CITY COUNCIL WORK SESSION REPORT

DATE: **March 21, 2017**

AGENDA ITEM: Work Session Item #2.

SUBJECT: Pavement Condition Update and Next Steps

PRESENTED BY: James L. Becklenberg, City Manager
Dawn Anderson, City Engineer
Bill Welborn, Project Engineer

DESCRIPTION:
The purpose of the work session is for the City Council to receive an update on the City's efforts to maintain existing streets, otherwise known as the pavement management program. The City Council last received a similar report in February of 2016. Staff is seeking direction on next steps regarding goals for pavement condition and the path for achieving them.

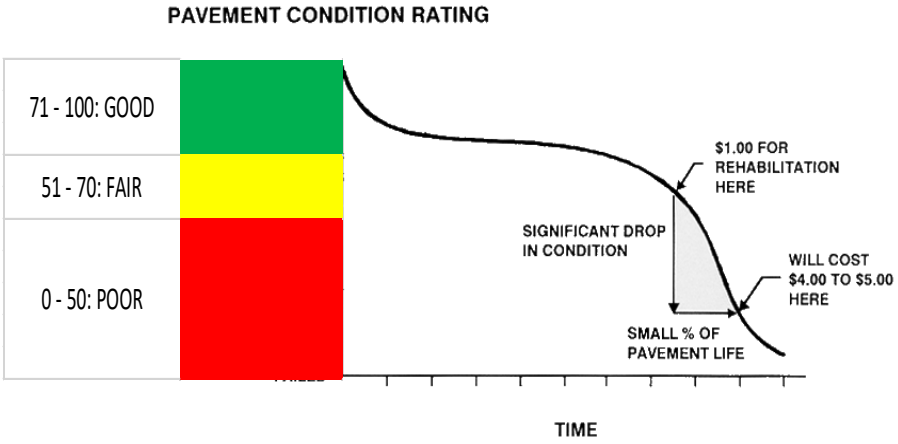
Engineering staff will provide an overview explanation of the pavement management program, recap the work accomplished over the last year, and outline the tentative pavement management program for 2017. Staff will also compare overall pavement conditions between this year and last and describe the budget scenarios that would be necessary to maintain existing conditions and improve the overall conditions of Evans' streets.

Staff recommends beginning a community dialogue about the condition of Evans' streets to build common understanding of why the issue is important and how it could be addressed in the future. With the Council's direction, staff is prepared to return at a future work session with a plan for engaging the community on the issue.

What is a Pavement Management System?
A Pavement Management System (PMS) is a set of defined procedures for collecting, analyzing, maintaining, and reporting pavement data, to assist the decision makers in finding optimum strategies for maintaining pavements in serviceable condition over a given period for the least cost.

Each street is inspected by an engineer every three years, so that on a three-year cycle the condition of the entire street system is inventoried. The inventory is maintained in the PMS software program, which models future pavement deterioration due to traffic and weather, and recommend maintenance and repairs to the road's pavement based on the type and age of the pavement and various measures of existing pavement quality. The City's software system was originally developed in the late 1970s to help the Department of Defense (DOD) manage Maintenance & Rehabilitation (M&R) for its vast inventory of pavements. Based on pavement condition, the system assigns a pavement condition index (PCI™) rating from zero (failed) to 100 (excellent) for each segment of street. Taken together, the system provides condition data at the level of each street segment, all segments of a certain type (arterial, collector, etc.), or at the aggregate community level.

The software analyzes the pavement condition data to recommend the most efficient allocation of resources to yield the highest overall condition of pavement. Recommendations favor preventive maintenance, which has been proven to cost far less to achieve a high-quality surface than reconstructing roads in poor condition. The graphic below shows the relative cost savings of treating a street while still in good condition compared with the much higher cost to achieve the same result once the street has deteriorated. In terms of lifetime cost and long-term pavement conditions, this approach results in better system performance. Agencies that concentrate on restoring their bad roads often find that by the time they've repaired them all, the roads that were in good condition have deteriorated.



Current City-wide PCI:
The current City of Evans Pavement Condition Index Values are as follows for various classifications of street:

Pavement Rank	**PCI***
Arterial	49
Collector	61
Tertiary/Local	64
All Inspected	**59**
*2017 Weighted Average	

The data suggests that overall, Evans' streets are in fair condition (PCI of 59), but that arterial streets have deteriorated into "poor" condition as a system. By comparison, the overall city PCI presented to the City Council in February 2016 was 61, suggesting that the citywide system continues to deteriorate at the current level of financial investment.

The attached map titled "Pavement Conditions 2017" shows the pavement condition by street segment.

What maintenance activities were completed with the asphalt maintenance budget in prior years?
The City of Evans used crack sealing and asphalt patching for minor preventative maintenance throughout the City. Refer to attached map titled "Prior Year Asphalt Patch and Crack Seal Map" Major maintenance areas were completed by performing a patch, mill and 3" asphalt overlay. See attached map titled "Proposed 2017 Major Maintenance Focus Areas".

What are the 2017 tentative focus areas?
Staff is recommending the same treatment options that were used in 2016 and described in the section above. Pending final analysis and revenue availability staff will present the final plan for the 2017 Pavement Management in May. Refer to attached map titled "Proposed 2017 Major Maintenance Focus Areas" for the tentative plan.

Pavement Management Budget Scenarios – ***What are the financial impacts, goals and consequences?***

Using the pavement management system, staff analyzed three different budget scenarios to illustrate the results and consequences of three levels of financial investment. These scenarios are intended to facilitate discussion; of course, there are numerous approaches to annual funding and timing based on goals adopted by the City Council for the street system. Scenarios are outlined below:

1) **Maintain Current Budget:**

Table 1

Plan Year	Total Funded	Total Unfunded	PCI Before Work	PCI After Work
2017	$725,000	$15,800,000	59	61
2018	$725,000	$17,500,000	59	60
2019	$725,000	$19,300,000	57	58
2020	$725,000	$20,800,000	56	57
2021	$725,000	$23,000,000	56	57
2022	$725,000	$24,500,000	55	56
2023	$725,000	$26,000,000	53	54
Total	**$5,075,000**		**59**	**54**

Table 1 illustrates the consequence of continuing to fund asphalt maintenance at the current level of $725,000 per year. The weighted average PCI would likely drop from 59 (Fair) to 54 (Fair, but declining) within the next seven years. Not only would the PCI drop but the total unfunded category increases rapidly, which would make it even harder to catch up in the future.

2) **Maintain a Current PCI of approximately 59 (Fair):**

Table 2

Plan Year	Total Funded	Total Unfunded	PCI Before Work	PCI After Work
2017	$2,500,000	$13,900,000	59	62
2018	$2,500,000	$14,400,000	60	62
2019	$2,500,000	$14,600,000	59	61
2020	$2,500,000	$14,900,000	59	62
2021	$2,500,000	$15,500,000	60	62
2022	$2,500,000	$15,500,000	59	61
2023	$2,500,000	$15,800,000	59	60
Total	**$15,400,000**		**59**	**60**

Table 2 shows that in order to maintain the current PCI of 59 (Fair) the City would need to invest $2.5M of funds over the next seven years. However, in the long term the total unfunded category slightly increases costing the city more in the long term.

3) Improve streets to good condition / eliminate maintenance backlog

Table 3

Plan Year	Total Funded	Total Unfunded	PCI Before Work	PCI After Work
2017	$4,400,000	$12,000,000	59	64
2018	$4,400,000	$10,400,000	62	66
2019	$4,400,000	$8,500,000	64	68
2020	$4,400,000	$6,600,000	66	71
2021	$4,400,000	$4,900,000	69	74
2022	$4,400,000	$2,300,000	72	76
2023	$4,400,000	$ -	74	78
Total	**$30,800,000**		**59**	**78**

Table 3 suggests that if the city invests in asphalt maintenance at funding level of $4.4M per year over the next seven years the weighted average PCI would increase from 59 (Fair) to 78 (Good). This approach would eliminate the existing maintenance backlog on existing streets and allow for potentially lower levels of investment after this period to maintain the streets at the new, good quality level.

DIRECTION REQUESTED FROM THE CITY COUNCIL:

Provide direction to staff on policy approach to street maintenance. Options include:

1. **Continue current investment within existing budget capabilities –** As this report suggests, investing in streets at a significantly higher level would be very expensive and would likely require new revenue sources. If identifying these sources is not the best path forward at this time, then staff will recommend a similar level of funding in future year's budgets as the current level (approximately $725,000)

2. **Begin dialogue with the community about the street conditions and the opportunities for improving them** - If this is the Council's direction, staff could schedule another work session for late spring to propose an engagement plan that would likely include community meetings with presentations such as the one presented for this work session, informational mailers about the subject included with utility bills, and additional informational pieces and video distributed via the website and social media.

   This approach would not necessarily include specific funding proposals – unless the Council desires them now – but would first focus on public education and engagement about the community need.

3. **Direct staff to develop additional approaches based on alternative policy perspectives or priorities.**

Pavement Conditions
- 2017 -

City of Evans, Colorado

34
47th Ave
35th Ave
23rd Ave
17th Ave
11th Ave
1st Ave
State Farm Rd Area
Sunny View
32nd St
31st St
37th St
42nd St
49th St
65th Ave
85

Grapevine Hollow
Orchard Park
Tuscany #2 (Future)
Tuscany
Ashcroft Heights
Legend Flats
Fox Crossing Condos
Carriage Estates (Weld County)
Country Estates (Weld County)
North Point
The Landings
Chappelow Village
The Village
Sundown
Platte Valley
Old Town/ East of US85
Prairie Heights Middle School
Igo (Future)
WCR Annex (Future)
Arrowhead (Weld County)
Tuscany #3 (Future)
Hunter's Reserve
Willowbrook
Platte Industrial Center
Green Meadows
Meadows
Prairie View Dr
Cave Creek (Mobile Homes)
The Ridge at Prairie View
Stonegate Industrial Park (Future)
Evans Industrial Park
Neville's Crossing
Hill-N-Park (Weld County)
Riverside Village/Ishiguro (Future)
Rehmer Lake (Future)
Dos Rios (Weld County)
Schank
Rumsey-Werning-Camenisch Annexations (North Front Range Metro District)

Legend

Evans City Limits
Highways

Pavement Condition:

Good
Fair
Poor

0 0.25 0.5 1 Miles

Note: Condition values are based on the last known pavement inspection date

Disclaimer:

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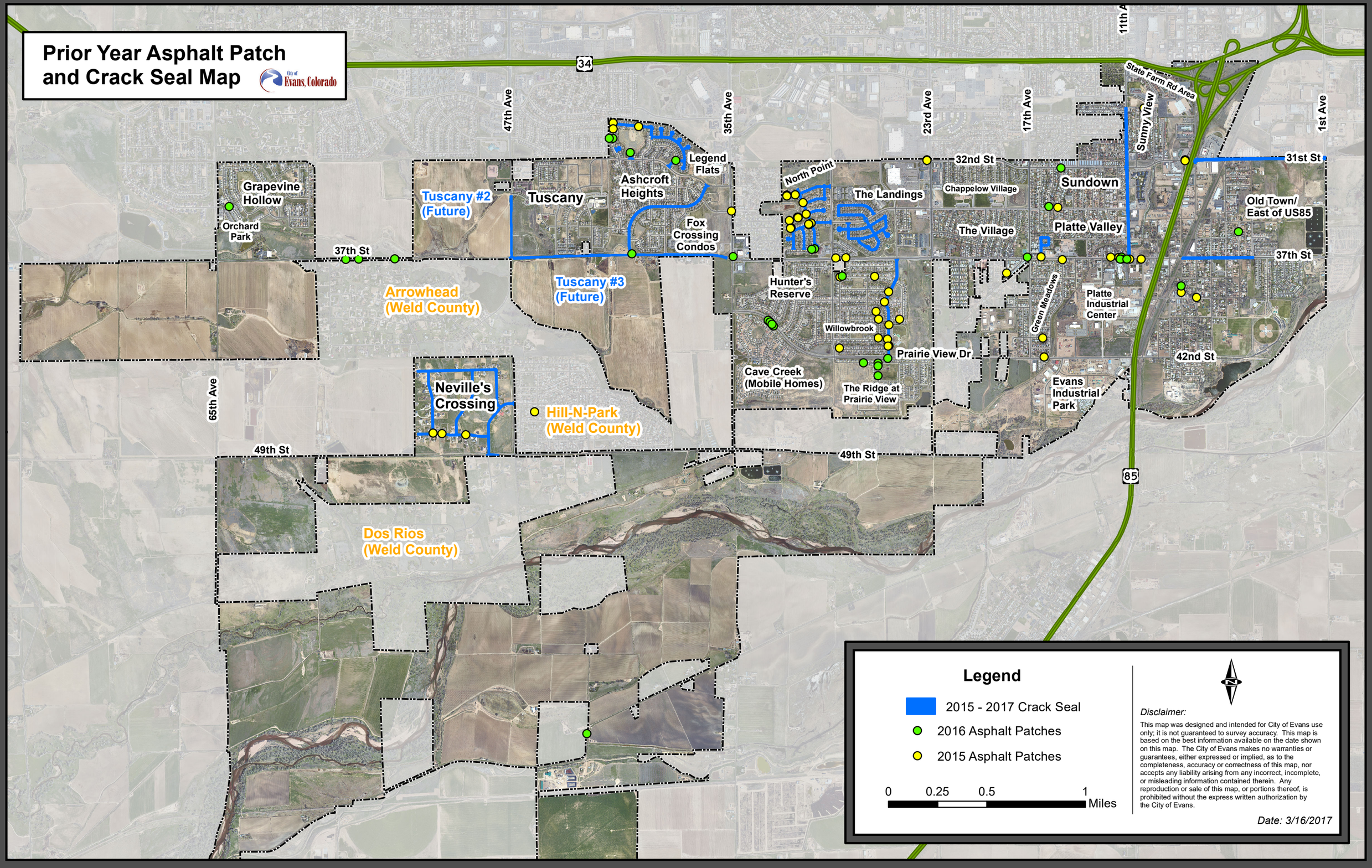
Date: 3/16/2017

Prior Year Asphalt Patch and Crack Seal Map

City of Evans, Colorado



Legend

- 2015 - 2017 Crack Seal
- 2016 Asphalt Patches
- 2015 Asphalt Patches

0 0.25 0.5 1 Miles

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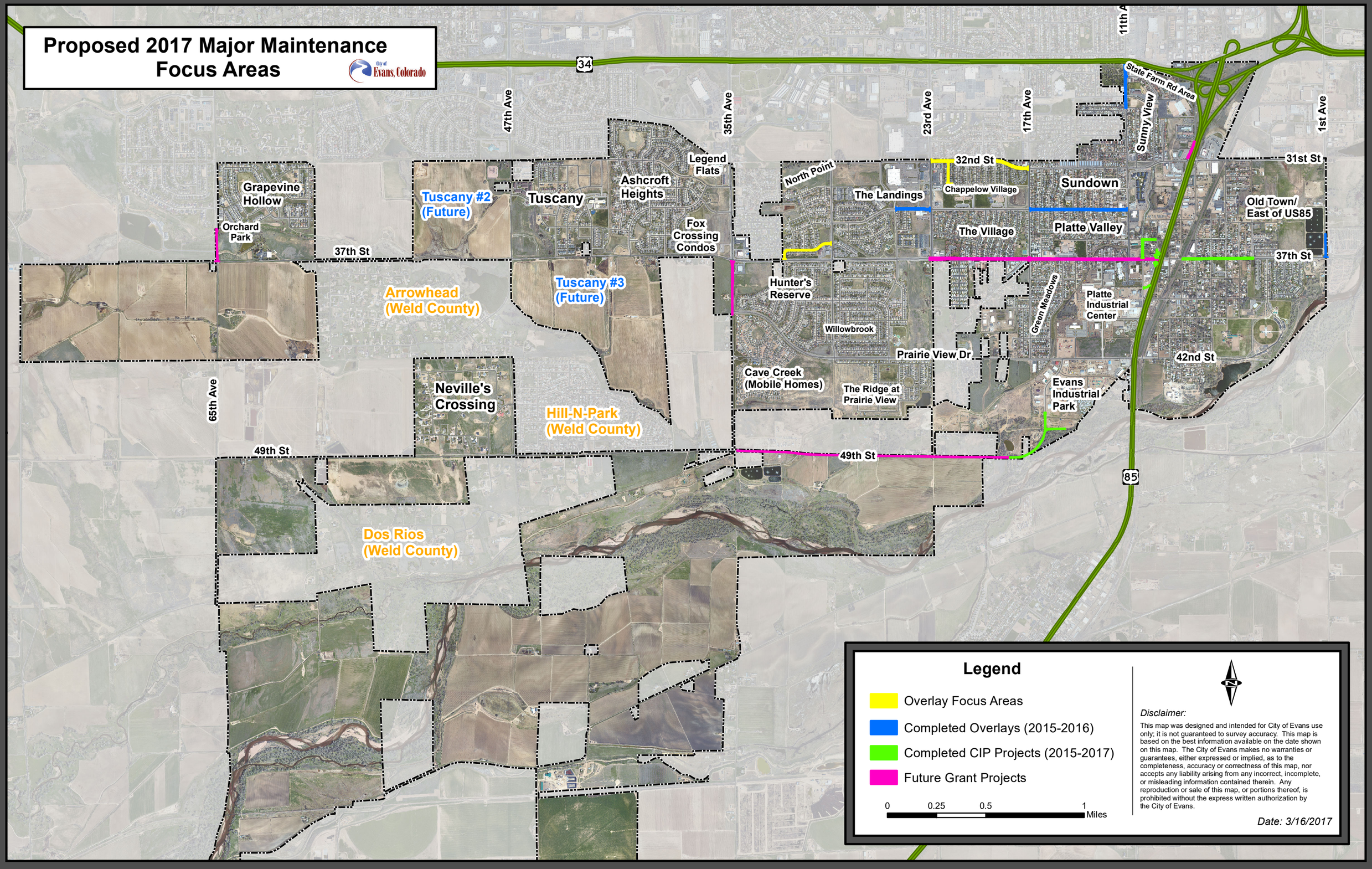
Proposed 2017 Major Maintenance Focus Areas

City of Evans, Colorado

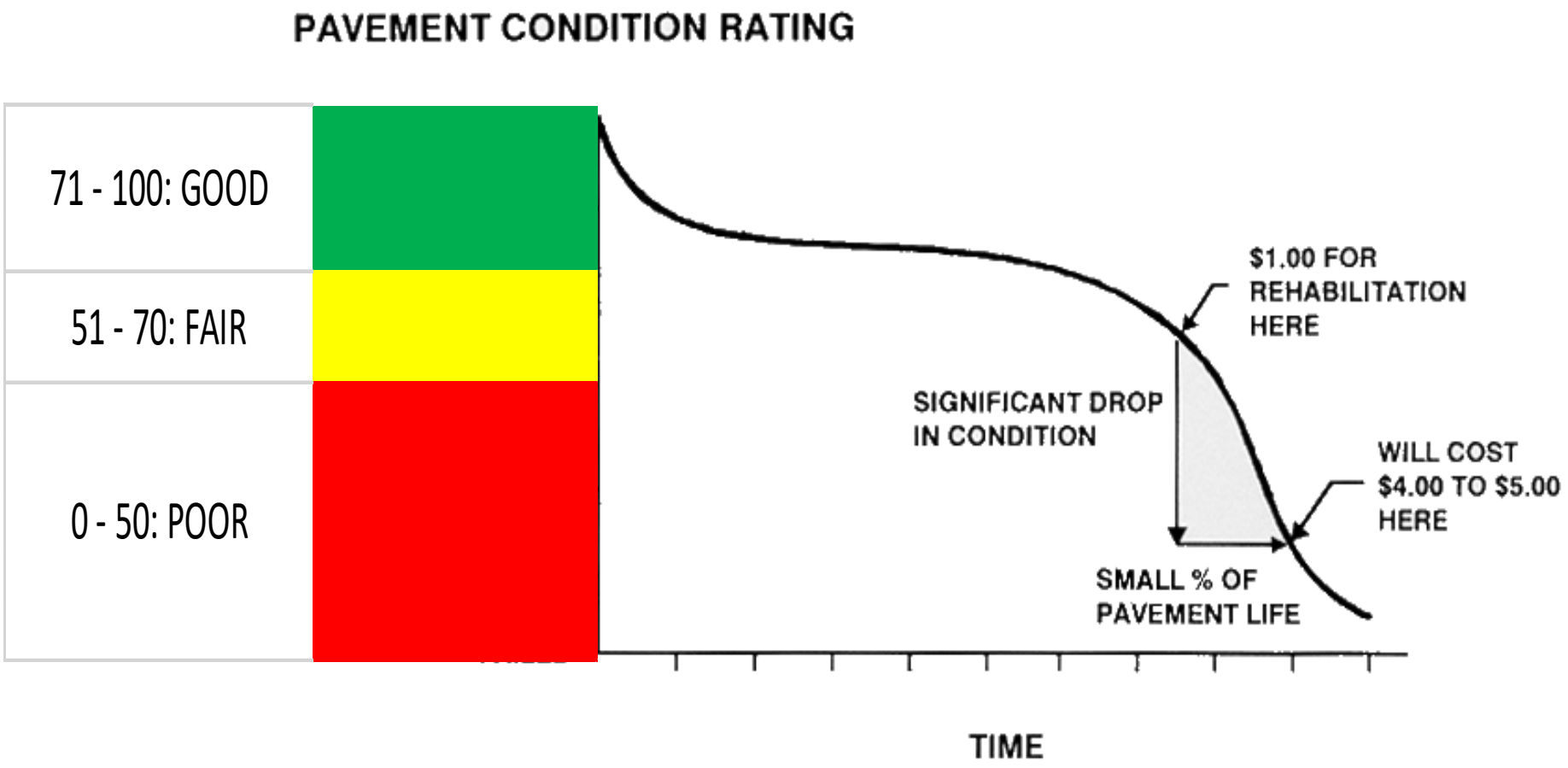


City of Evans, Colorado

The City of Evans Pavement Condition Update and Next Steps

3/21/2017

Why Use Pavement Management?



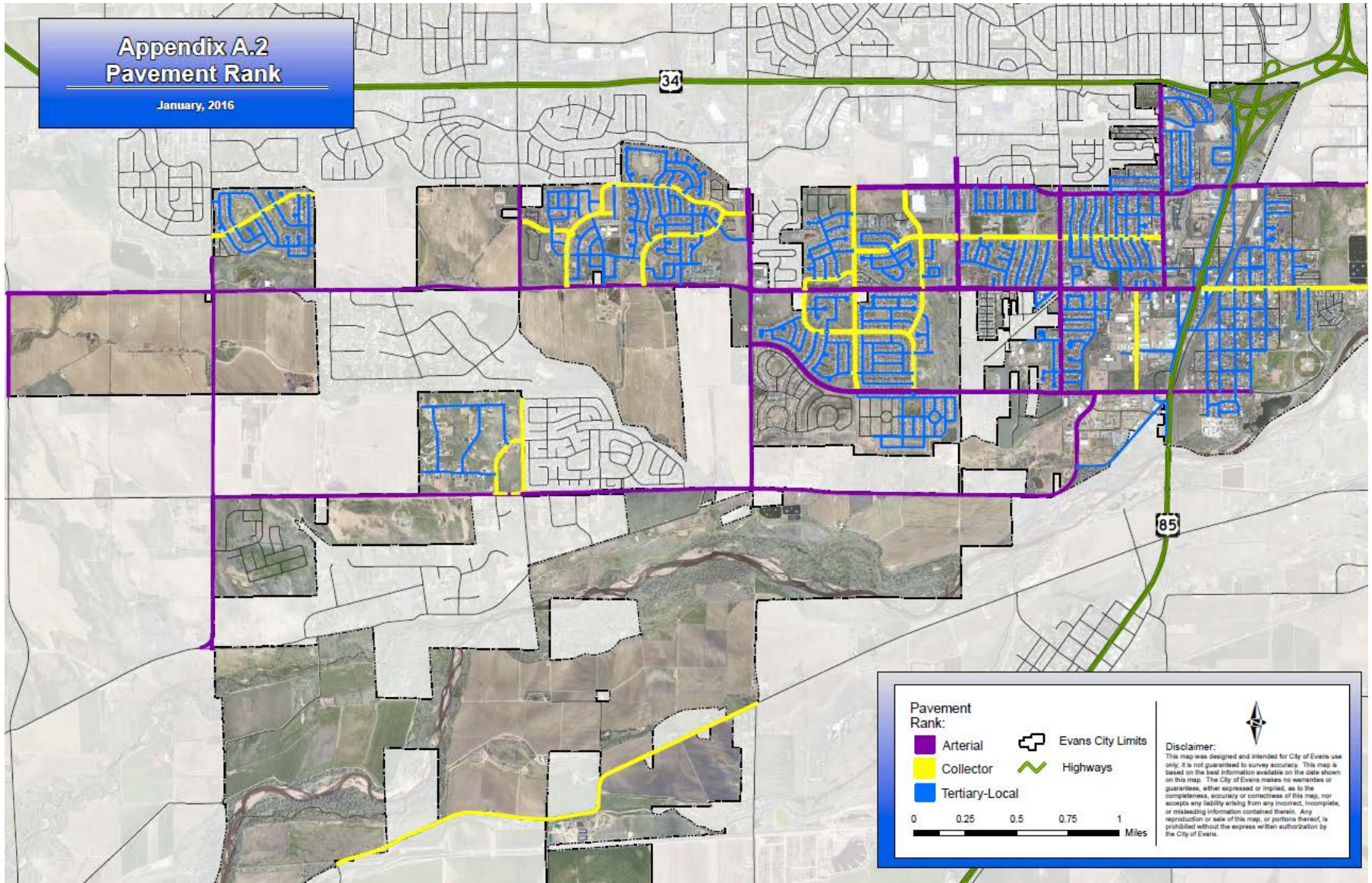
PAVER

- PMS PAVER was developed by the US Army Corps of Engineers for DOD to manage both airfield and landside pavements.
- Used to manage all DOD pavements and hundreds of city's and counties.
- PAVER capabilities/ process:
  - Inventory managed pavements
  - Determine current condition of pavements
  - Predict future conditions
  - Develop budget scenarios
  - Flag areas for project development.

