2016 PAVEMENT CONDITION ANNUAL REPORT

DEPARTMENT OF TRANSPORTATION

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Office of Materials and Road Research

Pavement Management Unit

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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 (ATP).

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 conditions, ages, 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 percent 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 every mile of trunk highway annually, in both directions. This van is equipped with two cameras to collect images for the Video Log. For pavement distress and rutting measurements, a scanning laser, and a 3D laser/camera system are used to produce 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 its terminal RQI value it does not mean the road cannot be driven on, but rather that it has deteriorated to the point where most people feel it is uncomfortable and a major 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 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 by technicians using computer workstations in the Pavement Management Unit of the Office of Materials and Road Research, located in Maplewood, MN. The workstations allow the technicians 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 help the technicians 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 percent sample). On undivided roadways, only the outside lane in the increasing direction (north or east) 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 the get a weighted distress value. The weighting factors are greater for higher severity levels of the same distress and greater for distress types that indicate more serious problems exist in the roadway such as alligator cracking or 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	
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 will be tracked by the following categories: Interstate, Other-NHS, and Non-NHS.

In 2016, Minnesota's trunk highway system mileage was comprised of 12.7 percent Interstate, 40.7 percent Other-NHS, and 46.6 percent Non-NHS. ATP-2 and ATP-8 do not have any roads on the Interstate system.

Performance targets for the Interstate system will be established by the FHWA and published at a later date. Until such time, MnDOT is using a target for the Interstate system of 70 percent, or more, in "Good" condition and 2 percent, or less, in "Poor" condition. Each state is to set targets for the Other-NHS. For 2016, the performance targets on the Other-NHS are 65 percent, or more, in "Good" condition and 4 percent, or less, in "Poor" condition, as shown in Table 2.

Although not required, MnDOT has also established targets for the Non-NHS system: 60 percent or more Good and 10 percent or less Poor.

RQI targets are based on the percent of miles in the "Good" and "Poor" categories as shown in Table 2. These are statewide targets. It is recognized that some ATPs' pavements will be better than these and some will be worse. However, it is desirable to have the ATPs' pavements in somewhat similar conditions so that the public will not encounter drastic differences as they drive around the state.

Table 2. Ride Quality Index (RQI) Targets by System

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

STATEWIDE HISTORICAL RQI TRENDS

In 2016, the smoothness of the state highway system as a whole improved with 86 more miles in the "Good" category and 30 fewer miles in the "Poor" category, compared to 2015. By system, both the Interstate and Other-NHS systems improved with an increase in the amount of "Good" roads and a decrease in the amount of "Poor" roads. The Non-NHS system, on the other hand, declined in 2016 with fewer "Good" roads and more "Poor" roads compared to 2015.

2007 - 2016 "Good" RQI Trend (Figure 2)

From 2015 to 2016, the percent of statewide miles on the Interstate system in "Good" condition increased from 74.5 percent to 81.0 percent. The Other-NHS system remained basically unchanged at 71.5 percent while the Non-NHS system decreased from 66.2 percent to 65.8 percent. This means there are roughly 86 more miles in "Good" condition statewide in 2016 than there were in 2015.

Based on the pavement projects listed in the 2017-2020 State Transportation Improvement Program (STIP), the percent of miles in "Good" condition on the Interstate system is expected to decrease from its current value of 81.0 percent to 76.7 percent by 2020. The percent of miles in "Good" condition is also expected to decrease on the Other-NHS system, from its current value of 71.5 percent to 68.3 percent. The Non-NHS system is expected to have roughly the same amount of "Good" road in 2020 as today, decreasing slightly from 65.8 percent to 65.6 percent. This results in an expected decrease of 278 miles of "Good" road over the next four years.

2007 - 2016 "Poor" RQI Trend (Figure 3)

From 2015 to 2016, the Interstate system improved, with a decrease in the percent of miles in "Poor" condition from 2.1 to 1.5 percent. The Other-NHS also improved from 2.7 to 2.0 percent. The Non-NHS however, had an increase in "Poor", from 5.1 to 5.5 percent. Overall, there are roughly 30 fewer miles in "Poor" condition statewide in 2016 than there were in 2015.

Based on the pavement projects listed in the 2017-2020 STIP, all three systems are expected to decline and have an increase in the percent of miles in "Poor" condition over the next four years. The Interstate system is expected to increase from 1.5 percent "Poor" to 3.5 percent. The Other-NHS system is expected increase from 2.0 percent "Poor" to 4.7 percent. The Non-NHS system

is expected to increase from 5.5 percent to 7.7 percent. This results in an expected increase of 342 miles of "Poor" road over the next four years.

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, all six ATPs with Interstate pavement had an increase in the percent of miles in "Good" condition in 2016. The increases ranged from 0.3 to 11.3 percent. ATP-7 had the largest increase (11.3 percent) followed by Metro (9.4 percent). This is shown in Figure 4 and Figure 6.

On the Other-NHS system, five of the eight ATPs had an increase in the percent of miles in "Good" condition in 2016. For the second year in a row, ATP-6 had the largest increase (6.8 percent). They were followed by ATP-8 (3.2 percent) and ATP-3 (3.1 percent). ATP-1, 2, and 7's Other-NHS systems declined in 2016, with ATP-2 having a fairly large loss in the amount of Good roads (8.6 percent). This is shown in Figure 4 and Figure 7.

On the Non-NHS system, ATP-6 remained unchanged while six of the remaining seven ATPs all had a decline in the percent of miles in "Good" condition ranging from 0.1 to 4.7 percent. ATP-1 had the largest decrease (4.7 percent) followed by ATP-2 (3.9 percent). Only ATP-8 had an increase in the percent of "Good" roads in 2016, an increase of 11.6 percent. This is shown in Figure 4 and Figure 8.

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

On the Interstate system, there was very little change in the amount of "Poor" roads in any of the ATPs. ATP-3 was the only ATP to have an increase in the percent of Interstate miles in "Poor" condition (0.3 percent). All the other ATP's had a decline, ranging from 0.1 to 1.9 percent. ATP-7 improved the most, with a decline of 1.9 percent. This is shown in Figure 5 and Figure 9.

On the Other-NHS system, six of the ATPs improved in 2016 with less miles in "Poor" condition compared to 2015; ATP-4 remained unchanged. Only ATP-2 had an increase in the amount of "Poor" roads, although very minor (0.4 percent). ATP-3 and 6 improved the most with a decrease of 1.4 percent and 2.7 percent, respectively. This is shown in Figure 5 and Figure 10.

On the Non-NHS system, ATP-1, 2, 4, and 6 had an increase in the percent of miles in "Poor" condition, ranging from 0.3 to 4.6 percent. ATP-1 had the largest increase in "Poor" roads gaining 4.6 percent. ATP-8 and Metro improved the most with a decline of 2.0 percent and 1.7 percent, respectively. This is shown in Figure 5 and Figure 11.

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 objectionable and some type of major rehabilitation is likely needed.

2007 - 2016 ARSL Trend (Figure 12)

The 2016 ARSL was 13.2 years on the Interstate system, 10.3 years on the Other-NHS system, and 8.4 years on the Non-NHS. The ARSL of the Interstate system increased in 2016, from 11.9 to 13.2 years, its highest level since 2000. The ARSL of the Other-NHS system remained unchanged at 10.3 years while the ARSL on Non-NHS system declined from 8.8 in 2015 to 8.4 years in 2016.

ARSL Comparison (Figure 13)

By ATP, the ARSL ranges from 8.0 (ATP-7) to 17.1 (ATP-4) years on the Interstate system, from 8.6 (ATP-7) to 12.1 (ATP-3) years on the Other-NHS, and from 5.4 (ATP-7) to 10.6 (ATP-2) years on the Non-NHS system.

ATP-4 has the highest Interstate ARSL (17.1 years), ATP-3 has the highest Other-NHS ARSL (12.1 years), and ATP-2 has the highest ARSL on the Non-NHS (10.6 years).

For the second year in a row, ATP-7 has the lowest ARSL on all three systems. However, the ARSL of ATP-7's Interstate system did improve from 5.6 years in 2015 to 8.0 years in 2016.

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 for all pavement fixes in the pavement management system in the mid-1980s and subsequently updated in 1992 and 2008. The default curves are based on historical statewide performance.

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.

In 2016, Districts 6, 7, and 2 were driven in the early part of the construction season before few, if any, projects were completed. Districts 1, 4, and 8 were driven around mid to late summer when about half of their pavement projects were completed. Districts 3 and Metro were driven in the fall when most of their pavement projects were complete.

Table 3 compares the predicted 2016 pavement conditions, using last year's data, with the actual 2016 measured conditions.

