



Implementing a Pavement Management System PASER Based – City of Omaha, NE



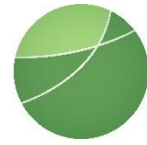
Introductions



JESS HASTINGS, PE
Project Manager
10 Years of Experience



TIM O'BRYAN, PE
Senior Project Manager
30 Years of Experience



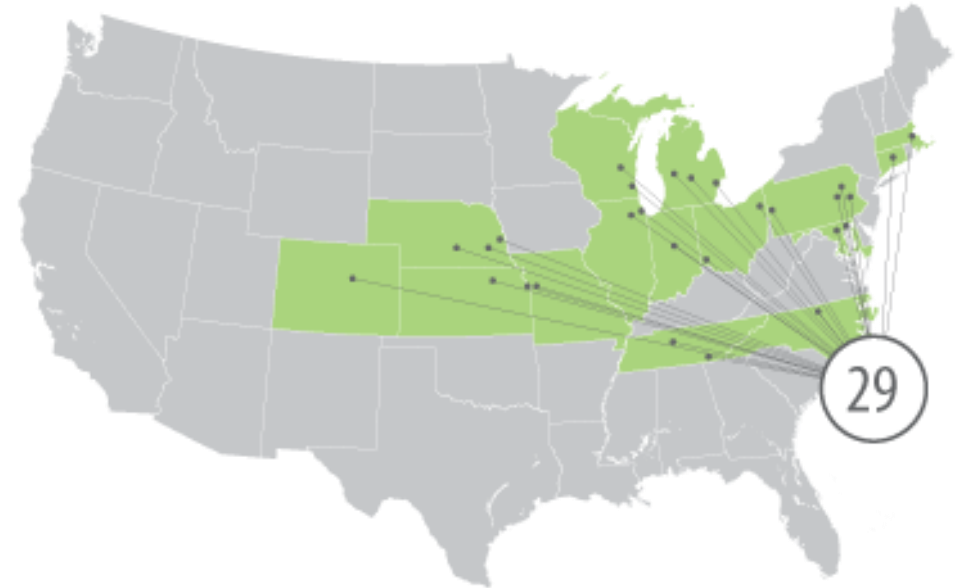
Introduction

Full-Service Consulting Firm

- Transportation Focus
- Value Engineering and Planning Background
- Asset Management

Pavement Management Experience

- Cities, Counties, DOT's and Airports
- PCI Evaluations
- PASER Evaluations



- 29 Offices in 16 States
- +600 Professionals



City of Omaha Case Study

City of Omaha Pavement Management Background

- **No Formal Process**
- **Lack of Documentation**
- **“Worst First” and Complaint Driven Approach**
- **Re-active not Pro-active (No concrete maintenance)**
- **Lane Miles Increase – Budget Stagnate/Decrease**



What do we do????

Develop a Formal Pavement Management System



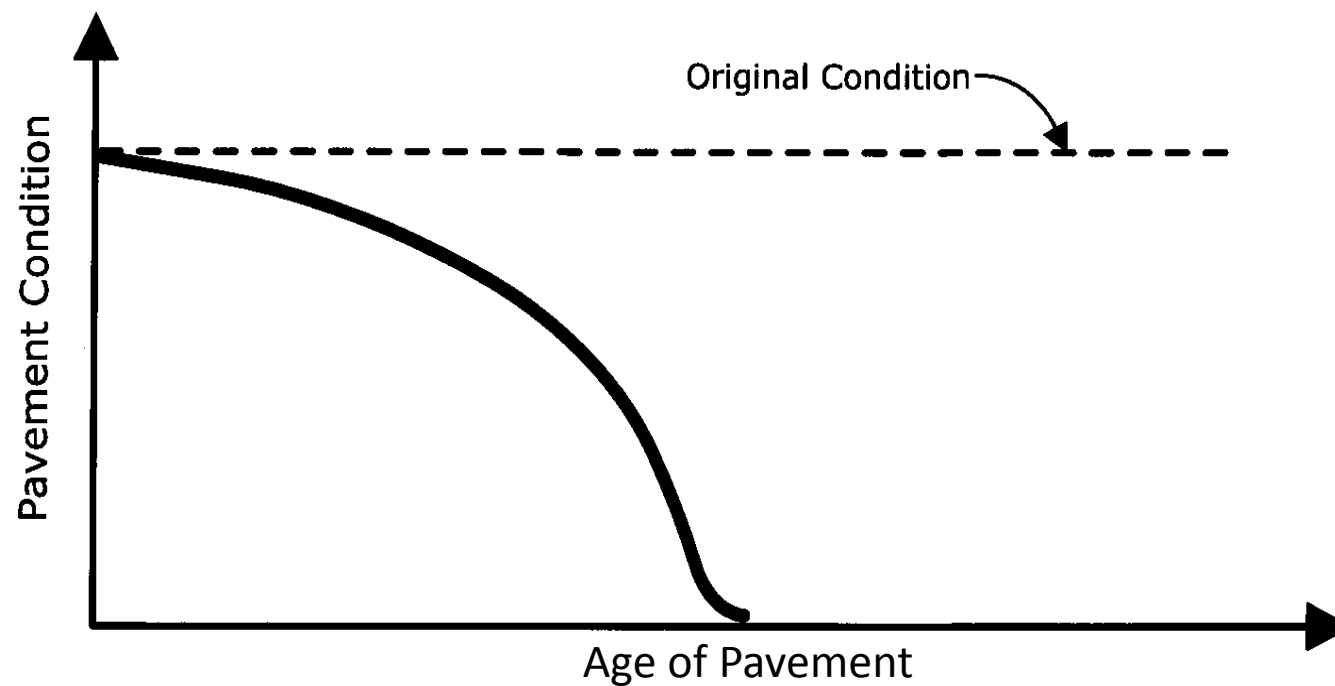
Why Pavement Management?

- Save maintenance and reconstruction costs
- Provides systematic method of maintaining network
- Increase longevity of pavement
- Assists with prioritization of maintenance and repair work
- Integrates scheduling and different department efforts
- Assist decision-makers with budgets
- Improve effectiveness of resources spent on network



Why Pavement Management?

