – 1.1	Poor
Very Poor	1.0 – 0.0	

PERFORMANCE TARGETS

The federal authorization bill Moving Ahead for Progress in the 21st Century Act (MAP-21), was signed into law July 6, 2012. MAP-21 places added emphasis on the performance of the National Highway System (NHS). To comply with MAP-21, pavement conditions are tracked by the following categories: Interstate, Other-NHS, and Non-NHS. Minnesota's trunk highway system mileage is shown in Table 2.

Table 2. Breakdown of State Highway Mileage

System	Roadway Miles	Percent
Interstate	1,821	12.7%
Other NHS	5,812	40.6%
Non-NHS	6,674	46.7%
Total	**14,307**	**100.0%**

Performance targets for the Interstate system will be established by the FHWA and published at a later date. Until such time, MnDOT is using performance targets as shown in Table 3.

Table 3. Ride Quality Index (RQI) Targets by System

System	Ride Quality Index (RQI)	
	"Good" RQI Target	"Poor" RQI Target
Interstate	70% or more	2% or less
Other-NHS	65% or more	4% or less
Non-NHS	60% or more	10% or less

STATEWIDE HISTORICAL RQI TRENDS

Overall, the smoothness of the trunk highway system improved in 2014 with more miles in the "Good" category and fewer miles in the "Poor" category, compared to 2013. By system, The Non-NHS system improved the most followed by the Interstate system. The Other-NHS system had a very slight decline.

2005 - 2014 "Good" RQI Trend (Figure 2)

From 2013 to 2014, the percent of statewide miles on the Interstate system in "Good" condition increased from 75.2 percent to 75.9 percent, the Other-NHS system decreased from 71.0 percent to 70.9 percent, and the Non-NHS system increased from 62.5 percent to 67.2 percent. Overall, this means there are approximately 300 more miles in "Good" condition statewide in 2014 compared to 2013.

Based on the planned projects in the 2015-2018 State Transportation Improvement Program (STIP), the percent of miles in "Good" condition on the Interstate system is expected to increase from its current value of 75.9 percent to 76.5 percent by 2018. The percent of miles in "Good" condition is expected to decrease on the Other-NHS system from its current value of 70.9 percent to 66.8 percent by 2018. The Non-NHS is also expected see a decline in the miles of pavement in "Good" condition from 67.2 percent to 62.7 percent. While all three systems are predicted to have fewer miles in "Good" condition at the end of the STIP, they are still expected to be higher than the targets.

2005 - 2014 "Poor" RQI Trend (Figure 3)

From 2013 to 2014, the percent of miles in "Poor" condition on the Interstate system declined from 2.4 percent to 1.9 percent (its lowest level since 2001), the Other-NHS had a very small increase, from 2.9 percent to 3.0 percent, and the Non-NHS decreased from 6.8 percent to 4.4 percent (its lowest level since 2003). Overall, there are about 170 fewer miles in "Poor" condition statewide in 2014 than there were in 2013.

Based on the 2015-2018 STIP, the Interstate system is expected to worsen with an increase in the percent of miles in the "Poor" RQI category from 1.9 percent in 2014 to 4.2 percent in 2018. The condition of the Other-NHS system is expected to worsen with an increase in the percent of miles in "Poor" condition, from 3.0 percent to 3.9 percent. The condition of the Non-NHS system is also expected to worsen, with a large increase in "Poor" from 4.4 percent to 10.3 percent.

Statewide, this is an expected increase of about 488 miles of "Poor" roads in four year. Once a pavement falls into the "Poor" category it normally will require major rehabilitation or reconstruction to restore any meaningful amount of service life. These types of repairs are expensive, thus making it much harder with a limited budget to recover once the amount of miles in this condition becomes very high.

RQI COMPARISON BY ATP

"Good" RQI Comparison (Figures 4, 6, 7 and 8)

On the Interstate system, ATP-1, 3, 4, and Metro had a decrease in the percent of miles in "Good" condition compared to 2013, ranging from 0.5 to 10.2 percent. Only ATP-6 and 7 had an increase, 13.2 and 0.9 percent, respectively. This is shown in Figure 4 and Figure 6. ATP-6 improved the most (+13.2%) while ATP-3 had the largest decline (-10.2%).

On the Other-NHS system, ATP-4, 6, and 8 had an increase in the percent of miles in "Good" condition, ranging from 2.0 to 6.7 percent. The other five ATPs had a decrease, ranging from 0.1% to 4.7 percent. ATP-4 improved the most (+6.7%) while ATP-1 had the largest decline (-4.7%). This is shown in Figure 4 and Figure 7.

On the Non-NHS system, ATP-1, 4, 6, 8, and Metro had an increase in the percent of miles in "Good" condition ranging from 1.8 to 15.5 percent. ATP-2, 3, and 7 had a decrease, ranging from 0.8 to 4.4 percent. ATP-6 had the largest increase (+15.5%) followed by ATP-8 (+12.1%). ATP-3 had the largest decline (-4.4%). This is shown in Figure 4 and Figure 8.

ATP-6 was the only ATP to have more miles in "Good" condition in 2014 than in 2013 on all three systems.

"Poor" RQI Comparison (Figures 5, 9, 10, and 11)

On the Interstate system, ATP-1, 3, and 7 had an increase in the percent of miles in "Poor" condition, ranging from 0.5 to 0.9 percent. ATP-6 and Metro had a decline of 1.9 and 0.9 percent, respectively. ATP-4 had no miles in Poor, as was the case in 2013. This is shown in Figure 5 and Figure 9.

On the Other-NHS system, ATP-1, 3, 7, and Metro had an increase in the percent of miles in "Poor" condition, ranging from 0.4 to 1.5 percent. ATP-4, 6, and 8 had a decline, ranging from 1.2 to 1.6 percent. ATP-2 remained the same. This is shown in Figure 5 and Figure 10.

On the Non-NHS system, ATP-1, 2, 4, 6, 8, and Metro had a decline in the number of miles in "Poor" condition, ranging from 0.1 to 9.2 percent. ATP-3 remained the same. Only ATP-7 had an increase in the number of miles in "Poor" condition (+1.0%). This is shown in Figure 5 and Figure 11.

ATP-6 was the only ATP to have fewer miles in "Poor" condition in 2014 than in 2013 on all three systems. ATP-8 does not have any interstate routes but did have fewer miles in "Poor" condition on both the NHS and Non-NHS systems.

AVERAGE REMAINING SERVICE LIFE (ARSL)

The Average Remaining Service Life (ARSL) is defined as the number of years until the RQI reaches a value of 2.5 or less. This is the point where most people begin to complain that a road's roughness is uncomfortable and some type of rehabilitation is likely needed.

2005 - 2014 ARSL Trend (Figure 12)

The 2014 ARSL was 12.4 years on the Interstate system, 10.0 years on the Other-NHS system, and 8.7 years on the Non-NHS. In 2013, the ARSL on the Interstate, Other NHS, and Non-NHS was 12.2 years, 10.1 years, and 8.0 years, respectively. The 0.7 year increase on the Non-NHS system is a significant improvement.

ARSL Comparison (Figure 13)

By ATP, the ARSL ranges from 6.8 to 17.7 years on the Interstate system, from 8.9 to 11.7 years on the Other-NHS, and from 5.5 to 11.5 years on the Non-NHS.

ATP-4 has the highest Interstate ARSL, ATP-3 has the highest Other-NHS ARSL, and ATP-6 has the highest ARSL on the Non-NHS.

ATP-7 has the lowest ARSL on both the Interstate and Non-NHS system while ATP-1 has the lowest ARSL on the Other-NHS system.

PREDICTED PAVEMENT CONDITIONS AND ACCURACY

Future year's pavement conditions are predicted using the pavement management system. These predictions are used to provide managers with insight into the impact different funding scenarios will have on pavement conditions. The accuracy of these predictions is reviewed yearly to reassure management that the pavement management system is operating correctly, therefore making it a reliable tool for predicting future needs.

The prediction of future pavement conditions relies on regression curves built into the pavement management system. The curves are either based on section specific historical data or statewide data. If there is adequate historical data since the last rehabilitation on a section, a regression curve is fit through the data and used to predict the RQI. If there is inadequate historical data for the section, or if the regression through the historical data results in an unrealistic curve, then a default curve is used to predict the future RQI. Default curves were developed using statewide data for all pavement fixes in the pavement management system in the mid-1980s and subsequently updated in 1992 and 2008.

For pavement sections scheduled for work during the STIP, default regression curves are used to predict future conditions. Additionally, an adjustment is made to the construction year to better predict the timing of the expected results. Since data collection cannot wait until all projects are complete, some projects will not have begun, some will still be under construction, and some will be completed when the van is in the area collecting data. This adjustment is made to the construction year of proposed STIP projects to reflect the estimated completeness at the time of data collection.

Districts 6, 7, and Metro are typically driven in the early part of the construction season before few, if any, projects are completed. Therefore, the construction year for all pavement projects listed in the STIP is increased by one year since it won't be until the following year that the impact of this work is measured.

Districts 1, 2, and 8 are driven around mid-construction season when about half of their pavement projects will be completed. Since there is no way to predict which projects will be complete when the van is there and which ones will not, half of the projects are randomly chosen and the construction year is increased by one year.