Inventory

- PAVER breaks up the inventory into three categories
  - Network – Logical grouping of pavements managed together.
  - Branch – Identifiable part of the network that has a distinct use.
  - Section – Part of a branch that has a uniform condition, driven by its traffic use, construction, surface type and history. Level at which pavement surveys are done, condition values produced and work is recommended by the PMS.
    - Example – City of Evans/ 11th Ave/ Between 37th St and 34th St

Inventory Map



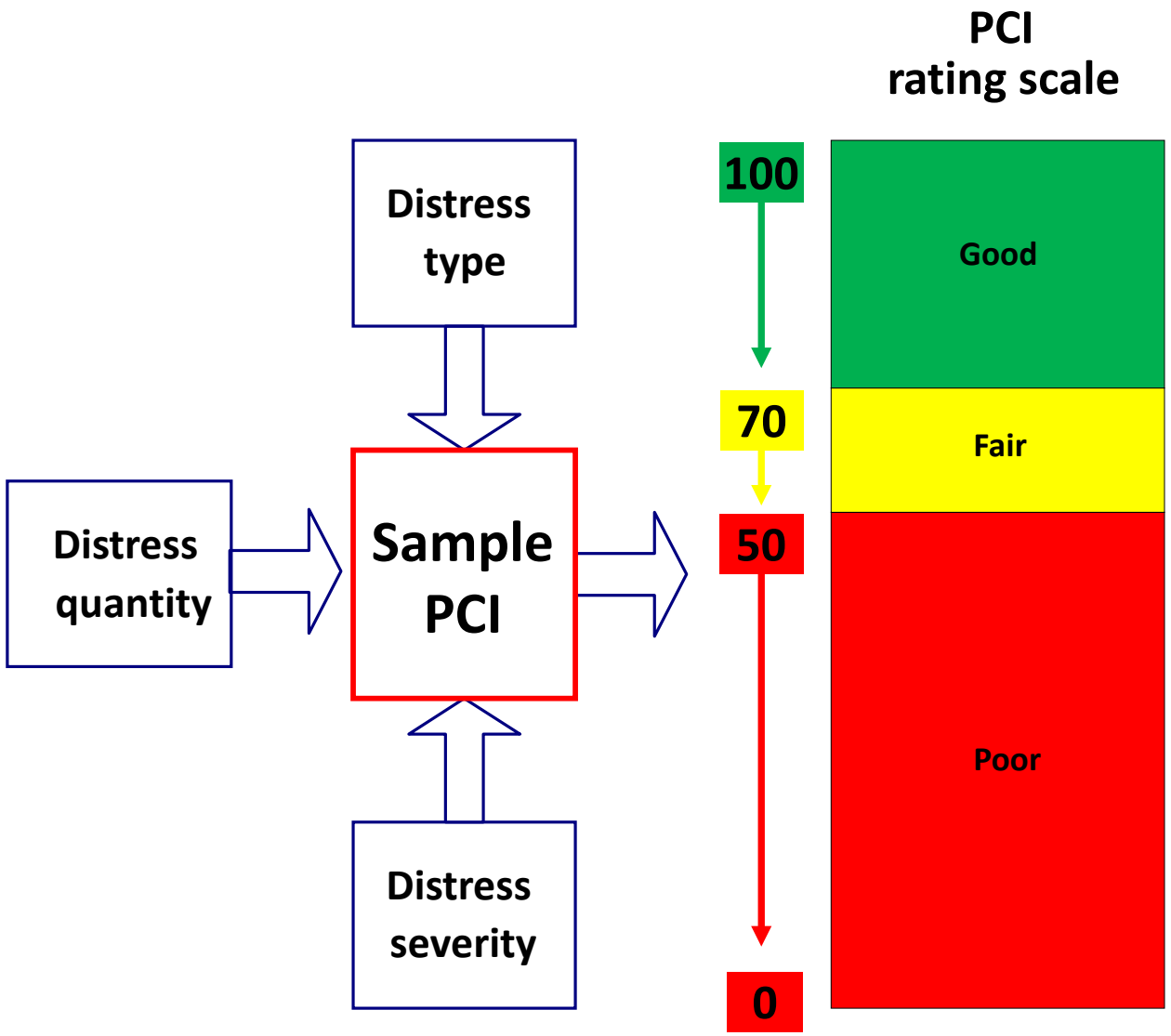
Evans Inventory Summary

	2017 Surfaced Roadway Inventory
Street Rank	**Length, Miles**
Arterial	22.1
Collector	13.6
Tertiary/ Local	43.85
Total:	**79.55**

Pavement Condition Index (PCI)

- True PCI value is obtained by following ASTM D-6433-11 “Standard Test Method for Roadway and Parking Pavement Condition Index Surveys”.
- PCI is a 0-100 rating scale with 100 being a brand new road and 0 being a road needing major reconstruction.
- PCI distresses are visual surface based surveys.
- 20 asphalt identified distresses indicated in the ASTM standard

Pavement Condition Index (PCI)



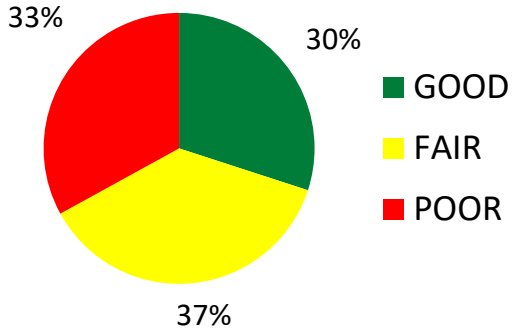
Pavement Condition Index (PCI)

- Common Evans Distresses:
  - Alligator Cracking
  - Block Cracking
  - L&T Cracking
  - Potholes
  - Rutting
  - Weathering

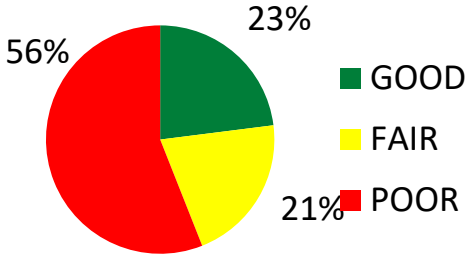
Evans 2017 Condition Values

Pavement Rank	Pavement Sections	Pavement Area (SF)	Pavement Area (%)	PCI*
Arterial	58	4,607,880	30	49
Collector	42	2,584,635	17	61
Tertiary/ Local	345	8,126,524	53	64
All Inspected	**445**	**15,319,039**	**100**	**59**

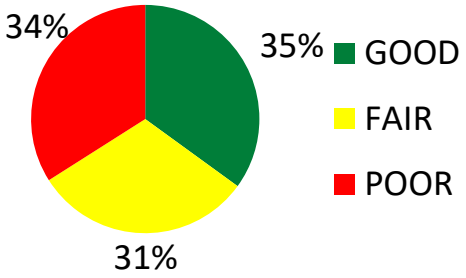
*March 2017 Area Weighted Average



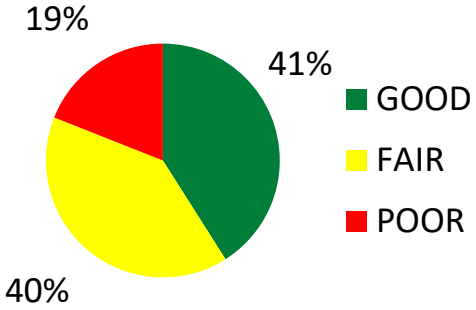
Overall



Arterial



Collector

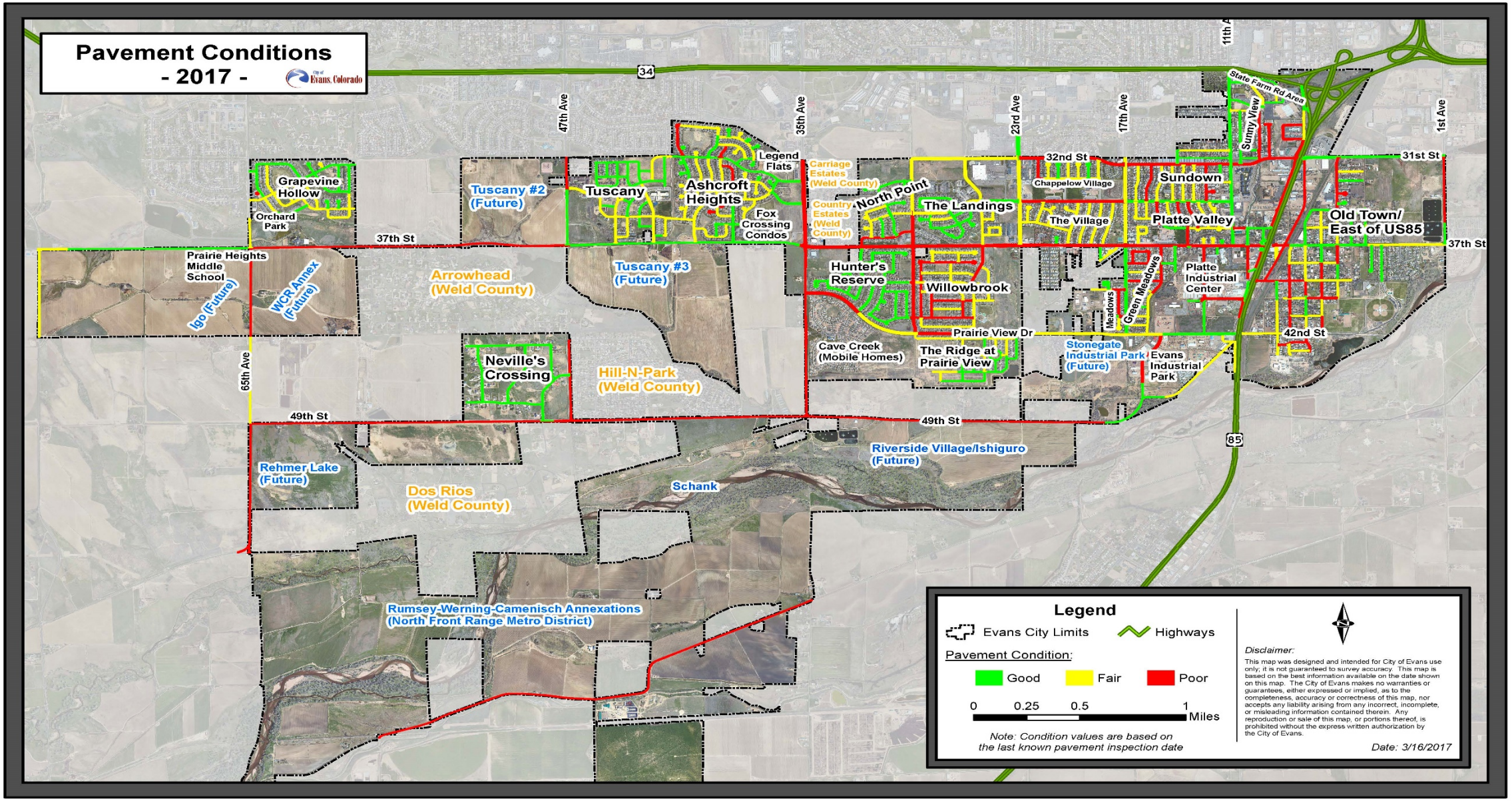


Tertiary/ Local Roads

Evans 2016 vs 2017 Condition Values

Pavement Rank	2016 PCI*	2017 PCI*
Arterial	52	49
Collector	61	61
Tertiary/ Local	67	64
All Inspected	**61**	**59**
*Area Weighted Average		

2017 PCI Map


Pavement Conditions
- 2017 -
City of Evans, Colorado
34
47th Ave
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23rd Ave
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Pavement Condition:
Good
Fair
Poor
0 0.25 0.5 1 Miles
Note: Condition values are based on the last known pavement inspection date
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Date: 3/16/2017

PMS Work Types

- **Major Work**
  - **Complete Reconstruction**
  - Patch, Mill and Overlay
- Localized Work
- Global Work

PMS Work Types

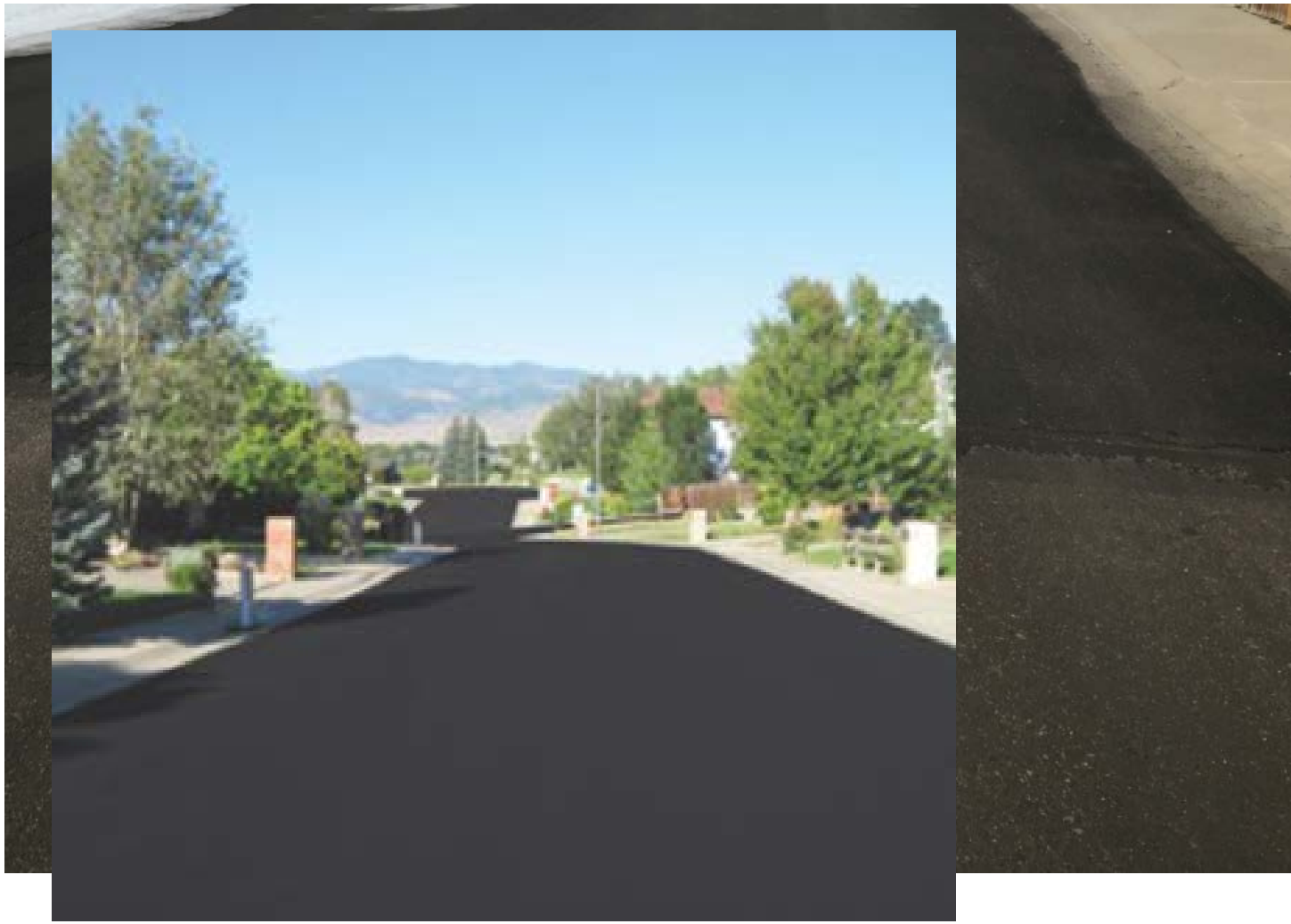
- **Major Work**
  - Complete Reconstruction
  - **Patch, Mill and Overlay**
- Localized Work
- Global Work

PMS Work Types

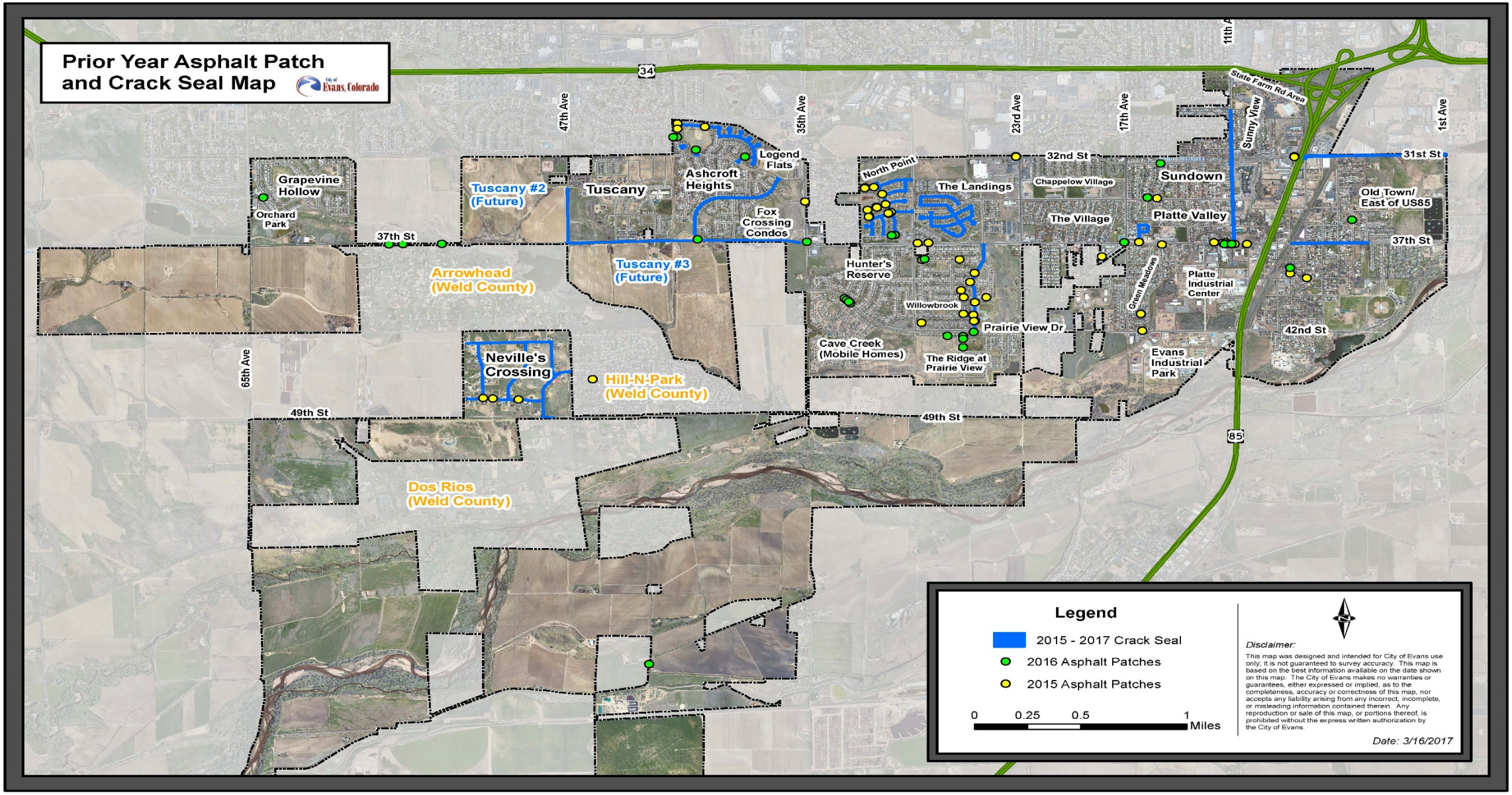
- Major Work
  - Complete Reconstruction
  - Patch, Mill and Overlay
- **Localized Work**
  - **Patching**
  - **Crack Sealing**
- Global Work

PMS Work Types

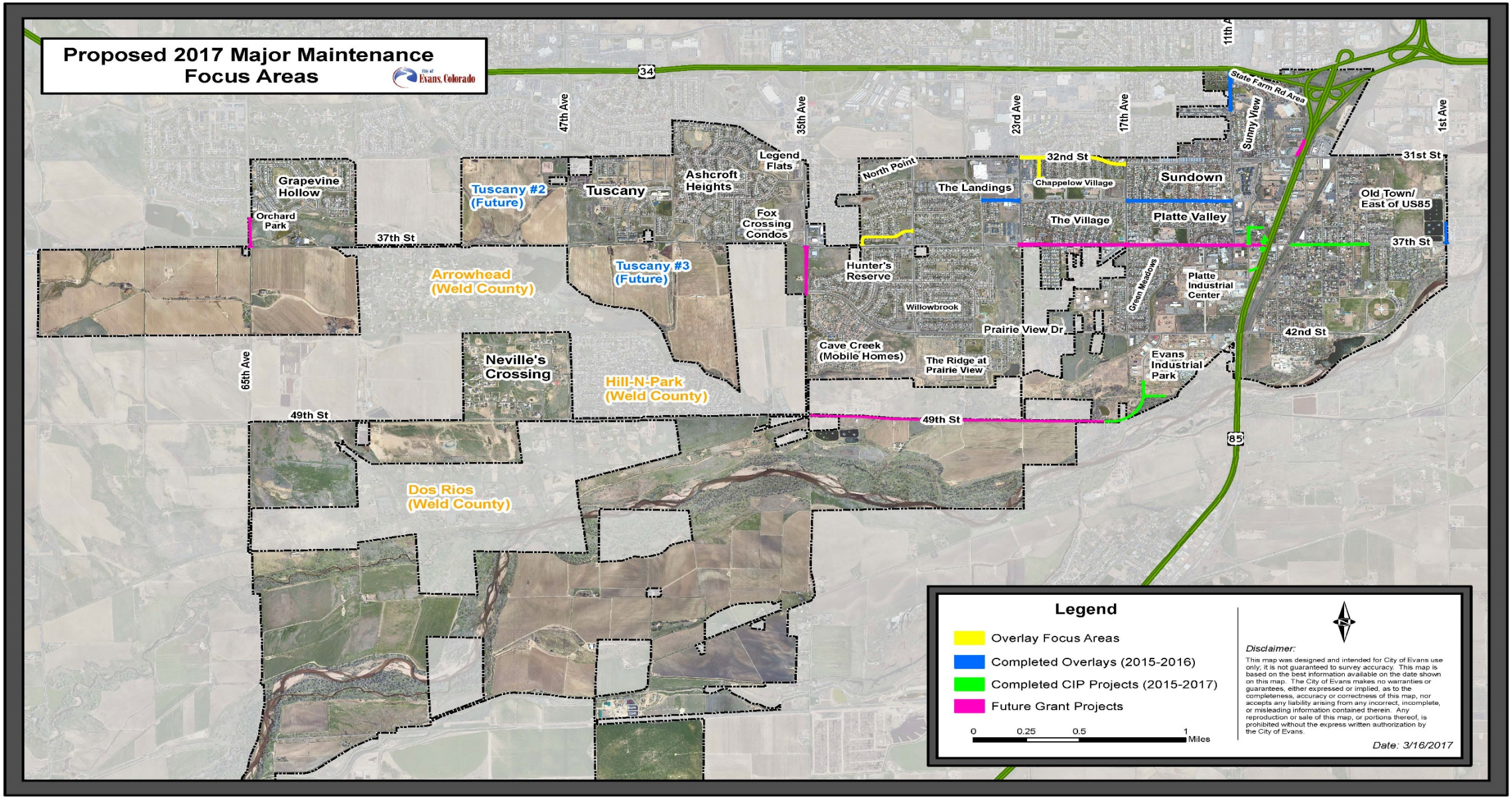
- Major Work
  - Complete Reconstruction
  - Patch, Mill and Overlay
- Localized Work
  - Patching
  - Crack Sealing
- **Global Work (Surface Treatments)**
  - **Chip Seals**
  - **Slurry Seals**
  - **Cape Seals**



Patch and Crack Seal Map



Current Major Focus Areas



Budget Scenarios

- 3 Different Budget Scenarios were analyzed. All include preventive as well as major work:
  - Maintain Current Condition (PCI = 59)
  - Maintain Current Budget (725K per year)
  - Eliminate Backlog Scenario

Budget Scenario 1: Maintain Current Condition, 59

Plan Year	Total Funded	Total Unfunded	PCI Before Work	PCI After Work
2017	$2,500,000	$13,900,000	59	62
2018	$2,500,000	$14,400,000	60	62
2019	$2,500,000	$14,600,000	59	61
2020	$2,500,000	$14,900,000	59	62
2021	$2,500,000	$15,500,000	60	62
2022	$2,500,000	$15,500,000	59	61
2023	$2,500,000	$15,800,000	59	60
Total	**$15,400,000**		**59**	**60**

*In order to maintain the current PCI of 59 (Fair) the City would need to invest $2.5M of funds over the next seven years. However, in the long term the total unfunded category slightly increases costing the city more in the long term.

Budget Scenario 2: Maintain Current Budget, $725K

Plan Year	Total Funded	Total Unfunded	PCI Before Work	PCI After Work
2017	$725,000	$15,800,000	59	61
2018	$725,000	$17,500,000	59	60
2019	$725,000	$19,300,000	57	58
2020	$725,000	$20,800,000	56	57
2021	$725,000	$23,000,000	56	57
2022	$725,000	$24,500,000	55	56
2023	$725,000	$26,000,000	53	54
Total	**$5,075,000**		**59**	**54**

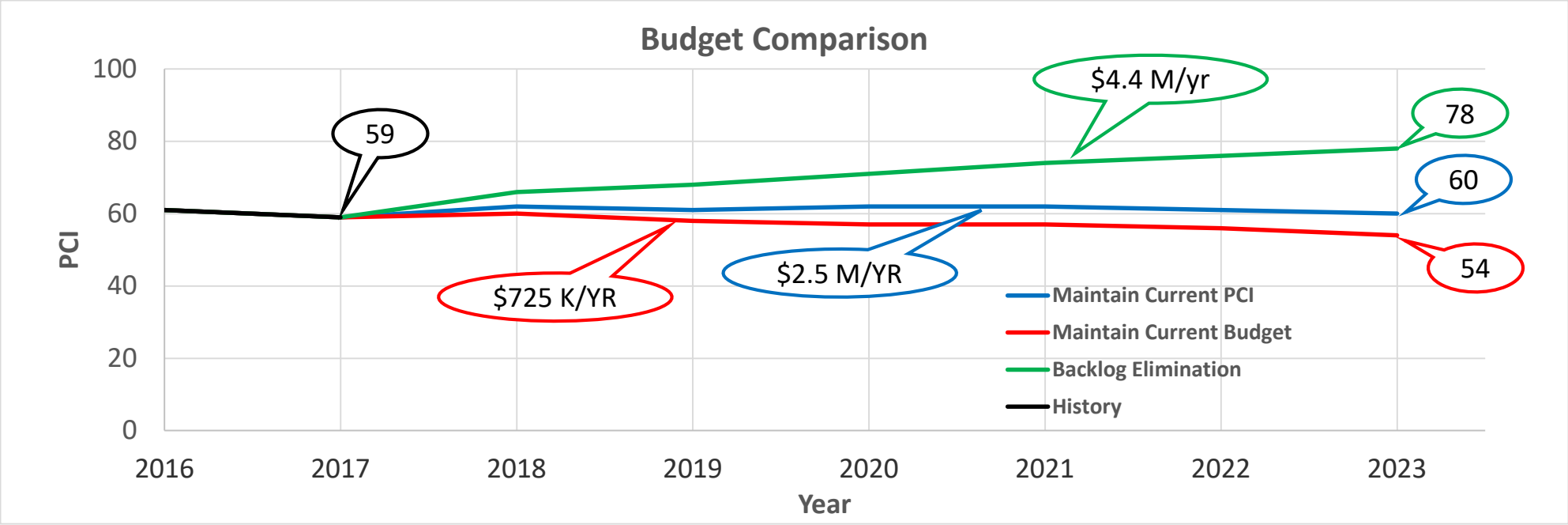
*Consequence – If the city continues to fund asphalt maintenance at the current $725,000 per year, the weighted average PCI will drop from 59 (Fair) to 54 (Fair) within the next seven years. Not only would the PCI drop but the total unfunded category increases rapidly.

