TO: Thomas Frutchey, City Manager
           Dick McKinley, Public Works Director

FROM: Ditas Esperanza, Capital Projects Engineer

SUBJECT: Award contract to update the Pavement Condition Index of all City Streets

DATE: September 6, 2016

Needs: For the City Council to award the contract to update the Pavement Condition
           Index (PCI) of all City streets.

Facts: 1. The City owns approximately 150 miles of streets. Streets represent the
              City's primary financial investment.

           2. Pavement deteriorate over time, in two primary ways:

              a. Oxidizing effects of sun and water, and
              b. Fatigue from heavy wheel loads.

           3. Pavement deterioration is gradual for the first 5-8 years and then
              accelerates rapidly. If the appropriate maintenance is not rigorously
              undertaken, the eventual costs are significantly higher.

           4. Streets are typically rated based on its Pavement Condition Index (PCI). A
              brand new street is rated 100 and this number decreases over time as the
              street ages, as its remaining lifespan is reduced.

           5. Attached are photos of what a street looks like in relation to its Pavement
              Condition Index (PCI):

                  100-91 is considered excellent
                  90-71 is considered good
                  70-51 is considered fair
                  50-31 is considered poor
                  30-00 is considered failed

           6. In 2005, the City engaged the services of Pavement Engineering, Inc.
              (PEI), to establish a PCI for each of the City's road segment and
              summarized below:

	Area (SF)	Centerline Miles	Weighted PCI
Arterials	7,428,956	31.8	69.2
Collectors	3,638,702	18.8	55.4
Residentials	16,818,281	93.5	63.8
Alleys	461,178	4.3	48.6
	28,347,117	148.3	63.9

              As noted, the average PCI of the City's streets in 2005 was 63.5 or fair.
              The weighted average PCI is probably now in the 50s, or poor.

7. Typically, PCIs of all streets should be evaluated every five years, in order to update the maintenance schedule. Therefore, updating of the City's 2005 PCI is long overdue. A most current and updated evaluation of the City's streets is necessary to have a comprehensive and cost effective Pavement Repairs Management Program.

8. The City issued a Request for Proposal (RFP) to update the 2005 Pavement Management Plan. Five firms responded to the RFP.

Analysis &
Conclusion: City staff evaluated the five responses and concluded that the proposal submitted by Pavement Engineering, Inc. was the most complete, and met the City's needs and expectations. Below is a summary of the ratings (out of a total of 100 points):

> PEI ………………… 98
> Trans Map …………. 87
> IMS ……………….... 84
> Fugro ………………. 80
> Rick ………………... 73

Policy
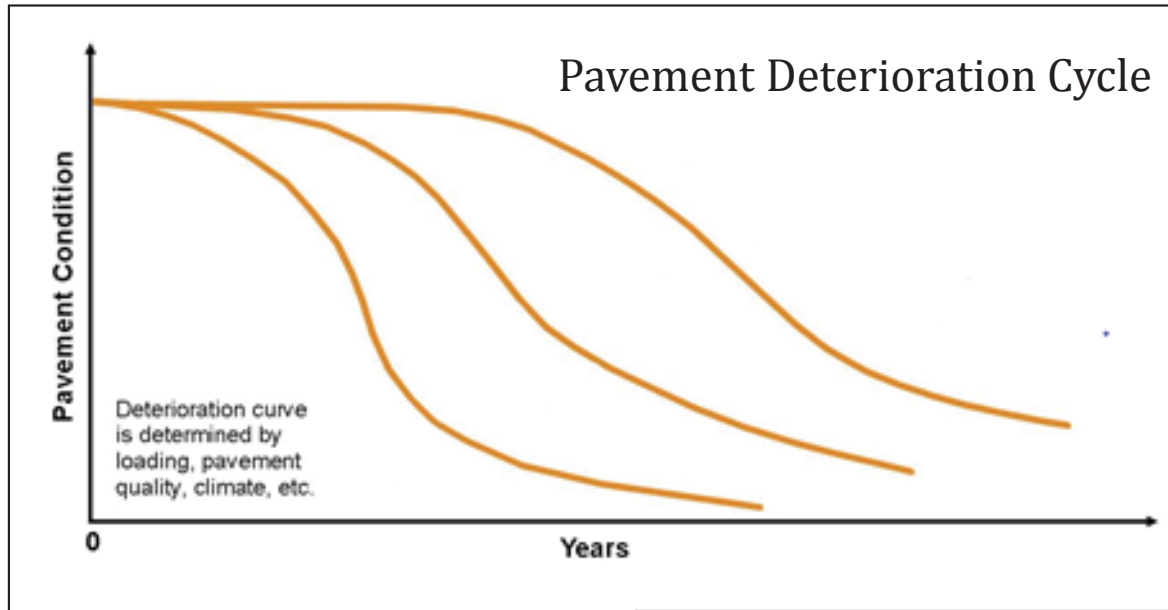Reference: City of Paso Robles General Plan, 2003

