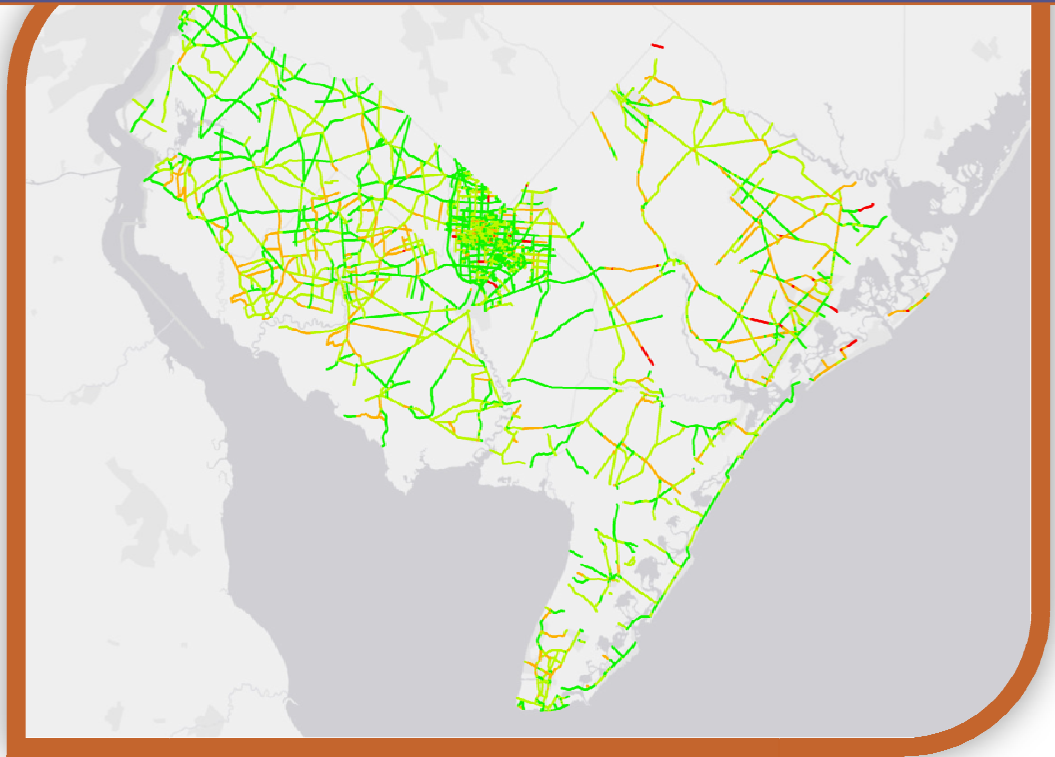




SOUTH JERSEY

TRANSPORTATION PLANNING ORGANIZATION

State of the Infrastructure



December 21, 2012

Table of Contents

Acknowledgements.....	1
Overview	2
Bridge Management System	2
Pavement Management System	3
Pavement Condition Data.....	4
Pavement Condition Indices	4
The SJTPO Asset Management System	7
Background	8
Atlantic County Pavement Condition Summary as of March 2012	9
Atlantic County Sign and Guiderail Condition Summary as of March 2012	10
Cape May County Pavement Condition Summary as of March 2012	11
Cape May County Sign Condition Summary as of March 2012	12
Cumberland County Pavement Condition Summary as of March 2012.....	12
Cumberland County Sign Condition Summary as of March 2012	14
Salem County Pavement condition summary as of March 2011	14
Salem May County Sign Condition Summary as of March 2011	15
Vineland City Pavement Condition Summary as of March 2010.....	16
Vineland City Sign Condition Summary as of March 2010	17
Pavement Drainage.....	18
Congestion Management Process.....	20

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Overview

The South Jersey Transportation Planning Organization's (SJTPO) *2012 State of the Infrastructure Report* was developed in order to give the SJTPO Policy Board and its planning partners a snapshot of the inventory, condition and performance level of the regional transportation infrastructure. This snapshot will serve as the baseline for future transportation planning efforts. The SJTPO is a metropolitan planning organization with jurisdiction over surface transportation facilities and as such the report is focused on this type of infrastructure using data derived from both the NJDOT and SJTPO management systems.

The report findings show that over the past four years, there has been some improvement in State-maintained bridges and as of March 2012, most bridges were neither "structurally deficient" nor "functionally obsolete." For State-maintained pavements, from 2011 to 2012, there was some improvement in the number of pavements rated "good." However, 44% of all State-maintained pavements in the region are still rated "deficient" suggesting that much more work needs to be done. For County roads and Vineland municipal roads, the mean Pavement Condition Index (PCI) for each of the four counties falls between 55 and 75. A PCI in this range indicates that some maintenance is needed, but a road with this score is not failing. Selected roadside assets such as road signs, guiderails and manholes were inventoried and these were mostly found to be in good condition. In summary, the state of infrastructure in the SJTPO region is, for the most part, adequate and improving but much work remains to be done.

Bridge Management System

NJDOT employs a Bridge Management System (BMS) to maintain an inventory of all bridges with a span over 20 feet in New Jersey with information on their physical characteristics, condition, and ownership. Bridges are inspected periodically and the various characteristics are rated on numerical scale. The scale ranges from 0 to 9, with 0 representing a failed condition and 9 representing an excellent condition. A bridge can be defined as *Structurally Deficient*, *Functionally Obsolete*, or both. A bridge is deemed *Structurally Deficient* if its deck, superstructure, substructure or culvert are rated 4 (poor) or less or if the overall structure evaluation for load capacity or waterway adequacy is rated 2 (critical) or less. *Structural deficiency* does not necessarily mean that a bridge is unsafe. It may mean that the bridge is unable to handle the vehicle loads or speeds that would normally be expected on the roadway where the bridge is located and is posted to indicate these limitations.

A bridge is classified as *Functionally Obsolete* if the deck geometry, underclearances (vertical and horizontal), approach roadway alignment, overall structural evaluation for load capacity or waterway adequacy are rated as 3 (serious) or less. *Functional obsolescence* may mean the width or vertical clearance of the bridge is inadequate. Bridges become functionally obsolete due to highway improvements, such as lane additions on the approaches to the bridge or due to changes in freight movement technology or practice.

The overall rating given to each bridge is called the sufficiency rating which indicates a bridge's ability to remain in service. The rating may range from 100 which represents a bridge meeting state-of-the-art standards, to 0 which represents a bridge in need of immediate repair or replacement. The physical condition of the structure is monitored by NJDOT at a minimum of once every two years to ensure that each bridge can safely carry vehicles at the posted truck load.

The primary use of the sufficiency rating is to allocate federal funds to address bridge needs. A structure is eligible for federal funds if its sufficiency rating is less than 80 and is designated as *Structurally Deficient* or *Functionally Obsolete*. If the sufficiency rating is between 50 and 80, the federal funds are applied for rehabilitation purposes only, while a sufficiency rating of less than 50 allows federal funds to be used for rehabilitation and replacement.

Data sets for two years, 2008 and 2012, are included in Table 1. The trend line indicates some improvement in the overall state of the region's bridges during this period, with the percentage of NJDOT owned *Structurally Deficient* or *Functionally Obsolete* bridges decreasing from 28.1% of the total in 2008 to 21.0% in 2012.

This is a significant finding as it indicates that the region has made significant progress in addressing bridge needs over the four year period covered by the data. This finding is in accordance with the overall progress that NJDOT has made in increasing the percentage of its bridges that are neither structurally deficient nor functionally obsolete from 2008 to 2011.

Table 1. Bridge Ratings in the SJTPO Region.

Bridge Status	2008		2012		Change, 2008-2012
	Count	% of Total	Count	% of Total	Count
Neither	383	71.9	378	78.8	(5)
Structurally deficient	78	14.6	48	10.0	(30)
Functionally obsolete	72	13.5	54	11.0	(18)
Total	533	100.0	480	100.0	(53)

Source: NJDOT Bridge Management System Database, December 2008; NJDOT Bridge Management System Database, March 2012.