Budget Scenario 3: Backlog/ Unfunded Work Elimination

Plan Year	Total Funded	Total Unfunded	PCI Before Work	PCI After Work
2017	$4,400,000	$12,000,000	59	64
2018	$4,400,000	$10,400,000	62	66
2019	$4,400,000	$8,500,000	64	68
2020	$4,400,000	$6,600,000	66	71
2021	$4,400,000	$4,900,000	69	74
2022	$4,400,000	$2,300,000	72	76
2023	$4,400,000	$ -	74	78
Total	**$30,800,000**		**59**	**78**

*Goal – If the city invests in asphalt maintenance at funding level of $4.4M per year over the next seven years the weighted average PCI would increase from 59 (Fair) to 78 (Good). Meeting this goal would provide a high level of service to the Evans residents as well as position the city to provide a fully funded CIP and maintenance program that would keep annual funding levels reasonable.

Budget Scenario Comparison

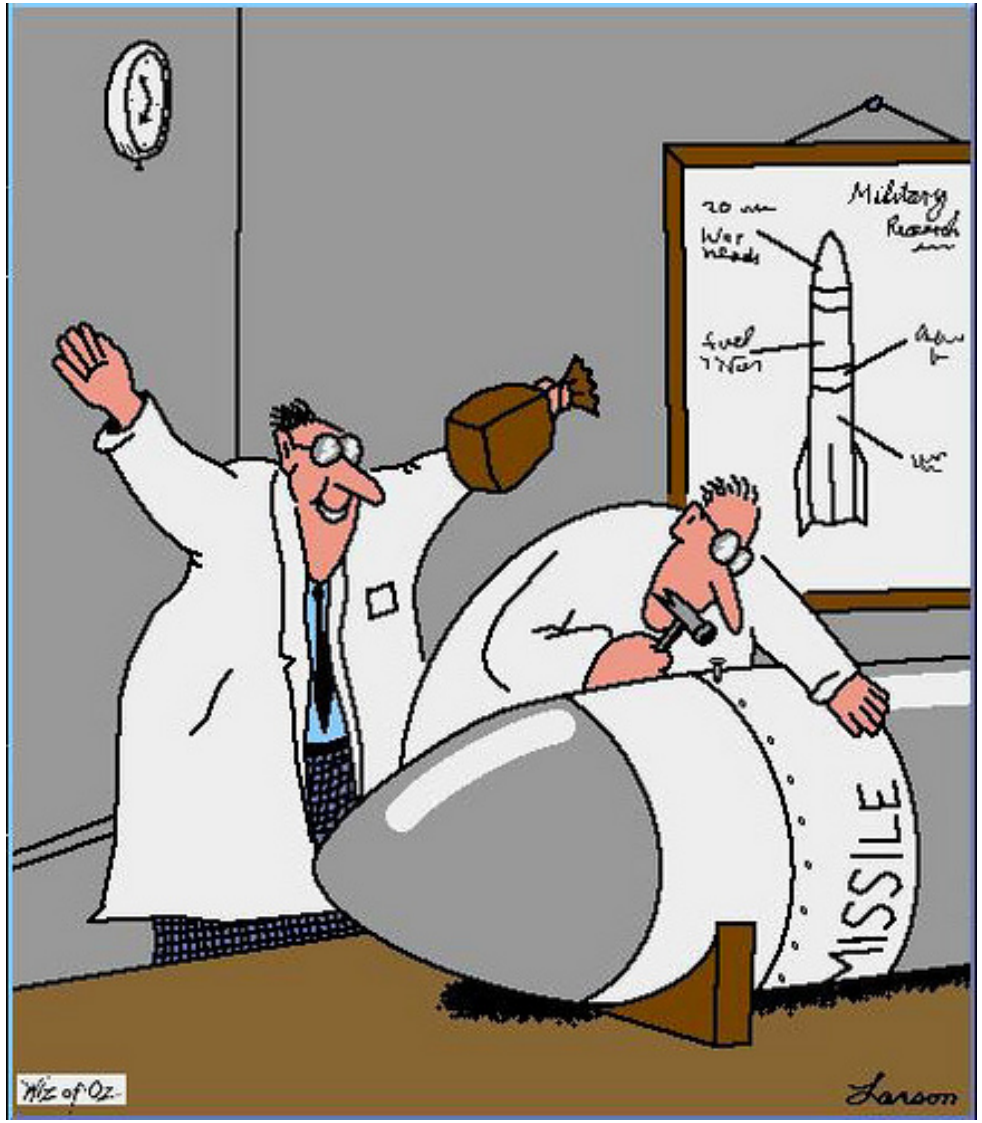


Scenario NOTES:

- $15.8 Million Backlog – 2017(Current)
- $26 Million Backlog with 725K/YR Scenario - 2023

- $0 Backlog with the $4.4 M/YR Scenario – 2023 (**ALL PAVEMENTS GREEN OR YELLOW**)
- $4.4 M/YR, initial 7 year investment - Estimated $2.1M/YR for 5 years will be required to maintain achieved level of service

Questions and Next Steps Discussion



City of Evans, Colorado

City of Evans, CO: Pavement Condition and Analysis

Draft Report, March 2017

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PREFACE

The contents presented in this report documents the findings of annual pavement condition surveys conducted for the City of Evans, CO. The purpose of this study was to detail the Pavement Condition Index (PCI) survey and determine the immediate and future maintenance and repair requirements of the roadway pavements maintained by the City of Evans, CO.

This report meets the roadway and parking area pavement condition evaluation standards defined by the ASTM D-6433-11, "Standard Test Method for Roadway and Parking Pavement Condition Index Surveys."

The field investigation and database updates were performed by Borstad Consulting Services, LLC. The analysis and presented findings of this report was performed by the City of Evans Engineering Department.

EXECUTIVE SUMMARY

PURPOSE

The purpose of this study is to present the current condition as well as the immediate and future maintenance and repair (M&R) requirements for the maintained roadway pavements at the City of Evans, CO. Through this effort, an update of the PAVER™ pavement management system was performed.

PAVEMENT CONDTION INDEX

Borstad Consulting Services, LLC has been performing annual pavement condition index (PCI) surveys for the City of Evans since 1999. Annual inspections normally include one third of the managed roadway pavements. The PCI survey was performed in accordance with "ASTM D6433-11: Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys." Borstad Consulting Services has updated the recorded survey information into a PAVER™ pavement management system database. The City of Evans Engineering Department has utilized the updated database and the PAVER™ software to develop pavement deterioration trends, predict future pavement conditions, develop M&R cost scenarios and formulate projects.

The scope of this analysis included 15,319,039 SF of roadway pavements. **The March 2017 projected area weighted average PCI for all pavements inspected was determined to be 59** (Note: Herein, average means area-weighted average unless otherwise specified). Attached at the end of the executive summary, Map ES.1 depicts the projected PCI values in a three color rating code. The projected average PCIs of the inspected pavements are shown in Table ES.1 and Figure ES.1. Both the table and figure display the PCI values broken down by respective pavement rank.

Table ES.1 - Condition Data by Pavement Rank.

Pavement Rank	Pavement Sections	Pavement Sections (%)	Pavement Area (SF)	Pavement Area (%)	Age at Inspection (yrs)*	PCI*
Arterial	58	13	4,607,880	30	16	49
Collector	42	10	2,584,635	17	14	61
Tertiary/ Local	345	87	8,126,524	53	19	64
All Inspected	**445**	**100**	**15,319,039**	**100**	**17**	**59**

*March 2017 Area Weighted Average

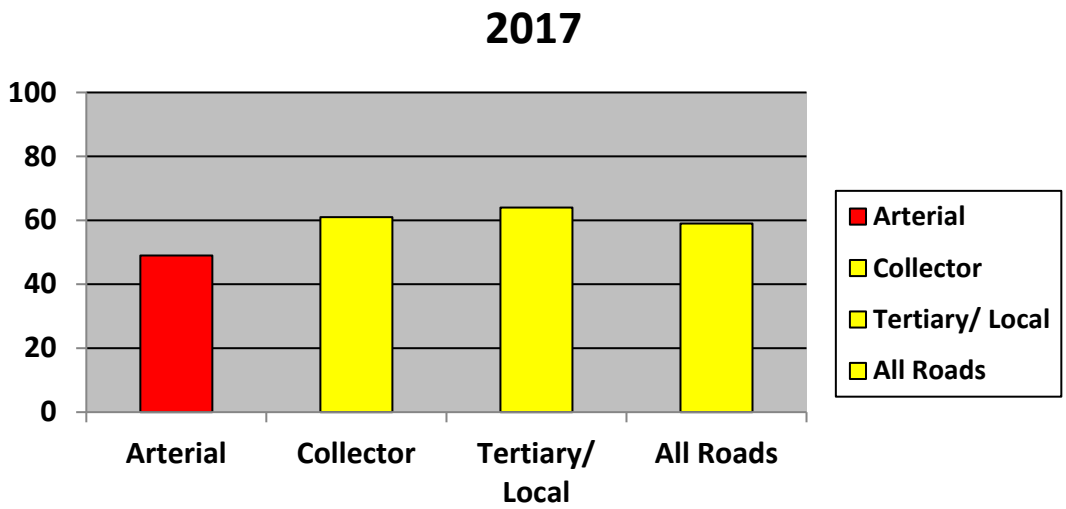


Figure ES.1 –PCI Comparison by Pavement Rank

The majority of the City of Evans pavements are in "FAIR" condition according to the three tier condition category scale. "FAIR" pavements have a PCI rating between 51 and 70 on a 0-100 scale. The most common distresses found were weathering, longitudinal cracking, alligator cracking and block cracking. The condition values can be seen on the attached condition map at the end of the Executive Summary.

PAVER™ RECOMMENDED MAINTENANCE AND REPAIR REQUIREMENTS

PAVER™ was used to generate 7-year M&R budget plans for all of the pavements at The City of Evans. The different budget scenarios included; eliminate major M&R backlog, maintain current PCI condition and maintain current budget. It was found that the ideal alternative for the maintenance of the roadway and parking area pavements is the "eliminate backlog in 7 years scenario". The eliminate backlog scenario eliminates all unfunded major M&R requirements in seven years. More specifically, it eliminates the M&R backlog (Major M&R underfunding) and insures that all pavement sections have PCI values greater than a PCI of 50. This option does have the highest allocation of funds in the initial 7 years when compared to the other scenarios. However, the overall outcome of this budget option will result in the highest PCI value and the lowest total cost at the end of the 7-year goal budget plan. Table ES.2 summarizes the annual recommended budget costs associated with the eliminate backlog scenario. A detailed year breakout and budget calculation process is presented in Chapter 3 of this report.

Table ES.2 - Total Annual Roadway and parking area Repair Budget, Eliminate Backlog.

FY Year							
2016	2017	2018	2019	2020	2021	2022	5 Years Following 2022
$4.5 Million	$4.5 Million	$4.5 Million	$4.5 Million	$4.5 Million	$4.5 Million	$4.5 Million	$1.6M/Year

PROJECT FORMULATION

Based on the assimilated data from the PAVER™ program as well as the detailed look at city wide priority areas and engineering judgement, projects have been formulated for years 2016, 2017 and 2018. A three year plan period was best suited for the city due to continual growth, development and other pavement impacting future development. A budget of $600,000 was used when developing the projects. Table ES.3 and Map ES.2 presents this data. A detailed analysis of these findings can be found in Chapter 4 of this report.

Table ES.3 - Total Annual Roadway and parking area Repair Budget, Eliminate Backlog.

Work Year	Branch Name	SectionID	Work Area (SY)	Reccommended Work	Cost
2016	Prairie View Drive	10, 15, 20 & 30	13,138	Patch, Crack Seal, Mill and Overlay	$ 241,061
	32nd Street	2	15,100	Patch, Crack Seal and Surface Treatment	$ 137,938
	37th Street	50, 55 & 60	25,735	Patch, Crack Seal and Surface Treatment	$ 156,042
	37th Steet	20	2,306	Patch, Crack Seal, Mill and Overlay	$ 62,231
2017	32nd Street	3	15,951	Patch, Crack Seal and Surface Treatment	$ 276,241
	37th Steet	30	8,000	Patch, Crack Seal, Mill and Overlay	$ 235,667
	37th Steet	65	10,102	Patch, Crack Seal and Surface Treatment	$ 85,320
2018	37th Steet	40	13,333	Patch, Crack Seal, Mill and Overlay	$ 351,466
	Ashcroft Heights and Old Town Evans	Misc	66,667	Patch, Crack Seal and Surface Treatment	$ 239,000

* All project costs are dependent on current Asphalt prices

SUMMARY

The purpose of this report was to present the current condition as well as the immediate and future maintenance and repair (M&R) requirements for the maintained pavements for the City of Evans, CO. An analysis of 15,319,039 SF of roadway pavements was performed for this report. The projected March 2017 area weighted average PCI for all roadway pavements was determined to be **59** resulting in a rating of "**FAIR**".

CHAPTER 1 : INTRODUCTION

OBJECTIVE AND SCOPE

The purpose of this study is to present the current condition as well as the immediate and future maintenance and repair (M&R) requirements for the maintained roadway pavements at the City of Evans, CO. Through this effort, an update of the PAVER™ pavement management system was performed.

The most recent roadway pavement survey was performed in May of 2016. Annual inspections normally include one third of the managed roadway pavements. The scope of this analysis included 15,319,039 SF of roadway pavements, of which all have been inspected. This study included the following major tasks:

1. Update the PAVER™ pavement management system; this sub task included:
    a. Develop the Geographic Information System (GIS) map of the roadway pavements and link the map to the PAVER™ database.
    b. Develop pavement deterioration family curves.
    c. Develop seven-year M&R plans for the roadway pavements considering various budget scenarios.
2. Provide project focus areas.
3. Assimilate all findings into a report.

DESCRIPTION

PAVEMENT CONDITION SURVEY

A pavement condition survey is a standard procedure that documents the quantity and severity of pavement distresses existing in a sample area of pavement. Once this data has been collected for a section of pavement, a Pavement Condition Index (PCI) value can be determined. The PCI scale is based on values ranging from 0 to 100, where 0 is a failed pavement and 100 is a perfect, newly constructed pavement. The PCI value is used to objectively quantify a pavement's condition. This PCI survey was conducted manually in accordance with, "ASTM D6433-11: Standard Practice for Roadway and Parking Lot Pavement Condition Index Surveys." Appendices A, B and C present the detailed results of the PCI survey.

IMPLEMENT THE PAVER™ PAVEMENT MANAGEMENT SYSTEM

GEOGRAPHICAL INFORMATION SYSTEM UPDATE

The GIS shapefile was digitized using an Aerial photograph of the Evans area. The shapefile was then linked to the PAVER™ database.

PAVEMENT DETERIORATION FAMILIES

Pavement deterioration families are created to model a pavement's regression over time. In this process, pavement sections that have similar functional use, surface type and rank are grouped together. Using the groupings, individual pavement section PCI values and construction information, a regression analysis is used to produce family deterioration curves. These family curves are used to predict a pavement's future condition, which is an essential component of M&R planning.

PAVER™ M&R BUDGET PLANNING

PAVER™'s M&R work planning economically identifies when and where M&R is required and how much it will cost. M&R plans can be developed either by assuming an annual budget or by identifying the desired pavement condition. A network level budget analysis is presented in Chapter 3. The following budget scenarios were considered:

1. Cost to eliminate M&R backlog in seven years.
2. Cost to maintain the current area weighted average PCI for seven years.
3. Projected PCI given an annual budget over a seven-year period.

SECTION LEVEL ASSESMENT AND PROJECT FORMULATION

An in-depth M&R plan analysis performed in Chapter 4. This analysis focuses on the main areas around the city. Combining the in-depth M&R plan results, section level condition assessment and engineering judgement, pavements were assimilated in to projects for years 2016, 2017 and 2018.

REPORT CREATION

All findings will be assimilated into a concise report intended to convey the current condition, M&R needs, projected costs and project formulation.

EVANS BACKGROUND DATA

LOCATION AND HISTORY

The City of Evans is in North Eastern Colorado along the banks of the South Platte River. The Weld County City has experienced significant growth since the year 2000 and is considered one of the fastest growing areas in Colorado. The City has experienced growth in residential development, commercial development and industrial growth in the oil and gas industry. The City of Evans is linked to neighboring communities such as Greeley, LaSalle, Milliken, Johnstown and Kersey and is affected by the growth of these communities as well. The 2010 U.S. The City of Evans has an approximate 22,000 residents. It is the small town and unique character that draws many residents to live in Evans.

CLIMATE DATA

The following Figure 1.1 shows climate data for nearby Greeley, CO obtained from NOAA.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Record high °F (°C)	74 (23)	76 (24)	85 (29)	92 (33)	101 (38)	110 (43)	112 (44)	106 (41)	99 (37)	92 (33)	84 (29)	76 (24)	112 (44)
Average high °F (°C)	46.0 (7.8)	50.0 (10)	60.0 (15.6)	67.9 (19.9)	77.3 (25.2)	87.3 (30.7)	93.8 (34.3)	91.4 (33)	83.0 (28.3)	69.7 (20.9)	55.1 (12.8)	44.7 (7.1)	68.9 (20.5)
Average low °F (°C)	16.6 (−8.6)	20.0 (−6.7)	27.6 (−2.4)	35.1 (1.7)	44.6 (7)	53.1 (11.7)	58.6 (14.8)	56.9 (13.8)	47.6 (8.7)	36.0 (2.2)	25.3 (−3.7)	16.6 (−8.6)	36.5 (2.5)
Record low °F (°C)	−25 (−32)	−20 (−29)	−4 (−20)	−3 (−19)	25 (−4)	35 (2)	42 (6)	41 (5)	17 (−8)	5 (−15)	−7 (−22)	−24 (−31)	−25 (−32)
Average precipitation inches (mm)	0.48 (12.2)	0.40 (10.2)	1.12 (28.4)	1.81 (46)	2.39 (60.7)	1.93 (49)	1.68 (42.7)	1.46 (37.1)	1.11 (28.2)	1.01 (25.7)	0.74 (18.8)	0.56 (14.2)	14.69 (373.2)
Average snowfall inches (cm)	5.6 (14.2)	5.0 (12.7)	5.5 (14)	3.1 (7.9)	0.8 (2)	0 (0)	0 (0)	0 (0)	0.3 (0.8)	2.4 (6.1)	4.0 (10.2)	8.0 (20.3)	34.7 (88.2)

Source: NOAA[15]

Figure 1.1 - Climate Data for Greeley, Colorado (NOAA)

CHAPTER 2 : PCI RESULTS

PCI INSPECTION INTRODUCTION

The City of Evans PCI inspection was performed in May of 2016. Annual inspections normally include one third of the managed roadway pavements. The PCI inspection was performed in accordance with "ASTM D6433-11: Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys."

PCI INSPECTION PROCEDURE

The PCI procedure was developed to help engineers and managers quantify a pavement's condition consistently and objectively. The PCI inspection procedure for roadways and parking lots is described in ASTM D6433-11.

A pavement network is broken down into smaller areas to be managed effectively. As described in the ASTM standards, a pavement network is broken into branches and within those branches, sections. Sections are then divided into sample units. Sample unit areas for roadway and parking area pavements are 2500 ft^2 ± 1000 SF for AC pavements and 20 slabs ± 8 slabs for PCC pavements. Visual pavement distress type, quantity and severity are recorded at the sample unit level. These three factors go into the calculation of the PCI for each sample unit. Inspecting all sample units within a section would over expend resources and add a considerable unneeded cost to the tax payer.

The PCI is a scale from 0 to 100, where 0 is a failed pavement and 100 is a perfect, newly constructed pavement. The PCI scale can be further defined into condition categories, where pavements with similar PCI values can be grouped together and analyzed more effectively. Each category within this scale provides a general idea of maintenance requirement needs. Figure 2.1 and Table 2.1 show the three condition categories used for this study.

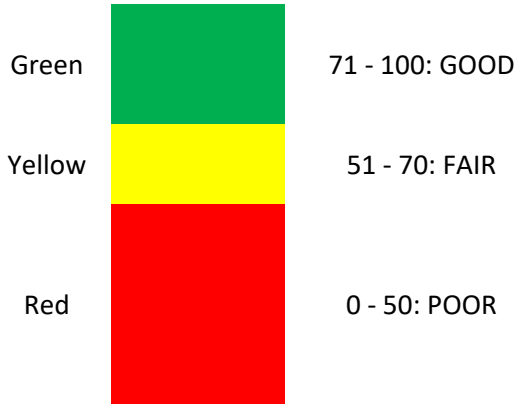


Figure 2.1 – PCI Rating Definition

Table 2.1 – PCI Rating Definition.

PCI	Rating	Definition
86 – 100	GOOD	Pavement has minor or no distresses and should require only routine maintenance.
71 – 85	GOOD	Pavement has scattered low-severity distresses, which should require only routine maintenance.
51 – 70	FAIR	Pavement has a combination of generally low- and medium-severity distresses. Near-term maintenance and repair needs may range from routine to major in scope.
41 – 50	POOR	Pavement has low-, medium-, and high-severity distresses. Near-term maintenance and repair needs may range from routine in nature up to a requirement for reconstruction.
26 – 40	POOR	Pavement has predominantly medium- and high-severity distresses that cause considerable maintenance. Near-term maintenance and repair needs will be intensive in nature.
11 – 25	POOR	Pavement has mainly high-severity distresses. Immediate repairs are needed.
0 – 10	POOR	Pavement deterioration has progressed to the point that complete reconstruction is required.

PAVEMENT LIFE CYCLE

A pavement's life cycle is the relationship between its condition and age. A newly constructed pavement is considered in perfect condition, but as it gets older factors such as use, applied load and climate cause its condition value to decrease. The condition deterioration rate vs. age is not always linear. A properly designed pavement will usually have a slow deterioration rate during the first part of its life. At some condition value and age, the pavement's deterioration rate will increase rapidly. The condition value at this point in a pavement's life is called the critical condition. Also associated with condition is a cost to repair. A pavement with a good to fair overall condition will not need as many M&R dollars to repair as a pavement with a very poor condition. Finding a pavement's critical condition and performing M&R before it reaches its critical condition is the key to saving M&R dollars. Figure 2.2 shows a pavement's typical life cycle as related to M&R cost to repair.

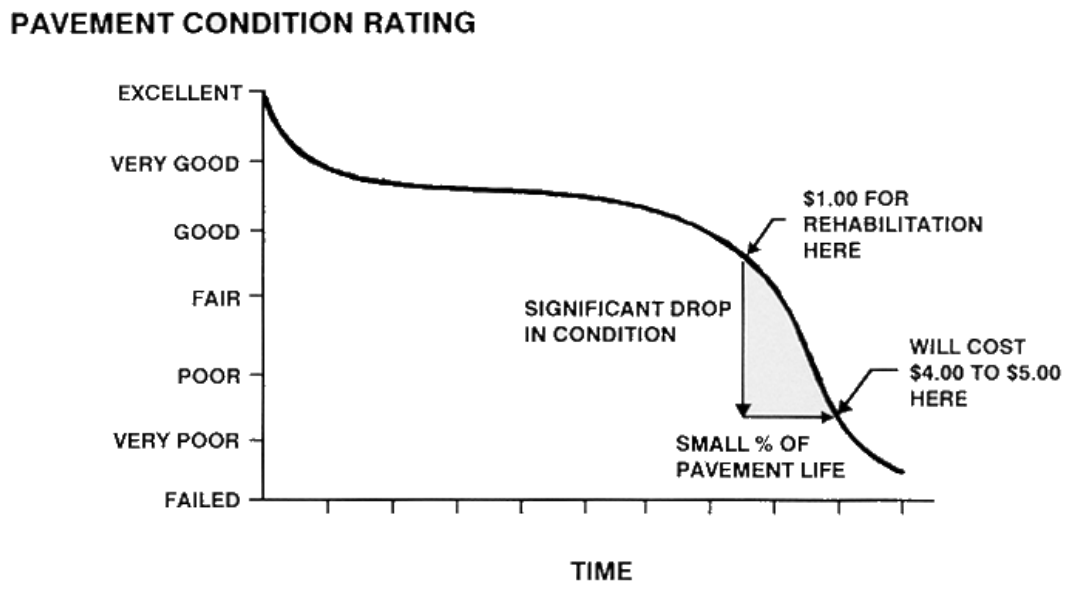


Figure 2.2 – Pavement Life Cycle and M&R Repair Cost Example

Modeling the deterioration of a single pavement's life cycle is difficult unless there are many condition vs. age data points available. Pavements with similar characteristics like use, surface and traffic patterns usually follow the same deterioration life cycle pattern.

For The City of Evans, the pavements with similar life cycle characteristics were grouped together. Deterioration family models were developed using these pavement groups. These family models are critical in the prediction of a pavement's future condition, which is an essential component of M&R planning.

PAVEMENT MANAGEMENT SYSTEM (PMS) IMPLEMENTATION AND PRODUCTS

The Civil Engineering Department is normally responsible for the tasks of planning, programming, budgeting, and executing infrastructure M&R activities. Shrinking budgets and re-organizations have resulted in a predominantly "reactive" style of M&R management. Projects are frequently developed and funded in response to either impending or critical failure and/or customer complaints. Reactive M&R management is both inconvenient and costly. The poor condition of infrastructure resulting from such an approach ultimately affects quality of life of the city's citizens.

"Proactive" management – unlike reactive management – determines what maintenance should be planned, when it should be programmed and what the consequences will be if the maintenance is not completed. A proactive approach uses a long-term, life-cycle perspective and takes advantage of sound, engineering-based procedures. With today's smaller multitasking public works staff, a pavement management system is a useful software tool that enables a proactive approach to this complex calculation and data laden environment.

The pavement management system PAVER™ was implemented in 1999 to aid the public works department for The City of Evans. The PAVER™ system was developed by the US Army Corps of Engineers, Construction Engineering Research Laboratory (CERL).

First released in 1981, PAVER™ development is supported by the following agencies: US Air Force, US Army, US Navy, Federal Aviation Administration, and Federal Highway Administration. PAVER™ represents the efforts of all supporting agencies.

PCI INSPECTION RESULTS

The 2017 projected area weighted average PCI of the inspected pavements for The City of Evans was **61**. Based on the condition categories, the average condition of the inspected pavements is "**FAIR**". A total of 15,319,039 SF (439 sections) were have been inventoried and were a part of this study. All of the data presented in this portion of the report summarizes the PCI data found, projected to 2017 values. Detailed inventory condition information may be found in the following three appendixes:

- Appendix A contains summary maps that show inventory identification, information and last inspected PCI data.
- Appendix B contains tables detailing branch and section level condition reports at time of last inspection.
- Appendix C contains tables detailing formulated project cost data.

Thirty percent of the inventoried area was classified as arterial roads while seventeen percent were collector roads and fifty-three percent were classified as tertiary or local roads. The arterial, collector and tertiary/ local roads have area weighted average PCI values of 52, 61 and 67, respectively. Below, Table 2.2 and Figure 2.3 summarize the PCI values by the use category and uses the seven tier category rating scale. Figures 2.4, 2.5 and 2.6 breaks down the rank by percent area in their condition category rating scale.

Table 2.2 –Condition Data by Pavement Rank.