Fiscal
Impact: The City Council adopted a budget, in the amount of $50,000 to perform the PCI update. Pavement Engineering, Inc., cost proposal is $43,045. This is an appropriate use of General Fund monies, including Gas Tax or Supplemental Sales Tax funds, among others.

Options: A.   Direct the City Manager to enter into an agreement with Pavement Engineering, Inc. to update the City's Pavement Condition Index of all its streets for a not-to-exceed fee of $47,350 ($43,045 plus 10% contingency); and

                B.   Authorize the City Manager to approve minor changes in the agreement, consistent with Council policies, to the benefit of the City; or

                C.   Amend, modify, or reject the above options.

Attachments:
   1. Exhibits (20 pages)

Pavement Deterioration

Pavement Deterioration Cycle

Pavement Condition

Deterioration curve is determined by loading, pavement quality, climate, etc.

0   Years
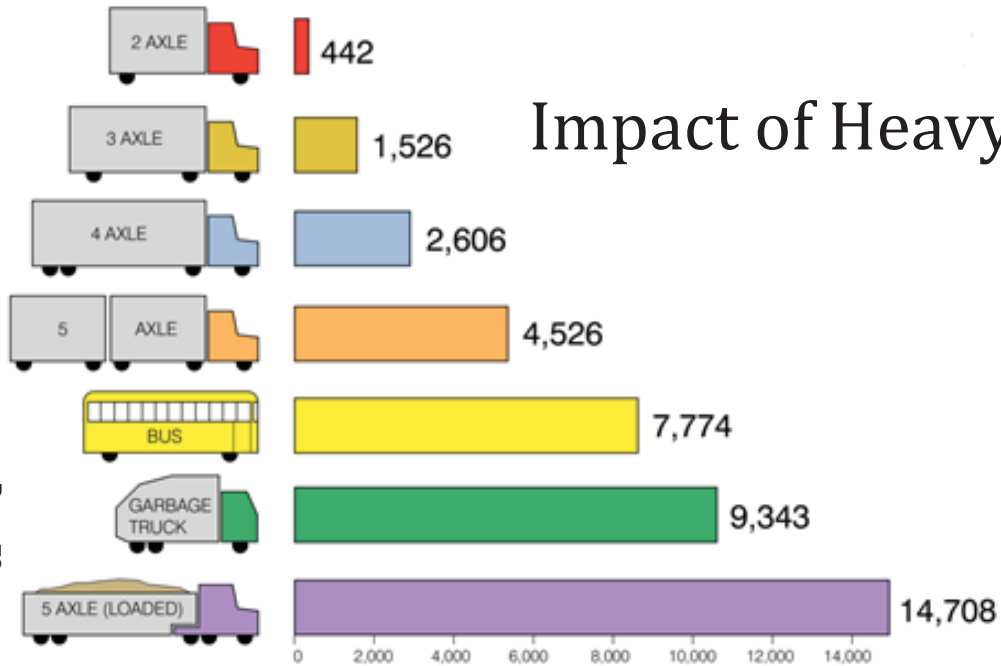

Pavement Deterioration
Asphalt concrete deteriorates in two ways:

Oxidizing effects of sun and water
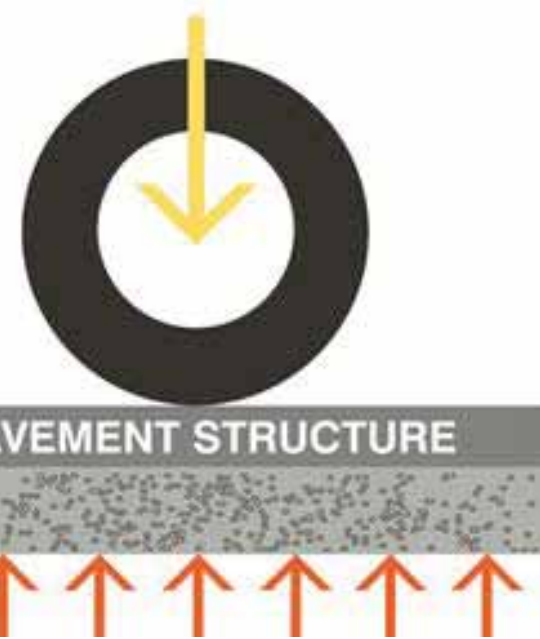
Fatigue from heavy wheel loads

PAVEMENT 101

Pavement Deterioration, cont'd

Impact of Heavy Loads

2 AXLE — 442
3 AXLE — 1,526
4 AXLE — 2,606
5 AXLE — 4,526
BUS — 7,774
GARBAGE TRUCK — 9,343
5 AXLE (LOADED) — 14,708

COMPARATIVE VEHICLE PAVEMENT STRESS
(S-10 BLAZER = 1 VEHICLE UNIT)

PAVEMENT STRUCTURE

Impact of Sun and Water

Pavement Deterioration, cont'd

Common Pavement Distresses

| Weathering or Raveling | Transverse or Longitudinal Cracking | Block Cracking | Alligator Cracking |

Pavement Evaluation

Evaluating Common Pavement Distresses

- Alligator cracking
- Block cracking
- Distortions
- Longitudinal / transverse cracking
- Patches
- Rutting / depressions
- Weathering / raveling

Pavement Condition Index

100 – 91 = Excellent
90 – 71 = Good
70 – 51 = Fair
50 – 31 = Poor
30 – 0   = Failed

Developed by the U. S. Army Corp of Engineers during World War II and standardized by ASTM, the PCI is an objective and rational basis for determining pavement condition and establishing maintenance priorities.