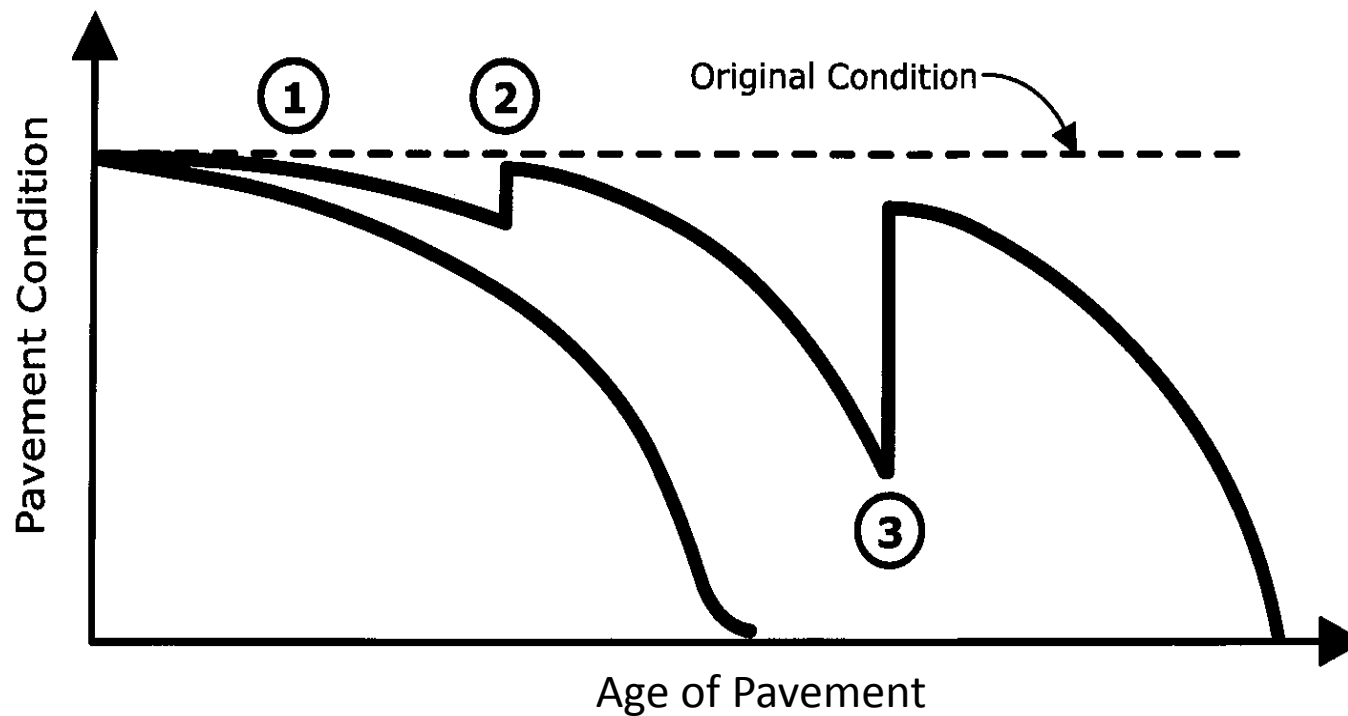
- Pavement does not deteriorate in a linear fashion





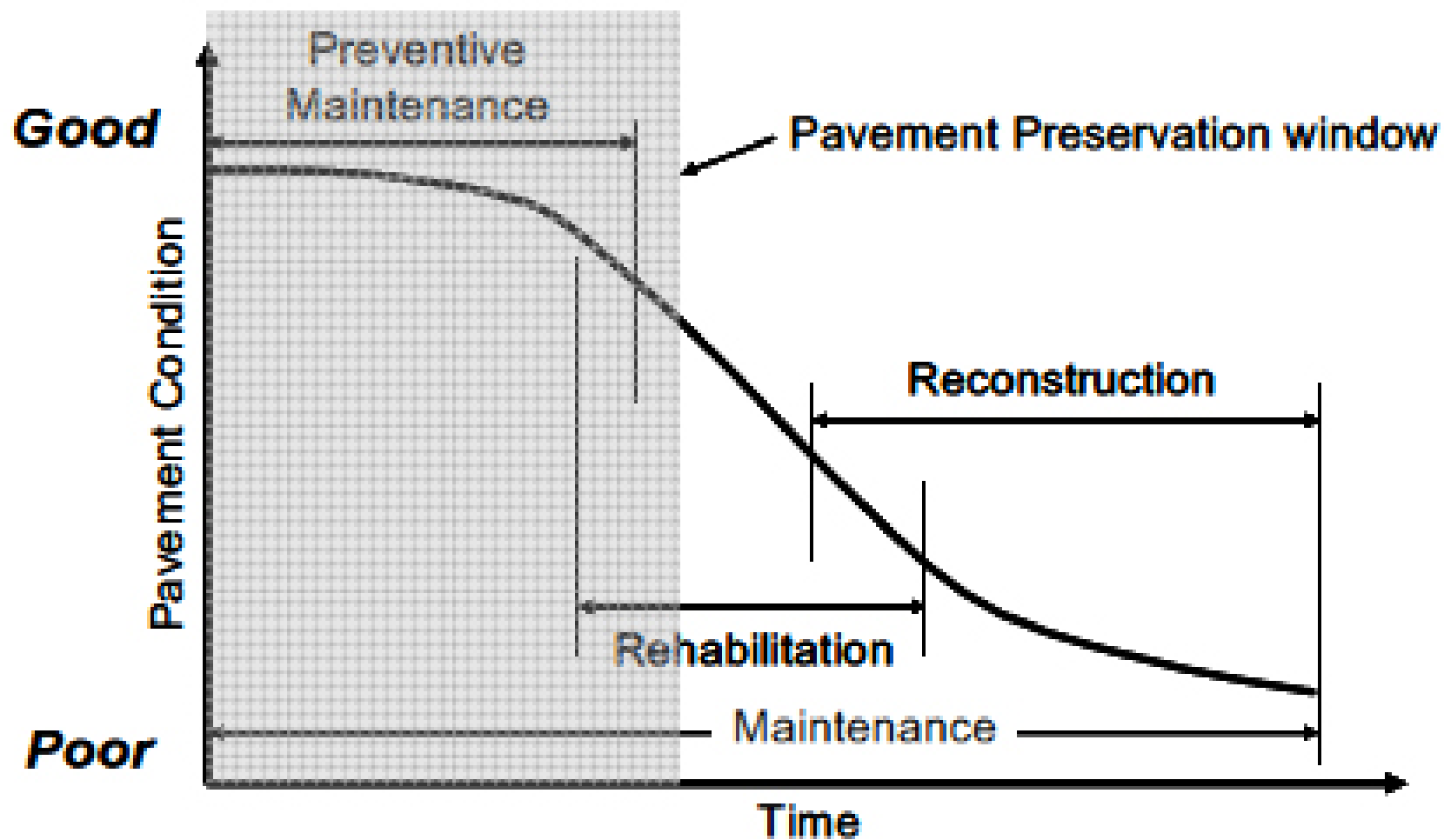
Why Pavement Management?