Pavement Rank	Pavement Sections	Pavement Sections (%)	Pavement Area (SF)	Pavement Area (%)	Age at Inspection (yrs)*	PCI*
Arterial	58	13	4,607,880	30	16	49
Collector	42	10	2,584,635	17	14	61
Tertiary/ Local	345	87	8,126,524	53	19	64
All Inspected	**445**	**100**	**15,319,039**	**100**	**17**	**59**

*March 2017 Area Weighted Average

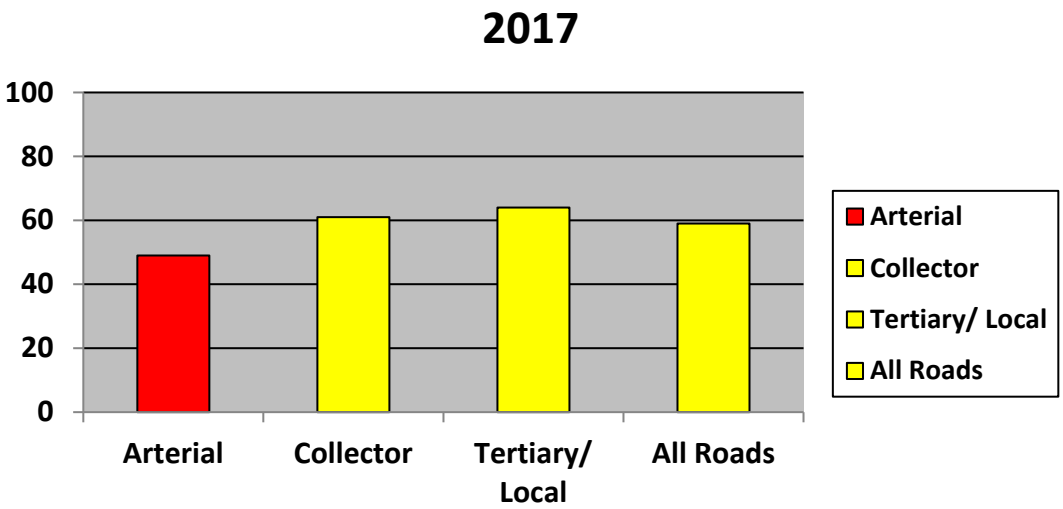


Figure 2.3 –2017 PCI Comparison by Pavement Rank

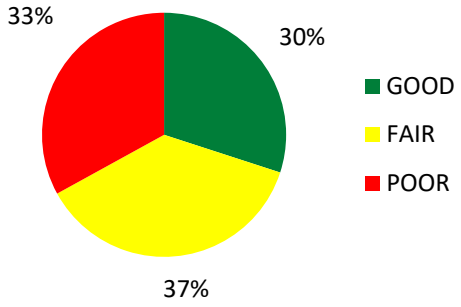


Figure 2.4 – 2017 Overall PCI Rating Distribution

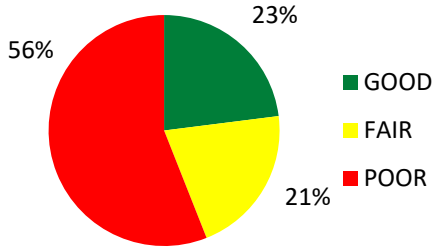


Figure 2.5 – 2017 PCI Rating Distribution for Arterial Pavements

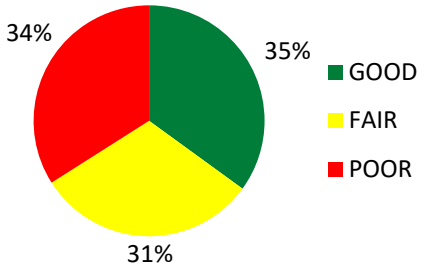


Figure 2.6 – 2017 PCI Rating Distribution for Collector Pavements

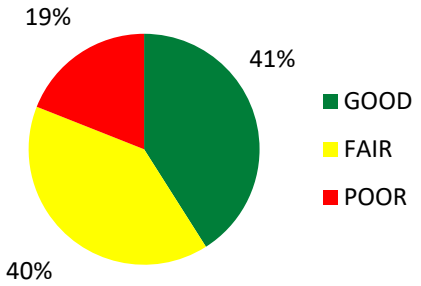


Figure 2.7 – 2017 PCI Rating Distribution for Tertiary/ Local Pavements

To further the analysis, pavement sections were grouped together and analyzed based on their respective subdivisions. Arterial and Collector roads were broken down as their own subdivision. Table 2.3 and Map 2.1 breaks down the subdivision data.

Table 2.3 – Pavement Condition Data by Subdivision.

Subdivision	PCI*
APOLLO ESTATES	54
ARMES	57
ALL ARTERIAL STREETS	49
ASHCROFT HEIGHTS	63
BAY AT THE LANDINGS	75
BROWN	71
CHAPPELOW VILLAGE	61
ALL COLLECTOR STREETS	64
COTTAGES AT THE LANDINGS	68
COVE AT THE LANDINGS	69
ELLIOTTS COURT	66
EVANS INDUSTRIAL PARK	72
FAULES VALLEY	68
GRAPEVINE HOLLOW	70
GREEN MEADOW	56
HEATHERWAY	55
HUNTERS RESERVE	87
KING	36
LAKE SHORE	70
LYNCHS	66

Table 2.3 – 2017 Pavement Condition Data by Subdivision – *Continued*.

Subdivision	PCI*
MEADOWS	56
NEVILLES CROSSING	82
NICKERSON	76
NORTH POINT	70
OLD TOWN EVANS	55
PAWNEE	43
PLATTE INDUSTRIAL CENTER	45
PLATTE VALLEY	56
PLEASANT ACRES	62
RIDGE AT PRAIRIE VIEW	71
RIVER BEND	47
RIVERSIDE MEADOWS	84
ROBIN SONS	76
SHARLYN PLACE TOWNHOMES	48
SOUTH GATE	46
SUNDOWN ESTATES	55
SUNNY VIEW	65
TIMBERLINE	70
TUSCANY	74
VILLAGE	64
VILLAGE CONDOS	69
WILLOWBROOK	52

PCI PREDICTION MODELS

Prediction models are used to predict future pavement condition, which is an essential component of M&R planning. The models are developed using historical PCI inspection data from a specific location (e.g., airport, city, town, etc.). A model is developed for each group of pavement sections that share similar characteristics (e.g., surface type, functional use, rank, etc.). For example, a model may be developed for asphalt-surfaced, primary roadways for a city.

When developing prediction models, it is critically important to know each pavement section's age. A pavement section's age is determined from the time it last received a major M&R activity (e.g., structural overlay, reconstruction, etc.). The date associated with the last major M&R activity is referred to as the last construction date (LCD).

Below are the prediction models developed to determine the deterioration rate of roadway pavements for The City of Evans. Four models were developed for the roadway pavements and were categorized as follows: Arterial roads, collector roads, tertiary/ local roads and surface treated roads. The models Figures 2.7 through 2.10 below.

The models show that the asphalt roadway pavements are deteriorating at a weighted average rate of approximately 2.6 points per year. As seen in the Figures, some of the data points were excluded from the model due to incomplete data records and low model correlation. For this reason, the weighted average deterioration rate of 2.6 was used to predict future condition values for those non- correlated data points.

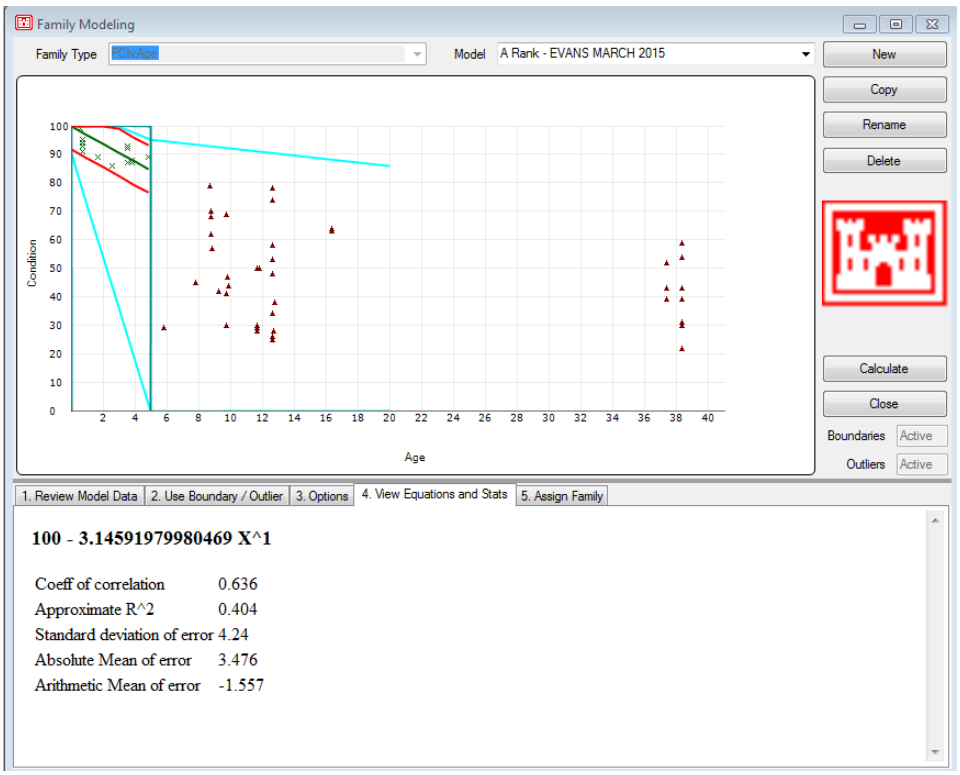


Figure 2.8 – Prediction Model for Arterial Roads

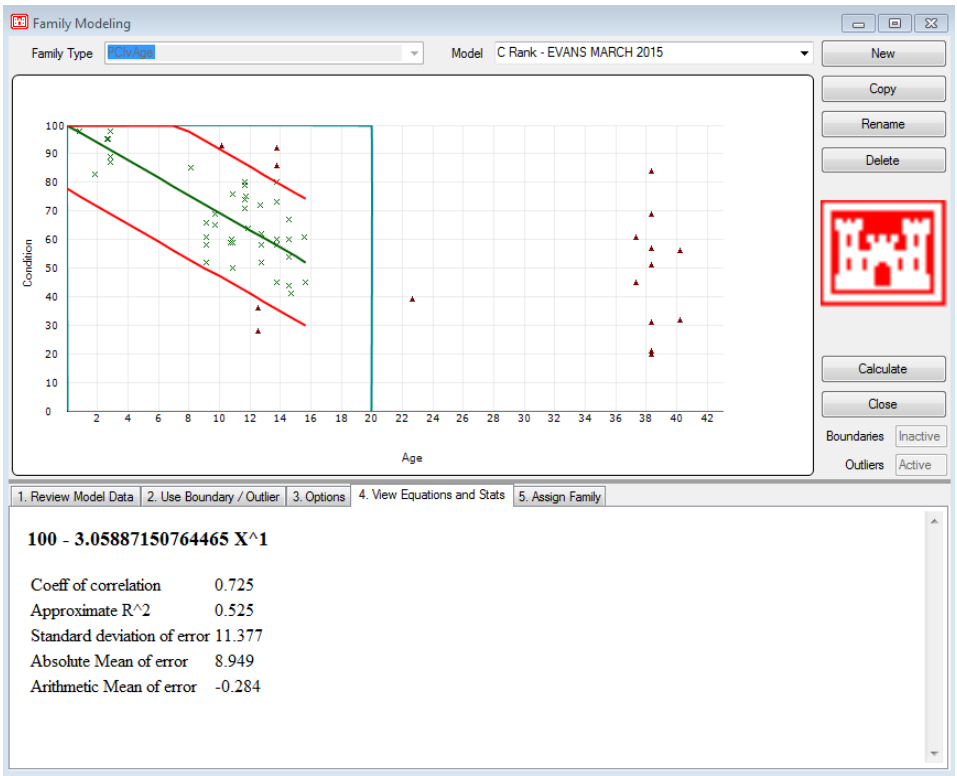


Figure 2.9 – Prediction Model for Collector Roads

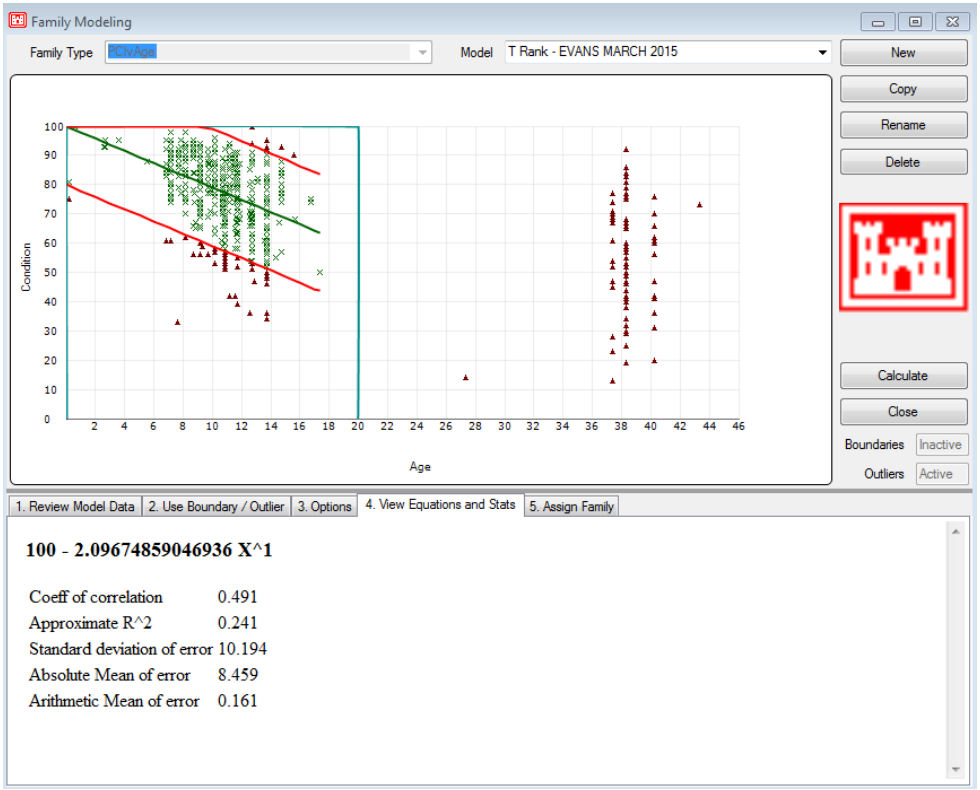


Figure 2.10 – Prediction Model for Tertiary/ Local Roads

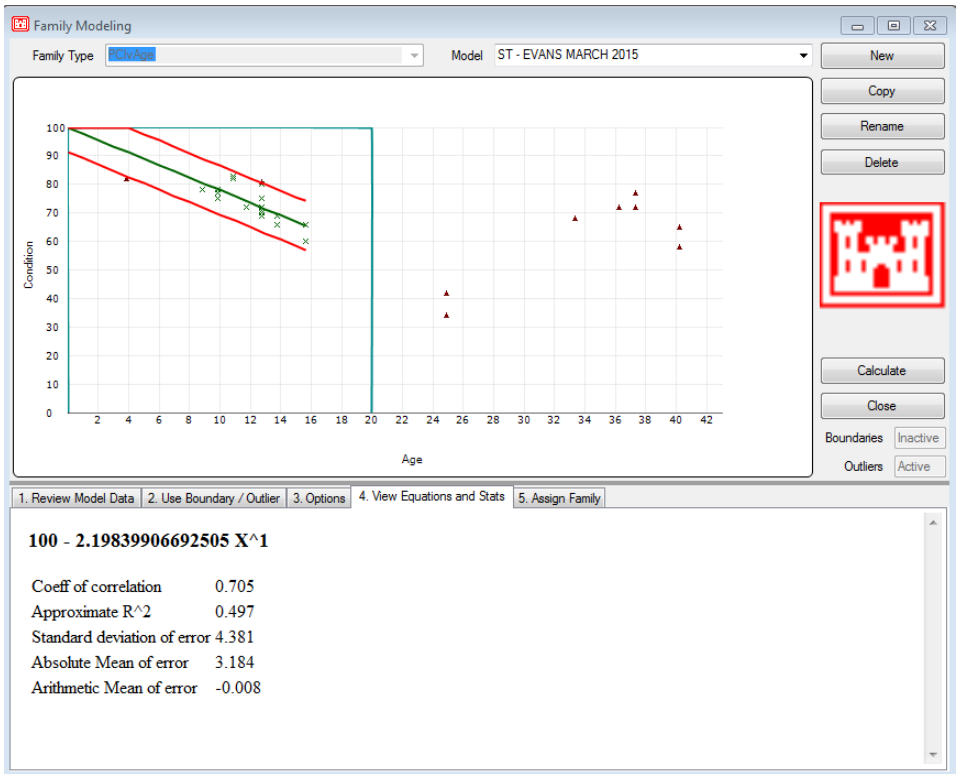


Figure 2.11 – Prediction Model for Surface Treated Roads

SUMMARY

The predicted March 2017 area weighted average PCI of the inspected pavements for The City of Evans was **59**. Based on the condition categories, the weighted average condition of the roadway pavements is "**FAIR**".

A total of 15,319,039 SF (445 sections) are inventoried in the Evans pavement management database. The City of Evans had deterioration rates ranging from 3.1 to 2.1. It was noticed that surface treatments had a positive effect on decreasing the deterioration rates on all types of pavements. Utilizing surface treatments as part of a regular maintenance cycle could add 7-10 years of pavement life as shown by the Evans data collected.

Using the prediction models above as well as the 2.6 average applied to non-correlated data, chapter 3 contains the results of an M&R Budget Analysis comparing three scenarios for maintaining the pavements at The City of Evans

CHAPTER 3 : BUDGET PLANNING

INTRODUCTION

Network budget planning scenarios were analyzed in two separate categories: Budget Requirements and Budget Consequences. The Budget Requirements category determines a budget based on network level set goals. These goals include the budget required to eliminate the backlog of pavement maintenance or the budget required to keep the pavements at its currently projected or desired PCI condition. The Budget Consequence category determines what the network pavement condition value will be based on an applied budget. This chapter details the criteria used to develop the budget alternatives and the budget scenario results for both categories mentioned above.

BUDGET SCENARIO DETAILS

DETERIORATION FAMILY MODELS

PAVER™ was used to develop deterioration family models for pavements having similar characteristics like use, surface and traffic patterns. After pavement groupings or families have been made, the PAVER™ prediction modeling tool is used to develop a family's deterioration trend. Data points of PCI condition vs. age are plotted to determine a family's historical deterioration trend. PAVER™ draws a best fit line to represent a family's deterioration model. The pavement family is assigned to the model it created allowing for future pavement condition predictions to be made. Deterioration family models are critical in the prediction of a pavement's future condition, which is an essential component of M&R planning. The Family models created for The City of Evans can be seen in Chapter 2.

CRITICAL PCI VALUES

The critical PCI value can be developed from the deterioration family model or set at a desired level of operation. From a work standpoint, the critical PCI is the transition point between recommending localized M&R or major M&R for a section. PCI values above the critical value will usually be recommended for localized M&R unless a pavement has structural distresses. Pavements above the critical level that have structural distress will be recommended for major M&R. Pavements below the critical level will be recommended for major M&R if funds are available. If funds are not available stopgap/ safety measures will be recommended.

A critical PCI of 50 was chosen for all of the roadways at The City of Evans. This value was chosen based on the current observed standards as well as a goal to maintain all roads in a Fair condition value. This critical PCI value will ensure that many of the roads are eligible and recommended for Localized and Global (surface treatments) for the budget scenarios.

PAVEMENT M&R PRIORITIES

The critical PCI budget model in PAVER™ will apply money to sections needing safety M&R work first and then to any section requiring localized preventive M&R work next. If there are enough budgetary funds available to satisfy those two conditions, PAVER™ will allow other work to be funded in this order:

1. Sections qualified for Global M&R
2. Sections requiring major M&R but still above the critical PCI
3. Sections needing major M&R that are below the critical PCI

Prioritizing funding for sections within any of the above categories is controlled by the priority matrix defined in PAVER™. In PAVER™, each use and rank is assigned a high, medium or low priority. These are then assembled into a matrix that prioritizes use vs. rank. Figure 3.1 was the prioritization used in the M&R budget plans. Further prioritization relies on individual section PCIs and distance from the critical PCI value.

Priority Table		Rank		
		Arterial (High)	Collector (Medium)	Tertiary/ Local (Low)
USE	Roadway (High)	1	2	3

Figure 3.1 – M&R Prioritization in PAVER™

WORK UNIT COSTS

Work unit costs were obtained from recent years contracts for The City of Evans. These values represent materials, labor, equipment costs, as well as ten percent overages. Table 3.1 shows the unit costs for Major, Global and Localized work used for the budget analysis.

Table 3.1 –Unit Costs.

Type of Work	Work Item	Amount	Work Unit
Major M&R	2 in Cold Mill & 2.5 in Overlay	$1.80	SqFt
	2 in overlay	$1.50	SqFt
	3 in Cold Mill & Overlay	$2.90	SqFt
	Complete Reconstruction (4" AC/6" ABC) - AC	$6.75	SqFt
	New Construction - AC	$5.00	SqFt
	Overlay - AC Thin	$0.90	SqFt
	Surface Reconstruction - AC	$2.47	SqFt
	Surface Reconstruction - PCC	$5.21	SqFt
	Thin Overlay - AC	0.90	SqFt
Global M&R	Chip Seal – 3/8 in Aggregate	0.32	SqFt
	Chip Seal – 1/4 in Aggregate	0.30	SqFt
	Slurry Seal 3% Latex Modified	0.35	SqFt
	Cape Seal	0.50	SqFt
Localized Preventive and Safety M&R	Crack Sealing - AC	$1.80	Ft
	Grinding (Localized)	$3.00	Ft
	Patching - AC Deep	$14.22	SqFt
	Patching - AC Shallow	$7.04	SqFt
	Shoulder leveling	$1.00	Ft

MAINTENANCE POLICIES

Localized maintenance policies are used to determine what work will be recommended per recorded distress in any given section. The two types of localized maintenance policies are preventive and safety. Preventive policies are for sections having a PCI value above the critical value. Preventive maintenance policies are designed to provide preventive repair when it is beneficial in the life of the pavement. Safety policies are for sections that have a PCI below the critical value. Safety policies are designed to repair any safety hazards to keep the pavement in operational condition. For the budget analysis, Table 3.2 represent the preventive AC policies used and Table 3.3 represent the safety AC maintenance policies used.

Table 3.2 – AC Preventive Maintenance Policies.

Distress	Distress Severity	Description	Work Type	Code	Work Unit
1	Low	ALLIGATOR CR	Do Nothing	N/A	N/A
1	Medium	ALLIGATOR CR	Crack Sealing - AC	PA-AD	SqFt
1	High	ALLIGATOR CR	Patching - AC Deep	PA-AD	SqFt
2	Low	BLEEDING	Do Nothing	N/A	N/A
2	Medium	BLEEDING	Do Nothing	N/A	N/A
2	High	BLEEDING	Do Nothing	N/A	N/A
3	Low	BLOCK CR	Crack Sealing - AC	N/A	N/A
3	Medium	BLOCK CR	Crack Sealing - AC	CS-AC	Ft
3	High	BLOCK CR	Crack Sealing - AC	CS-AC	Ft
4	Low	BUMPS/SAGS	Do Nothing	N/A	N/A
4	Medium	BUMPS/SAGS	Patching - AC Shallow	PA-AS	SqFt
4	High	BUMPS/SAGS	Patching - AC Deep	PA-AD	SqFt
5	Low	CORRUGATION	Do Nothing	N/A	N/A
5	Medium	CORRUGATION	Patching - AC Shallow	PA-AS	SqFt
5	High	CORRUGATION	Patching - AC Deep	PA-AD	SqFt
6	Low	DEPRESSION	Do Nothing	N/A	N/A
6	Medium	DEPRESSION	Patching - AC Deep	PA-AD	SqFt
6	High	DEPRESSION	Patching - AC Deep	PA-AD	SqFt
7	Low	EDGE CR	Crack Sealing - AC	N/A	N/A
7	Medium	EDGE CR	Crack Sealing - AC	CS-AC	Ft
7	High	EDGE CR	Patching - AC Shallow	PA-AS	SqFt
8	Low	JT REF. CR	Do Nothing	N/A	N/A
8	Medium	JT REF. CR	Crack Sealing - AC	CS-AC	Ft
8	High	JT REF. CR	Patching - AC Shallow	PA-AS	SqFt
9	Low	LANE SH DROP	Do Nothing	N/A	N/A
9	Medium	LANE SH DROP	Shoulder leveling	SH-LE	Ft
9	High	LANE SH DROP	Shoulder leveling	SH-LE	Ft
10	Low	L & T CR	Crack Sealing - AC	N/A	N/A
10	Medium	L & T CR	Crack Sealing - AC	CS-AC	Ft
10	High	L & T CR	Patching - AC Shallow	PA-AS	SqFt

Table 3.2 – AC Preventive Maintenance Policies – *Continued*.

Distress	Distress Severity	Description	Work Type	Code	Work Unit
11	Low	PATCH/UT CUT	Do Nothing	N/A	N/A
11	Medium	PATCH/UT CUT	Do Nothing	N/A	N/A
11	High	PATCH/UT CUT	Patching - AC Deep	PA-AD	SqFt
12	N/A	POLISHED AG	Do Nothing	N/A	N/A
13	Low	POTHOLE	Patching - AC Shallow	PA-AD	SqFt
13	Medium	POTHOLE	Patching - AC Deep	PA-AD	SqFt
13	High	POTHOLE	Patching - AC Deep	PA-AD	SqFt
14	Low	RAILROAD	Do Nothing	N/A	N/A
14	Medium	RAILROAD	Do Nothing	N/A	N/A
14	High	RAILROAD	Do Nothing	N/A	N/A
15	Low	RUTTING	Do Nothing	N/A	N/A
15	Medium	RUTTING	Patching - AC Shallow	PA-AS	SqFt
15	High	RUTTING	Patching - AC Deep	PA-AD	SqFt
16	Low	SHOVING	Do Nothing	N/A	N/A
16	Medium	SHOVING	Grinding (Localized)	GR-PP	Ft
16	High	SHOVING	Grinding (Localized)	GR-PP	Ft
17	Low	SLIPPAGE CR	Crack Sealing - AC	N/A	N/A
17	Medium	SLIPPAGE CR	Patching - AC Shallow	PA-AS	SqFt
17	High	SLIPPAGE CR	Patching - AC Shallow	PA-AS	SqFt
18	Low	SWELL	Do Nothing	N/A	N/A
18	Medium	SWELL	Do Nothing	N/A	N/A
18	High	SWELL	Do Nothing	N/A	N/A
19	Medium	RAVELING	Do Nothing	N/A	N/A
19	High	RAVELING	Do Nothing	N/A	N/A
20	Low	WEATHERING	Do Nothing	N/A	N/A
20	Medium	WEATHERING	Do Nothing	N/A	N/A
20	High	WEATHERING	Do Nothing	N/A	N/A

Table 3.3 – AC Safety Maintenance Policies.