Table 3. Comparison of Predicted 2016 and Actual 2016 RQI by System (percent of miles)

Interstate System RQI Category	Actual 2015 Data	Predicted 2016 Data *	Actual 2016 Data	Difference Predicted vs Actual
Good RQI (RQI > 3.0)	74.5	78.6	81.0	+2.4
Poor RQI (RQI ≤ 2.0)	2.1	1.7	1.5	-0.2
Other-NHS System RQI Category	**Actual 2015 Data**	**Predicted 2016 Data ***	**Actual 2016 Data**	**Difference Predicted vs Actual**
Good RQI (RQI > 3.0)	71.5	69.4	71.5	+2.1
Poor RQI (RQI ≤ 2.0)	2.7	3.1	2.0	-1.1
Non-NHS System RQI Category	**Actual 2015 Data**	**Predicted 2016 Data ***	**Actual 2016 Data**	**Difference Predicted vs Actual**
Good RQI (RQI > 3.0)	66.2	64.2	65.8	+1.6
Poor RQI (RQI ≤ 2.0)	5.1	6.5	5.5	-1.0

***Predictions based on the 2016-2019 STIP by 2015 M-Records

The actual 2016 conditions are fairly close to what they were predicted to be last year, on all three systems. On a statewide level there are 254 more miles in "Good" condition and 134 fewer miles in "Poor" condition than expected. The difference between the predicted and the actual 2016 condition can be attributed to the following.

1. Construction projects being advanced, reducing "Poor" and increasing "Good"
2. Construction projects not completed, keeping "Poor" from becoming "Good"
3. Changes in the STIP, either advances, delays, or additions.
4. Maintenance work, keeping roads from falling into "Poor" or out of "Good"
5. A change in a road's rate of deterioration (either faster or slower)
6. 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 12 shows how actual and predicted pavement conditions, based on the 2017-2020 STIP, compare with the established GASB 34 levels. 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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dave.janisch@state.mn.us

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

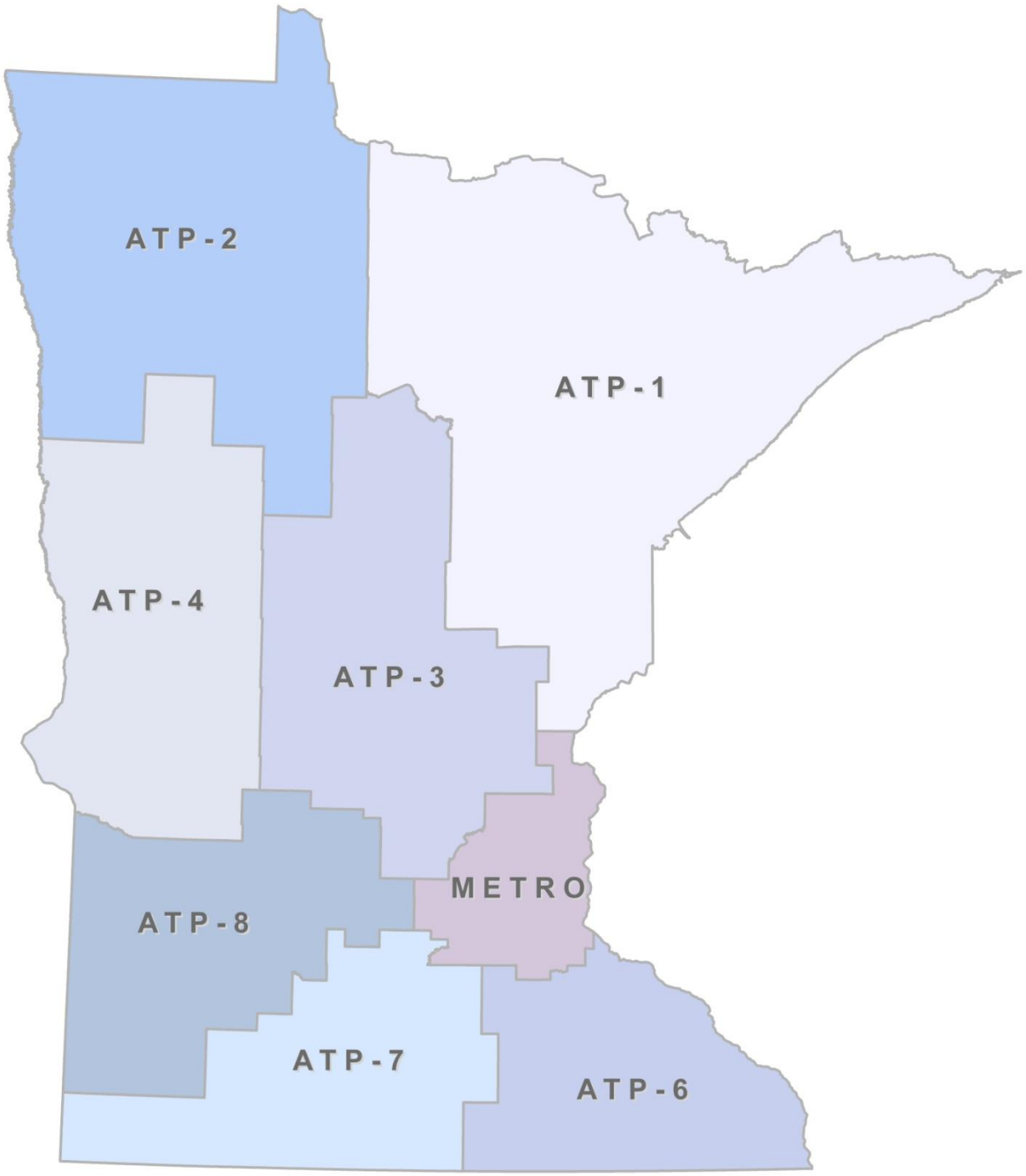
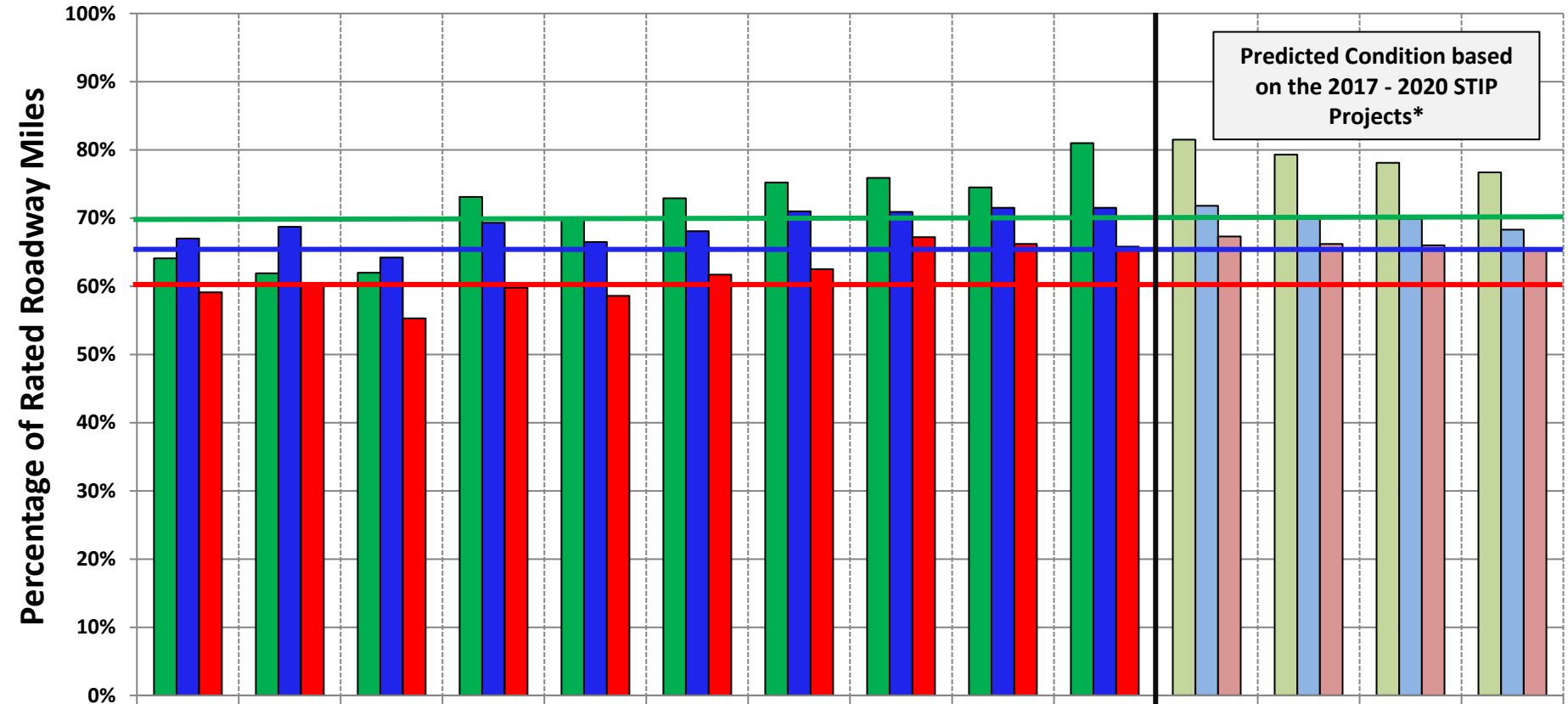