District 3 and 4 are normally driven in late summer or fall when most of their pavement projects are complete. No changes are made to the construction year for projects in the STIP. Thus, the van will likely drive on the new, improved, surface and the impacts of the pavement work will be captured.

In 2014, the van drove the districts in a slightly different order: Metro, District 6, District 7, District 2, District 3, District 1, District 8, and District 4.

Using the above adjustments, predictions were made using last year's condition data and planned projects. Table 4 compares the predicted 2014 pavement conditions, using 2013 data, with the actual 2014 measured conditions for each of the three systems, Interstate, Other NHS, and Non-NHS. A total of 14,339 miles were rated in 2013. A total of 14,307 miles were rated in 2014. This reduction in miles is attributed primarily to jurisdictional transfers (turnbacks) that occurred since the roads were driven in 2013. Table 5 compares the difference in actual and predicted conditions on for all trunk highways as a whole.

Table 4. Comparison of Predicted 2014 versus Actual 2014 RQI (by system)

Interstate System RQI Category	Actual 2013 Data	Predicted 2014 Data *	Actual 2014 Data	Difference Actual vs Predicted
Good RQI (RQI > 3.0)	75.2%	77.3%	75.9%	(1.4%)
Poor RQI (RQI ≤ 2.0)	2.4%	1.5%	1.9%	0.4%
Other-NHS System RQI Category	**Actual 2013 Data**	**Predicted 2014 Data ***	**Actual 2014 Data**	**Difference Actual vs Predicted**
Good RQI (RQI > 3.0)	71.0%	68.9%	70.9%	2.0%
Poor RQI (RQI ≤ 2.0)	2.9%	3.3%	3.0%	(0.3%)
Non-NHS System RQI Category	**Actual 2013 Data**	**Predicted 2014 Data ***	**Actual 2014 Data**	**Difference Actual vs Predicted**
Good RQI (RQI > 3.0)	62.5%	63.1%	67.2%	4.1%
Poor RQI (RQI ≤ 2.0)	6.8%	6.2%	4.4%	(1.8%)

***Predictions based on the 2014-2017 STIP by 2013 M-Records

Table 5. Comparison of Predicted 2014 versus Actual 2014 RQI (entire system)

Statewide RQI Category	Actual 2013 Data	Predicted 2014 Data *	Actual 2014 Data	Difference Actual vs Predicted
Good RQI (RQI > 3.0)	67.6%	67.2%	69.8%	2.6%
Poor RQI (RQI ≤ 2.0)	4.7%	4.4%	3.5%	(0.9%)

***Predictions based on the 2014-2017 STIP by 2013 M-Records

By system, the predicted percent "Poor" was very close to the actual percent "Poor" (less than 1% difference) with the exception of the Non-NHS. The Non-NHS system was much better in 2014 than we predicted it would be. On a statewide basis the actual 2014 conditions are very close to the predicted 2014 conditions, using last year's data and project list. On a statewide level there are 358 more miles in "Good" condition and 129 fewer miles in "Poor" condition than expected based on last year's report. The difference between the predicted 2014 condition and the actual 2014 condition can be attributed to one, or more, of the following.

1. Timing of the construction work was different than expected (versus our van schedule).
2. Districts were tested in a different order than originally expected.
3. Construction projects were advanced, reducing "Poor" and increasing "Good".
4. Construction projects were incomplete, keeping "Poor" from becoming "Good".
5. Maintenance work kept roads from falling into "Poor" or out of "Good".
6. A change in a road's rate of deterioration (either faster or slower).
7. Unforeseen funding or projects, such as the IDIQ program, improving the road.

GOVERNMENT ACCOUNTING STANDARDS BOARD, STATEMENT 34 (GASB 34)

The Government Accounting Standards Board (GASB), a private, nonprofit organization, was established in 1984 by the Financial Accounting Foundation. The Foundation oversees GASB, provides funding, and appoints the members of GASB's board. The Foundation has a similar relationship with GASB's sister organization, the private-sector, standard-setting Financial Accounting Standards Board. GASB's span of influence covers over 84,000 state, county, and other local governmental units. Also impacted by GASB's financial reporting standards are organizations such as public utilities, municipal hospitals, and state universities. GASB, which does not impact the federal government, establishes concepts and standards that guide the preparation of external financial reports. GASB establishes generally accepted accounting

principles that are utilized by auditors charged with evaluating state and local government financial statements.

In June 1999, GASB established a new financial reporting standard that fundamentally changed the way state and local governments report their financial results. Among other provisions, GASB Statement 34 (GASB 34), "Basic Financial Statements—and Management's Discussion and Analysis—for State and Local Governments," requires that major infrastructure assets acquired or having major additions or improvements in fiscal years beginning after June 15, 1980, be capitalized in financial statements. In addition, the cost of using the assets must be reflected. (Source: U.S. Department of Transportation, Federal Highway Administration, Office of Asset Management, Primer: GASB 34 (November 2002).

One of the primary purposes of GASB 34 is to demonstrate to the public, and others, that the agency is maintaining its infrastructure in an acceptable condition and does not have any undisclosed liabilities looming in the future.

In terms of determining the cost of using the assets, GASB 34 allows governments to report either a depreciation expense or to apply an alternative modified/preservation approach. Governments may use the modified approach in lieu of depreciating their assets if they have a systematic approach to managing their assets that, at a minimum, meets the following four requirements:

- Having a current inventory of eligible assets
- Documenting the condition of those assets via a reproducible assessment procedure
- Demonstrating that assets are being preserved at a level predetermined by the government
- Estimating the actual cost to maintain and preserve the assets.

MnDOT has chosen to use the modified/preservation approach since it can meet all the requirements listed above. For the purposes of GASB 34, MnDOT established that the state highway system will be maintained, at a minimum, at the following levels.

- Principal Arterial System: Average PQI of 3.0 or higher
- Non-Principal Arterial System: Average PQI of 2.8 or higher

Figure 14 shows how actual and predicted pavement conditions, based on the 2015-2018 STIP, compare with the established GASB 34 levels. Based on these predictions, we are expected to remain well above the GASB 34 thresholds through 2018. Although MAP-21 requires states to report the condition of the Interstate routes separate from the Other-NHS routes for the purposes of GASB 34 Minnesota will continue with reporting by PA and NPA.

ADDITIONAL INFORMATION

Additional information about the condition and performance of the state highway system, including color-coded maps of the most recent indices, can be obtained from the Pavement Management Unit's website: http://www.dot.state.mn.us/materials/pvmtmgmt.html or by contacting:

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Figure 1. MnDOT's Area Transportation Partnership (ATP) Boundaries