Distress	Distress Severity	Description	Work Type	Code	Work Unit
1	Low	ALLIGATOR CR	Do Nothing	N/A	N/A
1	Medium	ALLIGATOR CR	Do Nothing	N/A	N/A
1	High	ALLIGATOR CR	Do Nothing	N/A	N/A
2	Low	BLEEDING	Do Nothing	N/A	N/A
2	Medium	BLEEDING	Do Nothing	N/A	N/A
2	High	BLEEDING	Do Nothing	N/A	N/A
3	Low	BLOCK CR	Do Nothing	N/A	N/A
3	Medium	BLOCK CR	Do Nothing	N/A	N/A
3	High	BLOCK CR	Do Nothing	N/A	N/A
4	Low	BUMPS/SAGS	Do Nothing	N/A	N/A
4	Medium	BUMPS/SAGS	Do Nothing	N/A	N/A
4	High	BUMPS/SAGS	Patching - AC Shallow	PA-AS	SqFt
5	Low	CORRUGATION	Do Nothing	N/A	N/A
5	Medium	CORRUGATION	Do Nothing	N/A	N/A
5	High	CORRUGATION	Patching - AC Shallow	PA-AS	SqFt
6	Low	DEPRESSION	Do Nothing	N/A	N/A
6	Medium	DEPRESSION	Do Nothing	N/A	N/A
6	High	DEPRESSION	Do Nothing	N/A	N/A
7	Low	EDGE CR	Do Nothing	N/A	N/A
7	Medium	EDGE CR	Do Nothing	N/A	N/A
7	High	EDGE CR	Do Nothing	N/A	N/A
8	Low	JT REF. CR	Do Nothing	N/A	N/A
8	Medium	JT REF. CR	Do Nothing	N/A	N/A
8	High	JT REF. CR	Do Nothing	N/A	N/A
9	Low	LANE SH DROP	Do Nothing	N/A	N/A
9	Medium	LANE SH DROP	Do Nothing	N/A	N/A
9	High	LANE SH DROP	Shoulder leveling	SH-LE	Ft
10	Low	L & T CR	Do Nothing	N/A	N/A
10	Medium	L & T CR	Do Nothing	N/A	N/A
10	High	L & T CR	Do Nothing	N/A	N/A
11	Low	PATCH/UT CUT	Do Nothing	N/A	N/A
11	Medium	PATCH/UT CUT	Do Nothing	N/A	N/A
11	High	PATCH/UT CUT	Patching - AC Shallow	PA-AS	SqFt
12	N/A	POLISHED AG	Do Nothing	N/A	N/A

Table 3.3 – AC Safety Maintenance Policies – *Continued*.

Distress	Distress Severity	Description	Work Type	Code	Work Unit
13	Low	POTHOLE	Do Nothing	N/A	N/A
13	Medium	POTHOLE	Patching - AC Shallow	PA-AD	SqFt
13	High	POTHOLE	Patching - AC Deep	PA-AD	SqFt
14	Low	RAILROAD	Do Nothing	N/A	N/A
14	Medium	RAILROAD	Do Nothing	N/A	N/A
14	High	RAILROAD	Do Nothing	N/A	N/A
15	Low	RUTTING	Do Nothing	N/A	N/A
15	Medium	RUTTING	Do Nothing	N/A	N/A
15	High	RUTTING	Patching - AC Shallow	PA-AS	SqFt
16	Low	SHOVING	Do Nothing	N/A	N/A
16	Medium	SHOVING	Do Nothing	N/A	N/A
16	High	SHOVING	Patching - AC Shallow	PA-AS	SqFt
17	Low	SLIPPAGE CR	Do Nothing	N/A	N/A
17	Medium	SLIPPAGE CR	Do Nothing	N/A	N/A
17	High	SLIPPAGE CR	Patching - AC Shallow	PA-AS	SqFt
18	Low	SWELL	Do Nothing	N/A	N/A
18	Medium	SWELL	Do Nothing	N/A	N/A
18	High	SWELL	Do Nothing	N/A	N/A
19	Low	RAVELING	Do Nothing	N/A	N/A
19	Medium	RAVELING	Do Nothing	N/A	N/A
19	High	RAVELING	Do Nothing	N/A	N/A
20	Low	WEATHERING	Do Nothing	N/A	N/A
20	Medium	WEATHERING	Do Nothing	N/A	N/A
20	High	WEATHERING	Do Nothing	N/A	N/A

The localized maintenance policies above were used in the budget plan to represent a snap shot of what localized repair is needed immediately. While this is helpful knowledge for an engineer or pavement manager, planning a seven-year budget and work plan forecast needs to incorporate other work categories like major M&R. A seven-year work plan calculates a given or needed budget by applying a cost to repair based on a PCI condition. For localized maintenance, the cost by condition is found by running a "consequence of localized distress" maintenance plan in PAVER™. This plan is run by individually applying the localized maintenance policies over a period of one year. Section level distresses covered by the applied policies will have a total distress quantity(s) calculated and associated unit cost to repair applied, therefore calculating a total cost to repair per a section's PCI. Plotting the cost to PCI section values provides a model where a best fit line and equation can be derived. Tables 3.4 and 3.5 show the calculated AC preventive and safety maintenance cost by conditions respectively.

Table 3.4 – AC Preventive M&R Cost by Conditions.

PCI	AC Preventive M&R Cost per SF
0	$0.75
10	$0.60
20	$0.50
30	$0.40
40	$0.32
50	$0.25
60	$0.17
70	$0.11
80	$0.05
90	$0.00
100	$0.00

Table 3.5 – AC Safety M&R Cost by Conditions.

PCI	AC Safety M&R Cost per SF
0	$0.12
10	$0.10
20	$0.08
30	$0.06
40	$0.04
50	$0.03
60	$0.02
70	$0.01
80	$0.00
90	$0.00
100	$0.00

Table 3.6 shows the determined AC major maintenance cost by condition. The major M&R cost by condition is a relationship between minor and major M&R requirements for different PCI ranges. An assumption is made that pavements with PCI values greater than 70 usually need minor work, while pavements with PCI's less than 30 need major work. Minor work is defined as a two-inch overlay and major work is complete reconstruction. The different costs are constant above and below these ranges, while the values in between are interpolated. The interpolated values allow for work such as patching, milling, or any other remedial work that must be done as a pre-overlay.

Table 3.6 – AC Major M&R Cost by Conditions.

PCI	AC Major M&R Cost per SF
0	$6.75
10	$5.78
20	$4.82
30	$3.86
40	$2.90
50	$1.80
60	$1.80
70	$0.90
80	$0.90
90	$0.90
100	$0.90

M&R Work Planning

PAVER™'s M&R work planning module identifies when and where M&R is required and how much it will cost. M&R plans can be developed either by assuming an annual budget or by identifying the desired pavement condition. Based on either an inputted annual budget or a desired condition, PAVER™ will output an economically viable M&R plan.

The M&R plans developed over the seven-year analysis period are presented below. These models take a snapshot of what is needed and includes all pavements maintained by The City of Evans.

1. Eliminate Backlog in 7 years: This scenario eliminates all unfunded major M&R requirements in seven years. More specifically, it eliminates the M&R backlog (Major M&R underfunding) and insures that all pavement sections have PCI values greater than the critical PCI, 50. The critical PCI is described earlier in this chapter.

2. Maintain Current PCI: This scenario maintains the area weighted average PCI, 61, for all the pavements over the seven-year period.

3. Maintain Current Budget: This scenario maintains the current budget of $600K for all work types. Localized, global and major work type costs were broken up into $50K, $100K and $450K respectively.

BUDGET SCENARIO RESULTS

1. Eliminate Backlog in 7 years: $4.5M/year. This scenario results in a PCI (Before Repair) increase from 61 in Year 2016 to 80 in Year 2022, and eliminates the M&R backlog in 2022. The average annual spending for the five years following 2022 is approximately $1.6M/year.

2. Maintain Current PCI: $2.2M/year. This scenario maintains the PCI (Before Repair) of 61 for seven years. This results in a 2022 M&R backlog of approximately $19M.

3. Maintain Current Budget: Approximately $550K/year for major and global work and 50K/year for localized preventive and safety work. This budget results in a PCI decrease from 61 in Year 2016 to 53 in Fiscal Year 2022. The resulting M&R backlog is approximately $26M.

Table 3.7 – Budget Scenario Results and Comparison.

Plan Year	Funded M&R Work Type				Total Funded	Total Unfunded	Total Funded and Unfunded	PCI	
	Localized Preventive and Stopgap	Global	Major Below Critical PCI	Major Above Critical PCI				Before Work	After Work
Backlog Elimination									
2016	$ 1,132,877	$ 183,296	$ 3,171,157	$ -	$ 4,487,330	$ 11,901,679	$ 16,389,009	61	66
2017	$ 1,118,372	$ 29,756	$ 3,333,134	$ -	$ 4,481,261	$ 10,115,029	$ 14,596,290	64	68
2018	$ 1,111,458	$ -	$ 3,375,365	$ -	$ 4,486,824	$ 8,215,770	$ 12,702,594	66	70
2019	$ 1,044,536	$ 90,829	$ 3,343,488	$ -	$ 4,478,854	$ 6,706,978	$ 11,185,832	68	73
2020	$ 1,042,755	$ 147,516	$ 3,278,630	$ -	$ 4,468,900	$ 4,536,044	$ 9,004,944	70	76
2021	$ 1,036,095	$ 233,657	$ 3,217,161	$ -	$ 4,486,912	$ 2,265,425	$ 6,752,337	73	78
2022	$ 1,042,217	$ 190,415	$ 2,927,024	$ -	$ 4,159,656	$ -	$ 4,159,656	76	80
Total	**$ 7,528,311**	**$ 875,468**	**$ 22,645,958**	**$ -**	**$31,049,737**			**61**	**80**
Maintain Current PCI									
2016	$ 1,132,877	$ 183,296	$ 898,362	$ -	$ 2,214,535	$ 14,174,474	$ 16,389,009	61	63
2017	$ 1,118,372	$ 29,756	$ 1,058,793	$ -	$ 2,206,921	$ 14,840,898	$ 17,047,819	61	63
2018	$ 1,111,458	$ -	$ 1,101,176	$ -	$ 2,212,635	$ 15,514,124	$ 17,726,758	60	62
2019	$ 1,044,536	$ 90,829	$ 1,083,438	$ -	$ 2,218,804	$ 16,673,157	$ 18,891,961	60	62
2020	$ 1,041,353	$ 147,516	$ 1,028,343	$ -	$ 2,217,212	$ 17,349,546	$ 19,566,758	59	61
2021	$ 1,027,137	$ 233,657	$ 955,277	$ -	$ 2,216,071	$ 18,162,935	$ 20,379,006	59	61
2022	$ 1,021,245	$ 190,415	$ 1,007,305	$ -	$ 2,218,965	$ 18,783,567	$ 21,002,531	59	61
Total	**$ 7,496,979**	**$ 875,468**	**$ 7,132,693**	**$ -**	**$15,505,141**			**61**	**61**
Maintain Current Budget									
2016	$ 49,996	$ 99,395	$ 437,125	$ -	$ 586,517	$ 15,802,492	$ 16,389,009	61	62
2017	$ 49,997	$ 97,504	$ 445,949	$ -	$ 593,450	$ 17,459,519	$ 18,052,969	60	61
2018	$ 49,987	$ 16,153	$ 448,547	$ -	$ 514,687	$ 19,346,068	$ 19,860,755	58	59
2019	$ 49,980	$ 90,829	$ 449,623	$ -	$ 590,432	$ 20,813,528	$ 21,403,960	57	57
2020	$ 50,000	$ 97,195	$ 436,133	$ -	$ 583,327	$ 22,991,131	$ 23,574,458	55	56
2021	$ 49,982	$ 99,354	$ 448,677	$ -	$ 598,013	$ 24,499,413	$ 25,097,426	54	54
2022	$ 49,984	$ 98,416	$ 447,843	$ -	$ 596,243	$ 26,091,876	$ 26,688,119	52	53
Total	**$ 349,927**	**$ 598,846**	**$ 3,113,897**	**$ -**	**$ 4,062,670**			**61**	**53**

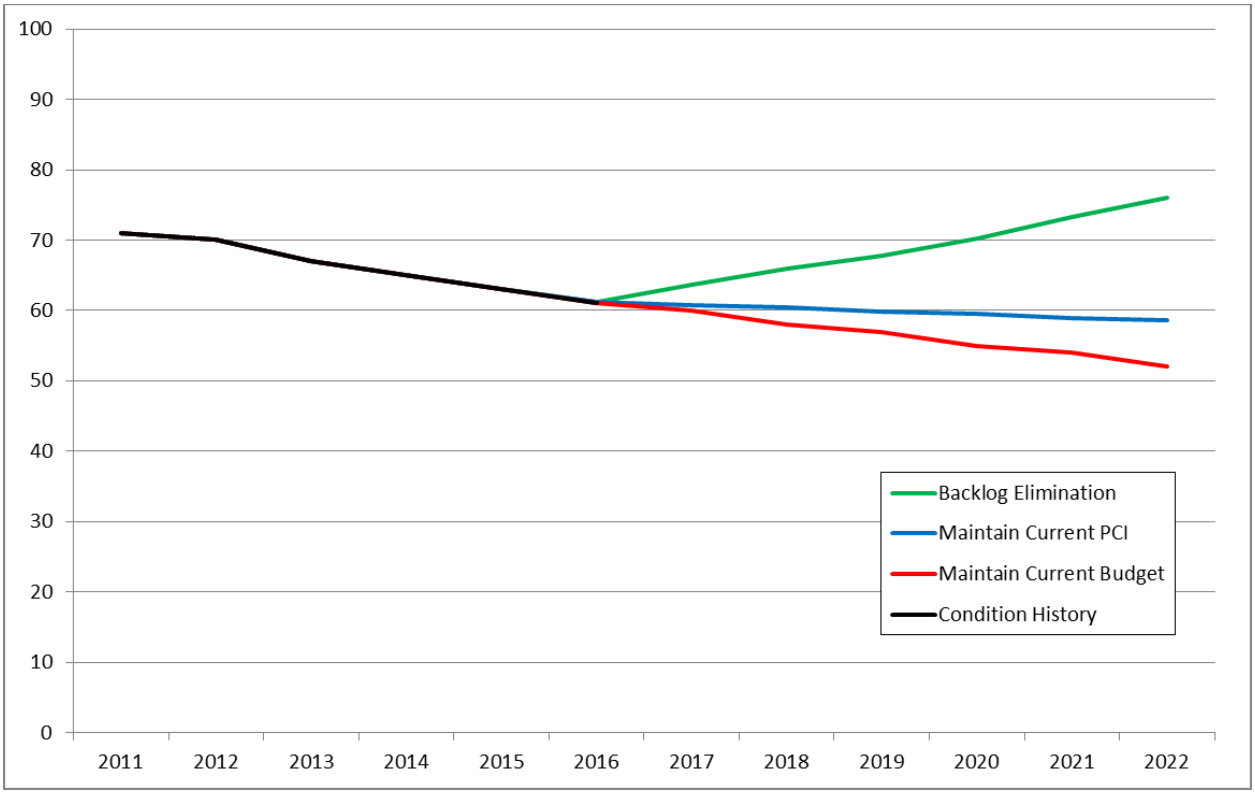


Figure 3.2 – Budget Scenario Results and Comparison

As shown above, the ideal alternative for the maintenance of the pavements for The City of Evans is the Eliminate Backlog in 7 years scenario. This option does have the highest allocation of funds in the initial 7 years when compared to the other scenarios. However, the overall outcome of this budget option will result in the highest PCI value and overall lowest total cost when backlog costs are also accounted for. Maps 3.1 – 3.3 are included to display the resulting PCI Rating at the end of the 7 year analysis for the scenarios presented above

The scenarios presented above are focused at analyzing a pavement network at a high level but unfortunately the high upfront costs are usually never a viable option. For this reason, further analysis has been done to maximize the available budget by excluding areas around potential development, excluding areas that are already earmarked for capital improvement projects and analyzing data at a closer section by section level. This analysis is presented in Chapter 4, which ultimately presents a sustainable work plan for the next three years for The City of Evans.

CHAPTER 4 SECTION LEVEL ASSESMENT AND PROJECT RECOMMENDATIONS

SECTION ASSESSMENT

The Pavement Condition Index (PCI) is a great indication to the overall health of a pavement. The PCI assimilates distress types including indications of climate, structural and other category damages. While the PCI's overall picture is valuable information, it is not always the best information when determining what M&R action is needed. Modified PCI's can be used to determine if the dominant effect on the condition value is climate or structural in nature. One of these modified PCI's is called the Structural Condition Index (SCI). The scale of the SCI is the same as the PCI, 0 – 100. Zero is a failed pavement and 100 is a newly constructed pavement. Differing from the PCI, the SCI only uses structural distresses to calculate a condition value. The SCI is a great index to determine if a pavement is structurally sound and if a global (surface treatment) application is a viable M&R option. Using both values, a better understanding of what M&R corrective action can be obtained. Table 4.1 shows the condition categories for both the PCI and SCI indices.

Table 4.1 – PCI & SCI Condition Categories.

PCI & SCI	>71	GOOD
	51 - 70	FAIR
	<51	POOR

Table 4.2 summarizes the results of the continued surveys performed for The City of Evans. The PCI and SCI values presented are based on the last calculated condition values from the most recent distress survey. More detailed pavement section and branch level information can be found in Appendix B of this report.

Table 4.2 – Section Condition Values.

Evans Subdivision	Branch ID	Name	Section ID	PCI	SCI
APOLLO ESTATES	32nd St	32nd Street	1	70	78
ARMES	33rd St	33rd Street	2	70	77
ARMES	Carson Ave	Carson Avenue	30	41	48
ARMES	Latham Ave	Latham Avenue	3	87	100
ARTERIAL STREETS	11th Ave	11th Avenue	10	88	95
ARTERIAL STREETS	11th Ave	11th Avenue	20	100	100
ARTERIAL STREETS	11th Ave	11th Avenue	25	100	100
ARTERIAL STREETS	11th Ave	11th Avenue	30	100	100
ARTERIAL STREETS	17th Ave	17th Avenue	10	80	88
ARTERIAL STREETS	17th Ave	17th Avenue	20	78	85
ARTERIAL STREETS	17th Ave	17th Avenue	30	60	69
ARTERIAL STREETS	17th Ave	17th Avenue	40	66	76
ARTERIAL STREETS	23rd Ave	23rd Avenue	1	89	98
ARTERIAL STREETS	23rd Ave	23rd Avenue	2	75	82
ARTERIAL STREETS	23rd Ave	23rd Avenue	3	99	100
ARTERIAL STREETS	31st St	31st Street	10	93	99
ARTERIAL STREETS	31st St	31st Street	20	92	96
ARTERIAL STREETS	31st St	31st Street	25	87	100
ARTERIAL STREETS	31st St	31st Street	30	54	62
ARTERIAL STREETS	32nd St	32nd Street	2	41	49
ARTERIAL STREETS	32nd St	32nd Street	3	32	39
ARTERIAL STREETS	32nd St	32nd Street	4	58	66
ARTERIAL STREETS	32nd St	32nd Street	4.1	62	66
ARTERIAL STREETS	35th Ave	35th Avenue	10	32	37
ARTERIAL STREETS	35th Ave	35th Avenue	15	25	28
ARTERIAL STREETS	35th Ave	35th Avenue	20	30	36
ARTERIAL STREETS	35th Ave	35th Avenue	30	42	47
ARTERIAL STREETS	37th St	37th Street	30	42	50
ARTERIAL STREETS	37th St	37th Street	40	38	43
ARTERIAL STREETS	37th St	37th Street	50	50	55
ARTERIAL STREETS	37th St	37th Street	55	31	33
ARTERIAL STREETS	37th St	37th Street	60	31	33
ARTERIAL STREETS	37th St	37th Street	65	29	32
ARTERIAL STREETS	37th St	37th Street	70	77	83
ARTERIAL STREETS	37th St	37th Street	75	89	97
ARTERIAL STREETS	37th St	37th Street	80	41	47
ARTERIAL STREETS	37th St	37th Street	82	57	63
ARTERIAL STREETS	37th St	37th Street	90	45	51
ARTERIAL STREETS	37th St	37th Street	92	30	36
ARTERIAL STREETS	37th St	37th Street	96	87	99
ARTERIAL STREETS	37th St	37th Street	98	82	94

Table 4.2 – Section Condition Values - *Continued*.

Evans Subdivision	Branch ID	Name	Section ID	PCI	SCI
ARTERIAL STREETS	42nd St	42nd Street	10	61	70
ARTERIAL STREETS	42nd St	42nd Street	20	87	99
ARTERIAL STREETS	42nd St	42nd Street	25	56	68
ARTERIAL STREETS	42nd St	42nd Street	30	79	83
ARTERIAL STREETS	47th Ave	47th Avenue	10	89	100
ARTERIAL STREETS	47th Ave	47th Avenue	15	53	61
ARTERIAL STREETS	49th St	49th St	05	32	35
ARTERIAL STREETS	49th St	49th St	10	49	57
ARTERIAL STREETS	49th St	49th St	20	58	65
ARTERIAL STREETS	65th Ave	65th Ave	10	34	39
ARTERIAL STREETS	65th Ave	65th Ave	20	78	86
ARTERIAL STREETS	65th Ave	65th Ave	25	28	30
ARTERIAL STREETS	65th Ave	65th Ave	30	25	29
ARTERIAL STREETS	Industrial	Industrial Parkway	10	51	58
ARTERIAL STREETS	Industrial	Industrial Parkway	20	35	41
ARTERIAL STREETS	PrairieVw	Prairie View Drive	10	36	42
ARTERIAL STREETS	PrairieVw	Prairie View Drive	15	28	33
ARTERIAL STREETS	PrairieVw	Prairie View Drive	20	68	75
ARTERIAL STREETS	PrairieVw	Prairie View Drive	30	45	49
ARTERIAL STREETS	Two Rivers	Two Rivers Parkway	10	74	89
ASHCROFT HEIGHTS	35th St	35th Street	4	80	90
ASHCROFT HEIGHTS	38th Ave	38th Ave	1	78	86
ASHCROFT HEIGHTS	39th Ave	39th Ave	1	69	77
ASHCROFT HEIGHTS	39th Ave	39th Ave	2	70	79
ASHCROFT HEIGHTS	39th Ave	39th Ave	3	88	98
ASHCROFT HEIGHTS	Armadillo	Armadillo Court	1	81	91
ASHCROFT HEIGHTS	Bison Ct	Bison Court	1	74	80
ASHCROFT HEIGHTS	Burro Ct	Burro Court	1	90	97
ASHCROFT HEIGHTS	Cactus Ave	Cactus Ave	1	82	91
ASHCROFT HEIGHTS	Canyon Cir	Canyon Circle	1	65	71
ASHCROFT HEIGHTS	Cody Ave	Cody Ave	1	64	73
ASHCROFT HEIGHTS	Cody Ave	Cody Ave	2	95	100
ASHCROFT HEIGHTS	Cody Ave	Cody Ave	3	37	42
ASHCROFT HEIGHTS	ConestogaA	Conestoga Ave	1	74	79
ASHCROFT HEIGHTS	ConestogaC	Conestoga Court	1	73	82
ASHCROFT HEIGHTS	Dry Gulch	Dry Gulch Road	1	58	71
ASHCROFT HEIGHTS	Galena Ln	Galena Lane	10	61	69
ASHCROFT HEIGHTS	GoldRushCt	Gold Rush Ct	1	53	61
ASHCROFT HEIGHTS	GunBarrel	Gun Barrel Ct	1	60	73
ASHCROFT HEIGHTS	Holiday Ct	Holiday Court	1	95	100
ASHCROFT HEIGHTS	Horseshoe	Horseshoe Court	1	92	100
ASHCROFT HEIGHTS	IronhorseC	Ironhorse Court	1	71	77

Table 4.2 – Section Condition Values - *Continued*.

Evans Subdivision	Branch ID	Name	Section ID	PCI	SCI
ASHCROFT HEIGHTS	IronhorseD	Ironhorse Drive	1	66	78
ASHCROFT HEIGHTS	Lodgepole	Lodgepole Ave	1	69	81
ASHCROFT HEIGHTS	Longhorn A	Longhorn Ave	1	65	70
ASHCROFT HEIGHTS	Longhorn C	Longhorn Ct	1	82	96
ASHCROFT HEIGHTS	Masterson	Masterson Court	1	80	84
ASHCROFT HEIGHTS	Maverick L	Maverick Lane	1	75	86
ASHCROFT HEIGHTS	Mesa Dr	Mesa Drive	1	83	89
ASHCROFT HEIGHTS	Milan St	Milan Street	10	57	74
ASHCROFT HEIGHTS	Oakley Ct	Oakley Court	1	93	100
ASHCROFT HEIGHTS	PonderosaC	Ponderosa Court	1	54	61
ASHCROFT HEIGHTS	PonderosaD	Ponderosa Drive	1	76	87
ASHCROFT HEIGHTS	PowderKeg	PowderKeg Drive	1	60	70
ASHCROFT HEIGHTS	Reeves Ct	Reeves Court	1	71	81
ASHCROFT HEIGHTS	Reeves Ln	Reeves Lane	1	66	74
ASHCROFT HEIGHTS	Rio Grande	Rio Grande Ave	1	75	86
ASHCROFT HEIGHTS	Rio Grande	Rio Grande Ave	2	48	56
ASHCROFT HEIGHTS	Santa Fe	Santa Fe Ave	1	59	65
ASHCROFT HEIGHTS	Santa Fe	Santa Fe Ave	2	67	75
ASHCROFT HEIGHTS	SantaFe Ct	Santa Fe Court	1	75	83
ASHCROFT HEIGHTS	SilverMine	Silver Mine Court	1	51	59
ASHCROFT HEIGHTS	Siringo Ct	Siringo Court	1	68	74
ASHCROFT HEIGHTS	Stagecoach	Stagecoach Drive	1	62	73
ASHCROFT HEIGHTS	Stampede C	Stampede Court	1	78	86
ASHCROFT HEIGHTS	Stirrup Ln	Stirrup Lane	1	50	55
ASHCROFT HEIGHTS	Tumbleweed	Tumbleweed Dr	1	58	69
ASHCROFT HEIGHTS	Windmill C	Windmill Court	1	75	81
ASHCROFT HEIGHTS	Windmill C	Windmill Court	2	78	86
ASHCROFT HEIGHTS	Wyatt Ct	Wyatt Ct	1	71	76
BAY AT THE LANDINGS	Boardwalk	Boardwalk	1	77	84
BAY AT THE LANDINGS	Boardwalk	Boardwalk	2	84	97
BAY AT THE LANDINGS	Chesapeake	Chesapeake Bay	1	80	88
BAY AT THE LANDINGS	Coronado B	Coronado Bay	1	88	97
BAY AT THE LANDINGS	Coronado B	Coronado Bay	2	74	78
BAY AT THE LANDINGS	Coronado B	Coronado Bay	3	76	80
BAY AT THE LANDINGS	Montego By	Montego Bay	1	84	93
BAY AT THE LANDINGS	Montego By	Montego Bay	2	90	98
BAY AT THE LANDINGS	Monterey	Monterey Bay	1	78	85
BAY AT THE LANDINGS	Nntckt Bay	Nantucket Bay	1	85	97
BROWN	33rd St	33rd Street	1	87	100
CENTENNIAL PINES	Cent Cr	Centennial Circle	10	73	85
CHAPPELOW VILLAGE	Baldwin Av	Baldwin Avenue	1	31	34
CHAPPELOW VILLAGE	Barclay Ct	Barclay Court	1	70	77

Table 4.2 – Section Condition Values - *Continued*.