PAVEMENT 101

Pavement Condition Index Examples

PCI = 100
Excellent 100-91

PCI = 85
Good 90-71

5

Pavement Condition Index Examples

PCI = 70

Fair 70-51

PCI = 60

Fair 70-51

6

Pavement Condition Index Examples

PCI = 51
Fair 70-51

PCI = 38
Poor 50-31

PAVEMENT 101

Pavement Condition Index Examples
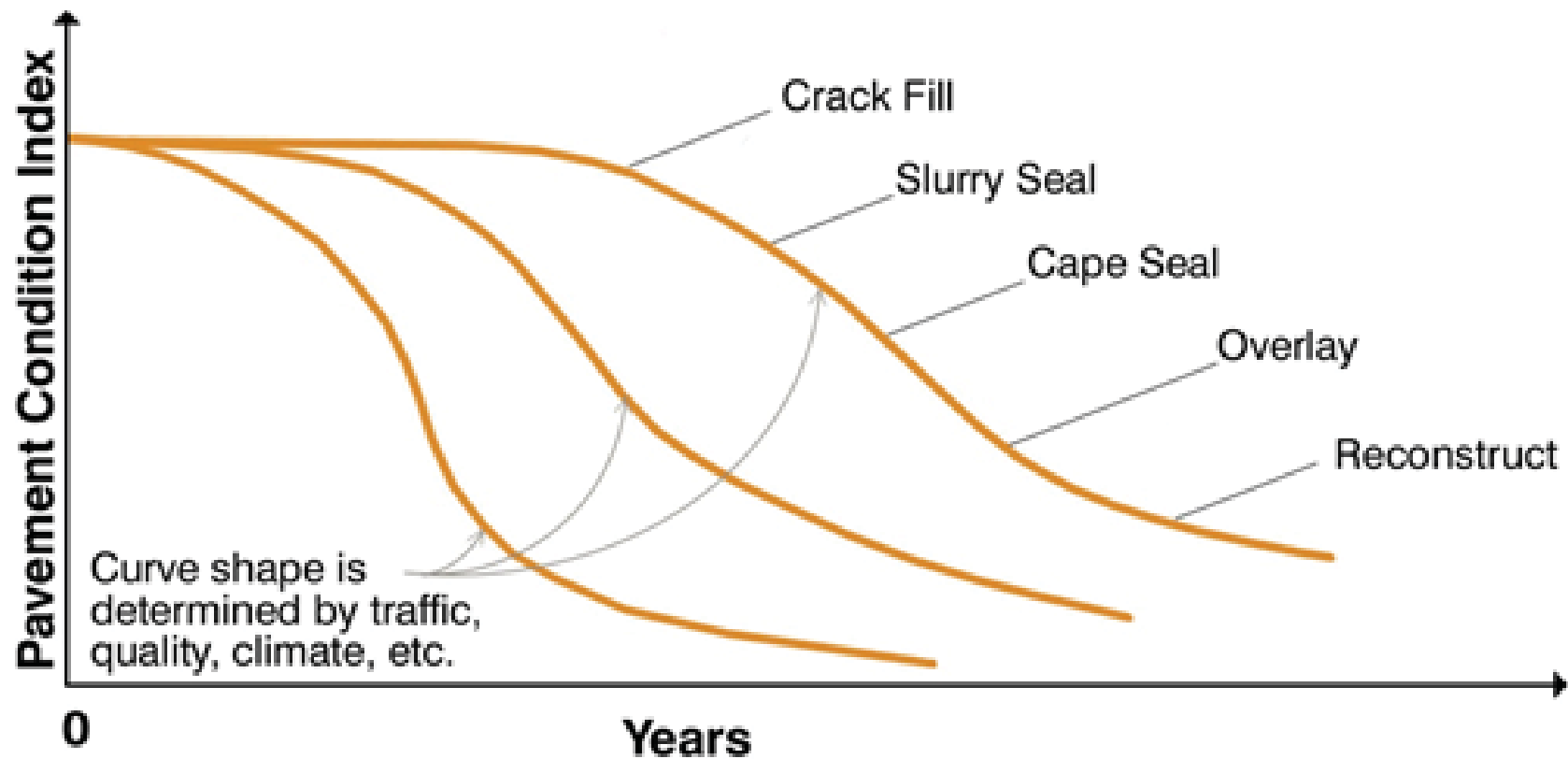

PCI = 28
Failed 30-0

PCI = ?
Enough said

8

Pavement Preservation

Applying the **RIGHT TREATMENT**

to the **RIGHT PAVEMENT**

at the **RIGHT TIME**

using the **RIGHT MATERIALS**

PAVEMENT PRESERVATION

Pavement Preservation Timing

It makes more sense to spend maintenance money on a "decent road" to extend that road's useful life while other more deteriorated roads are left alone.

Pavement Maintenance Treatment

Crack Sealing Treatment

- The right treatment for block or transverse cracking
- Inexpensive
- Prevents water from seeping beneath the asphalt to the subgrade where structural damage occurs

Slurry Seal Treatment

- The right treatment for raveled pavement in traffic areas with speed limits above 15 mph
- Skid resistant
- Fills in minor cracks, creates a uniform finish & provides a weather- and water-tight surface

Pavement Maintenance Treatment


Digout & Patching Treatment

- The right treatment to prevent damage to the subgrade
- Requires precise excavating of damaged areas that are then filled with a new asphalt mix
- Applied on a localized basis

Cape Seal Treatment

- Combines a chip (aggregate) layer followed within a few weeks by a slurry seal for durability
- Prevents water damage to the road bed and provides a new wear surface
- Significantly extends pavement life when combined with crack sealing & surface patching