Pavement Management System

NJDOT maintains a database with information on the current condition of pavement throughout the state of New Jersey, which is updated every two years. The most recent 2011 database was used for this report and comparison to data for 2008 to 2010 are also included, as shown in Table 2, Figure 1 and Figure 2. A detailed description of the Pavement Management System and the criteria behind the rankings is given below.

The process of pavement system condition analysis begins with collection of pavement condition data. Complete data are collected for all NJDOT maintained roadways throughout the State of New Jersey and are in the Pavement Management System (PMS) databases. Analysis is then performed to generate condition indices and to assess condition status.

Pavement Condition Data

All data with the exception of frictional skid data are collected on an annual basis using a high speed profiler van. Skid data are collected on an as-needed basis using a specially calibrated skid trailer. All data for network inventory purposes are collected in the rightmost lane in each direction of travel. Data are processed and recorded in tenth mile reporting intervals.

Roughness Data: International Roughness Index (IRI) is collected using lasers to measure the deviations of the pavement surface from a perfectly flat condition. A dynamic computer model of vehicle suspension is then used to predict vehicle occupant response to the imposed road profile. IRI is generated in inches per mile, with a larger IRI representing a rougher road surface. IRI is collected and recorded for the left and right wheel paths and an average of the two is also calculated.

Rut Data: Ruts (depressions in the pavement surface primarily in the wheel paths) are measured in inches using a laser line scan applied to images of the transverse road profile for the collection lane. Average rut is calculated as the average for each wheel path over the tenth mile reporting interval. Also calculated is the maximum rut for the left and right wheel path using a moving average of approximately 15 feet.

Surface Distress Data: Surface distress assessments are based on windshield surveys done by a rater in the high speed profiler van. The rater uses a computer keyboard with each key representing a specific type of distress and a specific severity level. The computer software records the road locations when a particular key is toggled on and off. It then calculates the portion of the tenth mile reporting interval (represented as a percent of the tenth mile length) that the particular distress and severity were present.

Frictional Skid Resistance Data: Skid numbers are measured in accordance with the ASTM E-274 method of testing using a wet condition wheel lockup. Measured numbers at various test speeds are normalized to equivalent skid resistance at 40 miles per hour called SN40R.

Pavement Condition Indices

International Roughness Index (IRI): The IRI average of both wheel paths measured in inches per mile and reported on a tenth mile interval as described above is used for analysis purposes.

Surface Distress Index (SDI): The SDI is an index measured on a 0 – 5 scale which indicates the sum total of distresses observed in each tenth mile reporting interval and also accounts for the types, severities and extents of distresses like cracking, rutting, patching, shoulder deterioration and drop-off, concrete faulting, and concrete joint deterioration (an SDI = 5 is a perfect pavement with no distresses).

To determine pavement condition status, IRI and SDI are combined using the following criteria:

Deficient (Poor): IRI > 170 **OR** SDI ≤ 2.4

Fair: Combinations between the Deficient and Good categories

Good: IRI < 95 **AND** SDI ≥ 3.5

To summarize the overall pavement network status, the PMS database is queried for each of the conditions above and the corresponding lane miles of each tenth mile segment are allocated to the

appropriate category. The sums of the lane miles in each category are used to calculate percentages of the total network lane miles.

Analysis results of the NJDOT maintained pavements under the SJTPO jurisdiction is shown below for the 2012 data collection cycle. Table 2 and Figure 1, below, summarize the pavement condition data. In the SJTPO region, 56% the total DOT-maintained system lane-miles were reported in *Fair* or *Good* condition in 2012, and more than 44% are ranked "*Deficient*". When compared to previous years, as shown in Figure 2, while there has been a steady increase in "*Deficient*" SJTPO pavements from 2008 to 2011, there has been a decrease in percentage "*Deficient*" from 54% to 44% in the past year, along with a corresponding increase in percentage of pavements marked "*Fair*" or "*Good*."

Table 2. Current Status of State Maintained SJTPO Pavements (Based on NJDOT 2012 Roughness & Distress Data). Source: NJDOT, Pavement Management and Technology Unit, December 4, 2012.

Condition	Road Miles (2 Directions)	Lane Mile (2 Directions)	% of Total System Lane Miles
Total Deficient	358.3	447.5	44%
Total Fair	300.5	376.9	38%
Total Good	126.4	179.2	18%
Total SJTPO Pavements	785.2	1003.6	100%

A multi-year comparison of the SJTPO pavement system is shown in Figure 2. When compared to previous years, there has been a steady increase since 2008 in "*Deficient*" SJTPO pavements, and a steady decrease in pavements ranked "*fair*." This reversal of the trend shows that pavement conditions are improving in the SJTPO region.

Figure 1. Pavement Conditions 2012.

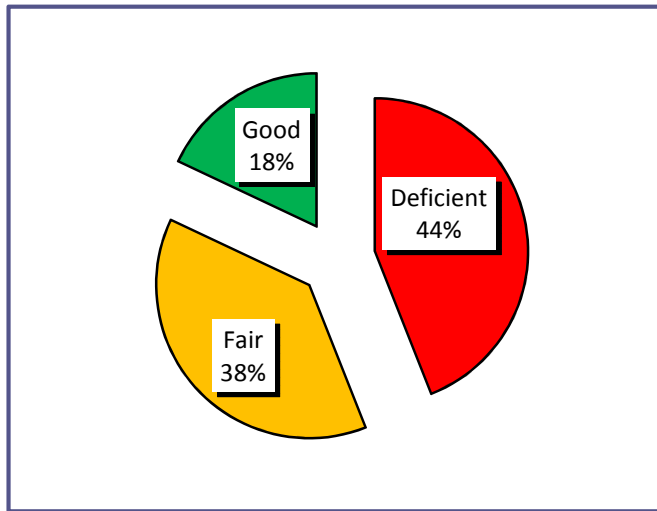
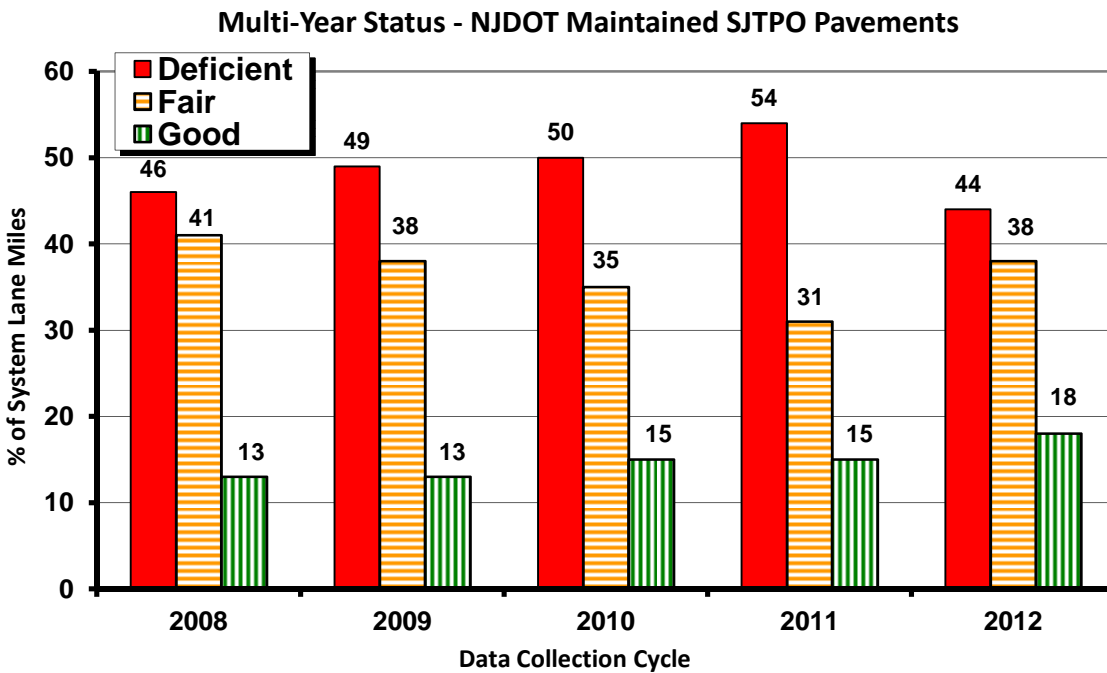


Figure 2. Multi-year Status of NJDOT Maintained Pavements in SJTPO.