- Increase Pavement Longevity with Routine Maintenance





Why Pavement Management?





Step 1 – Define Network

City of Omaha, Nebraska

- Approximately 4,600 lane miles of roadway

Roadway Classification	Lane miles
• Major and Minor Arterials ----	1175
• Collector Streets -----	351
• Local Roadways -----	3008
• Park and Frontage Roads-----	62
Roadway Surface	Lane miles
• Asphalt -----	1788
• Concrete -----	2598
• Brick -----	60
• Unimproved -----	150



Step 2 – Establish a Standard Rating System

Internal Assessment

- Integrate Existing Data
- Review historical resurfacing cycles
- Develop Program Objectives

Objectives

- Consistent and Comprehensive Process
- Functional and Easy to Maintain
- Ability to Coordinate with other Divisions
- Tool to Educate Decision Makers
- Cost effective



Step 2 – Establish a Standard Rating System

Many Different Choices

- Very Simple >>>>> Extremely Complex

Items Considered

- Subjectivity
- Amount of Measurements
- Specific Distresses and Locations
- Ability to Utilize Empirical Software
- Modelling and Projecting
- Simplicity for Non-Technical Personnel to Understand

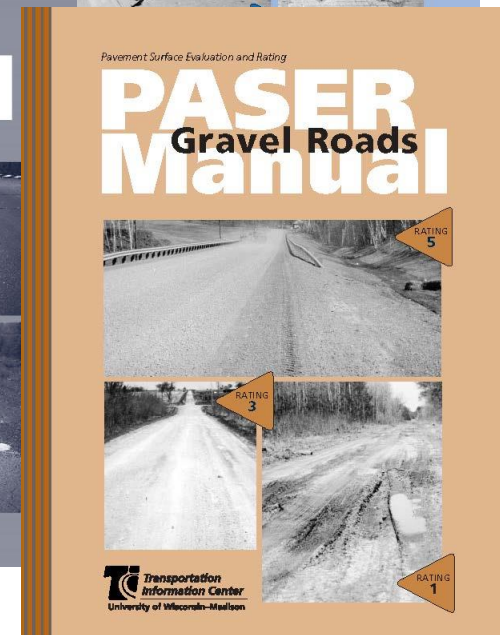
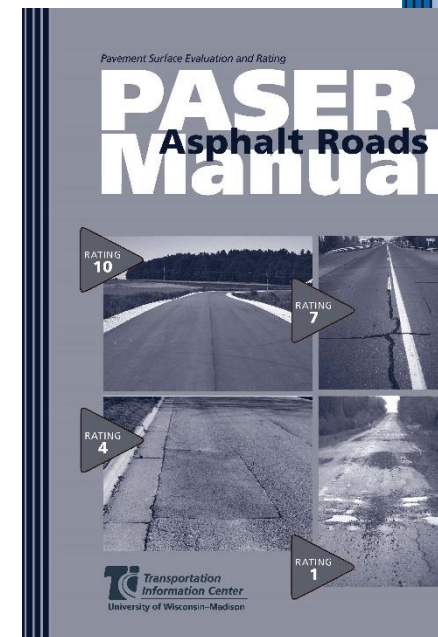
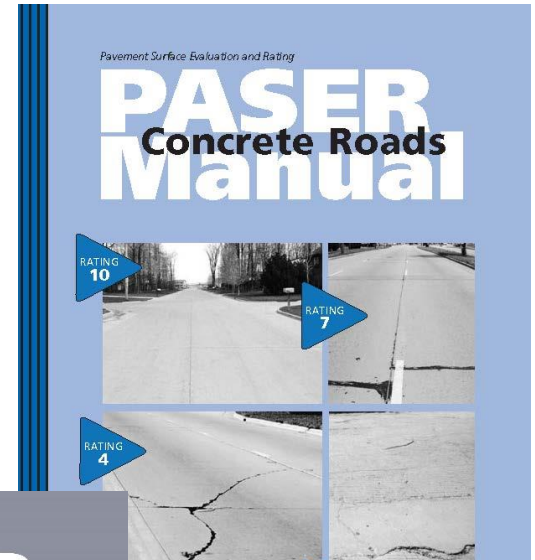


Step 2 – Establish a Standard Rating System

PAvement Surface Evaluation and Rating (PASER)

- Developed by the University of Wisconsin
- Visual Inspections with Rating System
- Easy and cost effective to implement
- Correlates rating to maintenance activity

*The Michigan Transportation Asset Management Council selected PASER as the statewide standard





PASER Rating System

PASER Rating System for Paved Roadways (Asphalt or Concrete)

<u>Rating</u>	<u>Condition</u>	<u>Needed Maintenance or Repair</u>
1	FAILED	Needs total reconstruction.
2	VERY POOR	Severe deterioration. Needs reconstruction with extensive base repair.
3	POOR	Needs major patching & structural overlay or complete recycling.
4	FAIR	Significant aging and first signs of need for strengthening. Would benefit from recycling or overlay.
5	FAIR	Surface aging, sound structural condition. Needs sealcoat or nonstructural overlay.
6	GOOD	Shows sign of aging. Sound structural condition. Could extend life with sealcoat.
7	GOOD	First signs of aging. Maintain with routine crack filling and minor patching.
8	VERY GOOD	Recent sealcoat or new road mix. Little or no maintenance required.
9	EXCELLENT	Recent construction or overlay, like new. No maintenance required.
10	EXCELLENT	New Construction. No maintenance required.