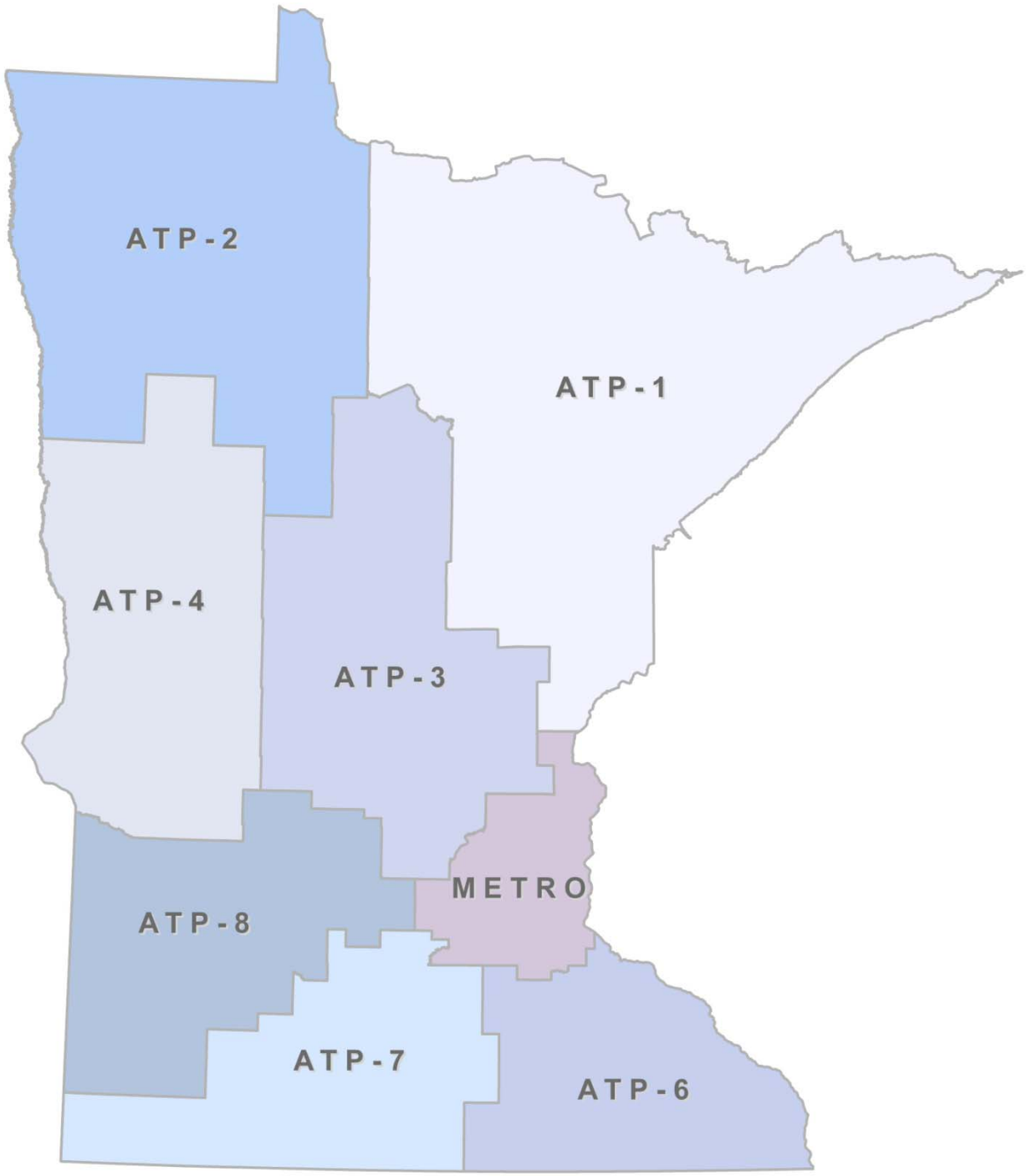
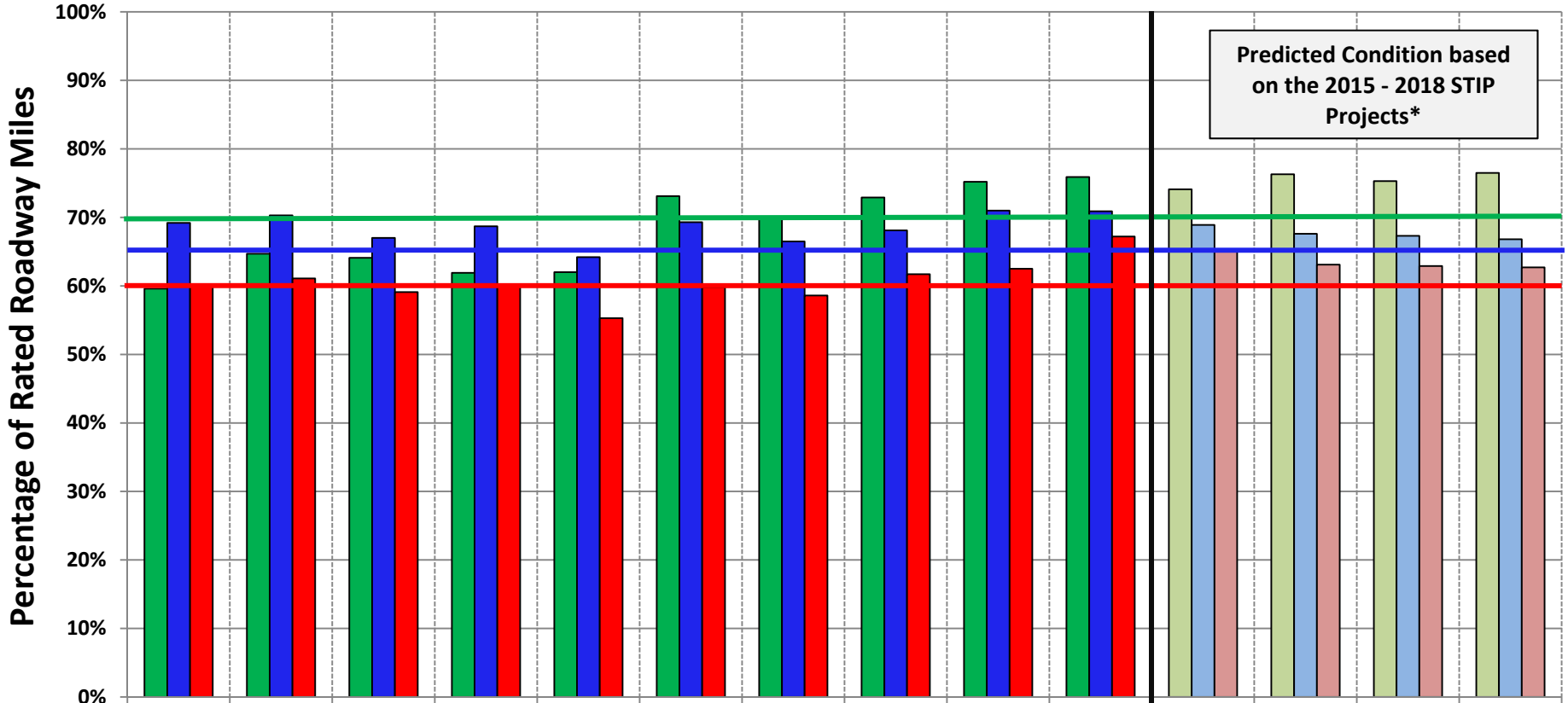


Figure 2

Statewide "Good" Ride Quality Index

(miles with an RQI greater than 3.0)

Actual 2005 - 2014, Predicted 2015 - 2018



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Interstate	59.6%	64.7%	64.1%	61.9%	62.0%	73.1%	69.8%	72.9%	75.2%	75.9%	74.1%	76.3%	75.3%	76.5%
Other-NHS	69.2%	70.3%	67.0%	68.7%	64.2%	69.3%	66.5%	68.1%	71.0%	70.9%	68.9%	67.6%	67.3%	66.8%
Non-NHS	60.1%	61.1%	59.1%	60.2%	55.3%	59.8%	58.6%	61.7%	62.5%	67.2%	65.0%	63.1%	62.9%	62.7%

Interstate Target	= 70 percent or more
Other-NHS Target	= 65 percent or more
Non-NHS Target	= 60 percent or more

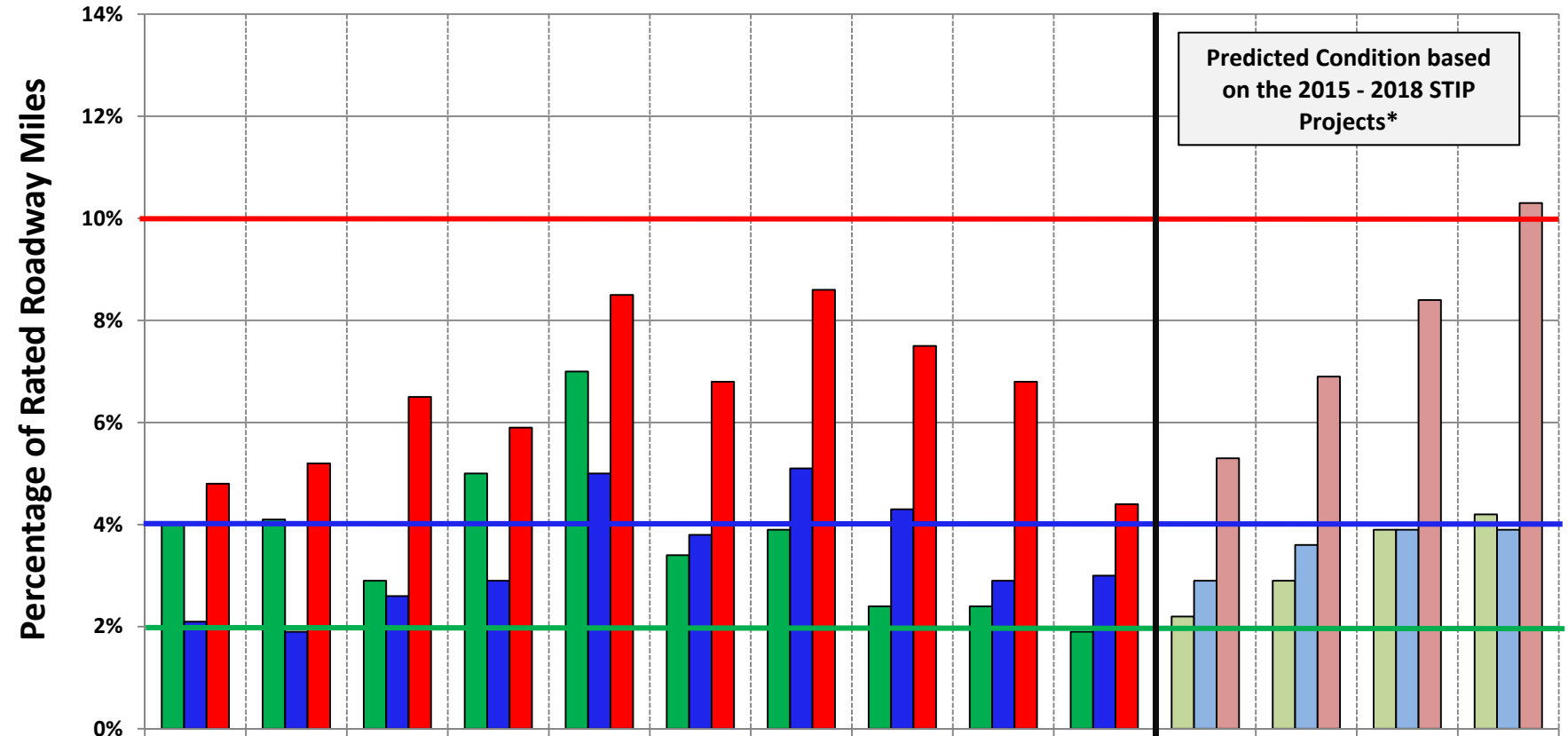
*2014 M-Records with '15-'18 STIP + PPM

Figure 3

Statewide "Poor" Ride Quality Index

(miles with an RQI of 2.0 or less)