Source: NJDOT Pavement Management

The SJTPO Asset Management System

SJTPO has been implementing an Asset Management System (AMS) throughout its region. This process will produce many benefits, the most important of which will be a more systematic project prioritization process. This decision support system allows engineers and other users to maximize the cost-effectiveness of system expenditures.

Scope: The SJTPO AMS encompasses all county roads and all City of Vineland municipal roads. The system implementation involves collecting inventory and condition data on roadways, signs, signpost, and guiderails. In Cape May County manhole cover information was included.

Database: The software provides improved network visualization by dynamically linking the GIS-based pavement and other data, mapping capabilities, and road asset images.

Analysis and Reporting Components: The AMS software provides a variety of analysis and reporting tools to summarize road assets and their condition. As the system was implemented, a road asset inventory was developed; this documentation serves as a record that the assets existed at the time of the inventory date. The road asset condition was evaluated and a score was provided for pavements. This score is reflected as a locally-developed Pavement Condition Index (PCI) that incorporates multiple road condition attributes.

The AMS is also a flexible tool for budgeting and estimating the cost of pavement improvement. An important feature is the locally-developed Repair Decision Tree. This feature allows for the input of projected response (repair types) for certain pavement conditions, and to incorporate their cost estimates for various repairs.

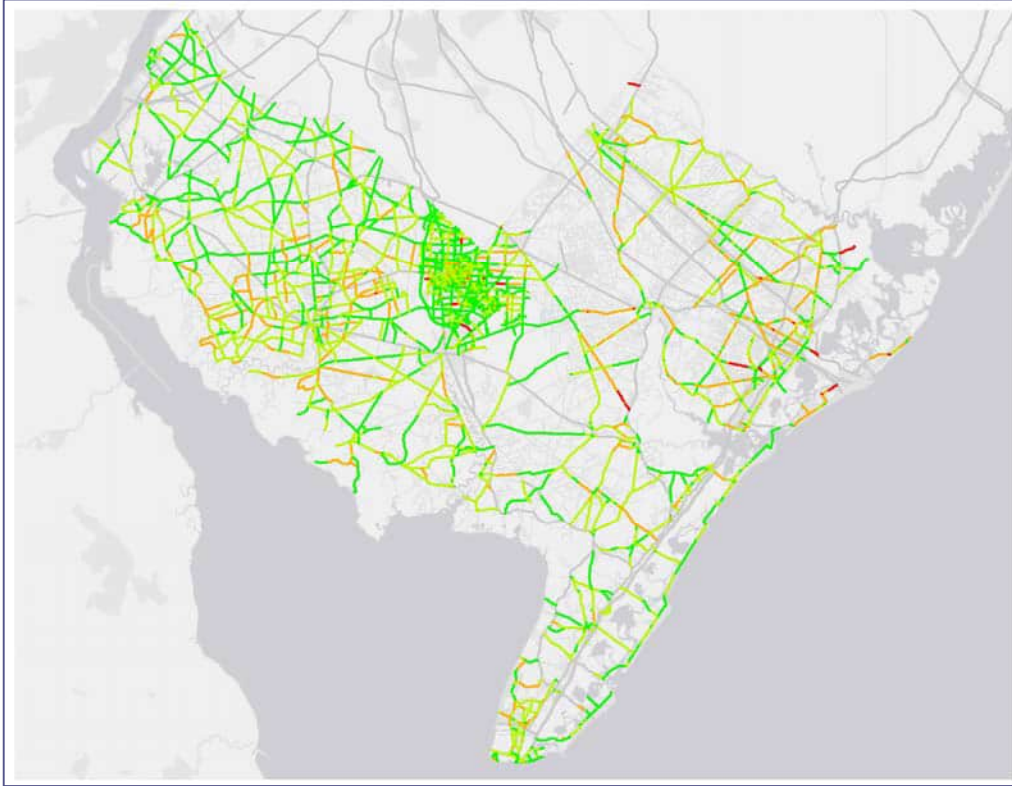
Given these inputs, the system can:

- Project pavement conditions under different budget and strategy scenarios
- Estimate funds needed to reach a particular condition goal.

The SJTPO AMS will be instrumental in future regional transportation planning and programming. The report that follows is the inventory of the roads and roadside assets that was collected from 2010 through 2012.

The following section of this report summarizes the Road Pavement and Roadside Assets at the time that inventories were taken between 2010 and 2012.

Figure 3: SJTPO Regional Pavement and Roadside Asset Inventory.



Background

Under contract by SJTPO, the asset inventory systems contractor EnterInfo conducted asset data collection efforts beginning in 2009 and continuing through 2012. EnterInfo vehicles drove on all county roads in the four-county SJTPO region, as well as all municipal roads in Vineland. These vehicles gathered data on pavement condition, sign post placement, and sign placement for all five areas. In addition, guiderail data was collected for Atlantic County, Cumberland County, Salem County, and Vineland, while manhole cover data was collected for Cape May County. All asset inventory data was compiled into databases, which have been summarized in this report.

The measure of pavement condition used is PCI, Pavement Condition Index. PCI is measured on a scale of 0 to 100, with 100 indicating new pavement with no surface distresses. Pavement with a PCI below 15 is considered failed. PCI is estimated by tabulating the extent and severity of surface distresses (such as cracking, rutting, and spalling) on short segments of roadway. Over time, the PCI of a roadway is expected to worsen due to weathering and vehicle loading, with a more rapid decrease in PCI occurring as substantial cracks begin to form. PCI may be partially restored with resurfacing projects and completely restored with roadway reconstruction.

Using the pavement inventory, the condition of individual roadway segments can be examined. Software provided by EnterInfo allows planners to develop road maintenance plans that optimize future pavement conditions within budget constraints. GIS may be used to map roadway conditions in any region, or to locate roadways in any particular condition. GIS may also be used to overlay complementary information, such as traffic counts, which may assist in developing a road maintenance

plan. The sign and guiderail inventories can also be imported into GIS and used to display the location and type of each sign or guiderail.

In this report, pavement conditions in each of the four counties and Vineland are summarized. The number of signs, condition of signs, and number of guiderails is also provided.

Atlantic County Pavement Condition Summary as of March 2012

PCI was estimated for 3,422 segments of county roads in Atlantic County during a survey by EnterInfo in March 2012. Tabulated below are summary statistics for all surveyed roads in Atlantic County. The mean PCI weighted by road segment length was 62.6.

Figure 4: Atlantic County Pavement Condition.