PASER Rating System

PASER Rating System for Asphalt Roadways

4 Major Categories for Asphalt Pavement Distress

- Surface Defects
 - Raveling, flushing, polishing
- Surface Deformation
 - Rutting, shoving, heaving
- Cracks
 - Transverse, reflective, alligator
- Patches and Potholes

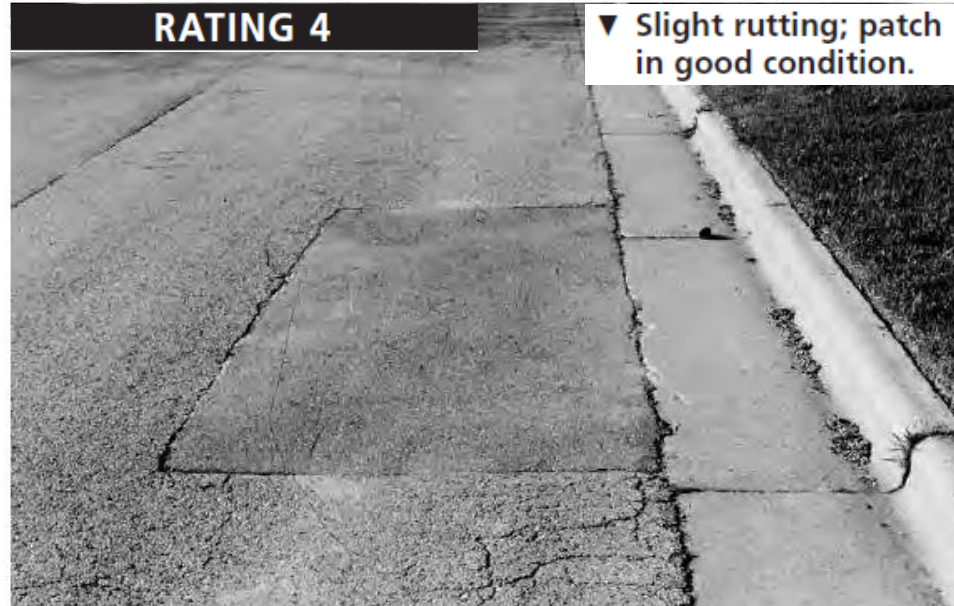
RATING 6

Large blocks, early signs of raveling and block cracking.



RATING 4

Slight rutting; patch in good condition.





PASER Rating System

PASER Rating System for Concrete Roadways

4 Major Categories for Concrete Pavement Distress

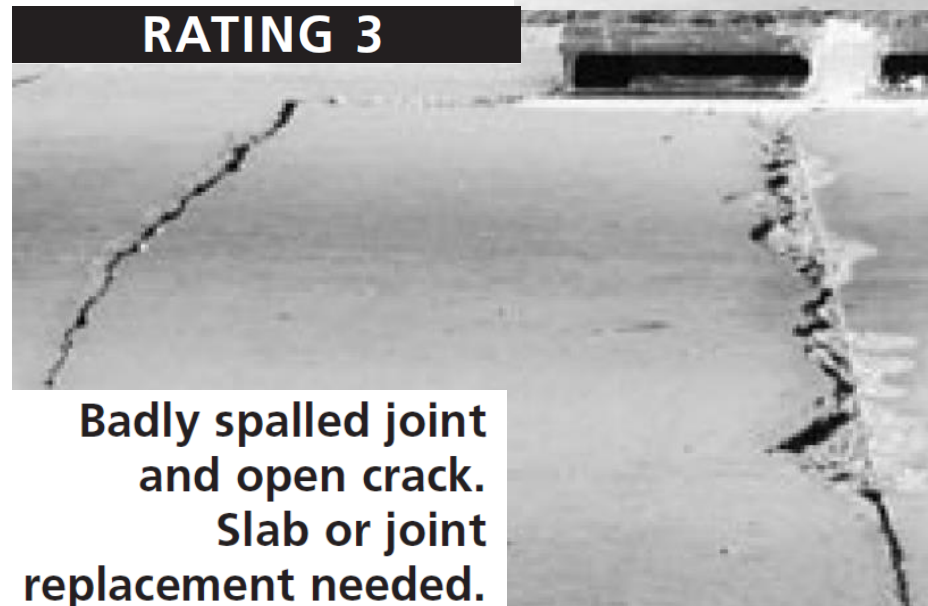
- Surface Defects
 - Spalling, polishing, map cracking, rebar
- Joints
 - Longitudinal and transvers
- Cracks
 - D-cracking, Corners, Random
- Deformation
 - Blow ups, faulting, heaves, patches, potholes, utilities

Isolated, tight meander crack. Several pop-outs. Remaining joints and cracks all tight and sound.

RATING 6

RATING 3

Badly spalled joint and open crack. Slab or joint replacement needed.





PASER Rating System

PASER Rating System for Unpaved Roadways (Gravel or Sealcoat)

<u>Rating</u>	<u>Condition</u>	<u>Needed Maintenance or Repair</u>
1	FAILED	Complete rebuilding required.
2	POOR	Needs addition of aggregate plus drainage maintenance.
3	FAIR	Needs routine regrading plus minor ditch maintenance.
4	GOOD	Good crown and drainage.
5	EXCELLENT	Excellent crown and drainage



PASER Rating System

PASER Rating System for Gravel Roadways

5 Major Categories for Gravel Road Evaluations

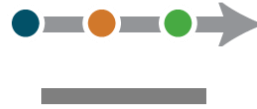
- Crown
- Drainage
 - Ditches and culverts
- Gravel Layer
 - Thickness and quality
- Surface Deformation
 - Washboarding, potholes, ruts
- Surface Defects
 - Dust and loose gravel

RATING 3

Good gravel and crown but ditch partially blocked. Needs cleaning or additional culvert.

RATING 2

Numerous potholes indicate additional gravel most likely required to restore crown. Needs extensive reworking. ▶



PASER Rating System

PASER Rating System for Brick and Unimproved Roadways

<u>Rating</u>	<u>Condition</u>	<u>Needed Maintenance or Repair</u>
1	POOR	Reconstruction needed.
2	FAIR	Significant grading required.
3	GOOD	Routine maintenance or spot grading helpful.
4	VERY GOOD	No improvement needed.



PASER Rating System

PASER Rating System for Brick Roadways

2 Major Categories for Brick Road Evaluations

- Defects
 - Gaps, breaks, joint erosion, settlement, patches
- Ride Quality

Extensive patching in poor condition.