Figure 2

Statewide "Good" Ride Quality Index

(miles with an RQI greater than 3.0)

Actual 2007 - 2016, Predicted 2017 - 2020



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Interstate	64.1%	61.9%	62.0%	73.1%	69.8%	72.9%	75.2%	75.9%	74.5%	81.0%	81.5%	79.3%	78.1%	76.7%
Other-NHS	67.0%	68.7%	64.2%	69.3%	66.5%	68.1%	71.0%	70.9%	71.5%	71.5%	71.8%	69.9%	69.9%	68.3%
Non-NHS	59.1%	60.2%	55.3%	59.8%	58.6%	61.7%	62.5%	67.2%	66.2%	65.8%	67.3%	66.2%	66.0%	65.6%

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

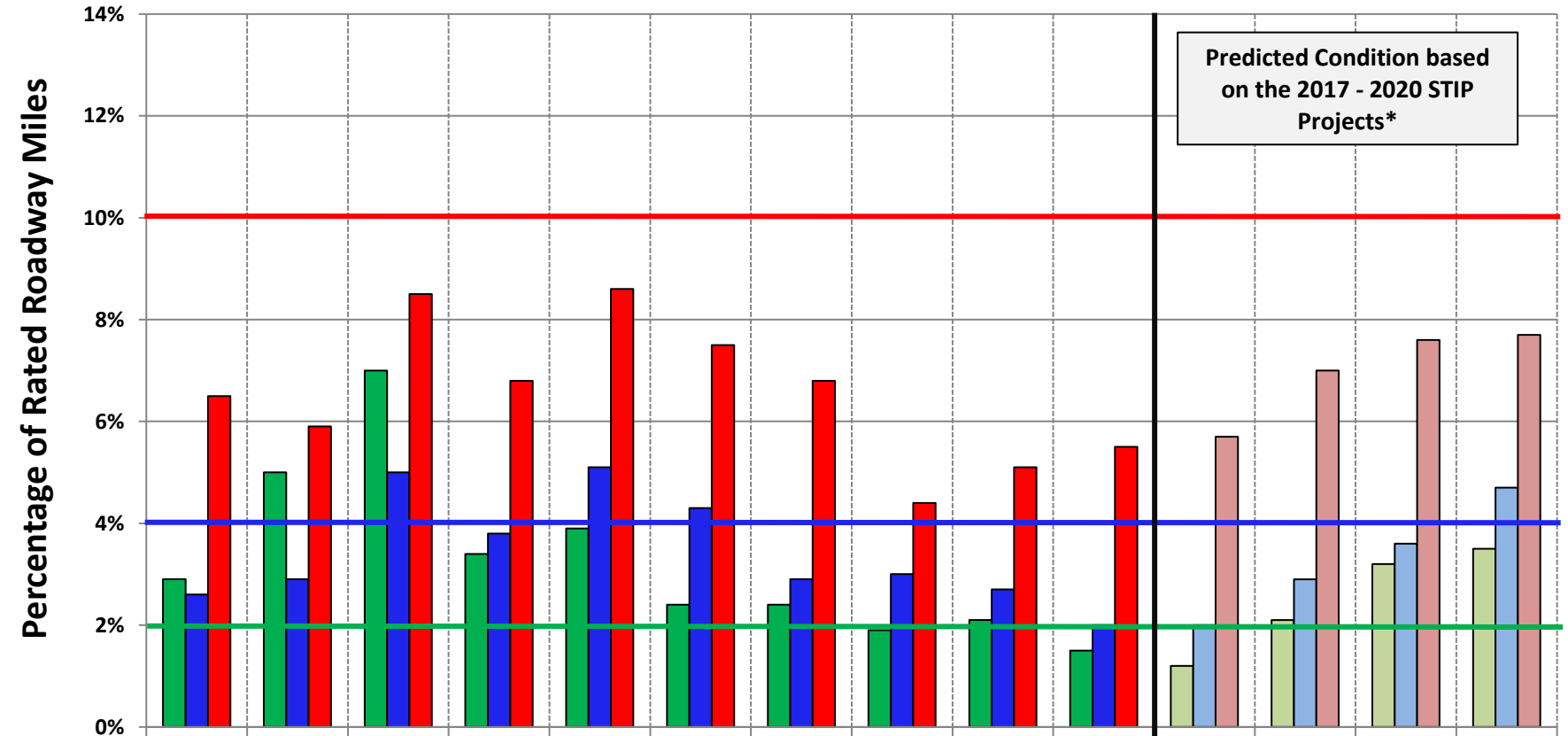
*2016 M-Records with '17 -'20 STIP + PPM

Figure 3

Statewide "Poor" Ride Quality Index

(miles with an RQI of 2.0 or less)

Actual 2007 - 2016, Predicted 2017 - 2020



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Interstate	2.9%	5.0%	7.0%	3.4%	3.9%	2.4%	2.4%	1.9%	2.1%	1.5%	1.2%	2.1%	3.2%	3.5%
Other-NHS	2.6%	2.9%	5.0%	3.8%	5.1%	4.3%	2.9%	3.0%	2.7%	2.0%	2.0%	2.9%	3.6%	4.7%
Non-NHS	6.5%	5.9%	8.5%	6.8%	8.6%	7.5%	6.8%	4.4%	5.1%	5.5%	5.7%	7.0%	7.6%	7.7%

*2016 M-Records with '17-'20 STIP + PPM

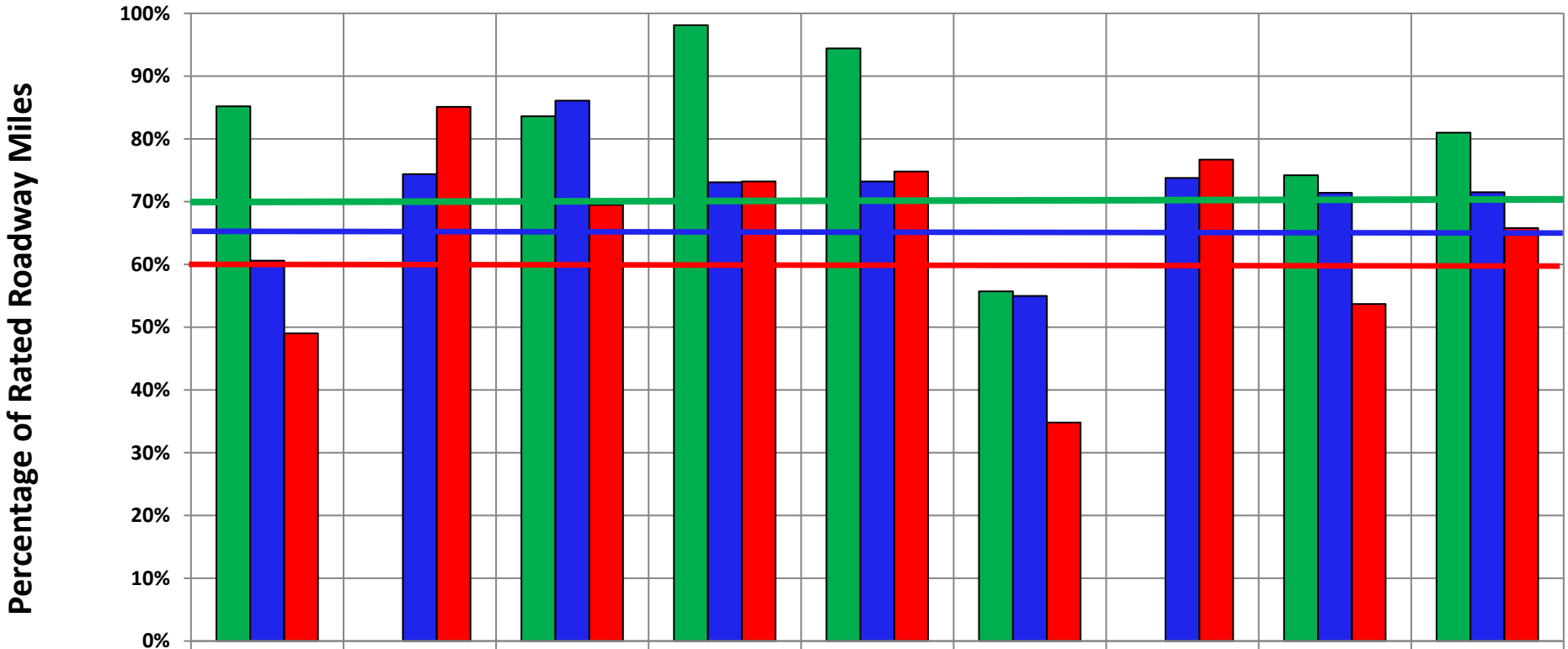
Interstate Target	= 2 percent or less
Other-NHS Target	= 4 percent or less
Non-NHS Target	= 10 percent or less