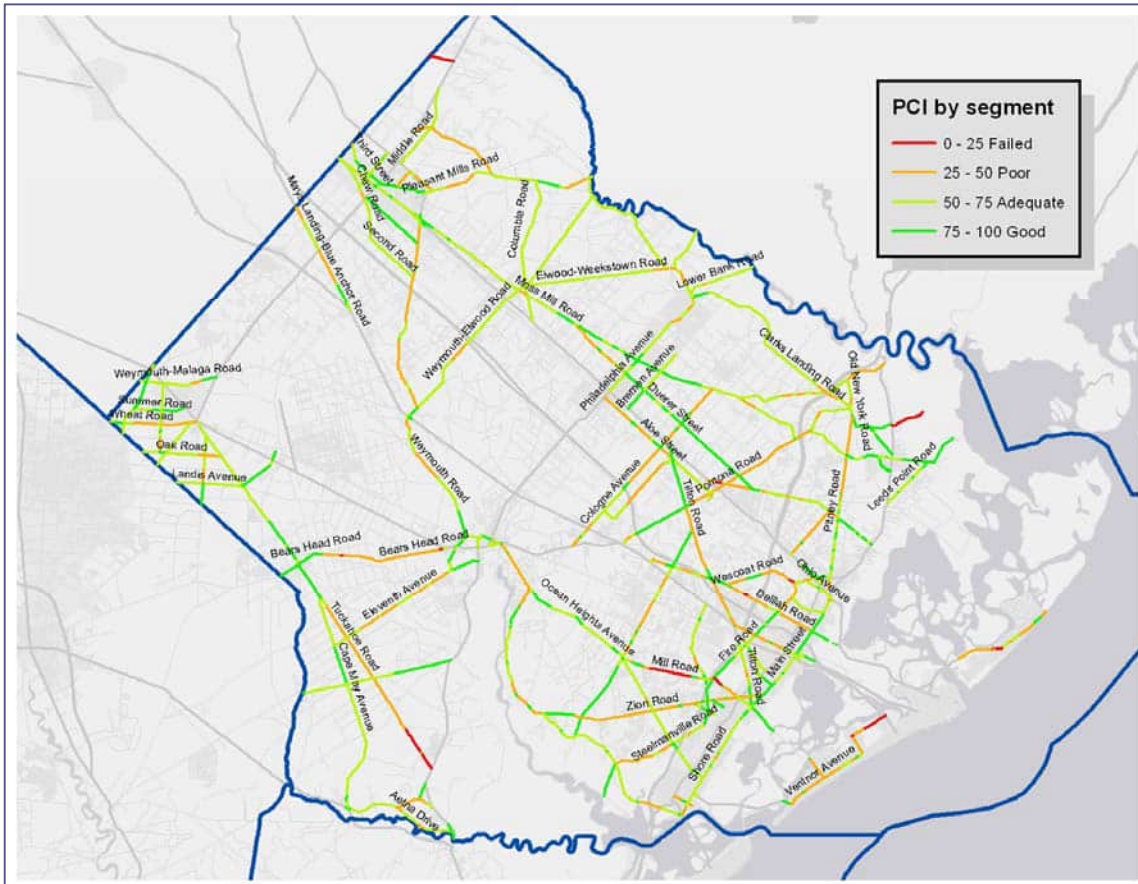
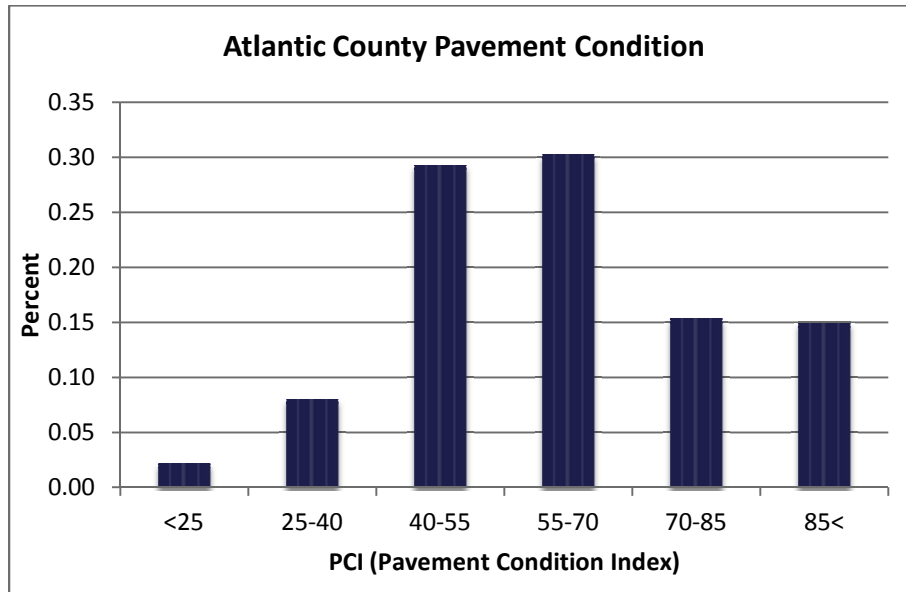


Table 3. Atlantic County Pavement Condition.

PCI	Miles of pavement	Percent
0-25	8.3	2.2%
25-40	30.8	8.0%
40-55	113.1	29.3%
55-70	116.9	30.3%
70-85	59.2	15.3%
85-100	57.7	14.9%

Figure 5: Atlantic County Pavement Condition.



Atlantic County Sign and Guiderail Condition Summary as of March 2012

During the asset management survey conducted by EnterInfo in March 2012, the locations of all roadway signs on county roads were catalogued. In total, 19,581 signs were located. Each sign was also subjectively assigned a condition. The table below is a summary of sign conditions. Guiderails were classified by type, and did not have a condition field. Below is the summary of guiderails by type.

Table 4. Atlantic County Sign Condition Summary.

Condition	Number	Percent
GOOD	17,804	90.9%
MISSING	54	0.3%
ON GROUND	3	0.0%
POOR	30	0.2%
REMOVED	1,682	8.6%
REPAIR	2	0.0%
REPLACE	1	0.0%
TWISTED	1	0.0%
VANDALISM	4	0.0%
Total	19,581	

Table 5. Atlantic County Guiderail Condition Summary.

	Total	Percent
W-beam	603	99.5%
Wood	3	0.5%
Other	0	0.0%
Total	606	

Cape May County Pavement Condition Summary as of March 2012

PCI was estimated for 1,366 segments of county roads in Cape May County during a survey by EnterInfo in March 2012. Summary statistics for all surveyed roads in Cape May County are tabulated below. The mean PCI weighted by road segment length was 70.2.

Figure 6: Cape May County Pavement Condition.