Extensive repairs with asphalt and concrete.



RATING 1

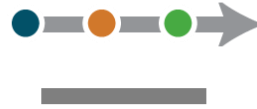
RATING 2



Step 3 – Establish Network Condition Baseline

- Integrate/Convert Existing Data to PASER Rating
- Establish Roadway Network Segments (To and From)
- Determined a Conversion Method by Comparisons & Assumptions

Conditions	Concrete Ride	Concrete Base	Concrete Patching	Concrete Cracking	Concrete Joints	Concrete Spalling
1	Excellent	No signs of any base failure	No patches	No cracks	All joint patterns are normal and sealed	No spalling
2	Can feel joints and areas of grade when driving	Little base failure; Possible blowup -fix w/ concrete repair	Little patching; utility cuts poured back with concrete	Shrinkage & random cracking (1-2 times/block)	Wide, unsealed joints; Not too late to seal; Joints in good shape	Slight spalling @ time of construction
3	Can feel several joints, cracks, and some base failure	Surface off grade, up to 2X per block	Little patching (low areas by inlets); Fix w/ conc. repair	Longitudinal cracks on 1 side (I.e. sewer trench) Max. 1/panel	Off grade joints w/ some spalling; Not too late to seal	Slight spalling Mostly salt damage
4	Very bad ride; Asphalt and concrete repairs felt	Several areas of base repair; Too late for repair?	Several asphalt patches, too late for concrete repair, good asphalt base	3-4 cracks per panel	Over 50% of joints patched, spalled and failed; Beyond sealing	Over 50% of area spalled
5	Next to impossible	Base is shot; Possible conc. removal and replacement before asphalt	Beyond conc. panel repair; 1/3 asphalt surface, possible R & R with concrete	Beyond concrete panel repair	All joints spalled and asphalt patched; all joints failed	Entire area spalled



Step 3 – Establish Network Condition Baseline

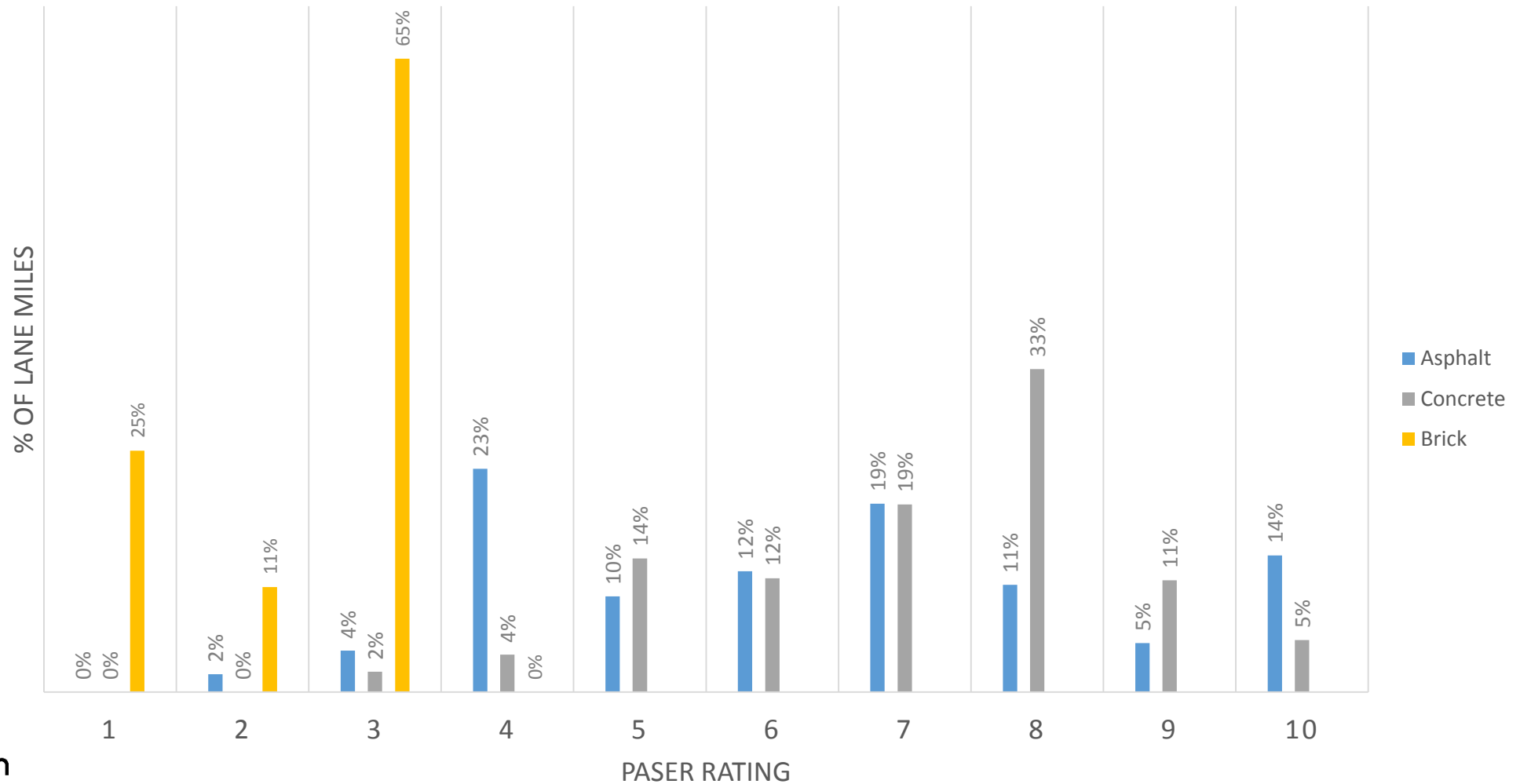
2012 PASER Ratings for Paved Roadways (Asphalt and Concrete)

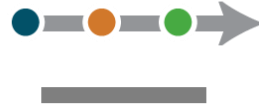
	Major Roadways		
Rating	Asphalt	Concrete	Recommended Maintenance Activity
1	0.0	0.0	No Maintenance
2	15.23	0.35	No Maintenance
3	35.47	17.10	Little or No Maintenance required
4	190.98	31.70	First signs of ageing, routine crack sealing
5	81.78	113.01	Crack seal or sealcoat
6	103.28	96.18	Sealcoat or thin non structural overlay(less than 2")
7	161.14	158.73	Asphalt Overlay
8	91.76	273.11	Requires patching and base repair with asphalt overlay
9	41.82	94.45	Needs reconstruction with extensive base repair
10	116.87	43.96	Total reconstruction
Total Lane Miles	838.33	828.59	
Average Rating	6.4	7.2	