Figure 4

"Good" Ride Quality Index

(miles with an RQI greater than 3.0)

Comparison of 2016 Data by ATP



	ATP-1	ATP-2	ATP-3	ATP-4	ATP-6	ATP-7	ATP-8	Metro	State
Interstate	85.2%		83.6%	98.1%	94.4%	55.7%		74.2%	81.0%
Other-NHS	60.6%	74.4%	86.1%	73.1%	73.2%	55.0%	73.8%	71.4%	71.5%
Non-NHS	49.0%	85.1%	69.5%	73.2%	74.8%	34.8%	76.7%	53.7%	65.8%

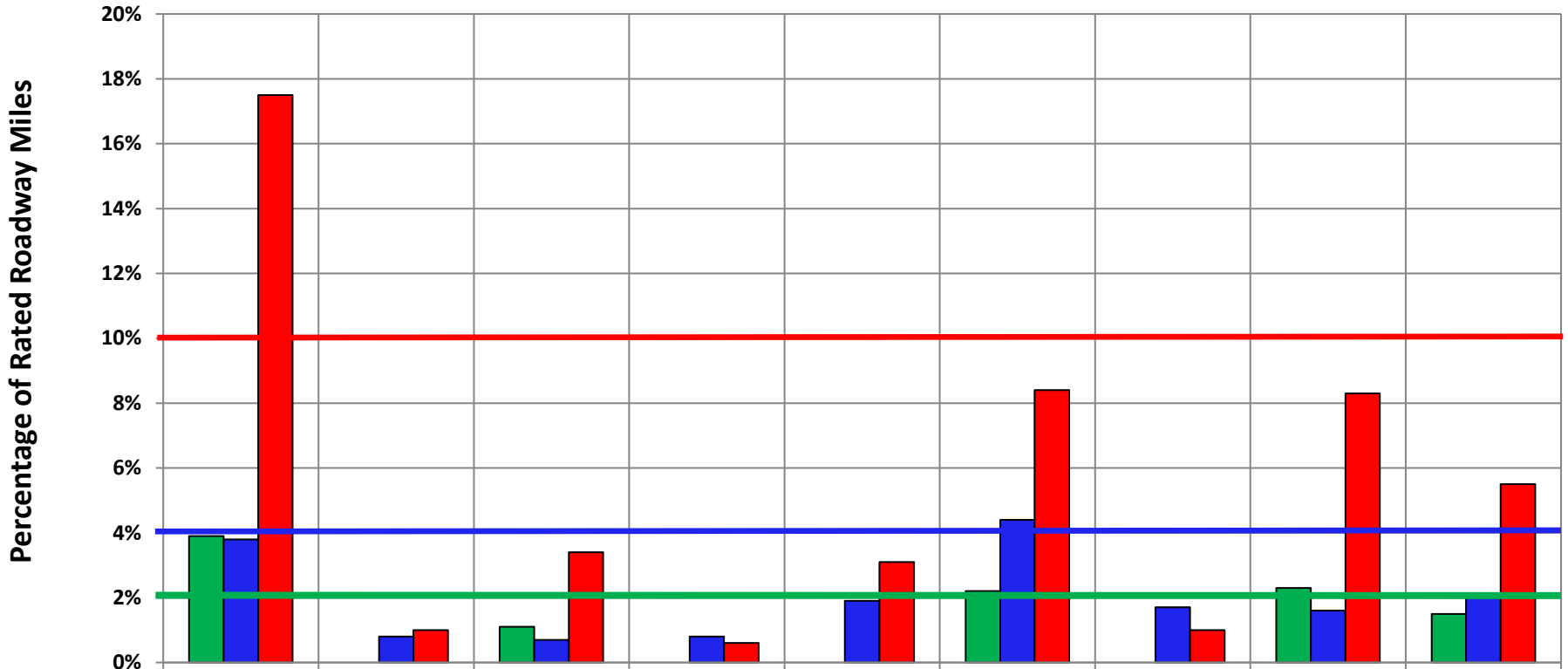
Interstate Target	= 70 percent or more
Other-NHS Target	= 65 percent or more
Non-NHS Target	= 60 percent or more

Figure 5

"Poor" Ride Quality Index

(miles with an RQI of 2.0 or less)

Comparison of 2016 Data by ATP



	ATP-1	ATP-2	ATP-3	ATP-4	ATP-6	ATP-7	ATP-8	Metro	State
Interstate	3.9%		1.1%	0.0%	0.0%	2.2%		2.3%	1.5%
Other-NHS	3.8%	0.8%	0.7%	0.8%	1.9%	4.4%	1.7%	1.6%	2.0%
Non-NHS	17.5%	1.0%	3.4%	0.6%	3.1%	8.4%	1.0%	8.3%	5.5%

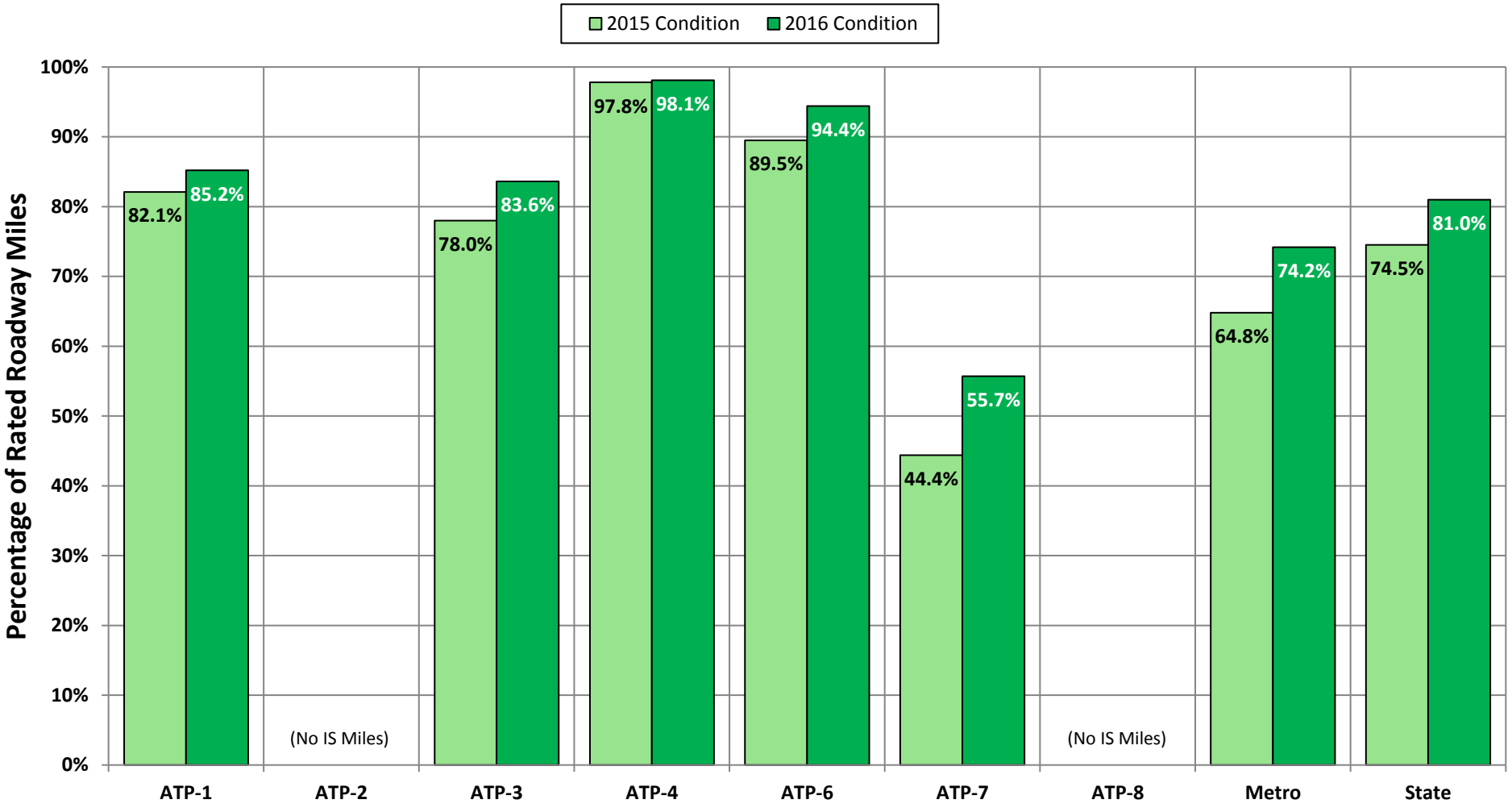
Interstate Target	= 2 percent or less
Other-NHS Target	= 4 percent or less
Non-NHS Target	= 10 percent or less