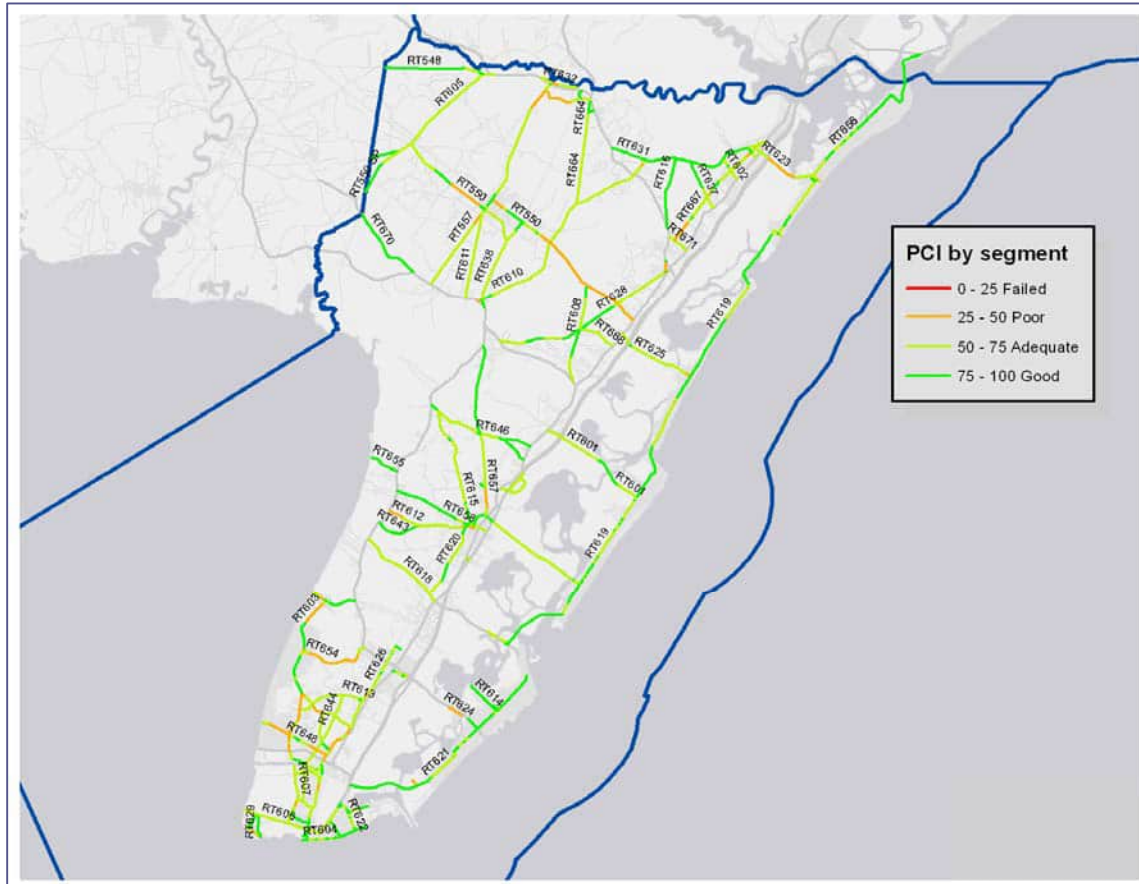
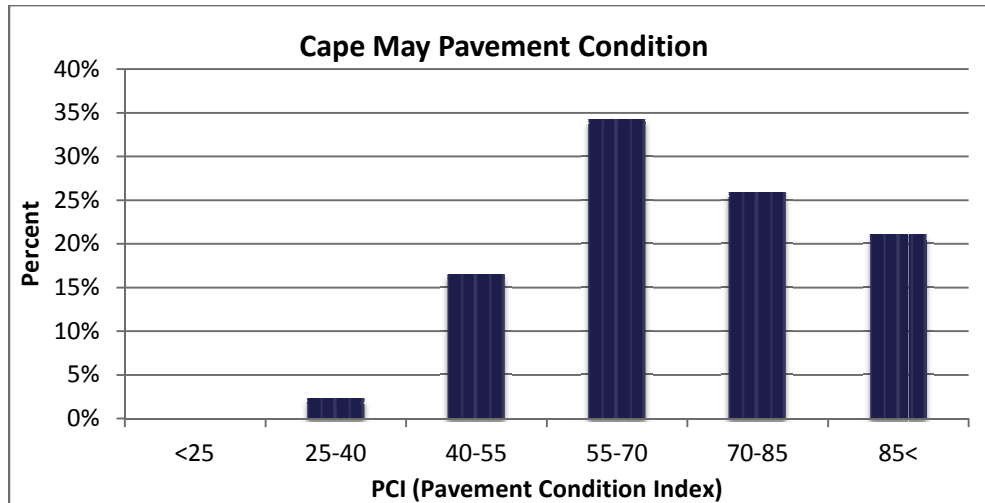


Table 6. Cape May County Pavement Condition Summary.

PCI	Miles of pavement	Percent
0-25	0.1	0.0%
25-40	4.9	2.3%
40-55	35.6	16.5%
55-70	73.8	34.2%
70-85	55.9	25.9%
85-100	45.4	21.0%

Figure 7: Cape May County Pavement Condition.



Cape May County Sign Condition Summary as of March 2012

During the asset management survey conducted by EnterInfo in March 2012, the locations of all roadway signs on county roads were catalogued. In total, 11,812 signs were located. Each sign was also subjectively assigned a condition. The table below is a summary of sign conditions.

Table 7. Cape May County Sign Condition Summary.

Condition	Number	Percent
FAIR	7	0.1%
GOOD	11,585	98.1%
MISSING	103	0.9%
POOR	106	0.9%
REPLACE	1	0.0%
VANDALISM	10	0.1%
Total	11,812	

Cape May County opted to have a manhole cover inventory taken instead of a guiderail inventory. As such, no guiderail data is available at this time.

Cumberland County Pavement Condition Summary as of March 2012

Table 8. Cumberland County Pavement Condition Summary.

PCI	Miles of pavement	Percent
0-25	0.8	0%
25-40	17.8	3%
40-55	133.3	25%
55-70	168.7	31%
70-85	83.0	15%
85-100	138.7	26%

PCI was estimated for 1,234 segments of county roads in Cumberland May County during a survey by EnterInfo in March 2012. Tabulated below are summary statistics for all surveyed roads. The mean PCI weighted by road segment length was 68.7.

Figure 8: Cumberland County Pavement Condition.

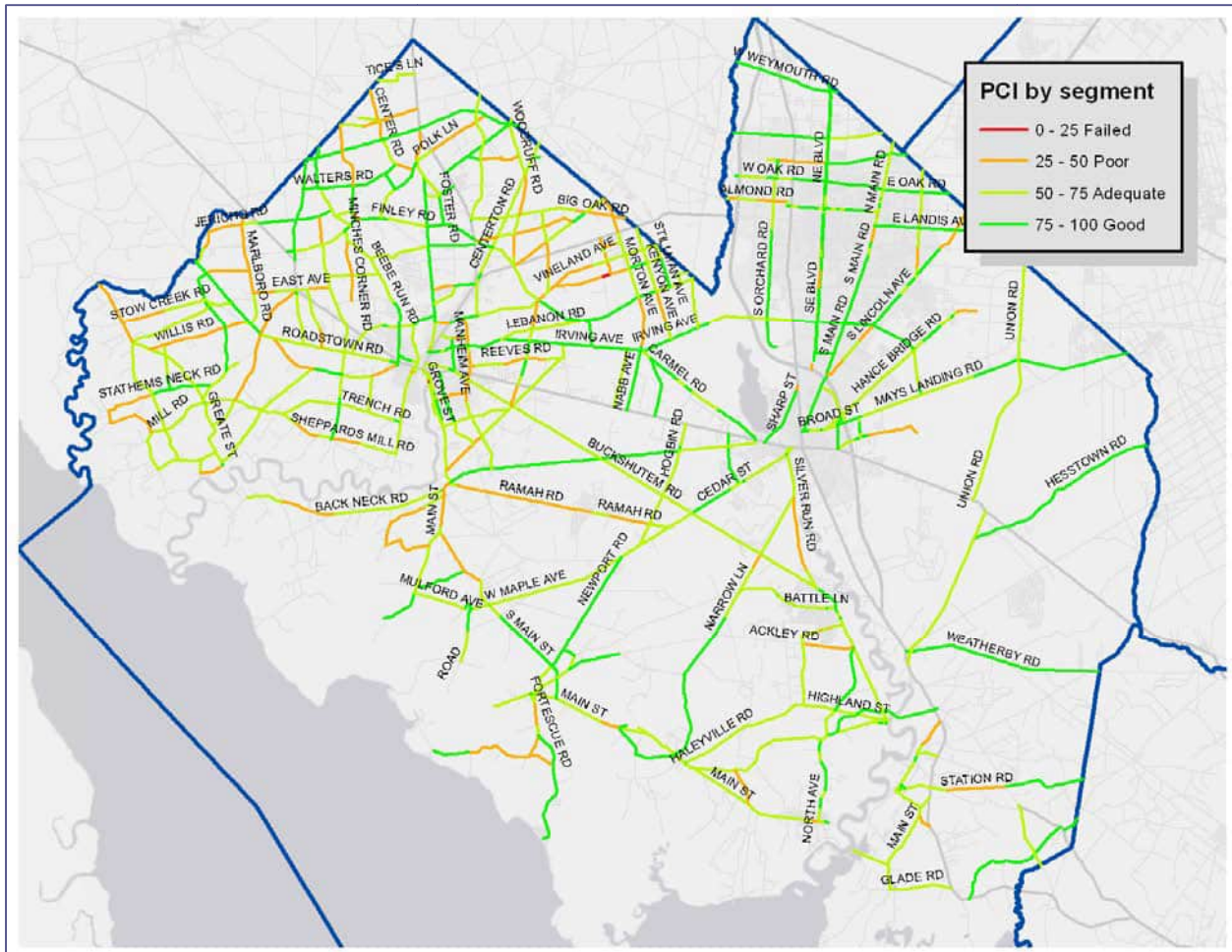
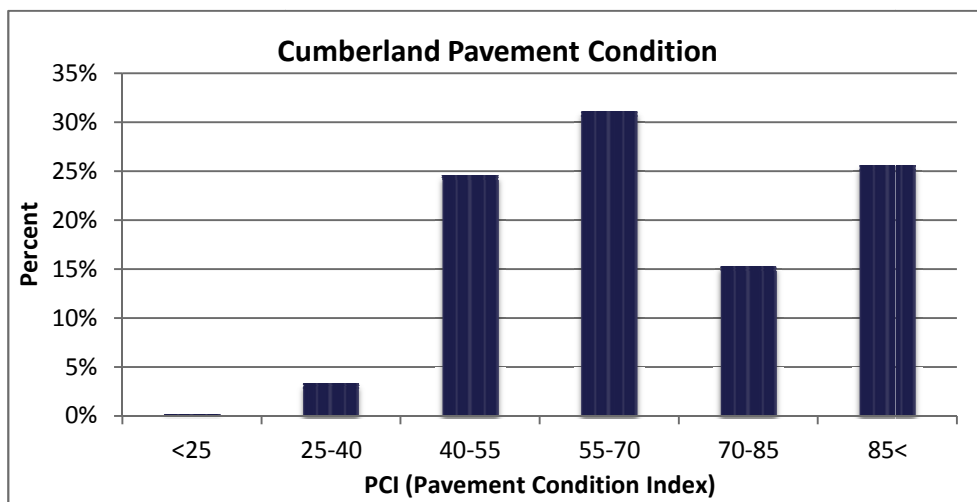