Step 3 - Establish Network Condition Baseline

2012 MAJOR STREETS





Step 4 – Identify Condition Targets

- Overall Rating of 7 for Paved Major/Arterial Roadways
- Overall Rating of 6 for Paved Collector and Local Roadways
- Overall Rating between 2 and 3 for Gravel and Sealcoat Roadways
- Overall Rating of 3 for Brick and Unimproved Roadways

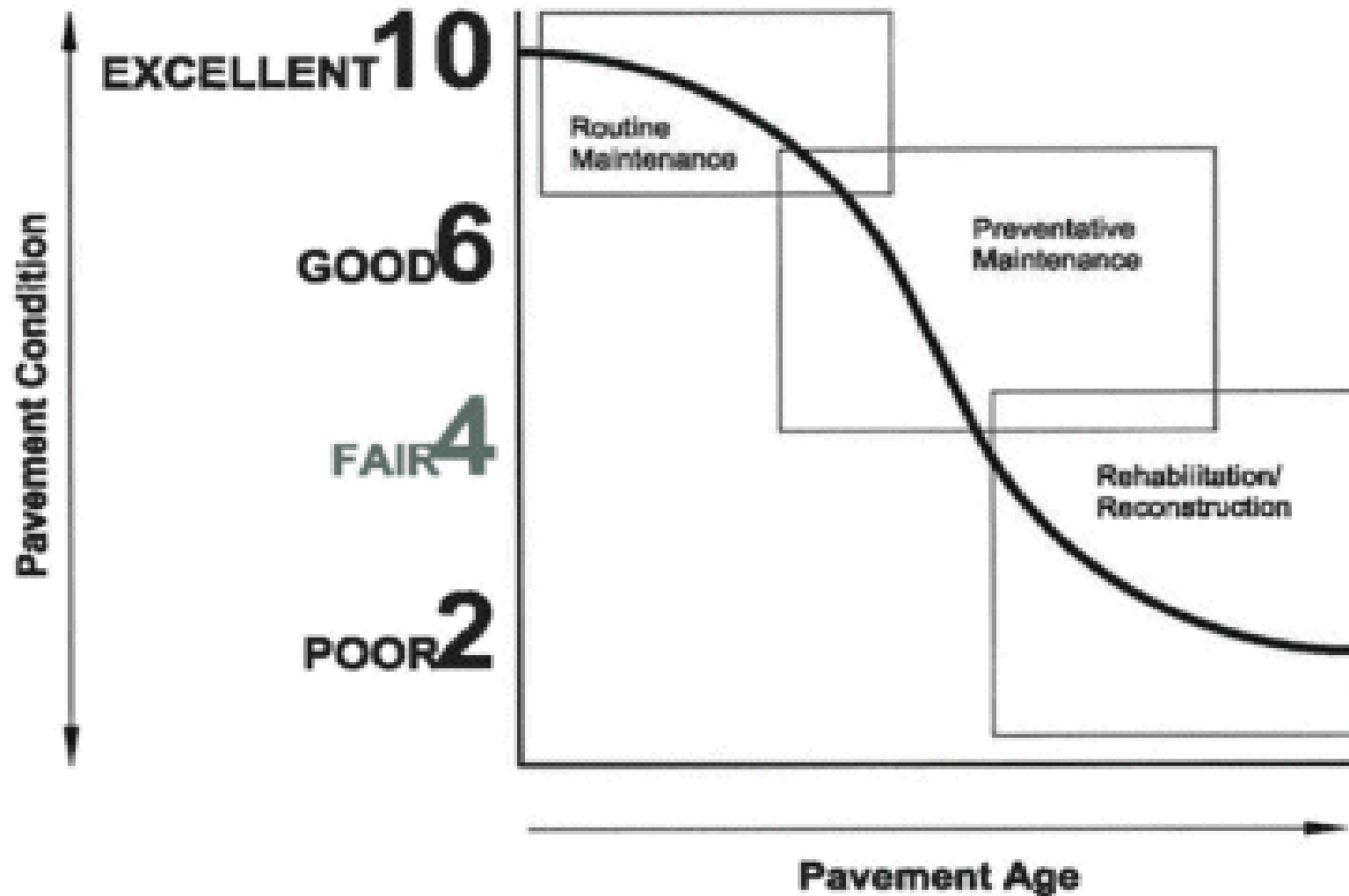


Step 5 – Identify Maintenance Practices

- Routine Maintenance
 - Pothole Patching ----- Street Maintenance
- Preventative Maintenance
 - Crack and Joint Sealing ----- Street Maintenance/Contractor
 - Surface Treatment----- Contractor
- Pavement Rehabilitation
 - Minor Rehabilitation (non-structural)
 - Street Resurfacing----- Contractor
 - Surface Restoration----- Contractor
 - Major Rehabilitation (structural)
 - Street Rehabilitation----- Contractor
 - Brick Street Repair----- Contractor



Step 5 – Identify Maintenance Practices





Step 5 – Identify Funding Needs

- Educate Decision-Makers & Elected Officials
 - Where we were at
 - Where we need to be
- Assess Annual Budget – What Does it Accomplish
- Determine Life Cycle Costs and Correlating Annual Budgets
- What's the Cost for Target Life Cycle / Condition Ratings?