Figure 6

Comparison of "Good" Ride Quality Index

(miles with an RQI greater than 3.0)

Interstate System, 2015 – vs – 2016 Condition



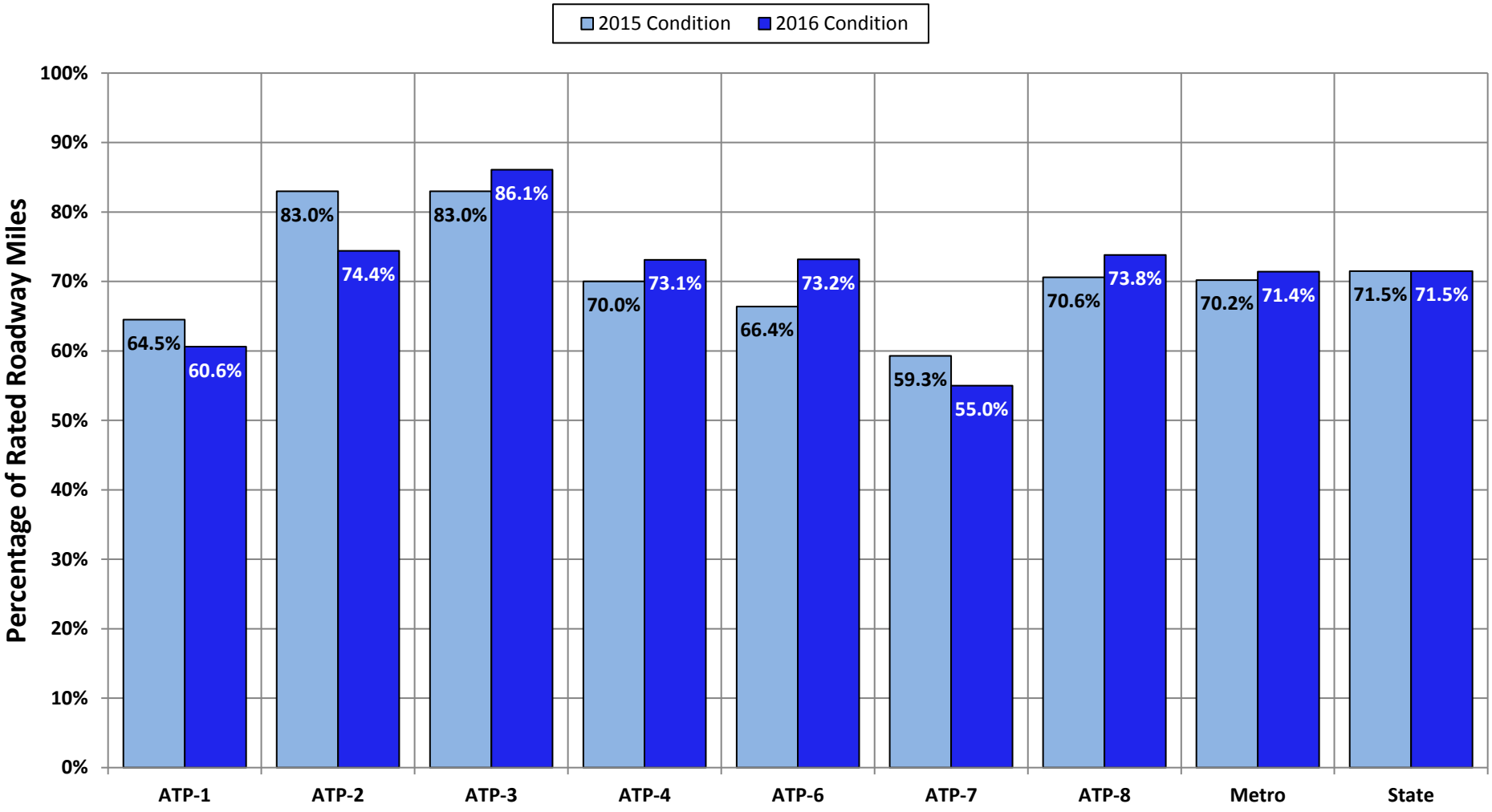
Interstate Target = 70 percent or more

Figure 7

Comparison of "Good" Ride Quality Index

(miles with an RQI greater than 3.0)

Other-NHS System, 2015 – vs – 2016 Condition



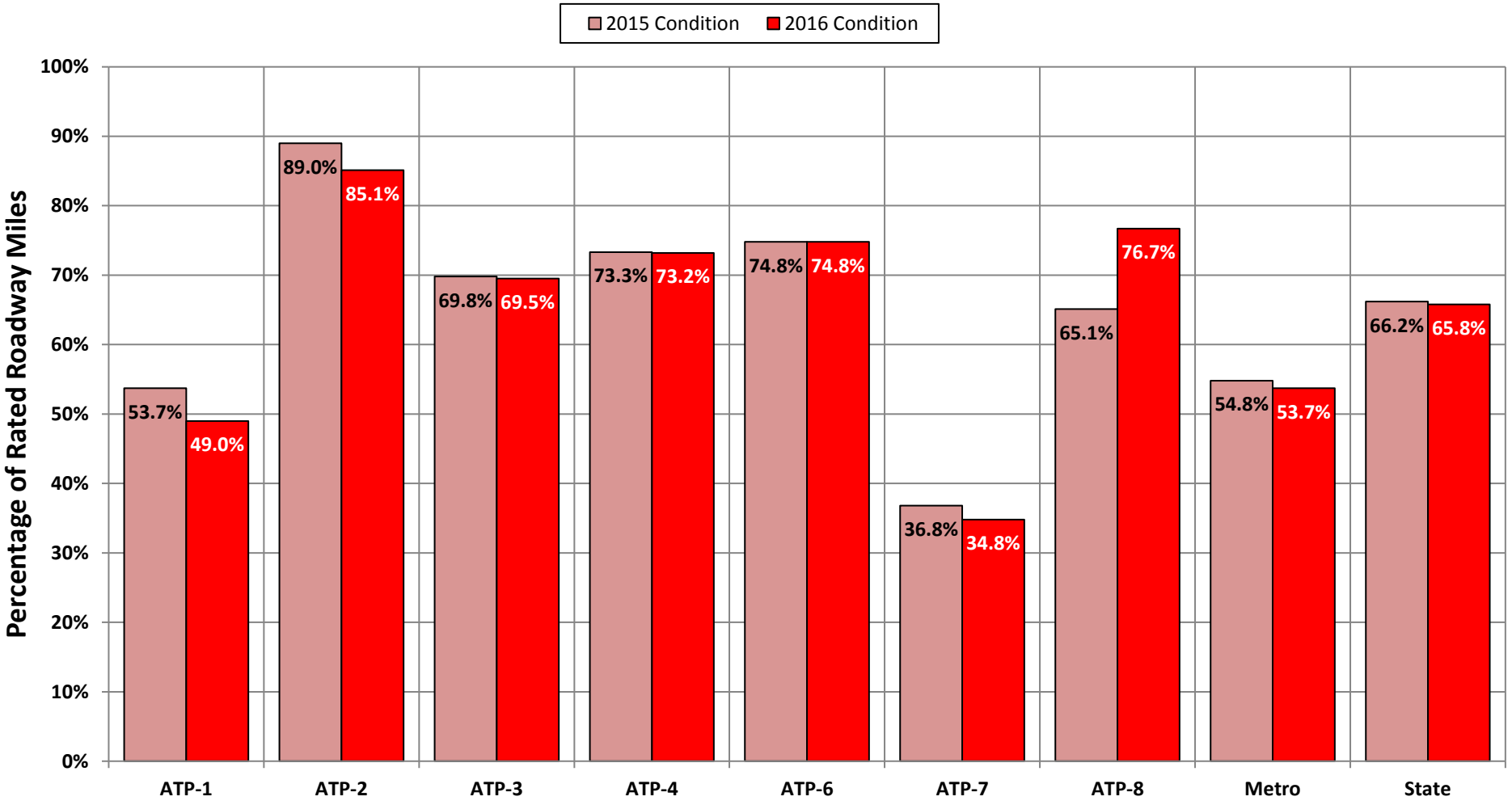
Other-NHS Target = 65 percent or more

Figure 8

Comparison of "Good" Ride Quality Index

(miles with an RQI greater than 3.0)