Figure 9: Cumberland County Pavement Condition.



Cumberland County Sign Condition Summary as of March 2012

During the asset management survey conducted by EnterInfo in March 2012, the locations of all roadway signs on county roads were catalogued. In total, 14,789 signs were located. Each sign was also subjectively assigned a condition. The table below is a summary of sign conditions. Guiderails were classified by type, and did not have a condition field. Below is the summary of guiderails by type.

Table 9. Cumberland County Sign Condition Summary.

Condition	Number	Percent
FAIR	34	0.2%
GOOD	14,496	98.0%
MISSING	52	0.4%
POOR	117	0.8%
REPLACE	50	0.3%
VANDALISM	40	0.3%
Total	14,789	

Table 10. Cumberland County Sign Condition Summary.

	Total	Percent
W-beam	570	99.7%
Wood	1	0.2%
Other	1	0.2%
Total	572	

Salem County Pavement condition summary as of March 2011

PCI was estimated for 700 segments of county roads in Salem County during a survey by EnterInfo in March 2011. Tabulated below are summary statistics for all surveyed roads. The mean PCI weighted by road segment length was 74.8.

Figure 10: Salem County Pavement Condition.

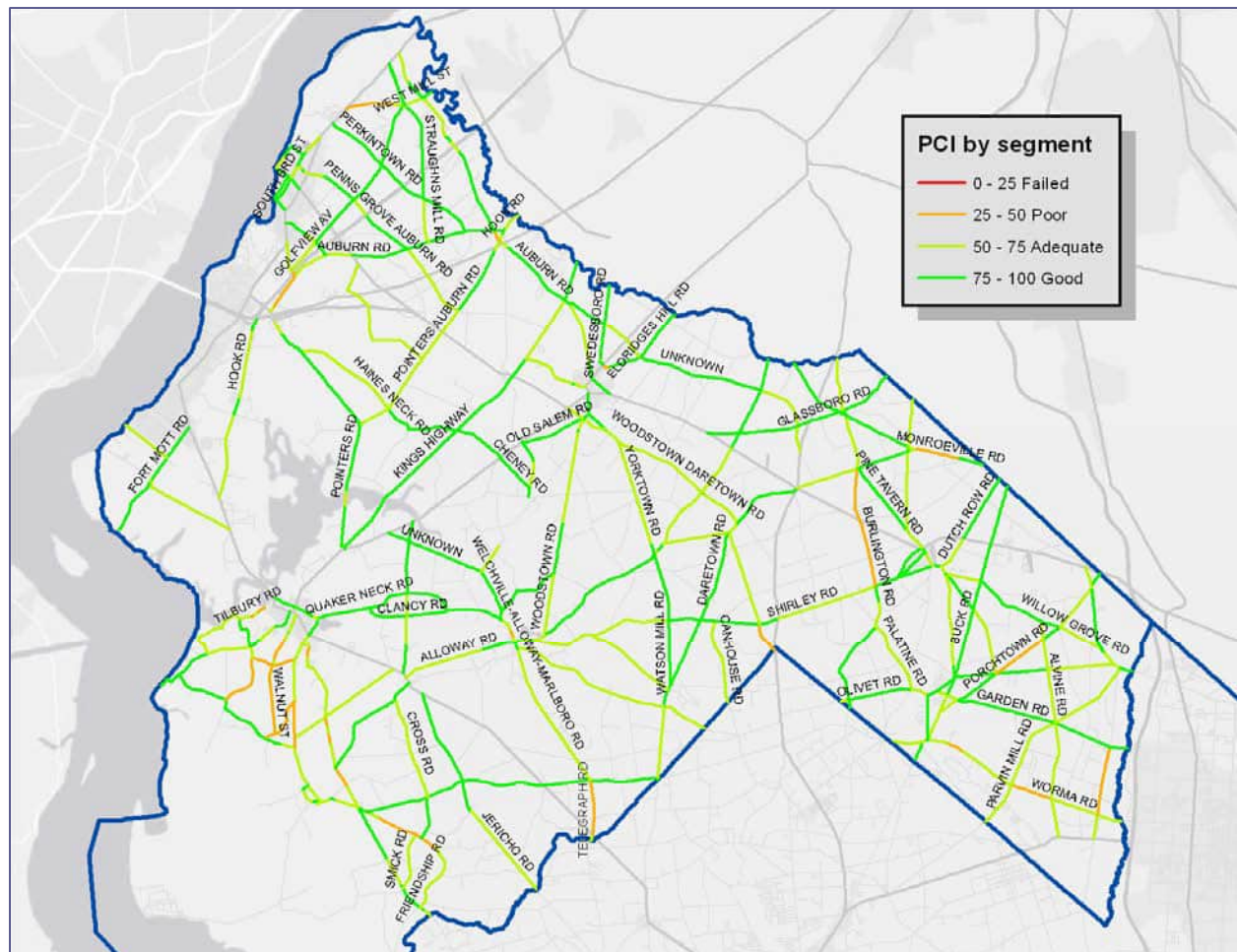
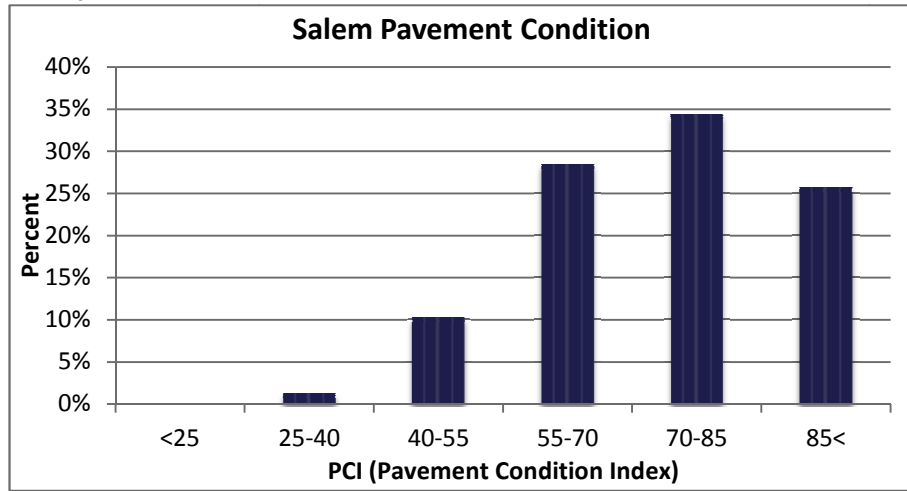


Table 11. Salem County Pavement Condition Summary.