Evans Subdivision	Branch ID	Name	Section ID	PCI	SCI
CHAPPELOW VILLAGE	Birney Ct	Birney Court	1	76	94
CHAPPELOW VILLAGE	Cramer Ave	Cramer Avenue	1	70	100
CHAPPELOW VILLAGE	Dickson Ct	Dickson Court	1	66	85
CHAPPELOW VILLAGE	Ellis Ct	Ellis Court	1	76	100
CHAPPELOW VILLAGE	McNitt St	McNitt Street	1	70	97
CHAPPELOW VILLAGE	O'Conner	O'Conner Avenue	1	63	77
COLLECTOR STREETS	1st Ave	1st Avenue	10	57	64
COLLECTOR STREETS	1st Ave	1st Avenue	20	100	100
COLLECTOR STREETS	29th Ave	29th Avenue	1	28	33
COLLECTOR STREETS	29th Ave	29th Avenue	2	52	56
COLLECTOR STREETS	29th Ave	29th Avenue	3	58	63
COLLECTOR STREETS	32nd St	32nd Street	5	92	98
COLLECTOR STREETS	34th St	34th Street	10	59	66
COLLECTOR STREETS	34th St	34th Street	20	47	57
COLLECTOR STREETS	34th St	34th Street	30	80	90
COLLECTOR STREETS	34th St	34th Street	40	86	94
COLLECTOR STREETS	37th St	37th Street	10	89	94
COLLECTOR STREETS	37th St	37th Street	11	100	100
COLLECTOR STREETS	37th St	37th Street	12	100	100
COLLECTOR STREETS	37th St	37th Street	20	30	36
COLLECTOR STREETS	47th Ave	47th Avenue	5	39	46
COLLECTOR STREETS	Anchor Dr	Anchor Drive	10	100	100
COLLECTOR STREETS	Anchor Dr	Anchor Drive	20	61	70
COLLECTOR STREETS	Carson Ave	Carson Avenue	09	88	100
COLLECTOR STREETS	Carson Ave	Carson Avenue	10	32	39
COLLECTOR STREETS	Cedar Park	Cedar Park Drive	1	87	98
COLLECTOR STREETS	Chardonnay	Chardonnay St	1	86	100
COLLECTOR STREETS	Chardonnay	Chardonnay St	2	70	96
COLLECTOR STREETS	FlorenceAv	Florence Ave	1	81	87
COLLECTOR STREETS	Harbor Ln	Harbor Lane	20	56	71
COLLECTOR STREETS	Harbor Ln	Harbor Lane	30	47	55
COLLECTOR STREETS	Harbor Ln	Harbor Lane	40	68	99
COLLECTOR STREETS	Harbor Ln	Harbor Lane	50	67	75
COLLECTOR STREETS	MarinersLa	Mariners Landing Dr	1	52	61
COLLECTOR STREETS	MountainV	Mountain View Dr	1	92	100
COLLECTOR STREETS	Palano Ave	Palano Ave	1	77	83
COLLECTOR STREETS	Parkview D	Parkview Drive	1	69	95
COLLECTOR STREETS	Parkview D	Parkview Drive	2	92	100
COLLECTOR STREETS	Sienna Ave	Sienna Ave	1	66	75
COLLECTOR STREETS	Sienna Ave	Sienna Ave	2	63	68
COLLECTOR STREETS	Sienna Ave	Sienna Ave	3	68	75
COLLECTOR STREETS	Stampede D	Stampede Drive	1	70	80

Table 4.2 – Section Condition Values - *Continued*.

Evans Subdivision	Branch ID	Name	Section ID	PCI	SCI
COLLECTOR STREETS	Stampede D	Stampede Drive	2	76	87
COLLECTOR STREETS	Stampede D	Stampede Drive	3	76	87
COLLECTOR STREETS	Stampede D	Stampede Drive	4	100	100
COLLECTOR STREETS	Tuscany St	Tuscany St	20	61	65
COTTAGES AT THE LANDINGS	Pelican Ln	Pelican Lane	1	74	79
COVE AT THE LANDINGS	Cove Way	Cove Way	1	75	83
CRAIG ARCHER KOHLER TRACYS	35th St	35th Street	1	90	100
CRAIG ARCHER KOHLER TRACYS	35th St	35th Street	1A	95	100
CRAIG ARCHER KOHLER TRACYS	Pueblo St	Pueblo Street	1	92	98
CRAIG ARCHER KOHLER TRACYS	Trinidad	Trinidad Street	1	92	98
ELLIOTTS COURT	Carson Ct	Carson Court	1	69	73
ELLIOTTS COURT	Elliot Ct	Elliot Court	1	67	73
ELLIOTTS COURT	Latham Ct	Latham Ct.	1	75	79
EVANS INDUSTRIAL PARK	Brantner	Brantner Road	10	51	63
EVANS INDUSTRIAL PARK	Brantner	Brantner Road	20	85	98
EVANS INDUSTRIAL PARK	W Service	West Service Road	08	54	60
FAULES VALLEY	Vlly Vw Av	Valley View Avenue	10	65	73
FAULES VALLEY	Whitney Wy	Whitney Way	10	59	66
GRAPEVINE HOLLOW	Barbera Ct	Barbera Ct	1	42	48
GRAPEVINE HOLLOW	Barbera St	Barbera St	1	73	86
GRAPEVINE HOLLOW	Barbera St	Barbera St	2	76	90
GRAPEVINE HOLLOW	Borrossa	Borrossa St	1	73	100
GRAPEVINE HOLLOW	Borrossa	Borrossa St	2	72	78
GRAPEVINE HOLLOW	Burgundy	Burgundy St	1	78	96
GRAPEVINE HOLLOW	Concord St	Concord St	10	79	93
GRAPEVINE HOLLOW	Constanita	Constanita St	1	75	100
GRAPEVINE HOLLOW	Corvina Ct	Corvina Ct	1	59	73
GRAPEVINE HOLLOW	Corvina St	Corvina St	1	74	91
GRAPEVINE HOLLOW	Grenache	Grenache St	1	75	100
GRAPEVINE HOLLOW	Grenache	Grenache St	2	83	100
GRAPEVINE HOLLOW	Laguna Ct	Laguna Ct	10	92	100
GRAPEVINE HOLLOW	Laguna St	Laguna St	10	91	100
GRAPEVINE HOLLOW	Merlot Ct	Merlot Ct	10	87	100
GRAPEVINE HOLLOW	Merlot St	Merlot St	10	89	100
GRAPEVINE HOLLOW	Muscat Ct	Muscat Ct	10	83	87
GRAPEVINE HOLLOW	Noble St	Noble St	1	79	85
GRAPEVINE HOLLOW	Pinot St	Pinot St	10	86	100
GRAPEVINE HOLLOW	RieslingCt	Riesling Ct	10	89	97
GRAPEVINE HOLLOW	RieslingSt	Riesling St	10	65	70

Table 4.2 – Section Condition Values - *Continued*.

Evans Subdivision	Branch ID	Name	Section ID	PCI	SCI
GRAPEVINE HOLLOW	SauvignonC	Sauvignon Ct	10	85	96
GRAPEVINE HOLLOW	SauvignonS	Sauvignon St	10	74	79
GRAPEVINE HOLLOW	Syrah St	Syrah St	10	65	76
GRAPEVINE HOLLOW	Syrah St	Syrah St	20	81	100
GRAPEVINE HOLLOW	Zinfandel	Zinfandel St	10	58	62
GREEN MEADOW	38th St	38th Street	30	53	62
GREEN MEADOW	38th St Rd	38th Street Road	1	67	75
GREEN MEADOW	39th St	39th Street	30	56	64
GREEN MEADOW	39th St Ct	39th Street Court	1	68	82
GREEN MEADOW	40th St Ct	40th Street Court	10	76	100
GREEN MEADOW	41st St	41st Street	20	79	100
GREEN MEADOW	41st St Rd	41st Street Road	10	68	100
GREEN MEADOW	Belmont Av	Belmont Avenue	10	70	80
GREEN MEADOW	Belmont Av	Belmont Avenue	20	60	69
HEATHERWAY	Ash Ct	Ash Court	1	61	66
HUNTERS RESERVE	Canvasback	Canvasback Ct	1	100	100
HUNTERS RESERVE	Dove Ln	Dove Lane	1	90	100
HUNTERS RESERVE	Dove Ln	Dove Lane	2	94	100
HUNTERS RESERVE	EaglesNest	Eagles Nest Dr	1	93	100
HUNTERS RESERVE	Falcon Ln	Falcon Lane	1	94	100
HUNTERS RESERVE	Grouse Dr	Grouse Drive	1	94	100
HUNTERS RESERVE	Hawk Dr	Hawk Drive	2	93	100
HUNTERS RESERVE	Mallard Av	Mallard Ave	1	93	100
HUNTERS RESERVE	PartridgeA	Partridge Ave	1	96	100
HUNTERS RESERVE	PartridgeC	Partridge Ct	1	93	100
HUNTERS RESERVE	PheasantCt	Pheasant Court	1	93	100
HUNTERS RESERVE	PheasantCt	Pheasant Court	2	93	100
HUNTERS RESERVE	PheasantSt	Pheasant St	1	95	100
HUNTERS RESERVE	PtarmiganD	Ptarmigan Drive	1	91	100
HUNTERS RESERVE	Quail St	Quail Street	1	93	100
HUNTERS RESERVE	Red Tail W	Red Tail Way	1	95	100
HUNTERS RESERVE	Swallow Ct	Swallow Ct	1	94	100
KING	King Ct	King Court	10	51	57
LAKE SHORE	Glendale	Glendale Drive	10	72	84
LAKE SHORE	Skyline	Skyline	10	75	94
LAKE SHORE	Skyline	Skyline	20	77	97
LAKE SHORE	State Farm	State Farm Road	10	56	100
LAKE SHORE	State Farm	State Farm Road	20	82	90
LYNCHS	36th St	36th Street	15	95	100
LYNCHS	36th St	36th Street	20	42	73
LYNCHS	Idaho St	Idaho St	10	93	100
LYNCHS	W Service	West Service Road	40	59	72

Table 4.2 – Section Condition Values - *Continued*.

Evans Subdivision	Branch ID	Name	Section ID	PCI	SCI
MAIN STREETS	29th St Rd	29th St Rd	10	93	100
MAIN STREETS	CR 394	CR 394	10	43	50
MAIN STREETS	CR 394	CR 394	20	35	42
MEADOWS	40th St	40th Street	40	20	26
MEADOWS	Meadows Av	Meadows Avenue	10	75	100
MEADOWS	Meadows Av	Meadows Avenue	20	55	70
MEADOWS	Meadw V Ct	Meadow View Ct	10	91	100
MEADOWS	Meadw V Ct	Meadow View Ct	5	35	41
NEVILLES CROSSING	Bush Mills	Bush Mills Ave	1	88	100
NEVILLES CROSSING	Charleston	Charleston Ave	1	88	94
NEVILLES CROSSING	Dry Creek	Dry Creek Rd	1	81	90
NEVILLES CROSSING	Kanawha Ln	Kanawha Lane	1	91	98
NEVILLES CROSSING	Pendleton	Pendleton Ave	1	89	98
NICKERSON	35th St Ct	35th Street Court	1	93	97
NORTH POINT	Anchor Dr	Anchor Drive	30	75	91
NORTH POINT	North Pt D	North Point Dr	1	76	86
NORTH POINT	Rock Pt Ct	Rock Point Court	1	80	90
NORTH POINT	Rock Pt Dr	Rock Point Drive	1	84	94
NORTH POINT	Shelt Harb	Sheltered Harbor Drive	1	79	89
NORTH POINT	SpringCove	Spring Cove Drive	1	85	100
NORTH POINT	Swan Pt Ct	Swan Point Ct	1	81	100
NORTH POINT	Swan Pt Dr	Swan Point Dr	1	64	75
NORTH POINT	TidewaterC	Tidewater Court	1	63	72
NORTH POINT	TidewaterD	Tidewater Drive	1	68	79
NORTH POINT	TidewaterD	Tidewater Drive	2	68	79
NORTH POINT	WatermanL	Watermans Landing Dr	1	78	88
OLD TOWN EVANS	35th St	35th Street	2	85	91
OLD TOWN EVANS	36th St	36th Street	10	66	71
OLD TOWN EVANS	36th St	36th Street	6	71	77
OLD TOWN EVANS	38th St	38th Street	10	58	77
OLD TOWN EVANS	39th St	39th Street	10	66	84
OLD TOWN EVANS	39th St	39th Street	20	40	50
OLD TOWN EVANS	40th St	40th Street	10	49	57
OLD TOWN EVANS	40th St	40th Street	20	74	100
OLD TOWN EVANS	41st St	41st Street	10	74	90
OLD TOWN EVANS	Boulder St	Boulder Street	2	68	77
OLD TOWN EVANS	Boulder St	Boulder Street	3	83	100
OLD TOWN EVANS	Boulder St	Boulder Street	4	53	60
OLD TOWN EVANS	Boulder St	Boulder Street	5	76	84
OLD TOWN EVANS	Boulder St	Boulder Street	6	67	81
OLD TOWN EVANS	Boulder St	Boulder Street	7	89	96
OLD TOWN EVANS	Central St	Central Street	20	54	63

Table 4.2 – Section Condition Values - *Continued*.

Evans Subdivision	Branch ID	Name	Section ID	PCI	SCI
OLD TOWN EVANS	Central St	Central Street	30	57	74
OLD TOWN EVANS	Central St	Central Street	40	52	63
OLD TOWN EVANS	Central St	Central Street	50	45	58
OLD TOWN EVANS	Central St	Central Street	60	50	60
OLD TOWN EVANS	Denver St	Denver Street	1A	63	68
OLD TOWN EVANS	Denver St	Denver Street	20	88	100
OLD TOWN EVANS	Denver St	Denver Street	30	58	84
OLD TOWN EVANS	Denver St	Denver Street	40	19	42
OLD TOWN EVANS	Empire St	Empire Street	1	58	63
OLD TOWN EVANS	Empire St	Empire Street	2	75	87
OLD TOWN EVANS	Empire St	Empire Street	3	45	60
OLD TOWN EVANS	Empire St	Empire Street	4	60	69
OLD TOWN EVANS	Empire St	Empire Street	5	54	62
OLD TOWN EVANS	Golden St	Golden Street	10	42	48
OLD TOWN EVANS	Golden St	Golden Street	20	61	71
OLD TOWN EVANS	Golden St	Golden Street	30	48	56
OLD TOWN EVANS	Golden St	Golden Street	40	35	41
OLD TOWN EVANS	Golden St	Golden Street	50	100	100
OLD TOWN EVANS	Golden St	Golden Street	60	68	74
OLD TOWN EVANS	State St	State Street	10	30	41
OLD TOWN EVANS	State St	State Street	20	52	69
PAWNEE	San Juan	San Juan Circle	10	46	73
PLATTE INDUSTRIAL CENTER	40th St	40th Street	30	25	32
PLATTE INDUSTRIAL CENTER	40th St	40th Street	35	95	100
PLATTE INDUSTRIAL CENTER	Latham Ave	Latham Avenue	10	84	91
PLATTE INDUSTRIAL CENTER	St Vrain	St. Vrain	10	40	50
PLATTE INDUSTRIAL CENTER	Valmont St	Valmont Street	05	95	100
PLATTE INDUSTRIAL CENTER	W Service	West Service Road	20	20	25
PLATTE INDUSTRIAL CENTER	W Service	West Service Road	25	95	100
PLATTE INDUSTRIAL CENTER	W Service	West Service Road	30	31	38
PLATTE VALLEY	15th Ave	15th Avenue	10	33	39
PLATTE VALLEY	15th Ave	15th Avenue	20	30	36
PLATTE VALLEY	35th St	35th Street	3	65	78
PLATTE VALLEY	36th St	36th Street	30	69	90
PLATTE VALLEY	36th St	36th Street	40	98	100
PLATTE VALLEY	Belmont Av	Belmont Avenue	30	53	60
PLATTE VALLEY	Burlington	Burlington Avenue	3	73	83
PLATTE VALLEY	Carson Ave	Carson Avenue	20	73	85
PLATTE VALLEY	Claremont	Claremont Ave.	1	52	61
PLATTE VALLEY	Collns Ave	Collins Ave.	1	61	67
PLATTE VALLEY	Latham Ave	Latham Avenue	2	68	75
PLATTE VALLEY	Lupton Ave	Lupton Avenue	1	61	68

Table 4.2 – Section Condition Values - *Continued*.

Evans Subdivision	Branch ID	Name	Section ID	PCI	SCI
PLEASANT ACRES	PlesantADr	Pleasant Acres Drive	10	57	81
PLEASANT ACRES	PlesantARd	Pleasant Acres Road	1	80	84
RIDGE AT PRAIRIE VIEW	Bluebells	Bluebells Drive	1	72	94
RIDGE AT PRAIRIE VIEW	Bluebells	Bluebells Drive	2	71	85
RIDGE AT PRAIRIE VIEW	Buttercup	Buttercup Lane	1	74	100
RIDGE AT PRAIRIE VIEW	Buttercup	Buttercup Lane	2	75	90
RIDGE AT PRAIRIE VIEW	Clover Cir	Clover Circle	1	85	95
RIDGE AT PRAIRIE VIEW	Daylily Wy	Daylily Way	1	83	100
RIDGE AT PRAIRIE VIEW	Harbor Ln	Harbor Lane	10	36	44
RIDGE AT PRAIRIE VIEW	Heather Ln	Heather Lane	10	85	92
RIDGE AT PRAIRIE VIEW	Heather Ln	Heather Lane	20	79	84
RIDGE AT PRAIRIE VIEW	Larkspur	Larkspur Rd	1	79	91
RIDGE AT PRAIRIE VIEW	Laurel Dr	Laurel Drive	1	78	82
RIDGE AT PRAIRIE VIEW	Laurel Dr	Laurel Drive	2	74	100
RIDGE AT PRAIRIE VIEW	Mariposa L	Mariposa Lane	1	89	100
RIDGE AT PRAIRIE VIEW	Mariposa L	Mariposa Lane	2	74	78
RIDGE AT PRAIRIE VIEW	Paintbrush	Paintbrush Dr	09	92	100
RIDGE AT PRAIRIE VIEW	Paintbrush	Paintbrush Dr	10	66	72
RIDGE AT PRAIRIE VIEW	Paintbrush	Paintbrush Dr	20	83	100
RIDGE AT PRAIRIE VIEW	Pennroyal	Pennroyal Lane	1	85	100
RIDGE AT PRAIRIE VIEW	Phlox Ln	Phlox Lane	09	92	100
RIDGE AT PRAIRIE VIEW	Phlox Ln	Phlox Lane	10	76	100
RIDGE AT PRAIRIE VIEW	Phlox Ln	Phlox Lane	20	67	73
RIDGE AT PRAIRIE VIEW	Rockcress	Rockcress Road	09	90	100
RIDGE AT PRAIRIE VIEW	Shootng St	Shooting Star Way	10	90	100
RIVER BEND	42nd St Rd	42nd Street Road	10	38	46
RIVER BEND	43rd St	43rd Street	10	53	67
RIVER BEND	Boulder St	Boulder Street	1	47	53
RIVER BEND	Central St	Central Street	10	44	52
RIVER BEND	Denver St	Denver Street	10	62	69
RIVERSIDE MEADOWS	Salida Ct	Salida Court	1	88	94
ROBIN SONS	38th St	38th Street	20	81	98
ROBIN SONS	Burlington	Burlington Avenue	10	86	91
SHARLYN PLACE TOWNHOMES	Sharlyn Ct	Sharlyn Court	10	60	65
SOUTH GATE	8th Ave	8th Avenue (W Service Rd)	10	98	100
SOUTH GATE	8th Ave	8th Avenue (W Service Rd)	5	21	26
SOUTH GATE	8th Ave	8th Avenue (W Service Rd)	7	83	92
SOUTH GATE	Southgate	Southgate Drive	10	32	38
SUNDOWN ESTATES	15th Ave	15th Avenue	3	57	65
SUNDOWN ESTATES	Belmont Av	Belmont Avenue	40	77	86
SUNDOWN ESTATES	Claremont	Claremont Ave.	20	85	90

Table 4.2 – Section Condition Values - *Continued*.

Evans Subdivision	Branch ID	Name	Section ID	PCI	SCI
SUNDOWN ESTATES	Collns Ave	Collins Ave.	2	43	47
SUNDOWN ESTATES	Lupton Ave	Lupton Avenue	2	56	64
SUNDOWN ESTATES	Valmont St	Valmont Street	10	60	67
SUNNY VIEW	30th St	30th Street	10	85	98
SUNNY VIEW	31st St Ln	31st Street Lane	10	84	88
SUNNY VIEW	High Dr	High Drive	10	83	93
SUNNY VIEW	Lakeside	Lakeside Drive	10	62	73
SUNNY VIEW	Sunset Dr	Sunset Drive	10	83	93
TIMBERLINE	Riverside	Riverside Parkway	10	83	89
TUSCANY	Capri St	Capri St	10	83	95
TUSCANY	Carrara St	Carrarra St	10	91	100
TUSCANY	Caruso St	Caruso St	1	91	100
TUSCANY	Cypress St	Cypress St	10	88	98
TUSCANY	Dante St	Dante St	10	85	93
TUSCANY	Messina St	Messina St	10	85	100
TUSCANY	Milan St	Milan Street	20	68	72
TUSCANY	Monte Cris	Monte Cristo	1	81	88
TUSCANY	MonteCimon	Monte Cimone St	1	62	69
TUSCANY	Naples St	Naples St	1	84	88
TUSCANY	Palermo Av	Palermo Ave	10	63	71
TUSCANY	Palermo Av	Palermo Ave	20	71	83
TUSCANY	Palermo Av	Palermo Ave	30	89	100
TUSCANY	Poppi Ave	Poppi Ave	1	79	83
TUSCANY	Poppi Ave	Poppi Ave	2	87	95
TUSCANY	Porto Fino	Porto Fino Avenue	10	69	77
TUSCANY	Rialto Ave	Rialto Avenue	1	70	77
TUSCANY	Rialto Ave	Rialto Avenue	2	83	92
TUSCANY	San Carlo	San Carlo Ave	10	86	96
TUSCANY	San Marco	San Marco Ave	10	90	100
TUSCANY	San Marino	San Marino Ave	10	87	93
TUSCANY	San Mateo	San Mateo Ave	10	72	77
TUSCANY	San Mateo	San Mateo Ave	20	80	88
TUSCANY	San Mateo	San Mateo Ave	30	86	100
TUSCANY	Tuscany St	Tuscany St	10	81	87
VILLAGE	35th St Ct	35th Street Court	2	72	78
VILLAGE	36th St	36th Street	5	72	97
VILLAGE	36th St Ct	36th Street Court	1	69	80
VILLAGE	Columbine	Columbine Court	1	72	82
VILLAGE	Dahlia St	Dahlia Street	1	71	76
VILLAGE	Lilac Ct	Lilac Court	1	70	76
VILLAGE	Lilac Lane	Lilac Lane	1	71	80
VILLAGE	Magnolia	Magnolia Street	1	65	70

Table 4.2 – Section Condition Values - *Continued*.

Evans Subdivision	Branch ID	Name	Section ID	PCI	SCI
VILLAGE	Montrose	Montrose Street	1	69	78
VILLAGE	Mrgld Ct	Marigold Court	1	81	87
VILLAGE	Mrgld St	Marigold Street	1	58	63
VILLAGE	Myrtle St	Myrtle Street	1	66	83
VILLAGE CONDOS	40th St	40th Street	50	70	78
VILLAGE CONDOS	Rowan Lane	Rowan Lane	1	75	87
WILLOWBROOK	24th Ave	24th Avenue	1	59	77
WILLOWBROOK	25th Ave	25th Avenue	1	32	38
WILLOWBROOK	25th Ave	25th Avenue	2	64	74
WILLOWBROOK	26th Ave	26th Avenue	1	55	69
WILLOWBROOK	27th Ave	27th Avenue	1	54	64
WILLOWBROOK	27th Ave	27th Avenue	2	58	64
WILLOWBROOK	28th Ave	28th Avenue	1	69	100
WILLOWBROOK	28th Ave	28th Avenue	2	51	70
WILLOWBROOK	Dock Drive	Dock Drive	1	71	78
WILLOWBROOK	Haven Ct	Haven Court	1	54	62
WILLOWBROOK	Hawk Dr	Hawk Drive	1	46	54
WILLOWBROOK	Lagoon Ct	Lagoon Ct	1	69	100
WILLOWBROOK	Marina St	Marina Street	1	60	78
WILLOWBROOK	Port St	Port Street	1	58	77
WILLOWBROOK	Quay St	Quay Street	1	62	82
WILLOWBROOK	Quay St	Quay Street	2	52	72
WILLOWBROOK	Waterfront	Waterfront Street	1	59	82
WILLOWBROOK	Wharf St	Wharf Street	1	56	76

PROJECT RECOMMENDATIONS

With the City of Evans is continually growing, there will be a need for existing roadways to be reconstructed and expanded to more efficiently service the new incoming subdivisions. It is city policy that these new subdivisions pay their way for upgrading the surrounding roadways to which they will utilize. Given the city's policy on growth, it is not economically wise to apply major M&R to areas surrounding future developments. It was determined that a more in-depth M&R budget scenario needed to be analyzed.

IN DEPTH PAVER™ M&R WORK PLAN RESULTS

The in-depth scenario uses the $600K budget and excludes areas where future development might occur. Excluded pavements will not be neglected entirely though, they will be eligible to receive preventive and safety funding. The split budget that provided the best overall plan outcome for localized, global and major work types were broken up into $50K, $100K and $450K respectively. The in-depth seven-year analysis summary as well as the recommended work per year is presented in the tables and maps below.

Table 4.3 – PAVER™In-Depth Summary Analysis.

Plan Year	Funded M&R Work Type				Total Funded	Total Unfunded	Total Funded and Unfunded	PCI	
	Localized Preventive and Stopgap	Global	Major Below Critical PCI	Major Above Critical PCI				Before Work	After Work
In Depth Analysis $600K									
2016	$ 49,992	$ 99,395	$ 448,004	$ -	$ 597,391	$ 10,306,855	$ 10,904,246	64	65
2017	$ 49,986	$ 97,504	$ 442,150	$ -	$ 589,640	$ 11,132,282	$ 11,721,922	63	64
2018	$ 49,970	$ 8,010	$ 435,300	$ -	$ 493,280	$ 12,212,318	$ 12,705,598	61	62
2019	$ 49,988	$ 90,829	$ 441,919	$ -	$ 582,736	$ 13,704,257	$ 14,286,994	60	61
2020	$ 49,972	$ 97,609	$ 448,277	$ -	$ 595,858	$ 15,329,164	$ 15,925,022	58	60
2021	$ 49,970	$ 99,772	$ 445,325	$ -	$ 595,067	$ 16,410,710	$ 17,005,777	57	58
2022	$ 49,969	$ 98,923	$ 443,747	$ -	$ 592,638	$ 17,569,268	$ 18,161,906	56	57
Total	**$349,847.03**	**$592,042.28**	**$3,104,722.31**	**$0.00**	**$4,046,611.62**			**64**	**57**

Table 4.4 – PAVER™ Suggested Major Work Recommendations.