Actual 2005 - 2014, Predicted 2015 - 2018



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Interstate	4.0%	4.1%	2.9%	5.0%	7.0%	3.4%	3.9%	2.4%	2.4%	1.9%	2.2%	2.9%	3.9%	4.2%
Other-NHS	2.1%	1.9%	2.6%	2.9%	5.0%	3.8%	5.1%	4.3%	2.9%	3.0%	2.9%	3.6%	3.9%	3.9%
Non-NHS	4.8%	5.2%	6.5%	5.9%	8.5%	6.8%	8.6%	7.5%	6.8%	4.4%	5.3%	6.9%	8.4%	10.3%

*2014 M-Records with '15-'18 STIP + PPM

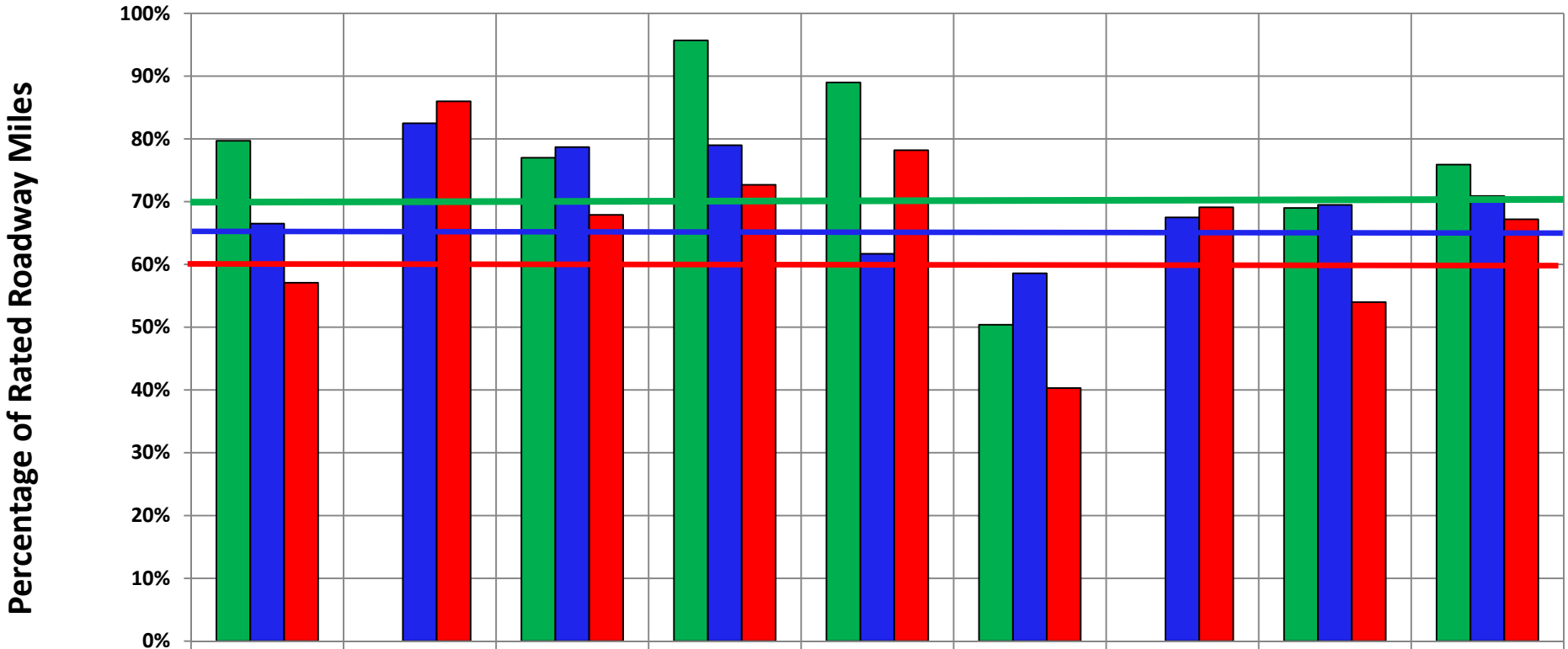
Interstate Target	= 2 percent or less
Other-NHS Target	= 4 percent or less
Non-NHS Target	= 10 percent or less

Figure 4

"Good" Ride Quality Index

(miles with an RQI greater than 3.0)

Comparison of 2014 Data by ATP



	ATP-1	ATP-2	ATP-3	ATP-4	ATP-6	ATP-7	ATP-8	Metro	State
Interstate	79.7% ▼		77.0% ▼	95.7% ▼	89.0% ▲	50.4% ▲		69.0% ▼	75.9% ▲
Other-NHS	66.5% ▼	82.5% ▼	78.7% ▼	79.0% ▲	61.7% ▲	58.6% ▼	67.5% ▲	69.5% ▼	70.9% ▼
Non-NHS	57.1% ▲	86.0% ▼	67.9% ▼	72.7% ▲	78.2% ▲	40.3% ▼	69.1% ▲	54.0% ▲	67.2% ▲

▲ = Better than 2013 ■ = Same as 2013 ▼ = Worse than 2013

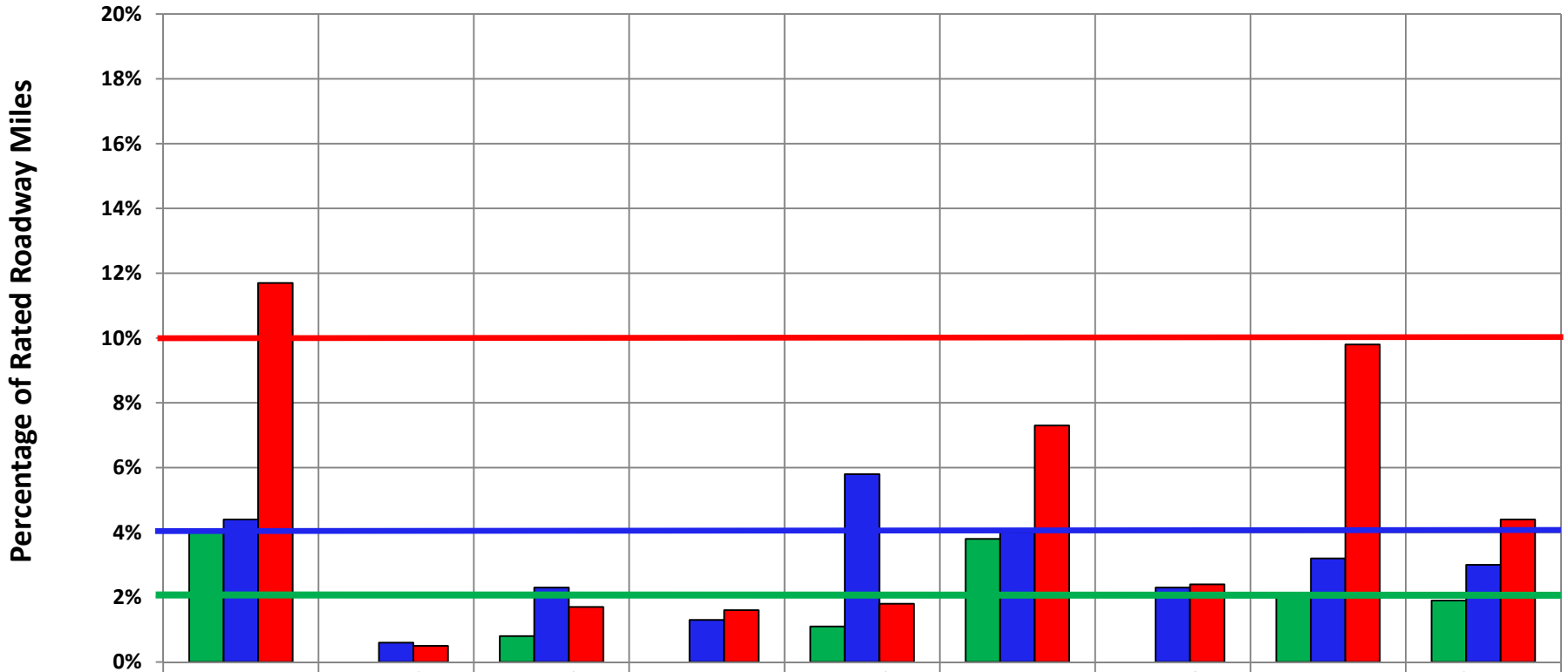
Interstate Target	= 70 percent or more
Other-NHS Target	= 65 percent or more
Non-NHS Target	= 60 percent or more

Figure 5

"Poor" Ride Quality Index

(miles with an RQI of 2.0 or less)

Comparison of 2014 Data by ATP



	ATP-1	ATP-2	ATP-3	ATP-4	ATP-6	ATP-7	ATP-8	Metro	State
Interstate	4.1% ▼		0.8% ▼	0.0% ■	1.1% ▲	3.8% ▼		2.1% ▲	1.9% ▲
Other-NHS	4.4% ▼	0.6% ■	2.3% ▼	1.3% ▲	5.8% ▲	4.0% ▼	2.3% ▲	3.2% ▼	3.0% ▼
Non-NHS	11.7% ▲	0.5% ▲	1.7% ■	1.6% ▲	1.8% ▲	7.3% ▼	2.4% ▲	9.8% ▲	4.4% ▲