Non-NHS System, 2015 – vs – 2016 Condition



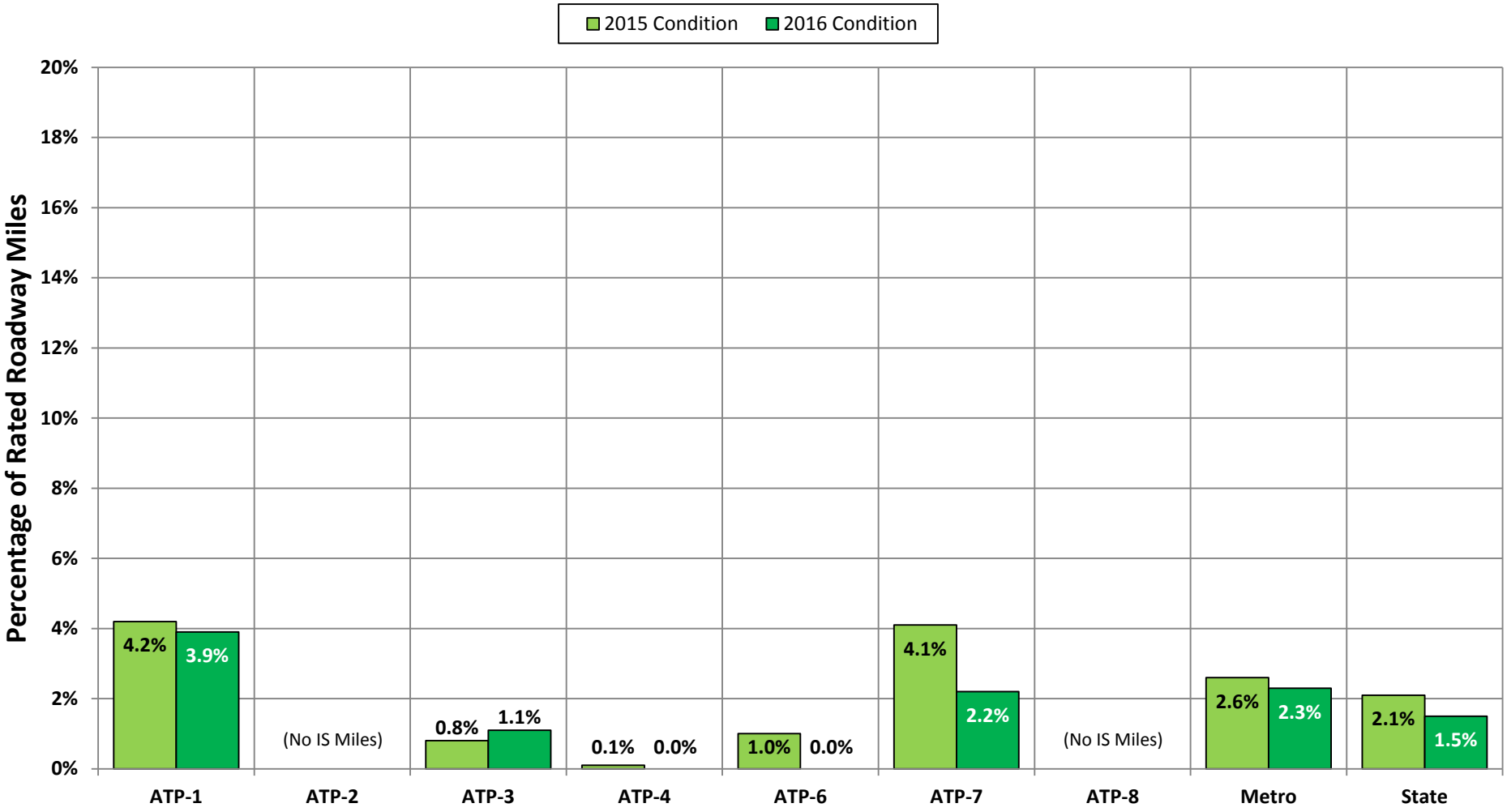
Non-NHS Target = 60 percent or more

Figure 9

Comparison of "Poor" Ride Quality Index

(miles with an RQI of 2.0 or less)

Interstate System, 2015 – vs – 2016 Condition



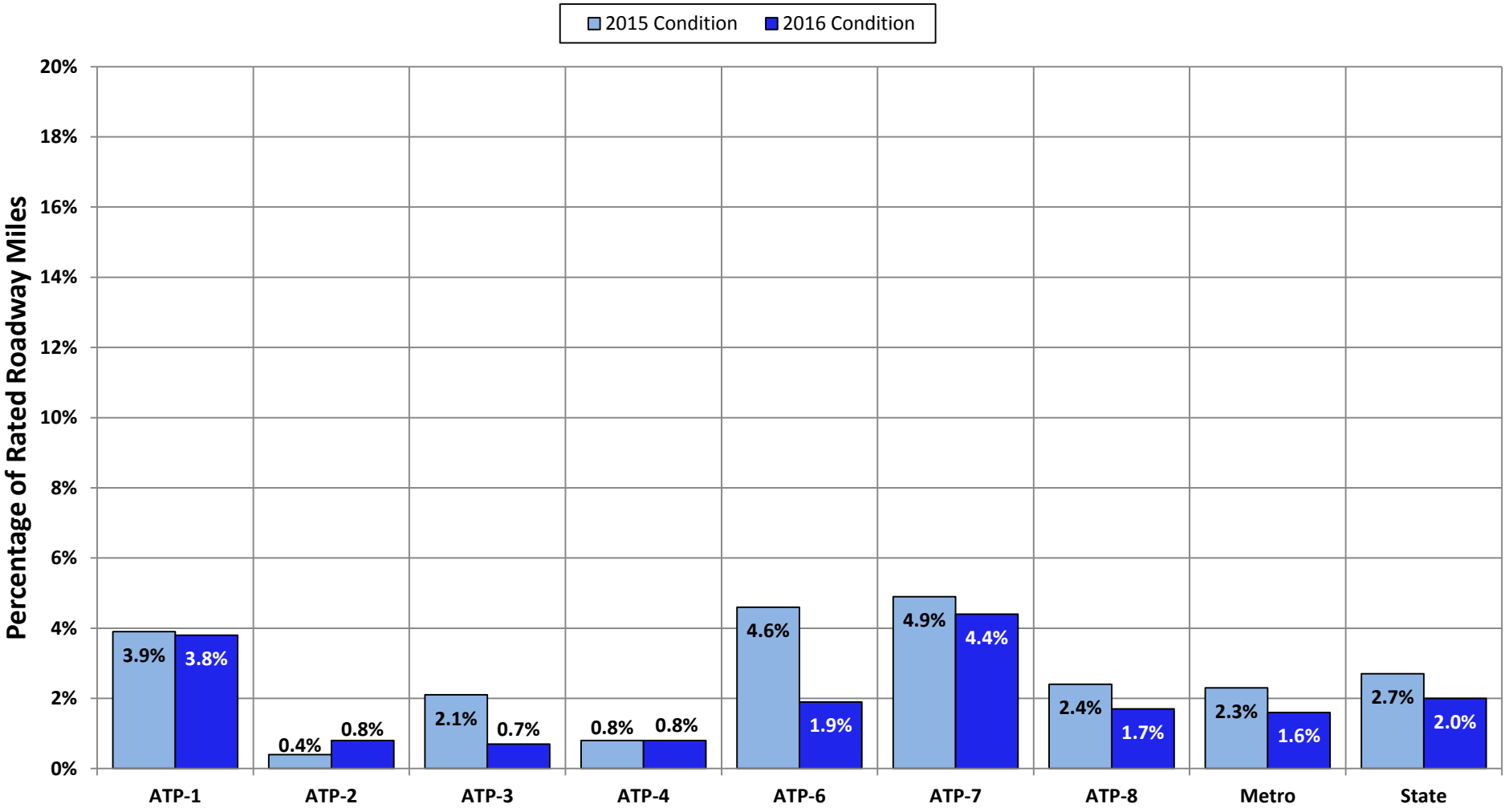
Interstate Target = 2 percent or less

Figure 10

Comparison of "Poor" Ride Quality Index

(miles with an RQI of 2.0 or less)