Suggested Major M&R			
Suggested Plan Year	Branch ID	Section ID	Cost
2016	1st Ave	10	$ 81,339
	37th St	50	$ 130,004
	GoldRushCt	1	$ 19,812
	PrairieVw	30	$ 216,850
2017	32nd St	2	$ 442,150
2018	35th Ave	30	$ 187,421
	PrairieVw	10	$ 247,879
2019	32nd St	4	$ 172,003
	32nd St	4.1	$ 140,200
	42nd St	10	$ 129,716
2020	17th Ave	30	$ 134,909
	42nd St	25	$ 107,101
	Anchor Dr	20	$ 190,323
	GunBarrel	1	$ 15,944
2021	37th St	60	$ 381,351
	Sienna Ave	1	$ 16,944
	Sienna Ave	2	$ 47,030
2022	Harbor Ln	40	$ 101,553
	Harbor Ln	50	$ 139,813
	Sienna Ave	3	$ 35,636
	Tuscany St	20	$ 166,744

Table 4.5 – PAVER™ Suggested Global Work Recommendations.

Suggested Global M&R			
Suggested Plan Year	**Branch ID**	**Section ID**	**Cost**
2016	Skyline	20	$ 1,149
	38th St Rd	1	$ 8,410
	39th St	10	$ 11,924
	36th St	30	$ 15,648
	Cent Cr	10	$ 12,705
	McNitt St	1	$ 14,827
	39th St Ct	1	$ 10,079
	41st St Rd	10	$ 4,776
	O'Conner	1	$ 7,884
	Boulder St	2	$ 5,071
	Dickson Ct	1	$ 6,921
2017	40th St Ct	10	$ 5,331
	Riverside	10	$ 11,178
	Boulder St	3	$ 6,255
	Latham Ave	10	$ 2,568
	Pelican Ln	1	$ 12,411
	Meadows Av	10	$ 6,177
	Barclay Ct	1	$ 6,904
	Birney Ct	1	$ 6,892
	41st St	20	$ 4,820
	Skyline	10	$ 12,123
	Cove Way	1	$ 9,335
	Ellis Ct	1	$ 6,925
	Cramer Ave	1	$ 6,585
2018	Burlington	10	$ 8,010
2019	Montego By	1	$ 12,732
	38th St	20	$ 3,495
	Nntckt Bay	1	$ 4,559
	Coronado B	1	$ 4,982
	40th St	20	$ 5,594
	Boulder St	5	$ 4,989
	Boardwalk	2	$ 5,424
	Boardwalk	1	$ 12,195
	Coronado B	3	$ 6,749
	Monterey	1	$ 13,991
	Chesapeake	1	$ 9,772
	Coronado B	2	$ 6,347

Table 4.5 – PAVER™ Suggested Global Work Recommendations - *Continued*.

Suggested Global M&R			
Suggested Plan Year	**Branch ID**	**Section ID**	**Cost**
2020	34th St	30	$ 7,445
	32nd St	5	$ 13,283
	34th St	40	$ 10,495
	Masterson	1	$ 3,784
	Stampede C	1	$ 3,189
	Armadillo	1	$ 3,890
	Rio Grande	1	$ 8,193
	35th St	4	$ 12,497
	Bison Ct	1	$ 3,197
	Stampede D	2	$ 16,589
	ConestogaC	1	$ 3,900
	Windmill C	2	$ 2,829
	SantaFe Ct	1	$ 3,195
	Windmill C	1	$ 5,124
2021	Latham Ave	3	$ 5,478
	Empire St	2	$ 4,891
	State Farm	20	$ 7,819
	Dry Creek	1	$ 19,581
	ConestogaA	1	$ 5,020
	Cactus Ave	1	$ 5,679
	PonderosaD	1	$ 7,884
	Cedar Park	1	$ 18,846
	38th Ave	1	$ 16,050
	Longhorn C	1	$ 2,982
	Mesa Dr	1	$ 5,543
2022	33rd St	1	$ 7,143
	Larkspur	1	$ 5,141
	Rock Pt Dr	1	$ 9,090
	Rock Pt Ct	1	$ 4,766
	Swan Pt Ct	1	$ 6,262
	Rialto Ave	2	$ 8,965
	Naples St	1	$ 2,863
	Rowan Lane	1	$ 8,020
	Paintbrush	20	$ 4,165
	PlesantARd	1	$ 9,508
	SpringCove	1	$ 5,724
	WatermanL	1	$ 6,166
	Daylily Wy	1	$ 2,164
	Tuscany St	10	$ 2,082
	San Mateo	20	$ 4,799
	Poppi Ave	1	$ 3,629
	Clover Cir	1	$ 8,434

PROJECT FORMULATION

The Major and Global recommendations in Tables 4.4 & 4.5 are made by PAVER™ considering multiple variables including a pavements PCI, critical PCI, priority matrix, deterioration rate, M&R costs and available budget. There are other factors that need to be considered that are not accounted for by the PAVER™ program. These items include globally grouping work together for scale of economy, The City of Evans priority areas and M&R engineering judgement.

Based on the assimilated data from the PAVER™ program as well as the detailed look at city wide priority areas and engineering judgement, projects have been formulated for years 2016, 2017 and 2018. A three-year plan period was best suited for the city due to continual growth, development and other pavement impacting future project development. All total costs below include detailed work items like pavement marking, localized patching, traffic control and raising utility access concrete collars. Detailed costs can be found in Appendix C. Table 4.6 and Map 4.1 presents the formulated project plan.

Table 4.6 – Formulated Project Plan.

Work Year	Branch Name	SectionID	Work Area (SY)	Reccommended Work	Cost
2016	Prairie View Drive	10, 15, 20 & 30	13,138	Patch, Crack Seal, Mill and Overlay	$ 241,061
	32nd Street	2	15,100	Patch, Crack Seal and Surface Treatment	$ 137,938
	37th Street	50, 55 & 60	25,735	Patch, Crack Seal and Surface Treatment	$ 156,042
	37th Steet	20	2,306	Patch, Crack Seal, Mill and Overlay	$ 62,231
2017	32nd Street	3	15,951	Patch, Crack Seal and Surface Treatment	$ 276,241
	37th Steet	30	8,000	Patch, Crack Seal, Mill and Overlay	$ 235,667
	37th Steet	65	10,102	Patch, Crack Seal and Surface Treatment	$ 85,320
2018	37th Steet	40	13,333	Patch, Crack Seal, Mill and Overlay	$ 351,466
	Ashcroft Heights and Old Town Evans	Misc	66,667	Patch, Crack Seal and Surface Treatment	$ 239,000

* All project costs are dependent on current Asphalt prices

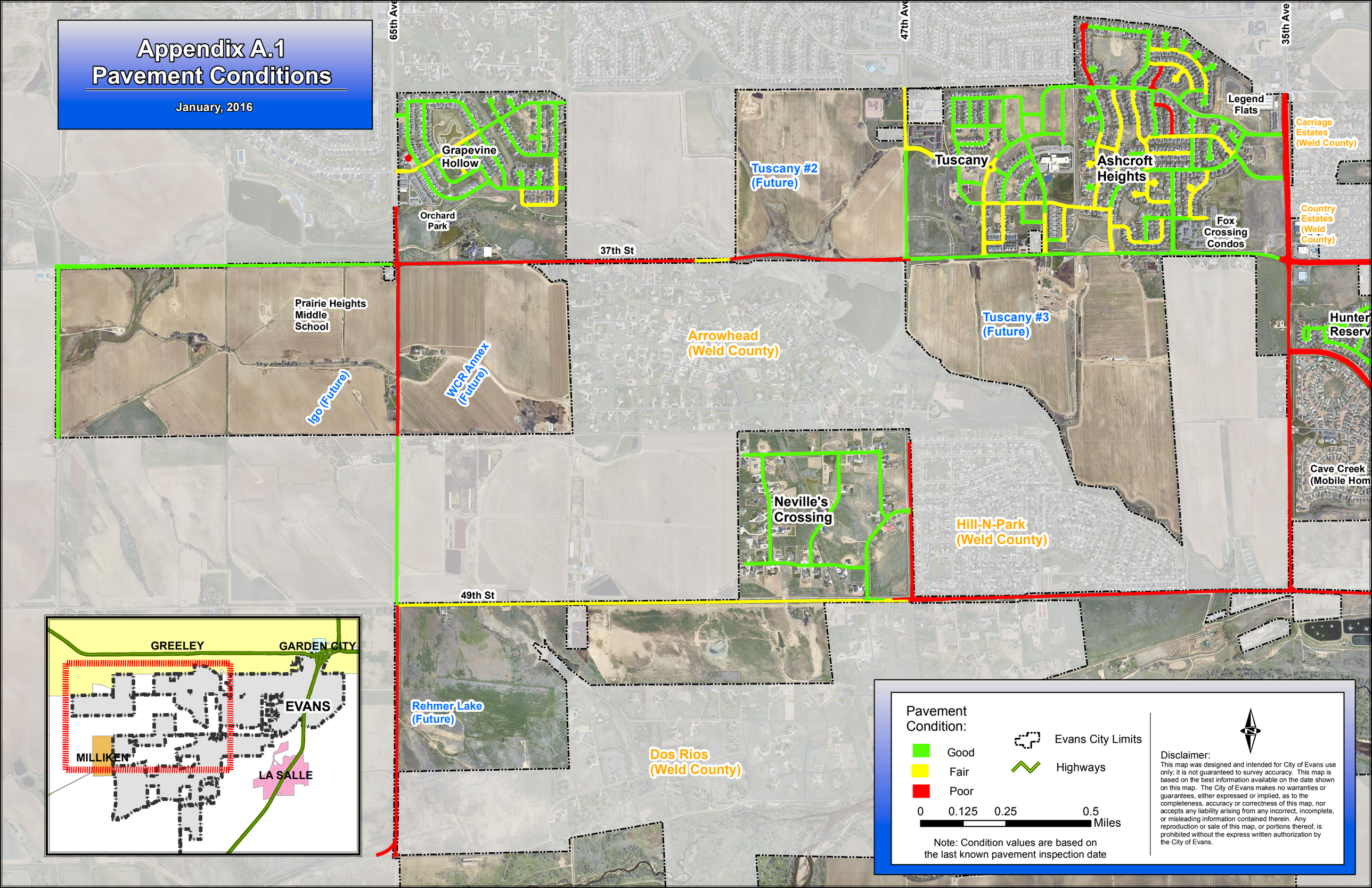
APPENDIX A : MAPS

Appendix A contains the following tables and figures for The City of Evans, Colorado:

- Map A.1 – Section Level Condition Map.
- Map A.2 – Pavement Rank.

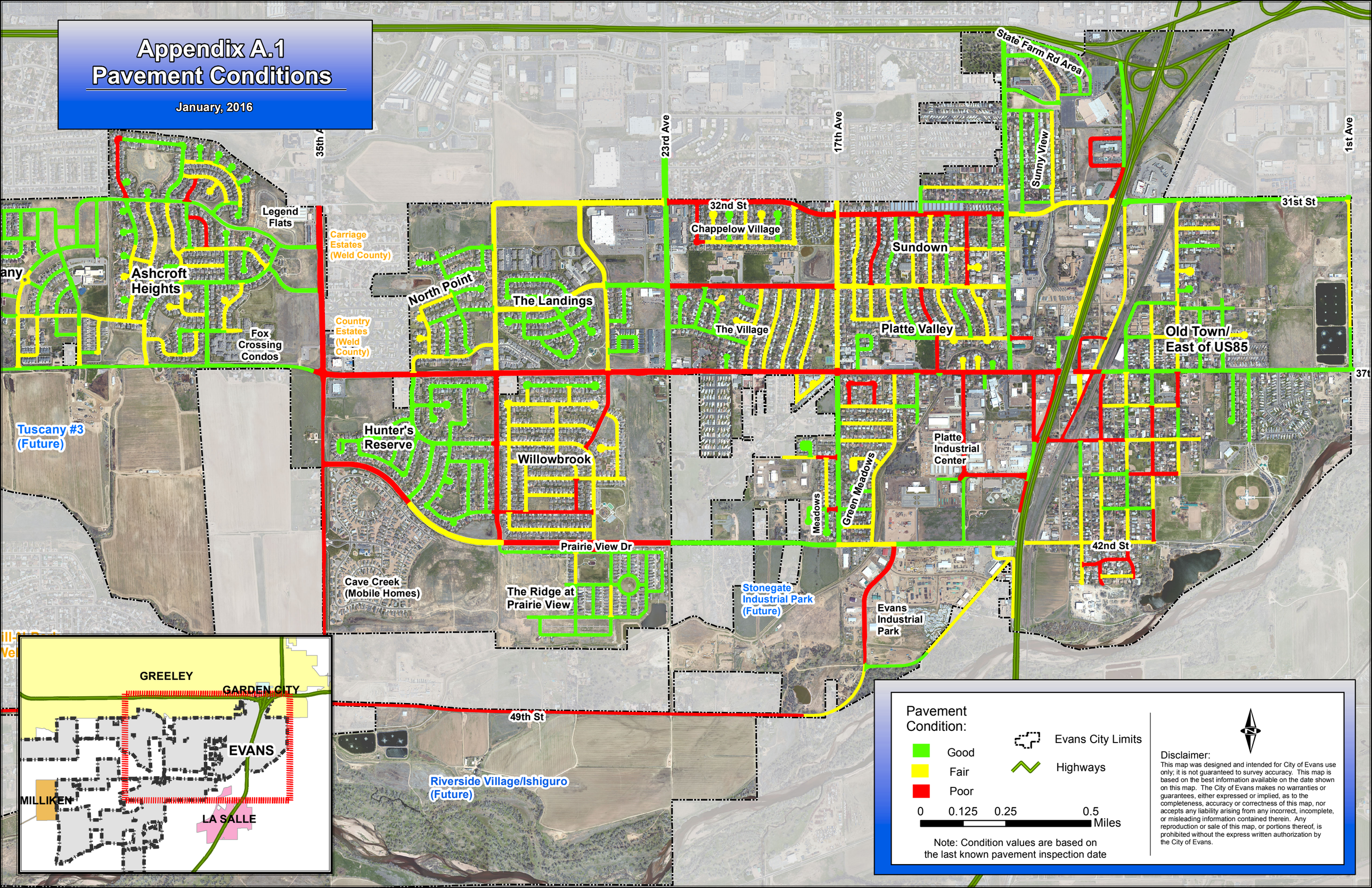
Appendix A.1
Pavement Conditions

January, 2016



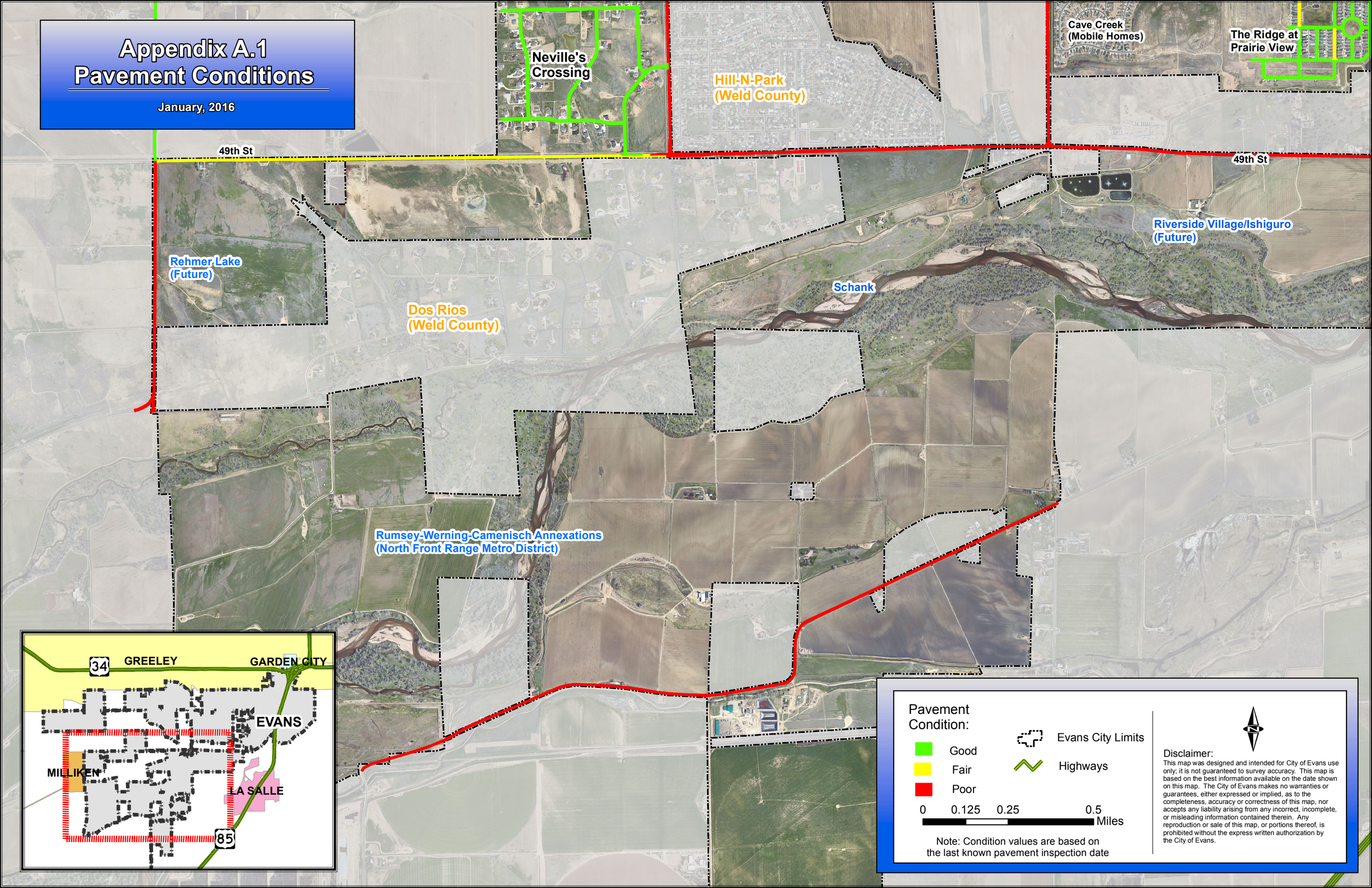
Appendix A.1
Pavement Conditions

January, 2016



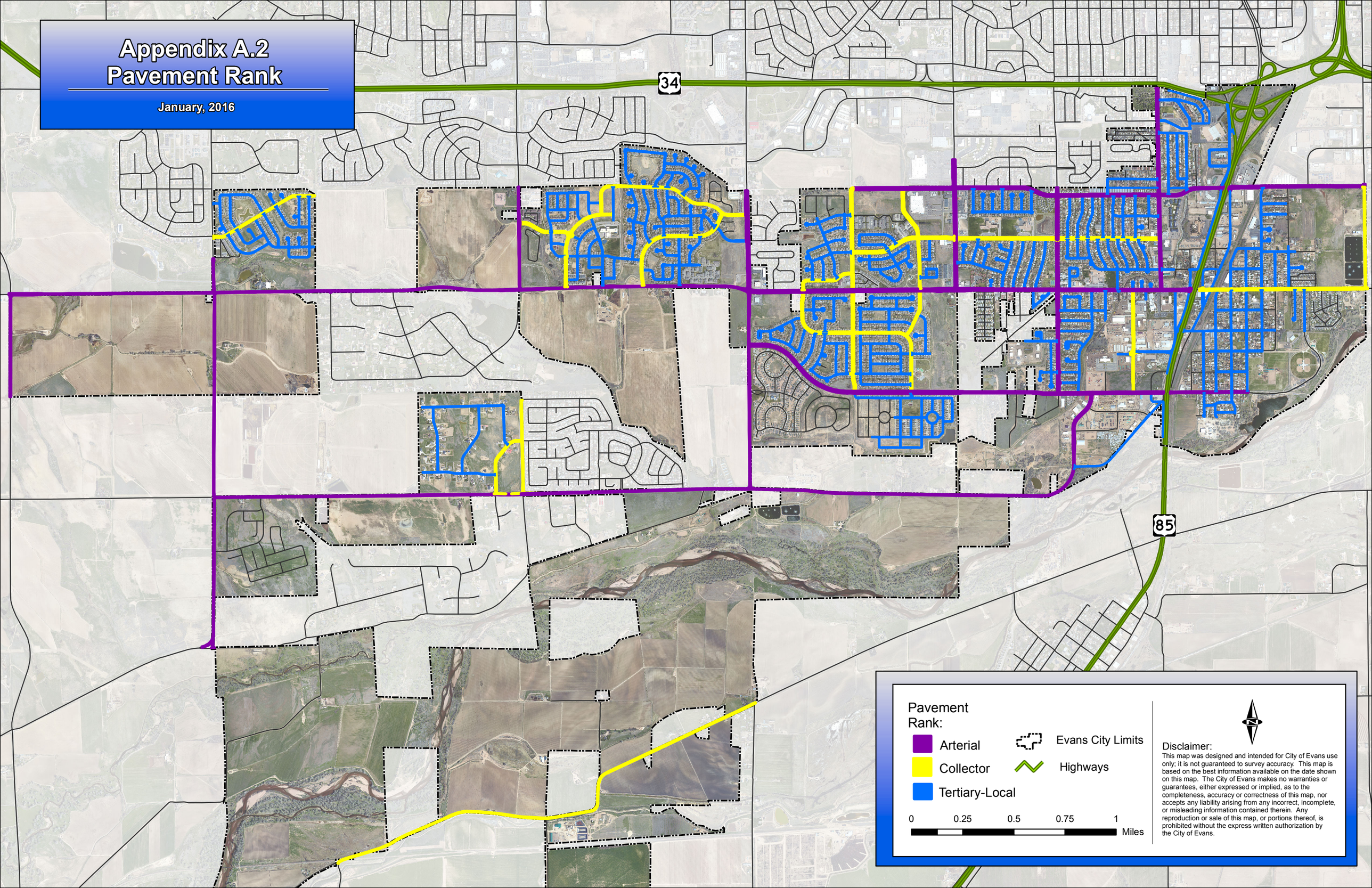
Appendix A.1
Pavement Conditions

January, 2016



Appendix A.2
Pavement Rank

January, 2016



APPENDIX B : PAVER™ REPORTS

Appendix B contains the following PAVER reports for The City of Evans, Colorado:

- Table B.1 – Branch Condition Report.
- Table B.2 – Section Condition Report

APPENDIX C: FORMULATED COST DATA

2016 Projects

PrairieVw SEC 20 &30 &Center Areas Ph	Item	USED	Quantity	Unit	Product Unit Cost	Cost
	Asphalt Pavement	Y	1445.2	TON	97.4	$ 140,758.15
	Roto Mill	Y	9100.0	SY	2.55	$ 23,205.00
	Petromat Fabric	Y	13137.8	SY	2.05	$ 26,932.44
	1/4 Inch Chip Seal	-	13137.8	SY	2.7	$ -
	3/8 Inch Chip Seal	-	13137.8	SY	2.88	$ -
	Slurry Seal	-	13137.8	SY	2.43	$ -
	Crack Seal	Y	15000.0	LF	1.08	$ 16,200.00
	Raise Existing Water Valve & Collar	Y	5	EA	375	$ 1,875.00
	Raise Existing Sewer MH & Collar (Repair)	Y	14	EA	475	$ 6,650.00
	Water Base Striping Double Yellow (Skip or Solid)	Y	100	LF	0.35	$ 35.00
	Sriping Skip Single Yellow	-		LF	0.15	$ -
	Water Base Striping Skip White	Y	1540	LF	0.15	$ 231.00
	Water Base Striping Solid White	-		LF	0.15	$ -
	Water Base Striping Channelization Line White	Y	700	LF	0.25	$ 175.00
	Thermo Plastic Cross Walks (2FT Wide)	-		LF	22	$ -
	Thermo Plastic Stopbars (2FT Wide)	-	34	LF	22	$ -
	Thermo Plastic Left Arrow	-	4	EA	170	$ -
	Thermo Plastic Left Arrow with Through Arrow	-		EA	302.5	$ -
	Thermo Plastic Through Arrow	-		EA	225	$ -
	Thermo Plastic ONLY (16" Symbol Width)	-	2	EA	247.5	$ -
	Thermo Plastic SCHOOL (16" Symbol Width)	-		EA	363	$ -
	Thermo Plastic XING (16" Symbol Width)	-		EA	250	$ -
	Thermo Plastic RR (16" Symbol Width)	-		EA	759	$ -
	Shallow Patch	Y	500	SY	50	$ 25,000.00
	Deep Patch	-		SY	110	$ -
					Total =	$ 241,061.60

Length Phase I	
FT of Applied Area =	118240.0
SY of Applied Area =	13137.8
SY Area of Full Mill =	9100.0
#/SY-IN	110.0
IN Asphalt	2.0
Striping Eradication (Grinding), $/SF)	0

32nd St SEC 2	Item	USED	Quantity	Unit	Product Unit Cost	Cost
	Asphalt Pavement	-	0.0	TON	97.4	$ -
	Roto Mill	-	0.0	SY	2.55	$ -
	Petromat Fabric	-	15099.6	SY	2.05	$ -
	1/4 Inch Chip Seal	-	15099.6	SY	2.7	$ -
	3/8 Inch Chip Seal	-	15099.6	SY	2.88	$ -
	Slurry Seal	-	15099.6	SY	2.43	$ -
	Cape Seal	Y	15099.6	SY	4.5	$ 67,948.00
	Crack Seal	Y	15000.0	LF	1.08	$ 16,200.00
	Raise Existing Water Valve & Collar	Y	5	EA	375	$ 1,875.00
	Raise Existing Sewer MH & Collar	Y	5	EA	475	$ 2,375.00
	Water Base Striping Double Yellow (Skip or Solid)	Y	5000	LF	0.35	$ 1,750.00
	Sriping Skip Single Yellow	-		LF	0.15	$ -
	Water Base Striping Skip White	-		LF	0.15	$ -
	Water Base Striping Solid White	Y	7500	LF	0.15	$ 1,125.00
	Water Base Striping Channelization Line White	Y	640	LF	0.25	$ 160.00
	Thermo Plastic Cross Walks (2FT Wide)	Y	150	LF	22	$ 3,300.00
	Thermo Plastic Stopbars (2FT Wide)	Y	100	LF	22	$ 2,200.00
	Thermo Plastic Left Arrow	Y	3	EA	170	$ 510.00
	Thermo Plastic Left Arrow with Through Arrow	-		EA	302.5	$ -
	Thermo Plastic Through Arrow	-		EA	225	$ -
	Thermo Plastic ONLY (16" Symbol Width)	Y	2	EA	247.5	$ 495.00
	Thermo Plastic SCHOOL (16" Symbol Width)	-		EA	363	$ -
	Thermo Plastic XING (16" Symbol Width)	-		EA	250	$ -
	Thermo Plastic RR (16" Symbol Width)	-		EA	759	$ -
	Shallow Patch	Y	800	SY	50	$ 40,000.00
	Deep Patch	-		SY	110	$ -
					Total =	$ 137,938.00

FT of Applied Area =	135896.0
SY of Applied Area =	15099.6
SY Area of Road Milled (50' at ends & 14' Sides) =	0.0
#/SY-IN	110.0
IN Asphalt	0.0
Striping Eradication (Grinding), $/SF)	0