12

PAVEMENT PRESERVATION

Pavement Maintenance Treatment
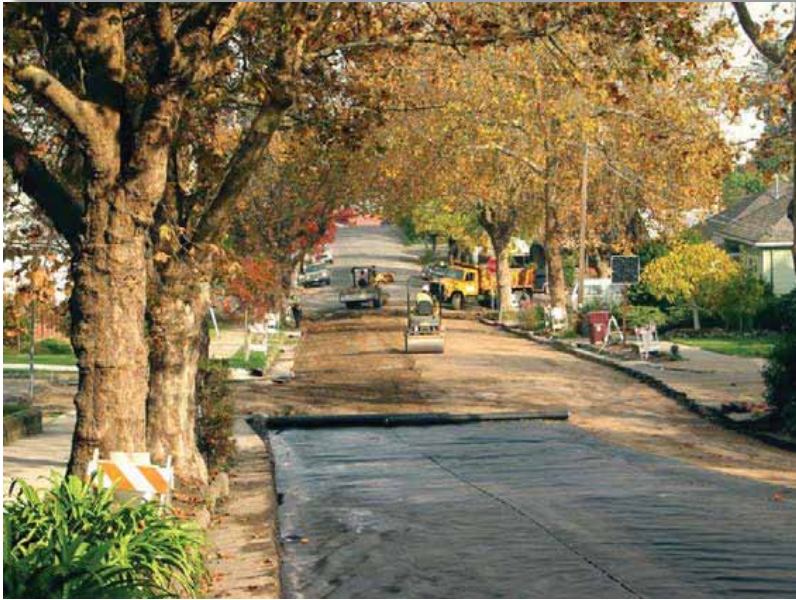

Page 83
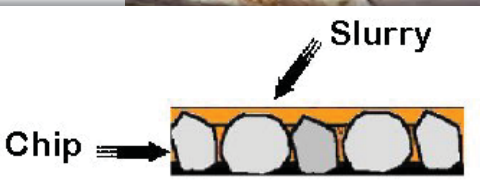
Overlay Treatment

- The right treatment for severely deteriorated pavement
- Overlays existing pavement with a new layer of bituminous asphalt
- Thickness depends on existing   pavement condition and traffic
- Strengthens overall pavement structure and improves ride

Mill & Fill Treatment

- Removes existing asphalt to a predetermined depth and replaces with new HMA.
- Extends the life of existing roads.
- Creates a smooth ride by eliminating the effects of tire ruts and any asphalt movement that may occur.

Pavement Maintenance Treatment

Reconstruction

- Required when paved has failed or become functionally obsolete
- Removes and replaces existing pavement structure
- Uses either new or recycled paving materials or a combination of both

Reconstruction Pulverization

- Grinds the existing asphalt surface and mixes it with the aggregate base
- Strengthens the existing base and forms a stronger foundation for reconstruction
- Improves drainage
- Eliminates bumps, humps and rutting

PAVEMENT PRESERVATION

Pavement Preservation Goals

- Good inspections

- Good design

- Good management

Good Pavement Inspections

- **Avoid guesswork** based solely on visual appearance or surface condition, which can be misleading.

- **Provide a complete picture** of the existing pavement and its in-place strength.

- **Determine pavement structure**, underlying soils, why pavement fails and how it will perform with various maintenance or rehabilitation treatments.

- **Employ recognized test methods** such as CTM and ASTM

- Accurately monitors asphalt concrete mixes to ensure mix designs meet specifications and to measure in-place HMA (Hot Mix Asphalt) density during the laydown phase to ensure sufficient compaction.

- Mix quality and compaction quality are essential to long-lasting pavements.

PAVEMENT INSPECTIONS

Good Pavement Design

- **Requires knowledge of entire pavement structure**: layer thicknesses, cracking influences, soil characteristics and structural support values of the existing pavement

- **Determines constraints** based on structural support

- **Considers "constructability"** of prospective treatments

- **Develops options** for increasing pavement service life

- **Eliminates guesswork** that results in cost overruns during construction

Good Pavement Management

- **Best-First "Top Down" Management:**
  focuses maintenance and rehabilitation on the best streets in the system.
  - Interim procedure

- **Worst-First "Bottom Up" Management:**
  focuses maintenance and rehabilitation on the worst streets in the system.
  - Interim procedure