Other-NHS System, 2015 – vs – 2016 Condition



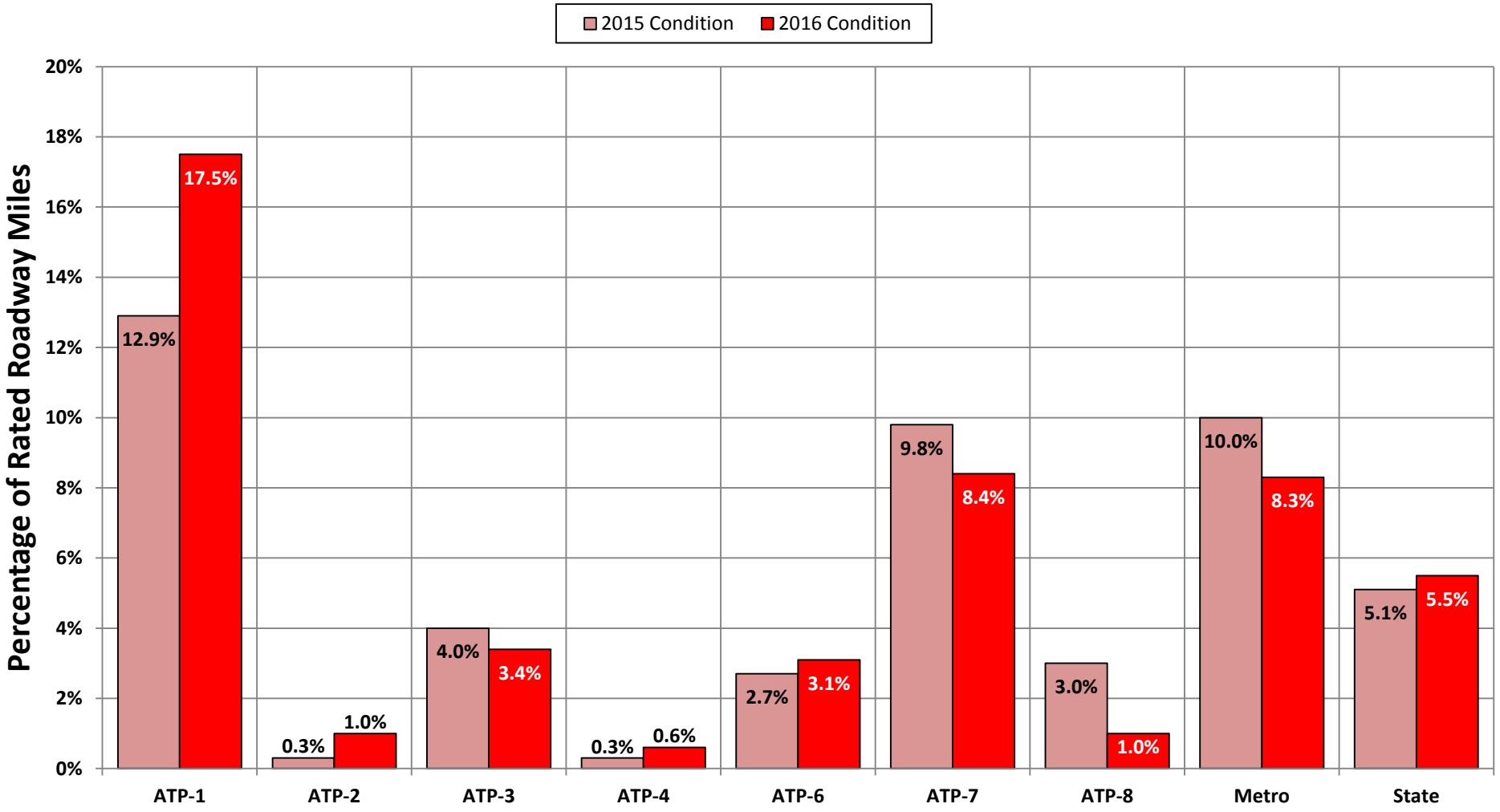
Other-NHS Target = 4 percent or less

Figure 11

Comparison of "Poor" Ride Quality Index

(miles with an RQI of 2.0 or less)

Non-NHS System, 2015 – vs – 2016 Condition



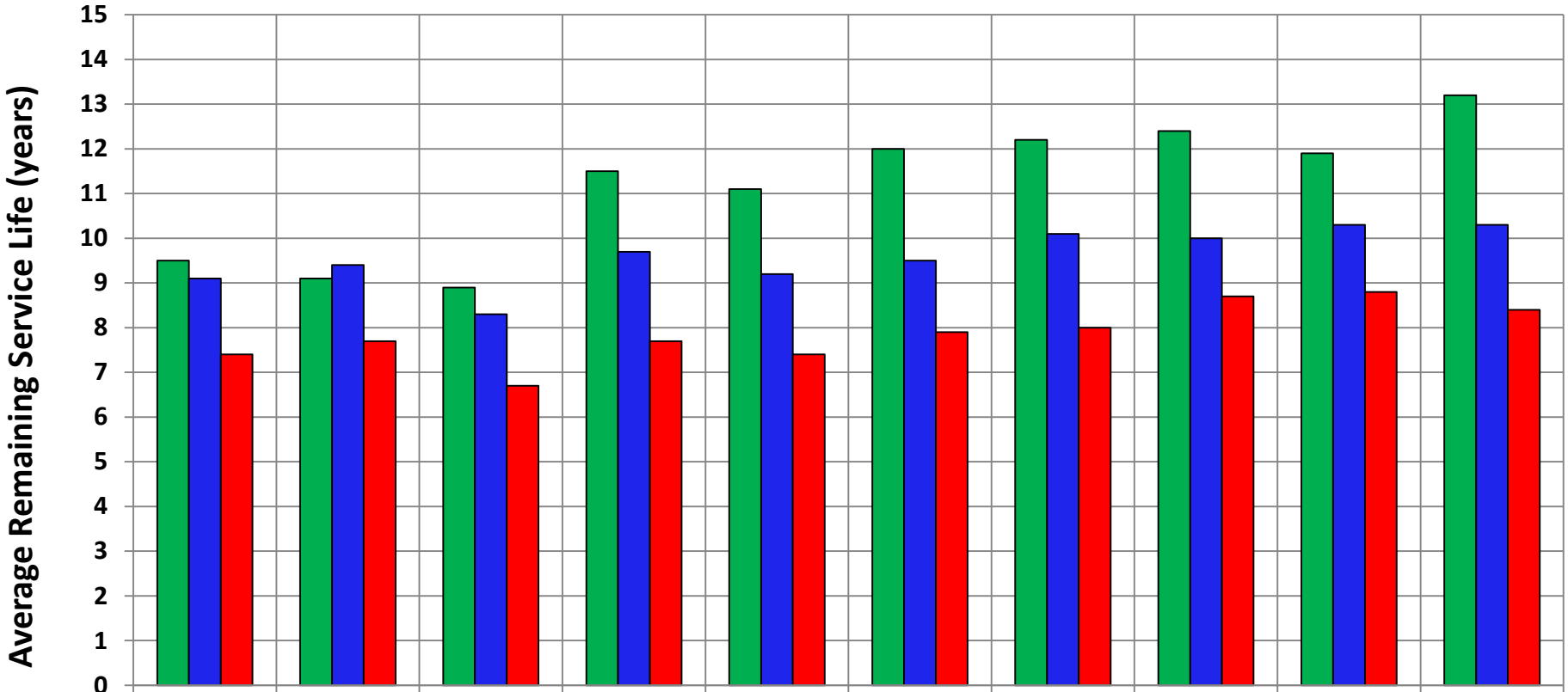
Non-NHS Target = 10 percent or less

Figure 12

Statewide Average Remaining Service Life (ARSL)

(years until RQI reaches 2.5)

Actual 2007 - 2016



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Interstate	9.5	9.1	8.9	11.5	11.1	12.0	12.2	12.4	11.9	13.2
Other-NHS	9.1	9.4	8.3	9.7	9.2	9.5	10.1	10.0	10.3	10.3
Non-NHS	7.4	7.7	6.7	7.7	7.4	7.9	8.0	8.7	8.8	8.4