PCI	Miles of pavement	Percent
0-25	0.0	0%
25-40	4.5	1%
40-55	37.0	10%
55-70	102.4	28%
70-85	123.7	34%
85-100	92.5	26%

Figure 11: Salem County Pavement Condition.



Salem May County Sign Condition Summary as of March 2011

During the asset management survey conducted by EnterInfo in March 2011, the locations of all roadway signs on county roads were catalogued. In total, 11,812 signs were located. Each sign was also subjectively assigned a condition. The table below is a summary of sign conditions. Guiderails were classified by type, and did not have a condition field. Below is the summary of guiderails by type.

Table 11. Salem County Sign Condition Summary.

Condition	Number	Percent
FAIR	13	0.2%
GOOD	7,720	98.7%
MISSING	28	0.4%
POOR	56	0.7%
REPLACE	2	0.0%
VANDALISM	2	0.0%
Total	7,821	

Table 12. Salem County Guiderail Condition Summary.

	Total	Percent
W-beam	504	98.8%
Wood	6	1.2%
Other	0	0.0%
Total	510	

Vineland City Pavement Condition Summary as of March 2010

PCI was estimated for 2,529 segments of city roads in Vineland City during a survey by EnterInfo in March 2010. Tabulated below are summary statistics for all surveyed roads. The mean PCI weighted by road segment length was 69.9.

Figure 12: Vineland City Pavement Condition.

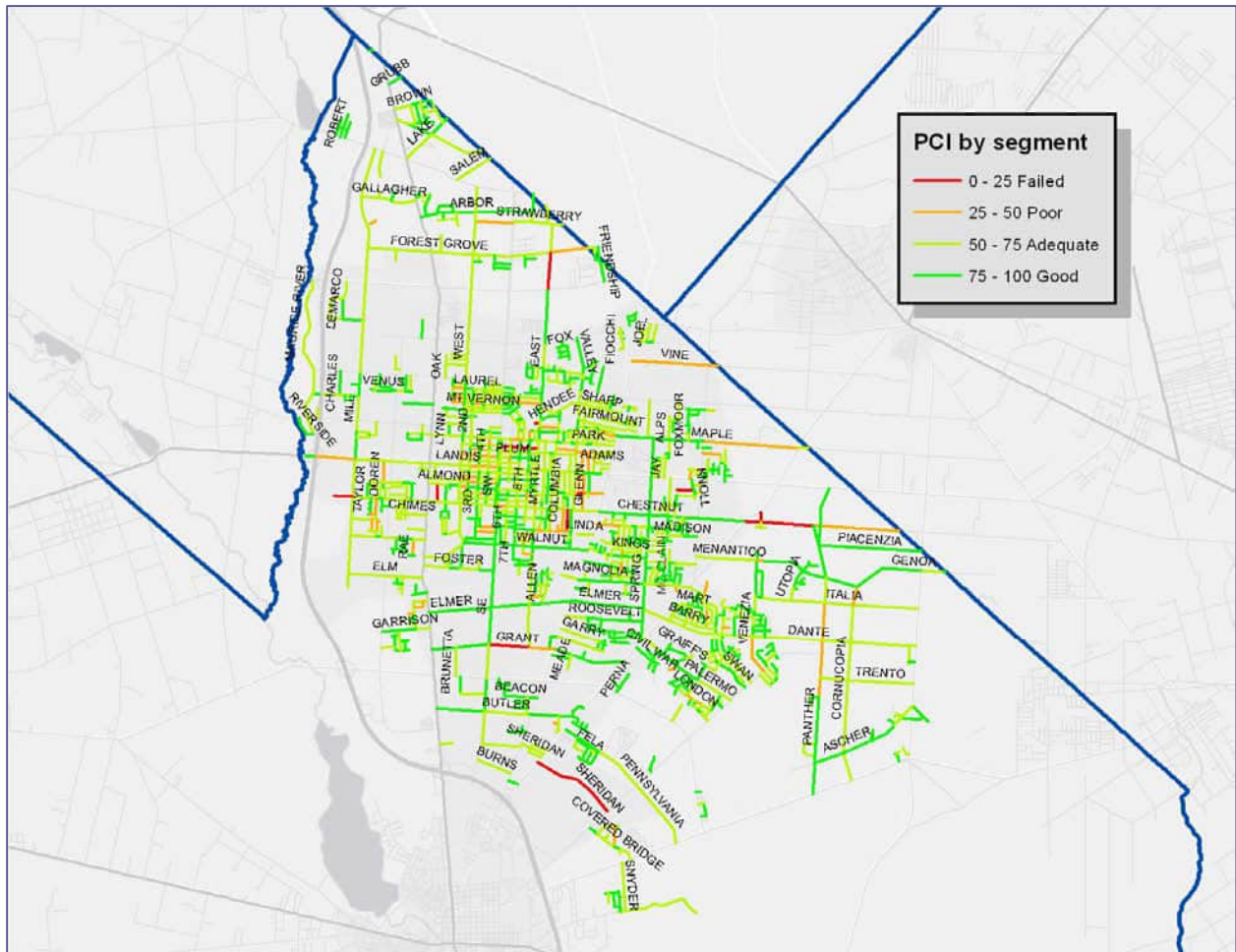
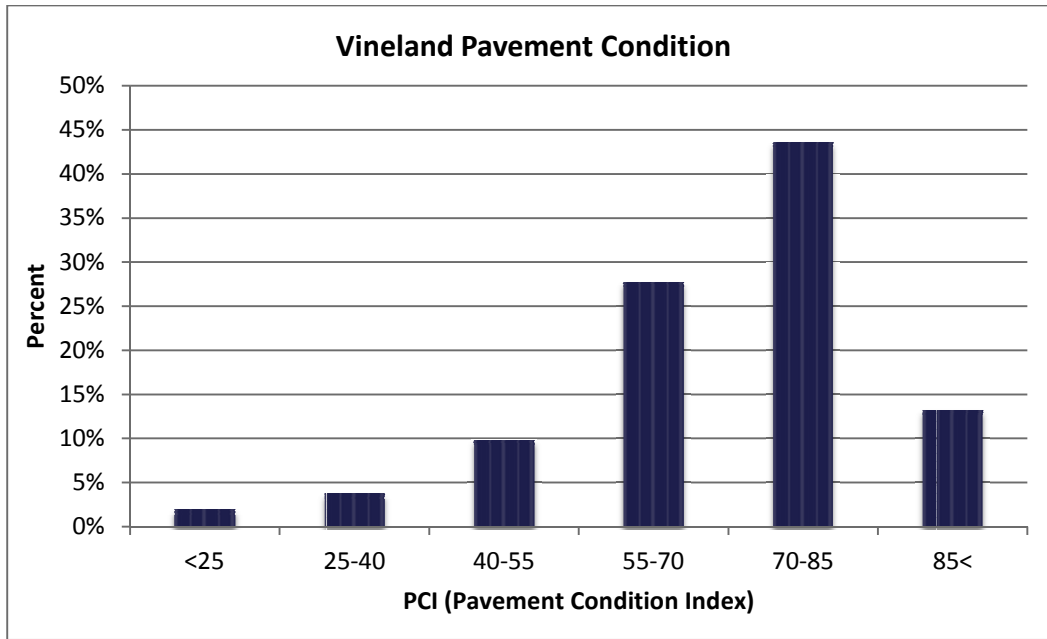


Table 13. Salem County Pavement Condition Summary.