▲ = Better than 2013 ■ = Same as 2013 ▼ = Worse than 2013

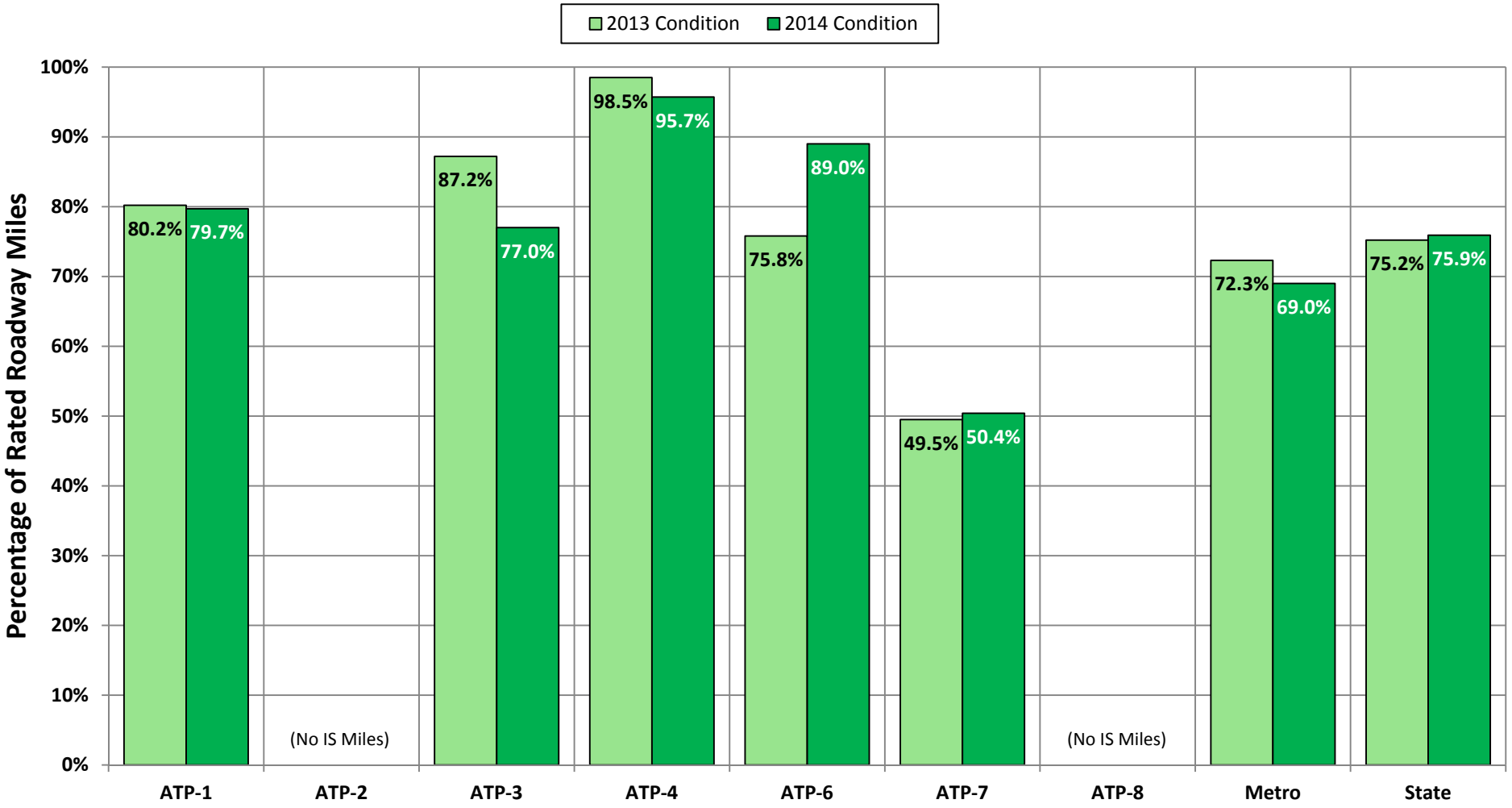
Interstate Target	= 2 percent or less
Other-NHS Target	= 4 percent or less
Non-NHS Target	= 10 percent or less

Figure 6

Comparison of "Good" Ride Quality Index

(miles with an RQI greater than 3.0)

Interstate System, 2013 – vs – 2014 Condition



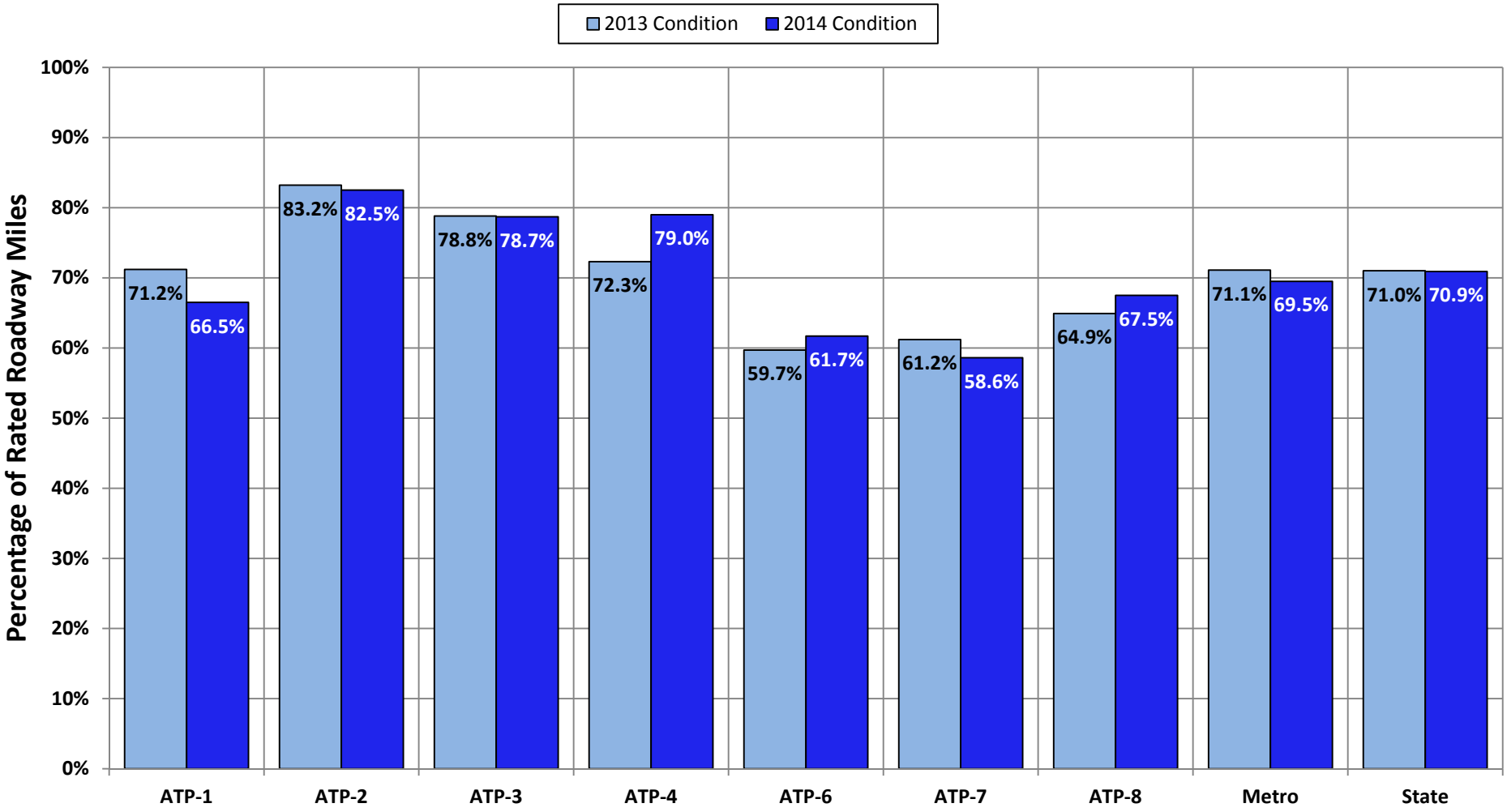
Interstate Target = 70 percent or more

Figure 7

Comparison of "Good" Ride Quality Index

(miles with an RQI greater than 3.0)