37th St SEC 60, 55, & 50	Item	USED	Quantity	Unit	Product Unit Cost	Cost
	Asphalt Pavement	-	0.0	TON	97.4	$ -
	Roto Mill	-	0.0	SY	2.55	$ -
	Petromat Fabric	-	25735.8	SY	2.05	$ -
	1/4 Inch Chip Seal	-	25735.8	SY	2.7	$ -
	3/8 Inch Chip Seal	-	25735.8	SY	2.88	$ -
	Slurry Seal	-	25735.8	SY	2.43	$ -
	Cape Seal	Y	25735.8	SY	4.5	$ 115,811.00
	Crack Seal	Y	15000.0	LF	1.08	$ 16,200.00
	Raise Existing Water Valve & Collar	Y	5	EA	375	$ 1,875.00
	Raise Existing Sewer MH & Collar	Y	5	EA	475	$ 2,375.00
	Water Base Striping Double Yellow (Skip or Solid)	-		LF	0.35	$ -
	Sriping Skip Single Yellow	-		LF	0.15	$ -
	Water Base Striping Skip White	Y	1840	LF	0.15	$ 276.00
	Water Base Striping Solid White	-		LF	0.15	$ -
	Water Base Striping Channelization Line White	Y	2090	LF	0.25	$ 522.50
	Thermo Plastic Cross Walks (2FT Wide)	-		LF	22	$ -
	Thermo Plastic Stopbars (2FT Wide)	Y	100	LF	22	$ 2,200.00
	Thermo Plastic Left Arrow	Y	15	EA	170	$ 2,550.00
	Thermo Plastic Left Arrow with Through Arrow	-		EA	302.5	$ -
	Thermo Plastic Through Arrow	-		EA	225	$ -
	Thermo Plastic ONLY (16" Symbol Width)	Y	7	EA	247.5	$ 1,732.50
	Thermo Plastic SCHOOL (16" Symbol Width)	-		EA	363	$ -
	Thermo Plastic XING (16" Symbol Width)	-		EA	250	$ -
	Thermo Plastic RR (16" Symbol Width)	-		EA	759	$ -
	Shallow Patch	Y	250	SY	50	$ 12,500.00
	Deep Patch	-		SY	110	$ -
					Total =	$ 156,042.00

FT of Applied Area =	231622.0
SY of Applied Area =	25735.8
SY Area of Road Milled (50' at ends & 14' Sides) =	0.0
#/SY-IN	110.0
IN Asphalt	0.0
Striping Eradication (Grinding), $/SF)	0

37th St SEC 20	Item	USED	Quantity	Unit	Product Unit Cost	Cost
	Asphalt Pavement	Y	380.6	TON	97.4	$ 37,068.65
	Roto Mill	Y	1500.0	SY	2.55	$ 3,825.00
	Petromat Fabric	Y	2306.6	SY	2.05	$ 4,728.44
	1/4 Inch Chip Seal	-	2306.6	SY	2.7	$ -
	3/8 Inch Chip Seal	-	2306.6	SY	2.88	$ -
	Slurry Seal	-	2306.6	SY	2.43	$ -
	Raise Existing Water Valve & Collar	Y	5	EA	375	$ 1,875.00
	Raise Existing Sewer MH & Collar	Y	7	EA	475	$ 3,325.00
	Water Base Striping Double Yellow (Skip or Solid)	Y	320	LF	0.35	$ 112.00
	Sriping Skip Single Yellow	-		LF	0.15	$ -
	Water Base Striping Skip White	-		LF	0.15	$ -
	Water Base Striping Solid White	-		LF	0.15	$ -
	Water Base Striping Channelization Line White	Y	320	LF	0.25	$ 80.00
	Thermo Plastic Cross Walks (2FT Wide)	-		LF	22	$ -
	Thermo Plastic Stopbars (2FT Wide)	-		LF	22	$ -
	Thermo Plastic Left Arrow	Y	3	EA	170	$ 572.50
	Thermo Plastic Left Arrow with Through Arrow	-		EA	302.5	$ -
	Thermo Plastic Through Arrow	-		EA	225	$ -
	Thermo Plastic ONLY (16" Symbol Width)	Y	2	EA	247.5	$ 645.00
	Thermo Plastic SCHOOL (16" Symbol Width)	-		EA	363	$ -
	Thermo Plastic XING (16" Symbol Width)	-		EA	250	$ -
	Thermo Plastic RR (16" Symbol Width)	-		EA	759	$ -
	Shallow Patch	Y	200	SY	50	$ 10,000.00
	Deep Patch	-		SY	110	$ -
					Total =	$ 62,231.59

FT of Applied Area =	20759.0
SY of Applied Area =	2306.6
SY Area of Road Milled (50' at ends & 14' Sides) =	1500.0
#/SY-IN	110.0
IN Asphalt	3.0
Striping Eradication (Grinding), $/SF)	2.5

2017 Projects

32nd St SEC 3	Item	USED	Quantity	Unit	Product Unit Cost	Cost
	Asphalt Pavement	-	0.0	TON	97.4	$ -
	Roto Mill	-	0.0	SY	2.55	$ -
	Petromat Fabric	-	15951.1	SY	2.05	$ -
	1/4 Inch Chip Seal	-	15951.1	SY	2.7	$ -
	3/8 Inch Chip Seal	-	15951.1	SY	2.88	$ -
	Slurry Seal	-	15951.1	SY	2.43	$ -
	Cape Seal	Y	34768.0	SY	4.5	$ 156,456.00
	Crack Seal	Y	15000.0	LF	1.08	$ 16,200.00
	Raise Existing Water Valve & Collar	Y	5	EA	375	$ 1,875.00
	Raise Existing Sewer MH & Collar	Y	5	EA	475	$ 2,375.00
	Water Base Striping Double Yellow (Skip or Solid)	Y	5000	LF	0.35	$ 1,750.00
	Sriping Skip Single Yellow	-		LF	0.15	$ -
	Water Base Striping Skip White	-		LF	0.15	$ -
	Water Base Striping Solid White	Y	5000	LF	0.15	$ 750.00
	Water Base Striping Channelization Line White	Y	640	LF	0.25	$ 160.00
	Thermo Plastic Cross Walks (2FT Wide)	Y	150	LF	22	$ 3,300.00
	Thermo Plastic Stopbars (2FT Wide)	Y	100	LF	22	$ 2,200.00
	Thermo Plastic Left Arrow	Y	4	EA	170	$ 680.00
	Thermo Plastic Left Arrow with Through Arrow	-	1	EA	302.5	$ -
	Thermo Plastic Through Arrow	-		EA	225	$ -
	Thermo Plastic ONLY (16" Symbol Width)	Y	2	EA	247.5	$ 495.00
	Thermo Plastic SCHOOL (16" Symbol Width)	-		EA	363	$ -
	Thermo Plastic XING (16" Symbol Width)	-		EA	250	$ -
	Thermo Plastic RR (16" Symbol Width)	-		EA	759	$ -
	Shallow Patch	Y	1800	SY	50	$ 90,000.00
	Deep Patch	-		SY	110	$ -
					Total =	$ 276,241.00

FT of Applied Area =	143560.0
SY of Applied Area =	15951.1
SY Area of Road Milled (50' at ends & 14' Sides) =	0.0
#/SY-IN	110.0
IN Asphalt	0.0
Striping Eradication (Grinding), $/SF)	0

37th St SEC 30 (Up to New WL Area)	Item	USED	Quantity	Unit	Product Unit Cost	Cost
	Asphalt Pavement	Y	1320.0	TON	97.4	$ 128,568.00
	Roto Mill	Y	5050.0	SY	2.55	$ 12,877.50
	Petromat Fabric	Y	8000.0	SY	2.05	$ 16,400.00
	1/4 Inch Chip Seal	-	8000.0	SY	2.7	$ -
	3/8 Inch Chip Seal	-	8000.0	SY	2.88	$ -
	Slurry Seal	-	8000.0	SY	2.43	$ -
	Raise Existing Water Valve & Collar	Y	18	EA	375	$ 6,750.00
	Raise Existing Sewer MH & Collar	Y	11	EA	475	$ 5,225.00
	Water Base Striping Double Yellow (Skip or Solid)	Y	1400	LF	0.35	$ 490.00
	Sriping Skip Single Yellow	-		LF	0.15	$ -
	Water Base Striping Skip White	Y	760	LF	0.15	$ 114.00
	Water Base Striping Solid White	-		LF	0.15	$ -
	Water Base Striping Channelization Line White	Y	440	LF	0.25	$ 110.00
	Thermo Plastic Cross Walks (2FT Wide)	-	380	LF	22	$ -
	Thermo Plastic Stopbars (2FT Wide)	Y	600	LF	22	$ 13,200.00
	Thermo Plastic Left Arrow	Y	7	EA	170	$ 1,190.00
	Thermo Plastic Left Arrow with Through Arrow	-		EA	302.5	$ -
	Thermo Plastic Through Arrow	-		EA	225	$ -
	Thermo Plastic ONLY (16" Symbol Width)	Y	3	EA	247.5	$ 742.50
	Thermo Plastic SCHOOL (16" Symbol Width)	-		EA	363	$ -
	Thermo Plastic XING (16" Symbol Width)	-		EA	250	$ -
	Thermo Plastic RR (16" Symbol Width)	-		EA	759	$ -
	Shallow Patch	Y	1000	SY	50	$ 50,000.00
	Deep Patch	-		SY	110	$ -
					Total =	$ 235,667.00

Length	1500
FT of Applied Area =	72000.0
SY of Applied Area =	8000.0
SY Area of Road Milled (50' at ends & 14' Sides) =	5050.0
#/SY-IN	110.0
IN Asphalt	3.0
Striping Eradication (Grinding), $/SF)	0

37th St SEC 65	Item	USED	Quantity	Unit	Product Unit Cost	Cost
	Asphalt Pavement	-	0.0	TON	97.4	$ -
	Roto Mill	-	0.0	SY	2.55	$ -
	Petromat Fabric	-	10102.3	SY	2.05	$ -
	1/4 Inch Chip Seal	-	10102.3	SY	2.7	$ -
	3/8 Inch Chip Seal	-	10102.3	SY	2.88	$ -
	Slurry Seal	-	10102.3	SY	2.43	$ -
	Cape Seal	Y	10102.3	SY	4.5	$ 45,460.50
	Crack Seal	Y	15000.0	LF	1.08	$ 16,200.00
	Raise Existing Water Valve & Collar	Y	5	EA	375	$ 1,875.00
	Raise Existing Sewer MH & Collar	Y	5	EA	475	$ 2,375.00
	Water Base Striping Double Yellow (Skip or Solid)	-	1500	LF	0.35	$ -
	Sriping Skip Single Yellow	-		LF	0.15	$ -
	Water Base Striping Skip White	Y	600	LF	0.15	$ 90.00
	Water Base Striping Solid White	-		LF	0.15	$ -
	Water Base Striping Channelization Line White	Y	750	LF	0.25	$ 187.50
	Thermo Plastic Cross Walks (2FT Wide)	-		LF	22	$ -
	Thermo Plastic Stopbars (2FT Wide)	Y	100	LF	22	$ 2,200.00
	Thermo Plastic Left Arrow	Y	7	EA	170	$ 1,190.00
	Thermo Plastic Left Arrow with Through Arrow	-		EA	302.5	$ -
	Thermo Plastic Through Arrow	-		EA	225	$ -
	Thermo Plastic ONLY (16" Symbol Width)	Y	3	EA	247.5	$ 742.50
	Thermo Plastic SCHOOL (16" Symbol Width)	-		EA	363	$ -
	Thermo Plastic XING (16" Symbol Width)	-		EA	250	$ -
	Thermo Plastic RR (16" Symbol Width)	-		EA	759	$ -
	Shallow Patch	Y	300	SY	50	$ 15,000.00
	Deep Patch	-		SY	110	$ -
					Total =	$ 85,320.50

FT of Applied Area =	90921.0
SY of Applied Area =	10102.3
SY Area of Road Milled (50' at ends & 14' Sides) =	0.0
#/SY-IN	110.0
IN Asphalt	0.0
Striping Eradication (Grinding), $/SF)	0

2018 Projects

37th St SEC 40 (From New WL to SEC 50)	Item	USED	Quantity	Unit	Product Unit Cost	Cost
	Asphalt Pavement	Y	2200.0	TON	97.4	$ 214,280.00
	Roto Mill	Y	7000.0	SY	2.55	$ 17,850.00
	Petromat Fabric	Y	13333.3	SY	2.05	$ 27,333.33
	1/4 Inch Chip Seal	-	13333.3	SY	2.7	$ -
	3/8 Inch Chip Seal	-	13333.3	SY	2.88	$ -
	Slurry Seal	-	13333.3	SY	2.43	$ -
	Raise Existing Water Valve & Collar	Y	17	EA	375	$ 6,375.00
	Raise Existing Sewer MH & Collar	Y	12	EA	475	$ 5,700.00
	Water Base Striping Double Yellow (Skip or Solid)	Y	2100	LF	0.35	$ 735.00
	Sriping Skip Single Yellow	-		LF	0.15	$ -
	Water Base Striping Skip White	Y	1040	LF	0.15	$ 156.00
	Water Base Striping Solid White	-		LF	0.15	$ -
	Water Base Striping Channelization Line White	Y	600	LF	0.25	$ 150.00
	Thermo Plastic Cross Walks (2FT Wide)	-	300	LF	22	$ -
	Thermo Plastic Stopbars (2FT Wide)	Y	150	LF	22	$ 3,300.00
	Thermo Plastic Left Arrow	Y	2	EA	170	$ 340.00
	Thermo Plastic Left Arrow with Through Arrow	-		EA	302.5	$ -
	Thermo Plastic Through Arrow	-		EA	225	$ -
	Thermo Plastic ONLY (16" Symbol Width)	Y	1	EA	247.5	$ 247.50
	Thermo Plastic SCHOOL (16" Symbol Width)	-		EA	363	$ -
	Thermo Plastic XING (16" Symbol Width)	-		EA	250	$ -
	Thermo Plastic RR (16" Symbol Width)	-		EA	759	$ -
	Shallow Patch	Y	1500	SY	50	$ 75,000.00
	Deep Patch	-		SY	110	$ -
					Total =	$ 351,466.83

Length Phase I	2100
FT of Applied Area =	120000.0
SY of Applied Area =	13333.3
SY Area of Road Milled (50' at ends & 14' Sides) =	7000.0
#/SY-IN	110.0
IN Asphalt	3.0
Striping Eradication (Grinding), $/SF)	0

Sub Division Surface Treatment: Ashcroft Heights and Old Town Evans	Item	USED	Quantity	Unit	Product Unit Cost	Cost
	Asphalt Pavement	-	0.0	TON	97.4	$ -
	Roto Mill	-	0.0	SY	2.55	$ -
	Petromat Fabric	-	66666.7	SY	2.05	$ -
	1/4 Inch Chip Seal	-	66666.7	SY	2.7	$ -
	3/8 Inch Chip Seal	-	66666.7	SY	2.88	$ -
	Slurry Seal	Y	66666.7	SY	2.43	$ 162,000.00
	Cape Seal	-		SY	4.5	$ -
	Crack Seal	-		LF	1.08	$ -
	Raise Existing Water Valve & Collar	Y	20	EA	375	$ 7,500.00
	Raise Existing Sewer MH & Collar	Y	20	EA	475	$ 9,500.00
	Water Base Striping Double Yellow (Skip or Solid)	-		LF	0.35	$ -
	Sriping Skip Single Yellow	-		LF	0.15	$ -
	Water Base Striping Skip White	-		LF	0.15	$ -
	Water Base Striping Solid White	-		LF	0.15	$ -
	Water Base Striping Channelization Line White	-		LF	0.25	$ -
	Thermo Plastic Cross Walks (2FT Wide)	-		LF	22	$ -
	Thermo Plastic Stopbars (2FT Wide)	-		LF	22	$ -
	Thermo Plastic Left Arrow	-		EA	170	$ -
	Thermo Plastic Left Arrow with Through Arrow	-		EA	302.5	$ -
	Thermo Plastic Through Arrow	-		EA	225	$ -
	Thermo Plastic ONLY (16" Symbol Width)	-		EA	247.5	$ -
	Thermo Plastic SCHOOL (16" Symbol Width)	-		EA	363	$ -
	Thermo Plastic XING (16" Symbol Width)	-		EA	250	$ -
	Thermo Plastic RR (16" Symbol Width)	-		EA	759	$ -
	Shallow Patch	Y	1200	SY	50	$ 60,000.00
	Deep Patch	-		SY	110	$ -
					Total =	$ 239,000.00

FT of Applied Area =	600000.0
SY of Applied Area =	66666.7
SY Area of Road Milled (50' at ends & 14' Sides) =	0.0
#/SY-IN	110.0
IN Asphalt	0.0
Striping Eradication (Grinding), $/SF)	0

APPENDIX D: REFERENCES

American Society for Testing and Materials (ASTM), ASTM D-6433-11, "Standard Test Method for Roadway and Parking Pavement Condition Index Surveys," *Annual Book of ASTM Standards, Section Four: Construction, Volume 4.03: Road and Paving Materials; Vehicle-Pavement Systems*, American Society for Testing and Materials, West Conshocken, PA, 2011.

APPENDIX E: GLOSSARY

Alkali-Silica Reactivity (ASR) – A chemical reaction between the silica in the aggregate and the alkali from the cement paste. The reaction takes place in the presence of water and results in a hydrophilic gel that forms around the affected aggregate particles, creating a gel filled void on the pavement surface.

Alligator (Fatigue) Cracking – Cracking that occurs on AC pavements in areas subjected to repeated traffic loadings and develops into a series of interconnected cracks with many sided, sharp-angled pieces resembling the skin of an alligator.

Arterial, Collector and Tertiary/ Local – Roadway designations that indicate traffic volume and future use.

Asphalt Concrete (AC) – A high quality mixture of asphalt cement and carefully graded coarse and fine aggregates.

Asphalt Over Asphalt (AAC) – Asphalt concrete overlay on top of existing asphalt concrete (AC) pavement structure.

Asphalt Over Concrete (APC) – Asphalt concrete overlay on top of existing portland cement concrete (PCC) pavement structure.

Backlog – Total unfunded major M&R requirements.

Base Course – A pavement layer of a specified material of designated thickness that is placed directly beneath the surface and placed on either a subbase or subgrade to serve as a construction platform and/or to provide support or drainage for the surface course.

Bleeding – The presence of excess asphalt binder on the pavement surface resulting from the upward migration of the binder, usually due to a combination of traffic action, warm temperatures, low air void content, and other factors.

Blowups – A localized upward movement of the slab edges or shattering caused by expansive pressure. Blowups often occur during extremely hot weather, usually at a transverse crack or joint that is not wide enough to permit slab expansion.

Branch – A readily identifiable part of the pavement network that has a distinct function. For example, a particular roadway or parking lot.

Constrained (Limited) Budget Scenario – A budget scenario in which funding is limited due to economic constraints.

Corner Break – A crack that intersects the joints at a distance less than or equal to one-half of the slab length on both sides. Corner breaks are caused by load repetitions combined with loss of support or curling at the corner.

Crack Sealing – A maintenance treatment in which a crack is routed, cleaned, and filled with sealant in order to prevent further deterioration of the crack and prevent moisture infiltration.

Critical PCI – The PCI value at which the rate of PCI loss increases with time, or the cost of applying M&R increases significantly.

Depression – Localized pavement surface areas having elevations slightly lower than that of the surrounding pavement.

Distress – Any indication of poor or unfavorable pavement performance or signs of impending failure, such as spalling or cracking in PCC pavements and alligator cracking or rutting in AC pavements.

Durability ("D") Cracking – A cracking pattern on PCC pavements caused by the inability of the PCC to withstand the detrimental effects of freezing and thawing.

Facility – An area of pavement that serves a distinct function, such as an entire runway, taxiway, apron, or helipad. A facility is referred to as a branch in PAVER.

Falling Weight Deflectometer (FWD) – A device used to measure the surface deflection of a pavement under a dynamic load in order to evaluate its structural capacity.

Faulting – A differential vertical displacement of abutting pavement slabs at joints or cracks creating a step-like deformation in the pavement.

Feature – A unique portion of the airfield pavement distinguished by traffic area, pavement type, pavement surface thickness and strength, soil layer thickness and strength, construction period, and surface condition. A feature is referred to as a section in PAVER

Flexural Strength – A measure of the extreme fiber stress developing under slab bending, the mode in which most PCC pavements are loaded and fail.

GeoDatabase – A file that contains feature classes information pertaining to map feature items (e.g., polygons) and map feature attributes (e.g., area, surface, use, etc).

Geographic Information System (GIS) – A computerized database that defines the specific locations of various attributes, features, or data items on a coordinate basis.

Global Preventive M&R – Activities applied to the entire pavement section (such as surface treatments) to slow the rate of deterioration and extend the life of the pavement.

Joint Reflection Cracking – Cracking in an AC overlay over the joints of a PCC pavement caused by movement of the underlying joints.

Joint Seal Damage – Joint sealant in such condition that it enables moisture and incompressible materials to infiltrate the joint.

Localized Stopgap M&R – Localized maintenance activities required to keep the pavement operational and in a safe condition such as emergency repairs to eliminate foreign object damage potential.

Localized Preventive M&R – Localized maintenance activities (such as crack sealing and patching) performed to slow the rate of deterioration and extend the life of the pavement.

Longitudinal Cracking (L&T Cracking) **–** A distress manifestation in AC pavements which the crack runs parallel to the pavement centerline. Longitudinal cracks are caused by shrinkage of the AC surface due to low temperatures or hardening of the asphalt, a poorly constructed paving lane joint, or a reflective crack above a crack in the underlying pavement.

Longitudinal, Transverse, and Diagonal Cracking – Cracks in PCC pavements that divide the slab into two or three pieces and are typically caused by a combination of repeated loadings, curing stresses, and shrinkage stresses.

Maintenance and Repair (M&R) Plan – A detailed work plan spanning a specified time period (such as 5 years) that outlines the sections in need of maintenance and repair to maintain the pavement in a suitable condition.

Maintenance Policies – Policies established to define the type of maintenance action to be taken to correct each distress type observed during the pavement evaluation.

Major Rehabilitation – Activities applied to the entire pavement section (such as an overlay) to correct or improve existing structural or functional requirements.

Map Cracking – Map cracking or crazing refers to a network of shallow, fine, or hairline cracks that extends only through the upper surface of a PCC pavement.

Network – A group of pavements that will usually be managed together.

Overlay – A rehabilitation method in which a new lift of material is placed on an existing pavement to restore ride quality or surface friction or to strengthen the pavement structure.

Patching – An area of the pavement that has been removed and replaced with a filler material.

Pavement Condition Index (PCI) – A numerical index, ranging from zero for a failed pavement to 100 for a pavement in perfect condition. Calculation of the PCI is based on the results of a visual condition survey in which distress type, severity, and quantity are identified. The PCI was

developed to provide an index of a pavement's structural integrity and surface operational condition. The distress information obtained as part of the PCI condition survey provides insight into the causes of distress. Refer to "ASTM D-6433-11: Standard Practice for Roads and Parking Lots Condition Survey" or "ASTM D5340-10: Standard Practice for Airfield Condition Index Surveys." for a complete discussion of the PCI.

Pavement Management System (PMS) – A wide spectrum of activities including the planning and programming of investments, design, construction, maintenance, and the periodic evaluation of performance used to provide a cost effective and efficient pavement network.

PAVER™ – A pavement management software package developed by the U.S. Army Corps of Engineers' Construction Engineering Research Laboratory. The software package consists of a set of engineering tools for performing condition surveys and condition prediction, and developing work plans with the objective of optimizing spending.

Popouts – A small piece of pavement that breaks loose from the surface due to freeze-thaw action, combined with expansive aggregates. Applies to PCC pavement surface types.

Portland Cement Concrete (PCC) – The product of mixing portland cement, water, and possibly additives (such as an air entraining agent) to form a hardened structural material through the hydration process.

Prediction Modeling – The process of grouping pavements with similar deterioration behavior together in order to develop deterioration trends. These trends are used for predicting future pavement condition and for determining the timing of M&R activities.

Preventive Maintenance – The planned strategy of cost-effective treatments to an existing pavement system that preserves the system, retards future deterioration, and maintains or improves the functional condition of the system (without increasing the structural capacity).

Pavement Ranking – A ranking system used to establish a pavements mission essential use.

Raveling – The dislodging of coarse aggregate particles from the surface of an asphalt pavement. Raveling may be caused by insufficient asphalt binder, poor mixture quality, insufficient compaction, segregation, or stripping.

Rutting – A surface depression in the wheelpath caused by permanent deformation in one or more of the pavement layers due to traffic loadings.

Sample Unit – A subdivision of a pavement section for PCI inspection purposes.

Scaling – Breakdown of the pavement surface caused by over finishing of the PCC surface, deicing salts, improper construction, freeze-thaw cycles, and poor aggregate. The typical depth of the surface breakdown is approximately ¼ to ½ of an inch.

Section – The smallest management unit when considering the application of M&R. Factors to consider when dividing a branch into sections: pavement structure, traffic, construction history, pavement rank (or functional classification), drainage facilities and shoulders, and condition.

Shapefile – A shapefile contains map feature items (e.g., polygons) and map feature attributes (e.g., area, surface, use, etc).

Shattered Slab – Intersecting cracks that break a PCC pavement slab into four or more pieces due to overloading and/or inadequate support.

Shrinkage Cracking – Hairline cracks formed during the setting and curing of PCC pavements. They are typically short cracks that do not extend through the depth of the slab.

Shoving – Permanent, longitudinal displacement of a localized area of the pavement surface caused by traffic loading resulting in an abrupt wave.

Slippage Cracking – Crescent-shaped cracks, usually transverse to the direction of traffic, which are produced when braking or turning wheels cause the pavement surface to slide or deform.

Spalling – The breakdown of the slab edges within 2 feet of the side of the joint due to excessive stresses at a joint or crack caused by infiltration of incompressible materials or traffic loadings.

Stopgap Maintenance – Maintenance work that is performed instead of major M&R work because adequate funding is not available. The goal of these policies is to keep the pavement operational through the repair of those distress type/severity level combinations that could create hazardous situations through the potential for Foreign Object Damage (FOD), tire damage, or hydroplaning.

Structural Capacity – The load carrying capacity of a pavement that can be determined through an in-depth evaluation of the material layers and thickness within a pavement structure and/or through an evaluation of the surface deflections.

Structural Index – The ratio of the Aircraft Classification Number (ACN) to the Pavement Classification Number (PCN) for a feature.

Subbase Course – The layer or layers of specified material or designed thickness between the base and subgrade to support the base course.

Subgrade – The prepared and compacted soil designed to support the pavement structure.

Surface Course – The upper layer of the pavement system that must accommodate traffic loadings as well as resist skidding, traffic abrasion, and the disintegrating effects of climate.

Surface Treatment – A preventive maintenance or rehabilitation treatment used to seal a pavement surface, improve the ride quality and surface friction, and extend the life of the pavement.

Swelling – An upward bulge in the pavement's surface.

Transverse Cracking – A distress manifestation in which the crack runs perpendicular to the pavement centerline. Transverse cracks are caused by shrinkage of the AC surface due to low temperatures or hardening of the asphalt or a reflective crack above a crack in the underlying pavement.

Unlimited Funding – A best-case scenario for pavement management to illustrate the pavement condition over time assuming unlimited funding for maintenance and rehabilitation.

Weathering – The wearing away of the asphalt binder and fine aggregate matrix from the surface of an asphalt pavement.