PCI	Miles of pavement	Percent
0-25	4.8	1.9%
25-40	9.3	3.7%
40-55	24.4	9.8%
55-70	69.0	27.7%
70-85	108.5	43.6%
85-100	32.9	13.2%

Figure 13: Vineland Pavement Condition.



Vineland City Sign Condition Summary as of March 2010

During the asset management survey conducted by EnterInfo in March 2010, the locations of all roadway signs on city roads were catalogued. In total, 11,812 signs were located. Each sign was also subjectively assigned a condition. The table below is a summary of sign conditions. Guiderails were classified by type, and did not have a condition field. Below is the summary of guiderails by type.

Table 14. Vineland Sign Condition Summary.

Condition	Number	Percent
FAIR	33	0.5%
GOOD	6405	96.8%
MISSING	45	0.7%
POOR	103	1.6%
REPLACE	1	0.0%
VANDALISM	29	0.4%
Total	6616	

Table 15. Vineland Guiderail Condition Summary.

	Total	Percent
W-beam	109	93.2%
Wood	7	6.0%
Other	1	0.9%
Total	117	

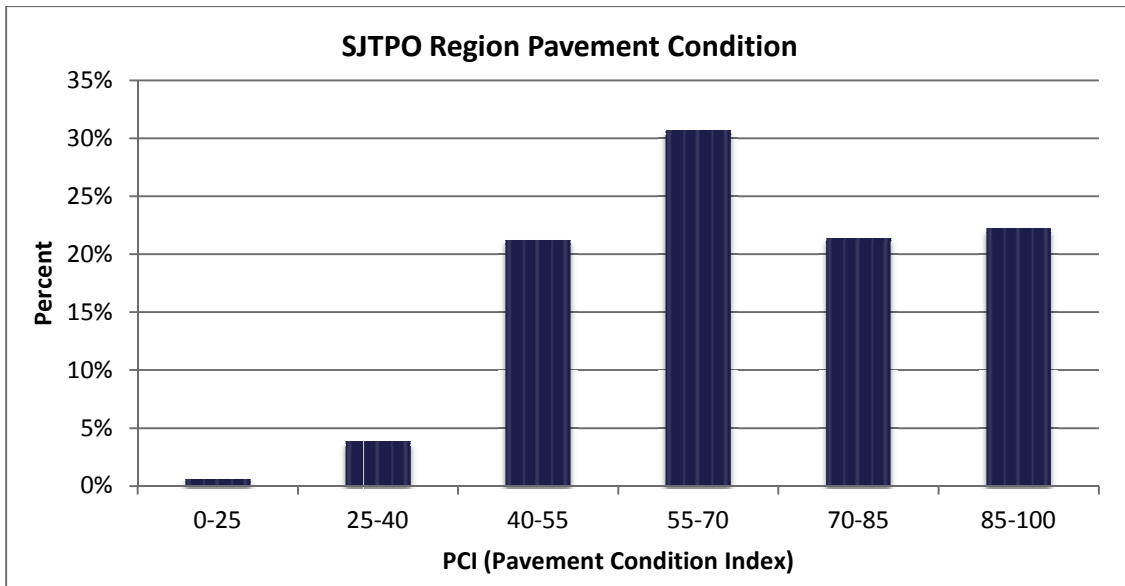
SJTPO Regional Pavement Condition Summary

The table below summarizes the condition of all county roads in the SJTPO planning area. Note that Vineland was omitted from the summary as it is a municipality, and no data was available for the other municipalities. Therefore, only the four counties were included for consistency.

Table 16. SJTPO Region Pavement Condition Summary.

PCI	Miles of pavement	Percent
0-25	9.2	0.6%
25-40	58	3.9%
40-55	319	21.2%
55-70	461.8	30.7%
70-85	321.8	21.4%
85-100	334.3	22.2%

Figure 14: SJTPO Region Pavement Condition.



Pavement Drainage

The following table presents certain locations on NJDOT maintained roads in the SJTPO region. These locations were ranked relative to the severity of their drainage issues by NJDOT's Drainage Management System (DMS). This System is maintained by the Drainage Management Group. The Group incorporates the roadways' length, frequency of flooding or icing incidents, and Average Annual Daily Traffic (AADT) as part of the ranking process. The Drainage Management Group is part of the NJDOT Pavement Management Unit.

The NJDOT Pavement Management Unit develops, maintains, and operates the Pavement Management System. The functions and activities of this unit include: collecting, processing, and storing pavement condition data for the NJDOT maintained roadway system.

The Unit analyzes and assesses the pavement conditions, and provides pavement-related reporting.

Table 17. Roads in the SJTPO region maintained by NJDOT.

DMS Year	Flooding/Icing	Rank Flooding/Icing	State Route	MP From	MP To	Flood/Icing Incidents	AADT	Year Added
2012	flooding	13	40	59.60	63.80	124	32,340	2007
2012	flooding	37	47	0.50	3.20	86	24,425	2007
2012	flooding	54	30	51.60	52.04	26	58,146	Old DMS
2012	flooding	68	322	48.90	49.00	62	20,281	2008
2012	flooding	100	30	41.00	41.51	38	20,536	Old DMS
2012	flooding	110	30	54.09	54.10	12	58,146	2009
2012	flooding	116	147	3.20	4.00	49	13,409	2007
2012	flooding	129	30	52.70	53.00	10	58,146	2009
2012	flooding	133	9	8.31	8.85	43	13,057	Old DMS
2012	flooding	138	30	52.25	52.40	9	58,146	2010
2012	flooding	155	322	49.75	50.13	10	37,564	2009
2012	flooding	167	47	8.30	9.00	29	11,051	2009
2012	flooding	214	47	41.52	41.53	4	32,451	2009
2012	flooding	215	30	47.93	48.00	6	21,417	2009
2012	flooding	216	40	46.97	47.00	5	25,532	2009
2012	flooding	229	49	2.29	2.43	4	15,005	2009
2012	icing	114	322	46.00	46.00	6	11,958	2012
2012	icing	120	322	49.00	49.00	5	11,992	2012
2012	icing	124	130	3.40	3.40	8	5,778	2012
2012	icing	131	54	10.80	10.80	5	5,379	2012

Congestion Management Process

This section summarizes the Locations of Interest that were generated by the SJTPO Congestion Management Process in 2012. Strategic locations for CMP analysis were selected based on extensive qualitative input from local sources. Once these locations were identified, two quantitative measures were constructed: the volume to capacity ratio and a safety performance ratio. The volume (count) and crash data were taken from recent years. The strategic locations were also scored for spatial characteristics. These characteristics were indicators of the location's impact on several key congested-related issues (public transit, evacuation, etc.) This information was summarized using a weighting technique, which allowed SJTPO to produce a prioritized list of the Locations of Interest. This prioritized list will be a resource for the SJTPO project selection process.

Table 18. SJTPO CMP Locations of Interest (Based on SJTPO 2011 Count and Crash Data, and Select Spatial Characteristics of Location). Source: SJTPO, Congestion Management Process, June 2012.

Route Number	Begin Mile Post	End Mile Post	Score
US 40	52.260	53.850	148.4
NJ 47	46.800	47.050	140.0
NJ 77	1.682	1.900	139.3
US 130	3.000	3.100	138.2
NJ 50	19.840	20.910	135.8
NJ 47	42.000	42.500	135.5
US 40	57.100	57.280	132.6
NJ 47	42.900	44.200	130.0
US 40	46.600	46.970	129.7
US 322	49.300	50.200	129.7
US 9	12.400	13.000	128.8
NJ 77	3.610	3.900	127.9
US 130	3.400	3.650	126.2
US 40	48.900	49.610	121.3
NJ 47	4.900	5.000	119.0
NJ 47	41.300	41.920	118.1
US 9	12.000	12.200	116.1
C MAY CR 623 Roosevelt Blvd.	1.610	2.090	110.4
US 9	8.000	9.600	109.9
NJ 45	9.900	10.140	108.1
AT CR 651 Fire Road	8.060	8.460	Local Input