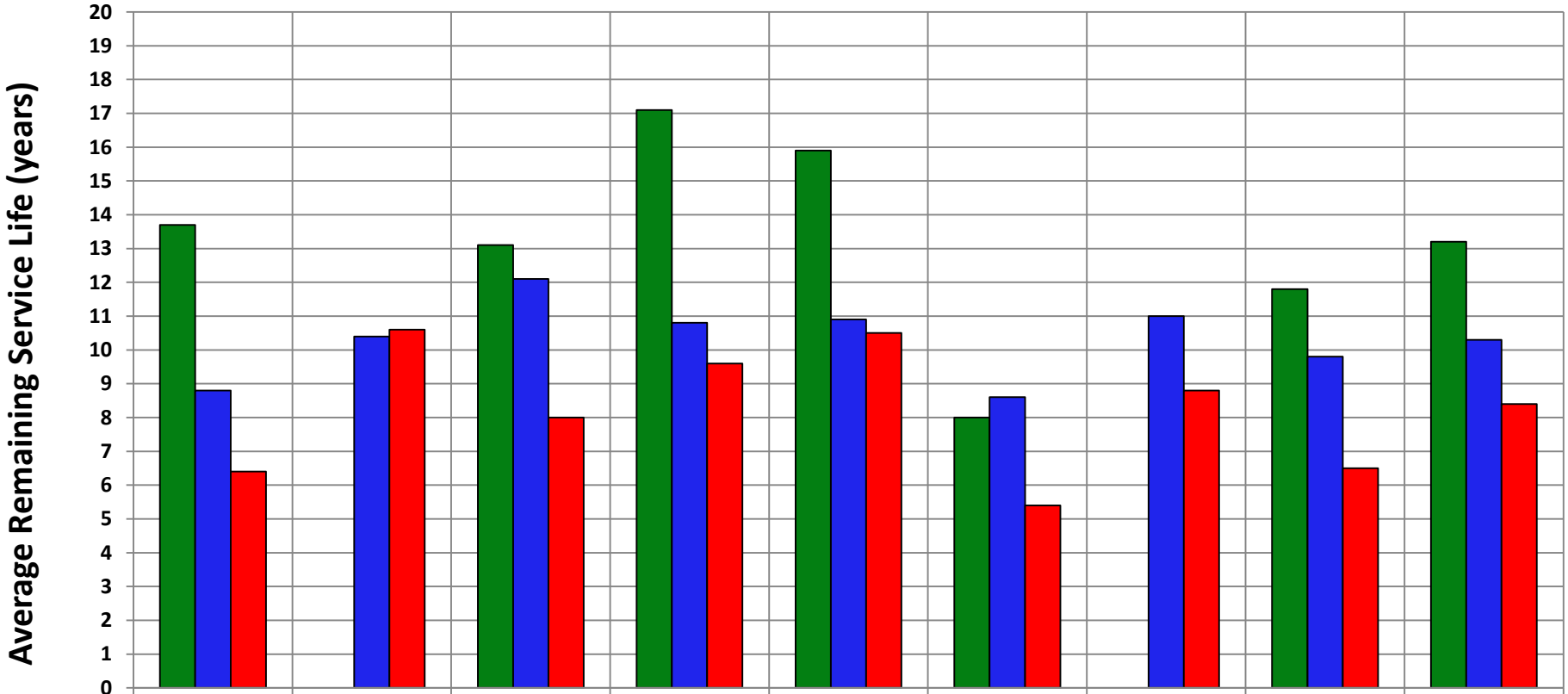
No official targets have been established for ARSL

Figure 13

Average Remaining Service Life (ARSL)

(years until RQI reaches 2.5)

Comparison of 2016 Data by ATP



	ATP-1	ATP-2	ATP-3	ATP-4	ATP-6	ATP-7	ATP-8	Metro	State
Interstate	13.7		13.1	17.1	15.9	8.0		11.8	13.2
Other-NHS	8.8	10.4	12.1	10.8	10.9	8.6	11.0	9.8	10.3
Non-NHS	6.4	10.6	8.0	9.6	10.5	5.4	8.8	6.5	8.4

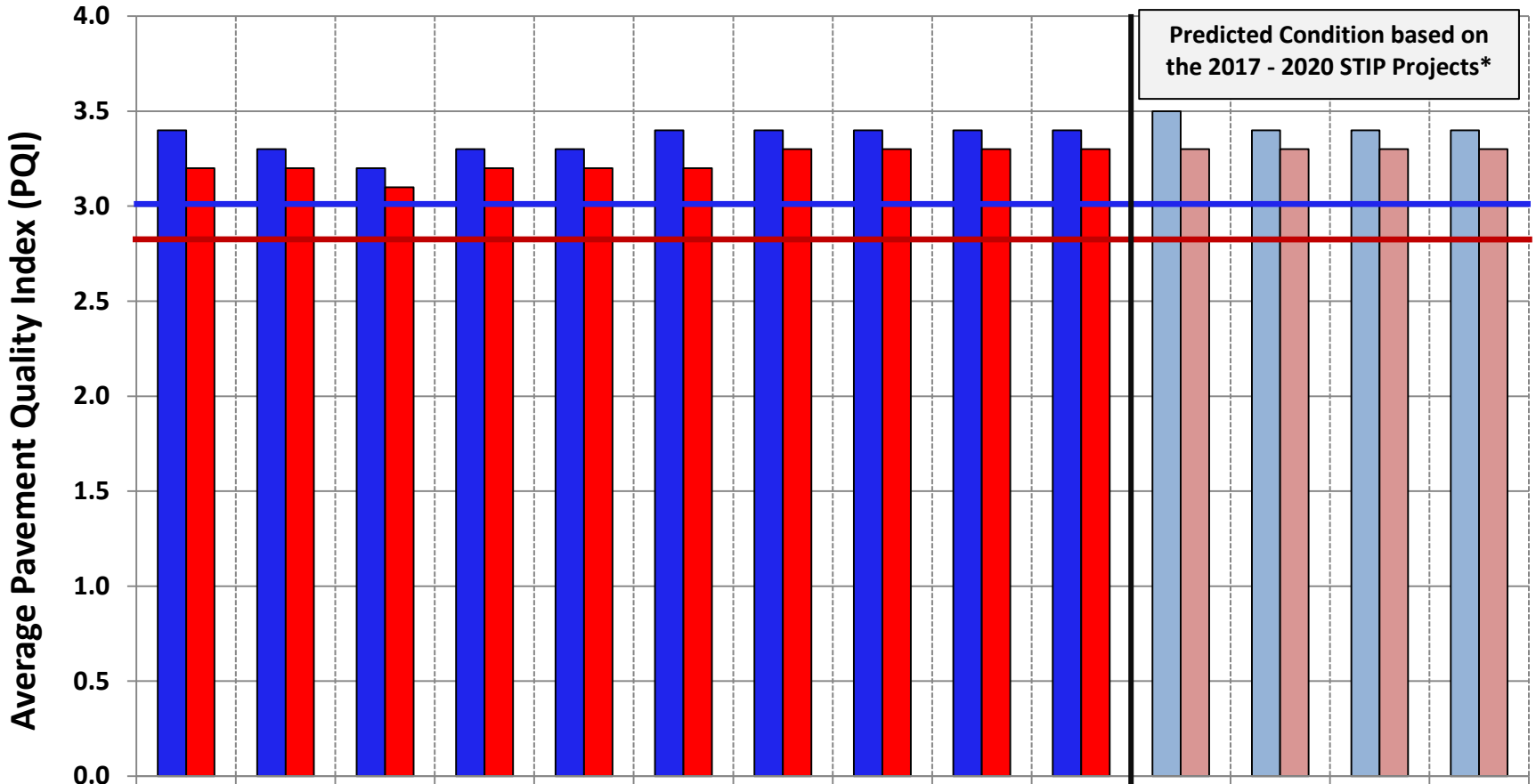
No official targets have been established for ARSL

Figure 14

Statewide Average Pavement Quality Index (PQI)

for GASB 34 Reporting

(PQI = Combined Index of Pavement Smoothness and Cracking)



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Principal Art.	3.4	3.3	3.2	3.3	3.3	3.4	3.4	3.4	3.4	3.4	3.5	3.4	3.4	3.4
Non-Principal Art.	3.2	3.2	3.1	3.2	3.2	3.2	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3

*2016 M-Records with '17-'20 STIP + PPM

Principal Arterial Threshold: Average PQI ≥ 3.0

Non-Principal Arterial Threshold: Average PQI ≥ 2.8


DEPARTMENT OF
TRANSPORTATION