Step 5 – Identify Funding Needs

- Residential Roadway Network
 - Asphalt – 1060 Lane Miles
 - Concrete – 1850 Lane Miles
- Assume 1 Lane Mile = 6 City Blocks
- Total Estimated Asphalt Pavement Blocks $6 \times 1060 = 6,360$ Blocks
- Total Estimated Concrete Pavement Blocks $6 \times 1850 = 11,100$ Blocks



Step 5 – Identify Funding Needs

Estimated Cost to Maintain One Asphalt Residential Block

- Assumes life expectancy of 16 years for asphalt roadways
- Cost includes resurfacing and maintaining (crack sealing)

Resurface One Block	\$10,725
Base Repair and Utility Adjustments	\$1,275
Install ADA Curb Ramps (4 corners)	\$12,000
<u>Crack Sealing (4 year, 8 year, 12 year)</u>	<u>\$8,820</u>
Estimated Cost to Maintain One Block	\$32,820



Step 5 – Identify Funding Needs

- 6,360 Blocks of Residential Asphalt Roadways
- For a 16 Year Life Cycle $6,630 \div 16 = 398$ Blocks/year
- Cost to maintain 398 Blocks/year X \$32,820 = \$13,045,950

Cost to Maintain at various Life Cycles

Life Cycle	24	22	20	18	16
Blocks per year	265	289	318	353	398
Cost to resurface	\$6,360,000	\$6,938,181.82	\$7,632,000	\$8,480,000	\$9,540,000
Crack Seal Year 4	\$779,100	\$849,927	\$934,920	\$1,038,800	\$1,168,650
Crack Seal Year 8	\$779,100	\$849,927	\$934,920	\$1,038,800	\$1,168,650
Crack Seal Year 12	\$779,100	\$849,927	\$934,920	\$1,038,800	\$1,168,650
Total Cost	\$8,697,300	\$9,487,964	\$10,436,760	\$11,596,400	\$13,045,950



Step 5 – Identify Funding Needs

Remember to Identify Funding by Departments and Programs!

- Previous example had potentially 3 different departments or programs and therefore different budgets or sources

		Department/Program
Resurface One Block	\$10,725	Streets
Base Repair and Utility Adjustments	\$1,275	Streets
Install ADA Curb Ramps (4 corners)	\$12,000	Sidewalk
Crack Sealing (4 year, 8 year, 12 year)	\$8,820	Maintenance



Step 6 – Implement Pavement Management Plan

- Have decision makers and/or elected officials understand current and target conditions of network
- Appropriate funds to different identified strategies
- Determine cycle for re-rating roadways
- Monitor and update roadway network ratings based on work performed and ratings
- Research and implement new strategies

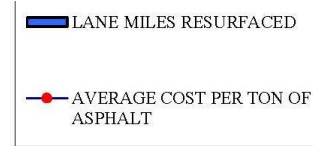
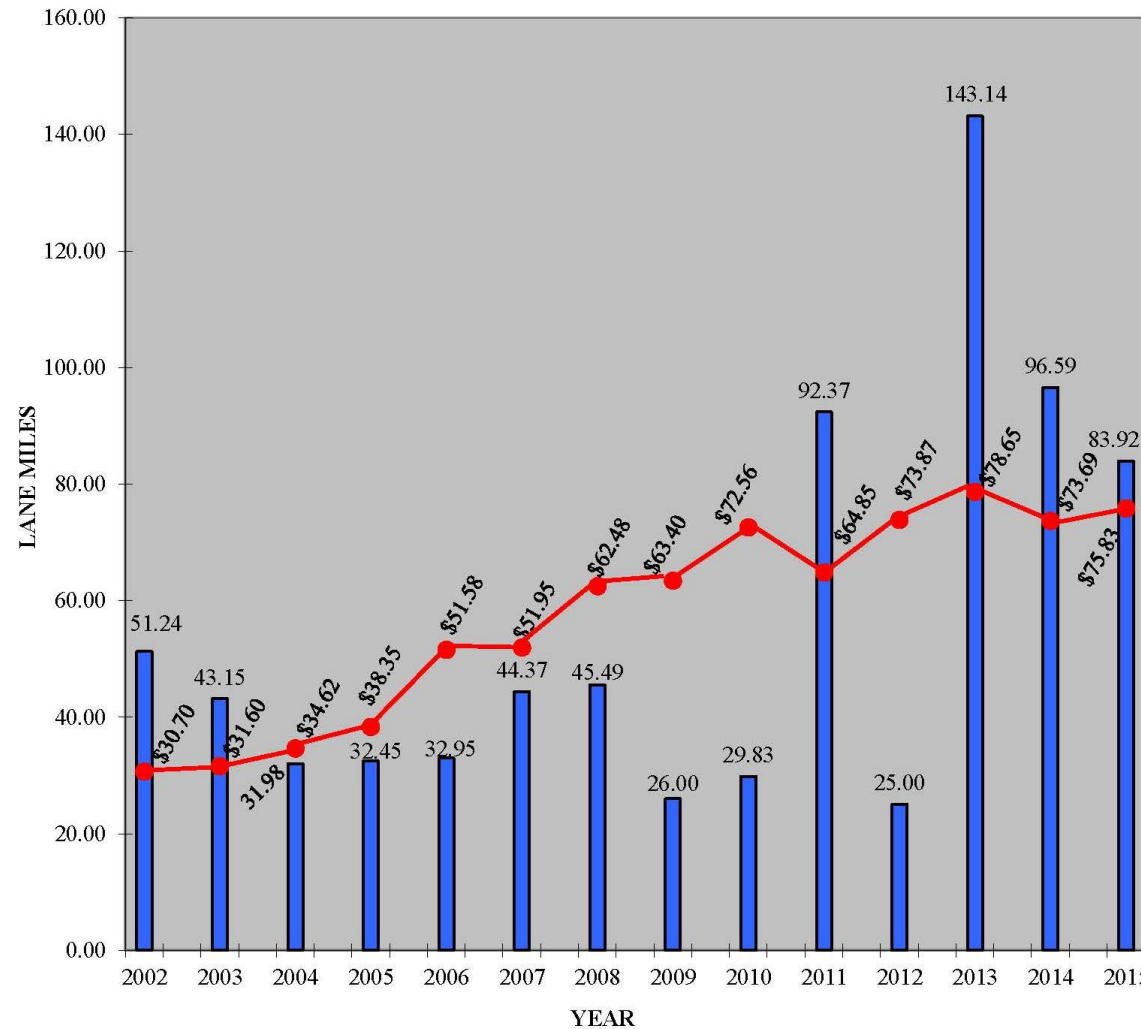


Results of City's Pavement Management System

- Increase of Streets Funding
- Increase of Funding Sources
 - State and Federally funded projects
- Established Documented System
- Increase in Overall Network Rating
- Acceleration of City's ADA Network
- Development of City's Asset Management Plan