Other-NHS System, 2013 – vs – 2014 Condition



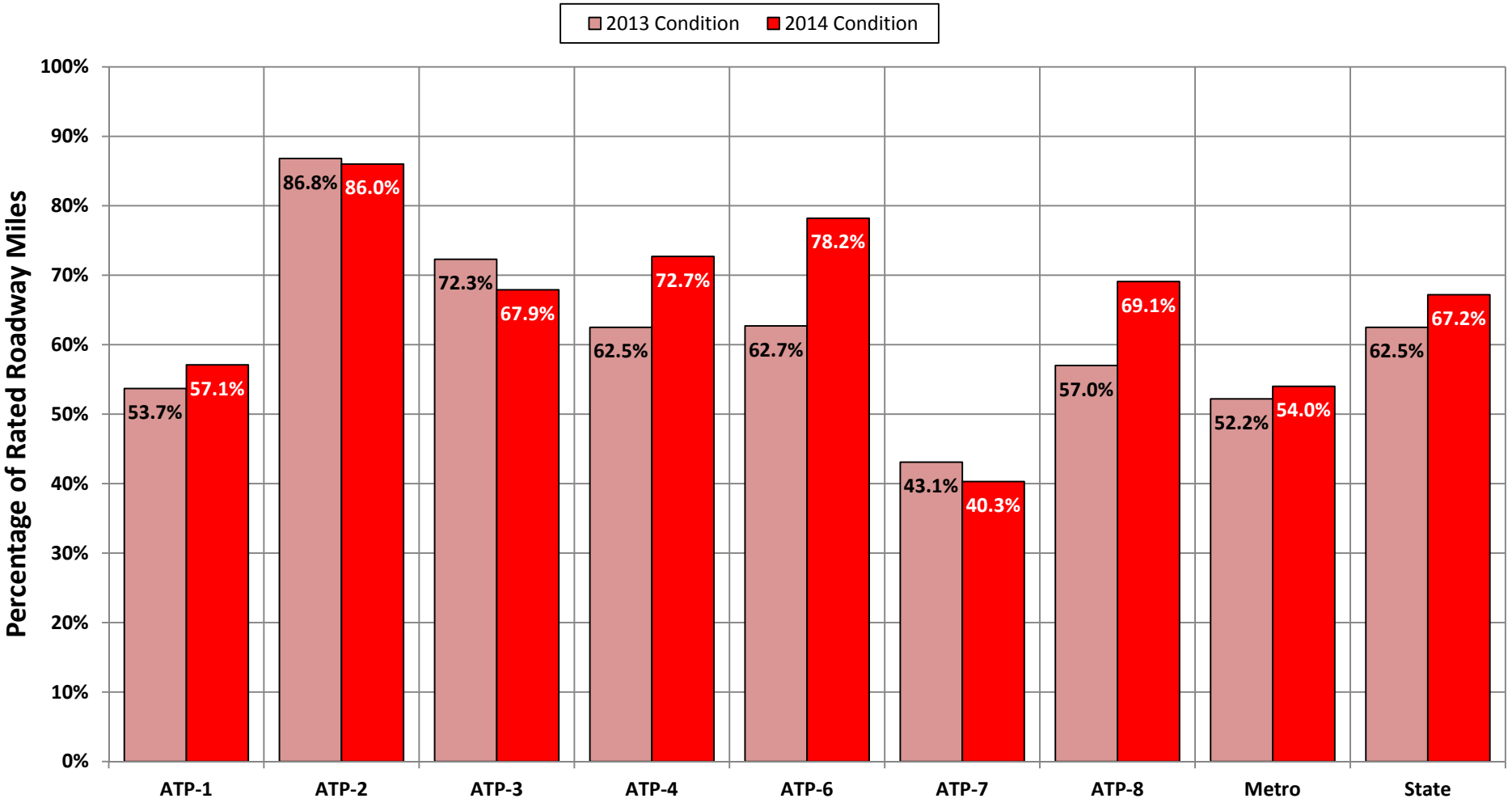
Other-NHS Target = 65 percent or more

Figure 8

Comparison of "Good" Ride Quality Index

(miles with an RQI greater than 3.0)

Non-NHS System, 2013 – vs – 2014 Condition



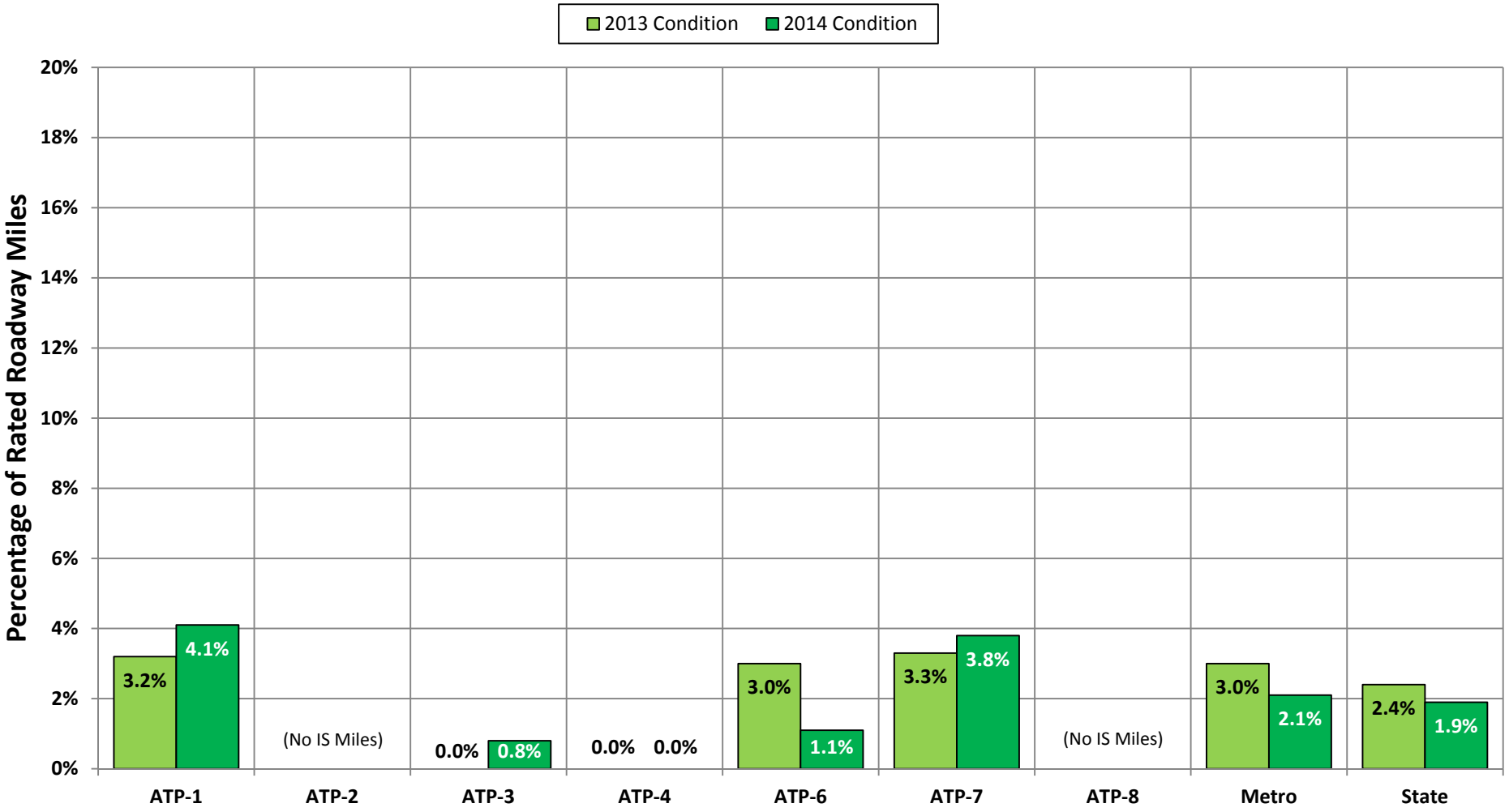
Non-NHS Target = 60 percent or more

Figure 9

Comparison of "Poor" Ride Quality Index

(miles with an RQI of 2.0 or less)