- **Critical-Point Management:**
  focuses maintenance and rehabilitation on streets above rather than below a critical PCI.
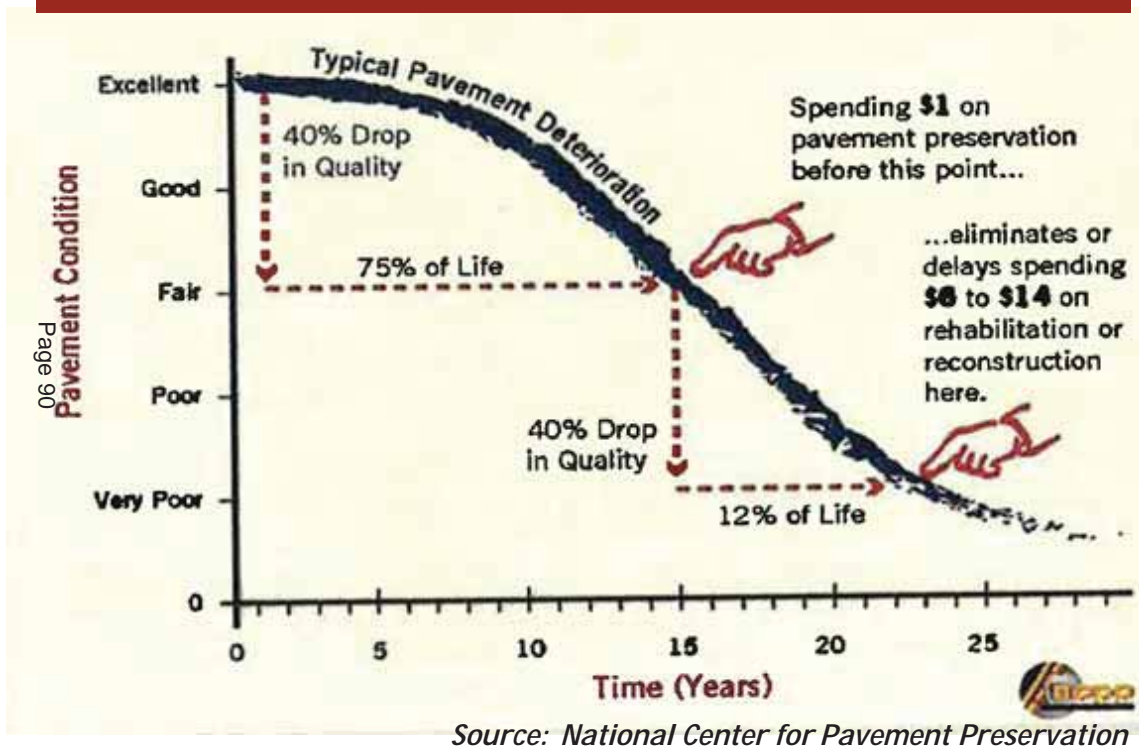 - Most economical in the long run