MAJOR STREET RESURFACING PROGRAM



YEAR	EXPENDED
2002	2,400,000
2003	2,400,000
2004	2,400,000
2005	2,400,000
2006	3,000,000
2007	3,700,000
2008	4,300,000
Note: Appropriated Budget	3,300,000
2009	3,000,000
Note: Appropriated Budget	3,800,000
2010	3,203,962
Federal Stimulus	2,903,962
2011	7,629,471
Federal Funding 80/20	5,863,577
2012	2,800,000
Note: In addition to Street Resurfacing - 3.5 million in Concrete Panel Repair maintenance consisted of 22 separate street segments or 6.25 lane miles	
2013	13,514,007
Note: In addition to Street Resurfacing - 1.1 million in Concrete Panel Repair maintenance consisted of 5 separate street segments or 16.6 lane miles.	
2014	9,118,991
Note: In addition to Street Resurfacing - 2.5 million in Concrete Panel Repair maint. will address 2 street segments for a total of 31 lane miles.	
2015	8,200,000
Note: Includes West Center Road Resurfacing - NDOR/City funded - 1.6 million.	



Results of City's Pavement Management System

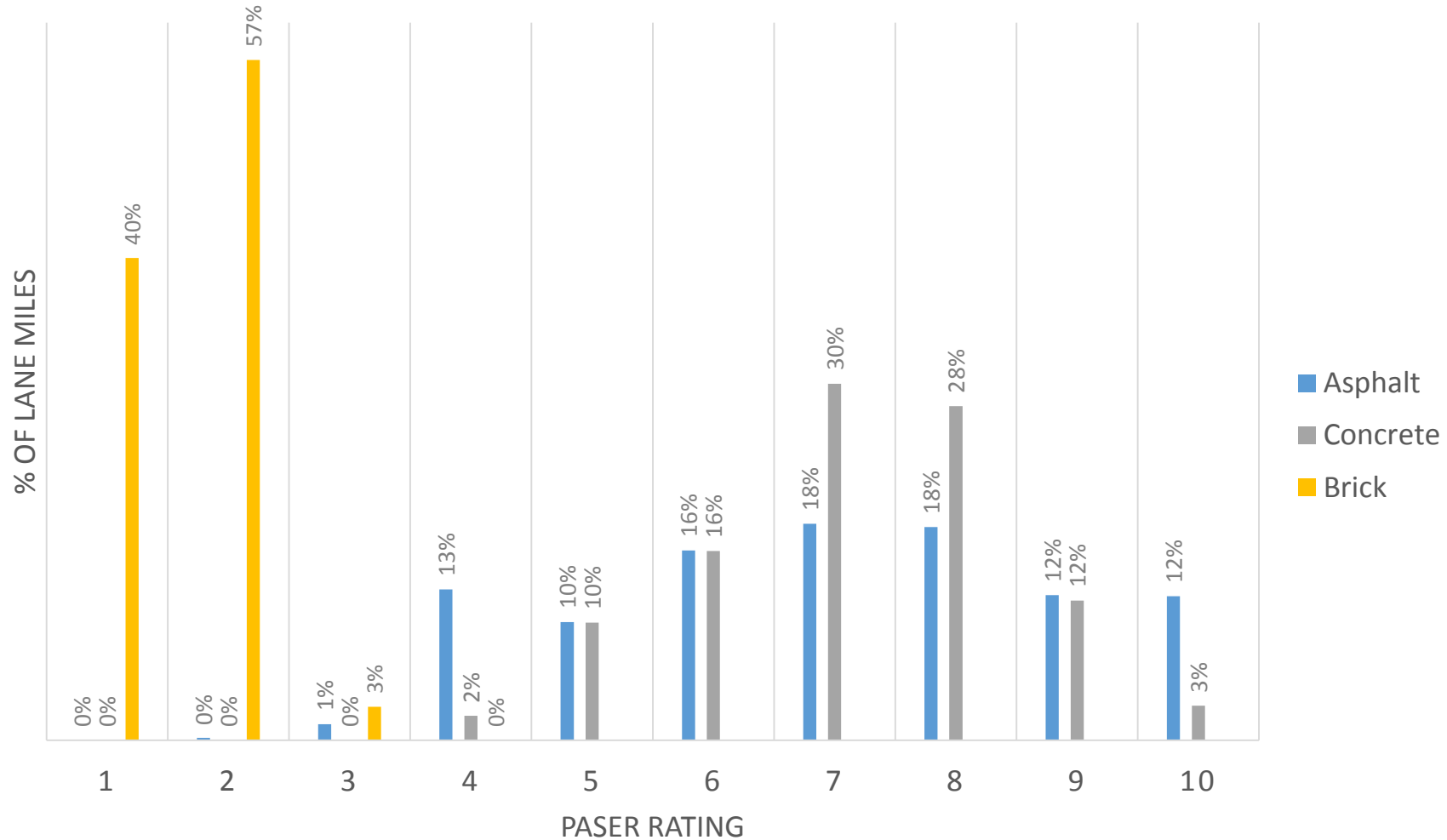
2015 PASER Ratings for Paved Roadways (Asphalt and Concrete)

Rating	2012 Major		2015 Major	
	Asphalt	Concrete	Asphalt	Concrete
1	0.0	0.0	0.0	0.0
2	15.23	0.35	1.8	0.0
3	35.47	17.10	12.59	0.0
4	190.98	31.70	117.81	19.26
5	81.78	113.01	92.26	92.77
6	103.28	96.18	148.14	149.20
7	161.14	158.73	169.02	281.04
8	91.76	273.11	166.51	263.55
9	41.82	94.45	113.2	110.11
10	116.87	43.96	112.35	27.17
Total Lane Miles	838.33	828.59	933.68	943.1
Average Rating	6.4	7.2	7.0	7.2



Results of City's Pavement Management System

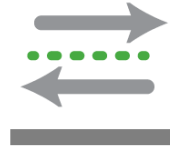
2015 MAJOR STREETS





Future Goals of City's Pavement Management System

- **Integrate Database into City's GIS System**
- **Add additional features**
 - **Curb and gutter**
 - **Shoulders**
 - **Median Surfacing**
 - **Guardrail**
- **Implement Alternative Pavement Preservation and Preventative Maintenance Methods**



Additional Information and Sources

- **MGPEC**
- **State and Local Agencies**
- **FHWA, NHI, NCHRP, AASHTO**
- **LTAP**

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Questions ?