Interstate System, 2013 – vs – 2014 Condition



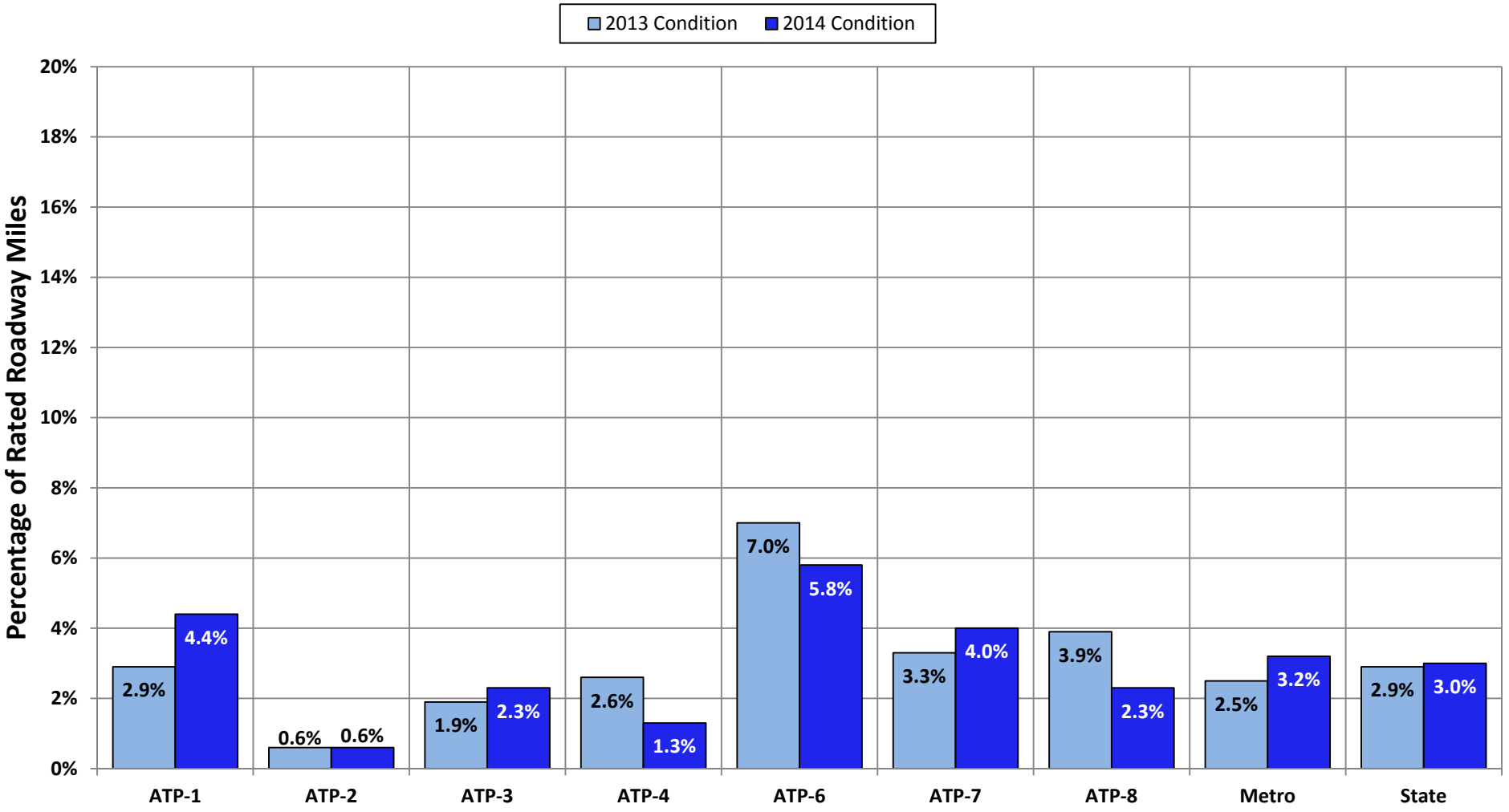
Interstate Target = 2 percent or less

Figure 10

Comparison of "Poor" Ride Quality Index

(miles with an RQI of 2.0 or less)

Other-NHS System, 2013 – vs – 2014 Condition



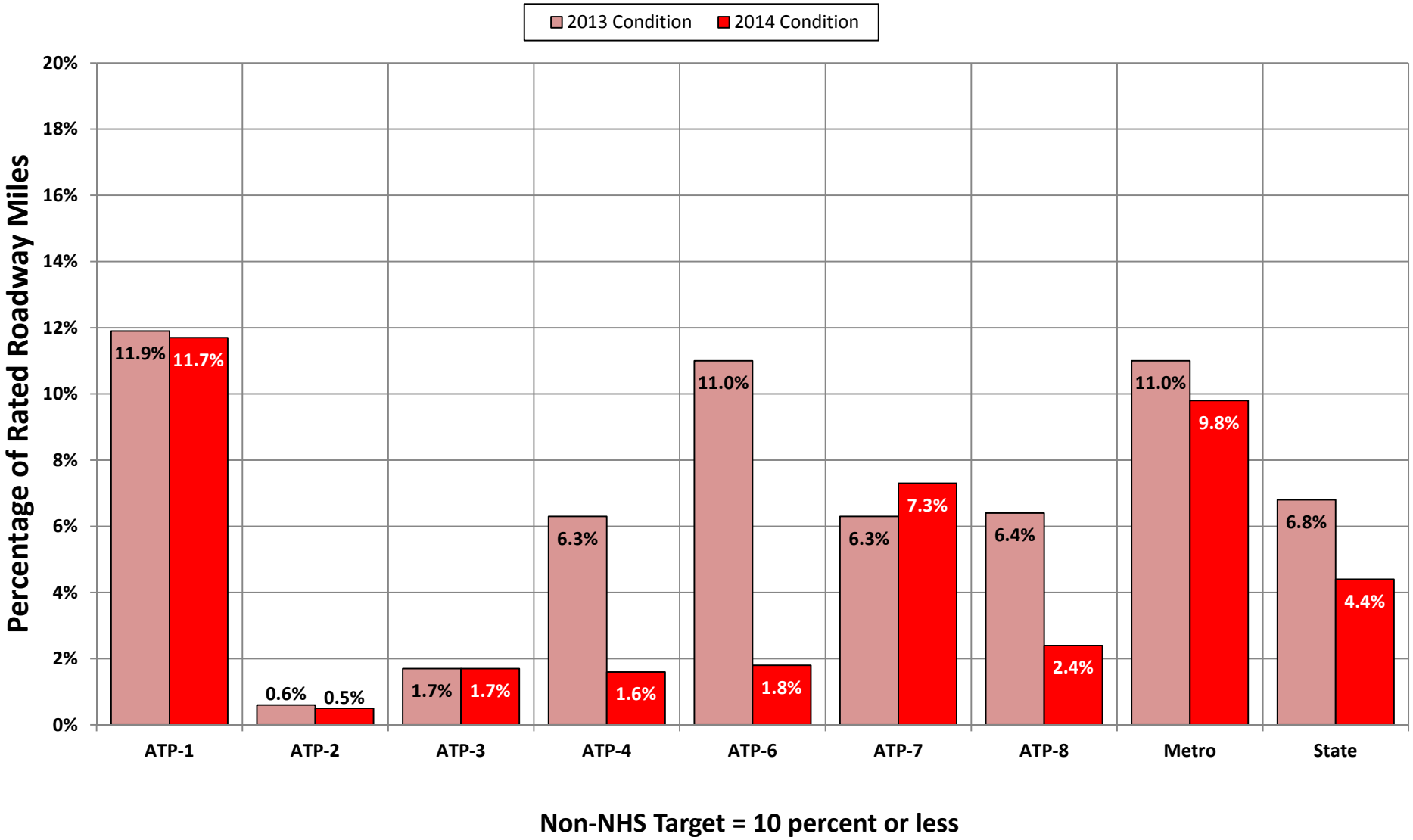
Other-NHS Target = 4 percent or less

Figure 11

Comparison of "Poor" Ride Quality Index

(miles with an RQI of 2.0 or less)

Non-NHS System, 2013 – vs – 2014 Condition



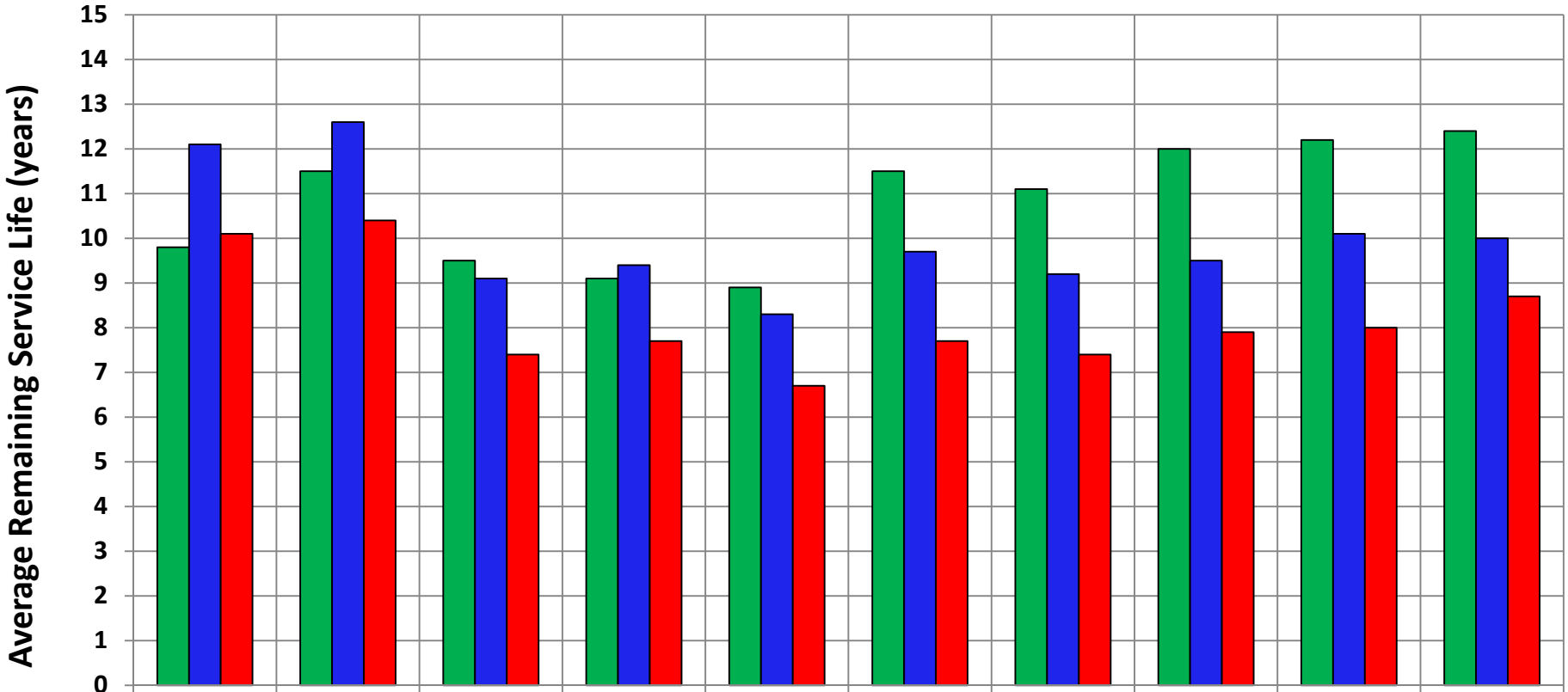
Non-NHS Target = 10 percent or less

Figure 12

Statewide Average Remaining Service Life (ARSL)