Good Pavement Management

Pavement Condition vs.
Maintenance / Rehabilitation Cost
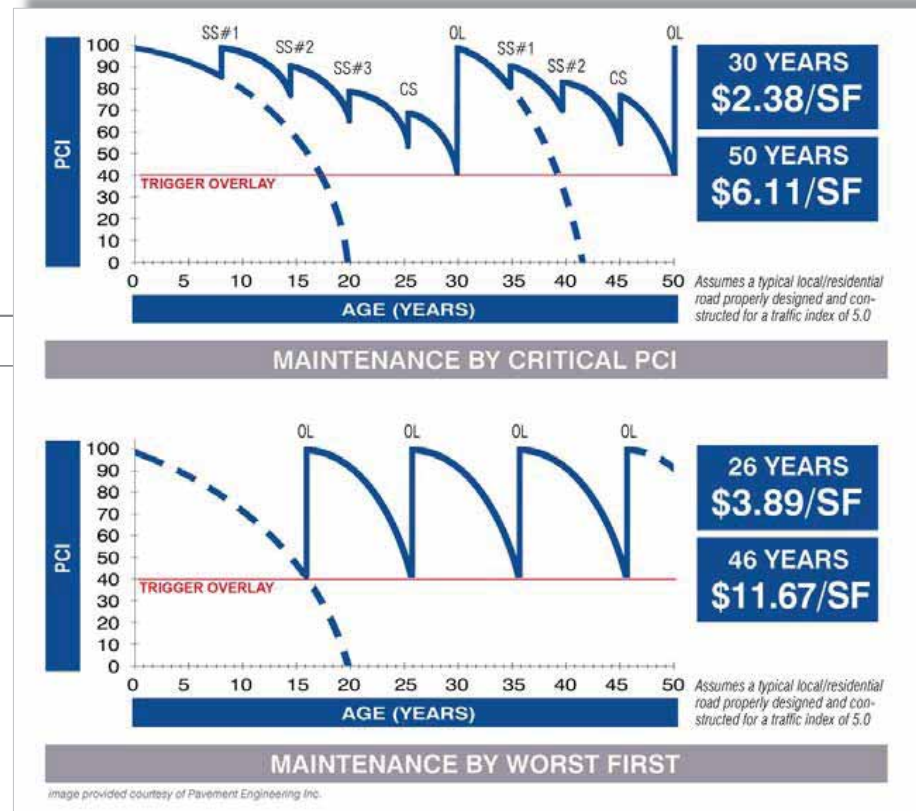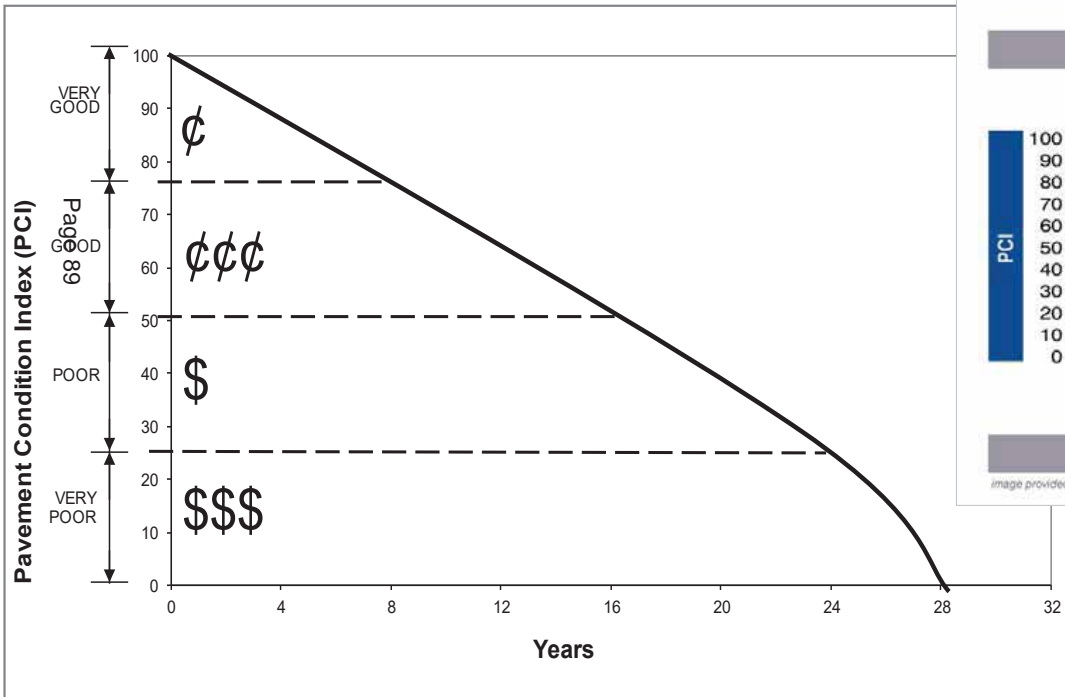
Critical Pavement Management

PAVEMENT MANAGEMENT

Good Pavement Management

PAVEMENT PRESERVATION IS COST EFFECTIVE

Typical Pavement Deterioration

Excellent

40% Drop in Quality

Good

Spending $1 on pavement preservation before this point...

75% of Life

Fair

...eliminates or delays spending $6 to $14 on rehabilitation or reconstruction here.

Poor

40% Drop in Quality

Very Poor

12% of Life

Pavement Condition

Page 90

0

0   5   10   15   20   25

Time (Years)

Source: National Center for Pavement Preservation

This table shows that for every $1 spent early on pavement preservation, the need to spend $6 to $14 on future repair or replacement can be avoided.

With the Pavement Preservation Graph in mind, in 2006 City Council adopted the following policies in a **Pavement Management Program**:

- Repair streets to maintain an average PCI of 80 or greater.

- Use the annual street maintenance budget for preventive maintenance and the remainder for heavy maintenance or reconstruction.