(years until RQI reaches 2.5)

Actual 2005 - 2014



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Interstate	9.8	11.5	9.5	9.1	8.9	11.5	11.1	12.0	12.2	12.4
Other-NHS	12.1	12.6	9.1	9.4	8.3	9.7	9.2	9.5	10.1	10.0
Non-NHS	10.1	10.4	7.4	7.7	6.7	7.7	7.4	7.9	8.0	8.7

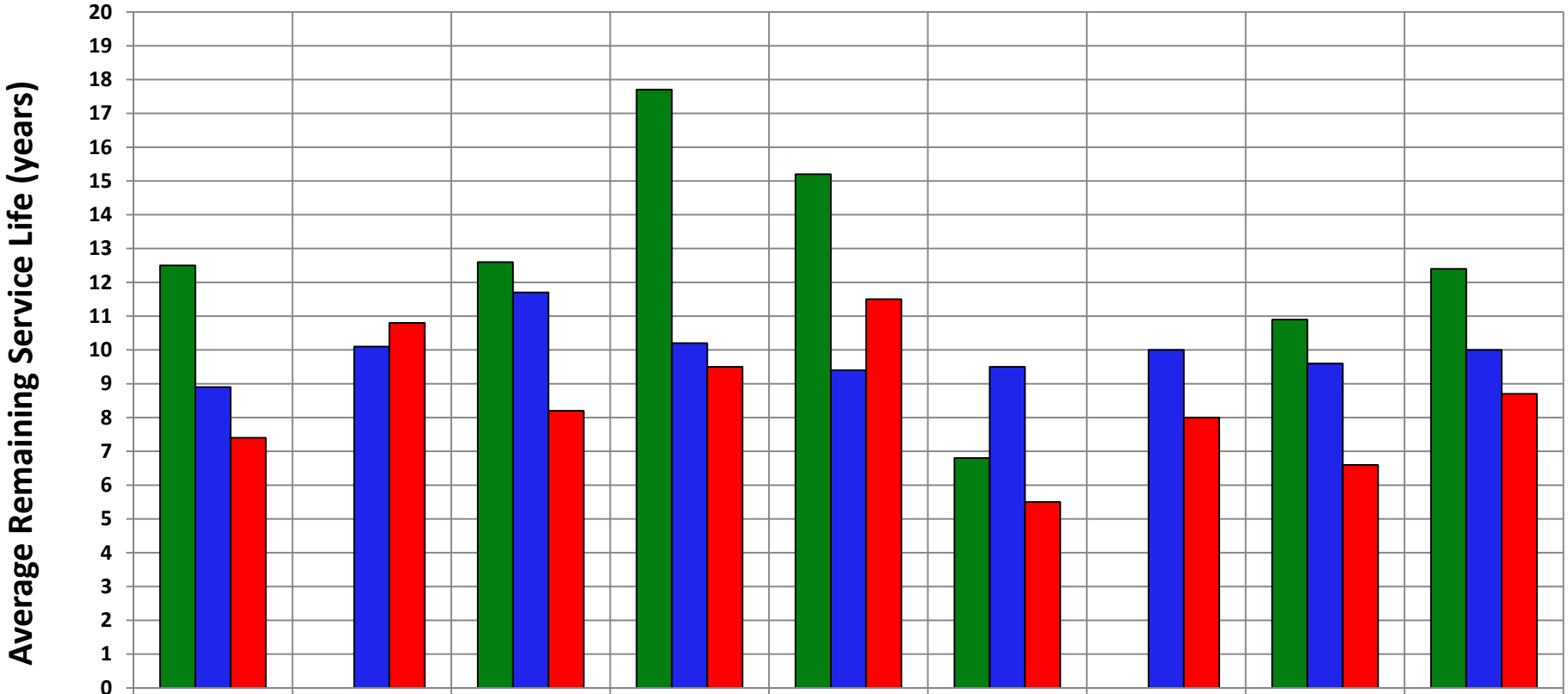
No official targets have been established for ARSL

Figure 13

Average Remaining Service Life (ARSL)

(years until RQI reaches 2.5)

Comparison of 2014 Data by ATP



	ATP-1	ATP-2	ATP-3	ATP-4	ATP-6	ATP-7	ATP-8	Metro	State
Interstate	12.5		12.6	17.7	15.2	6.8		10.9	12.4
Other-NHS	8.9	10.1	11.7	10.2	9.4	9.5	10.0	9.6	10.0
Non-NHS	7.4	10.8	8.2	9.5	11.5	5.5	8.0	6.6	8.7

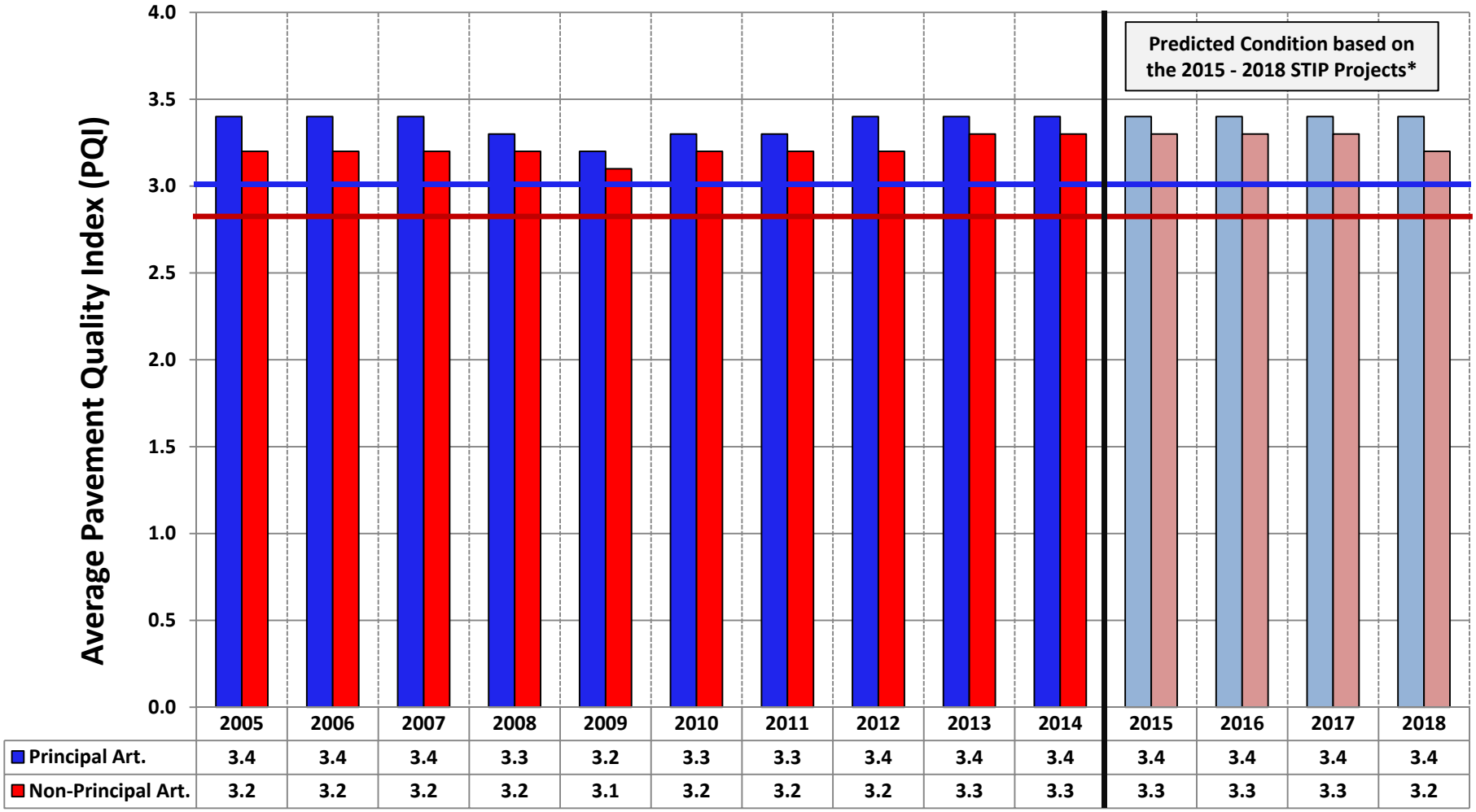
No official targets have been established for ARSL

Figure 14

Statewide Average Pavement Quality Index (PQI)

for GASB 34 Reporting

(PQI = Combined Index of Pavement Smoothness and Cracking)



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Principal Art.	3.4	3.4	3.4	3.3	3.2	3.3	3.3	3.4	3.4	3.4	3.4	3.4	3.4	3.4
Non-Principal Art.	3.2	3.2	3.2	3.2	3.1	3.2	3.2	3.2	3.3	3.3	3.3	3.3	3.3	3.2

*2014 M-Records with '15-'18 STIP + PPM

Principal Arterial Threshold: **Average PQI ≥ 3.0**

Non-Principal Arterial Threshold: **Average PQI ≥ 2.8**


MINNESOTA
DEPARTMENT OF TRANSPORTATION