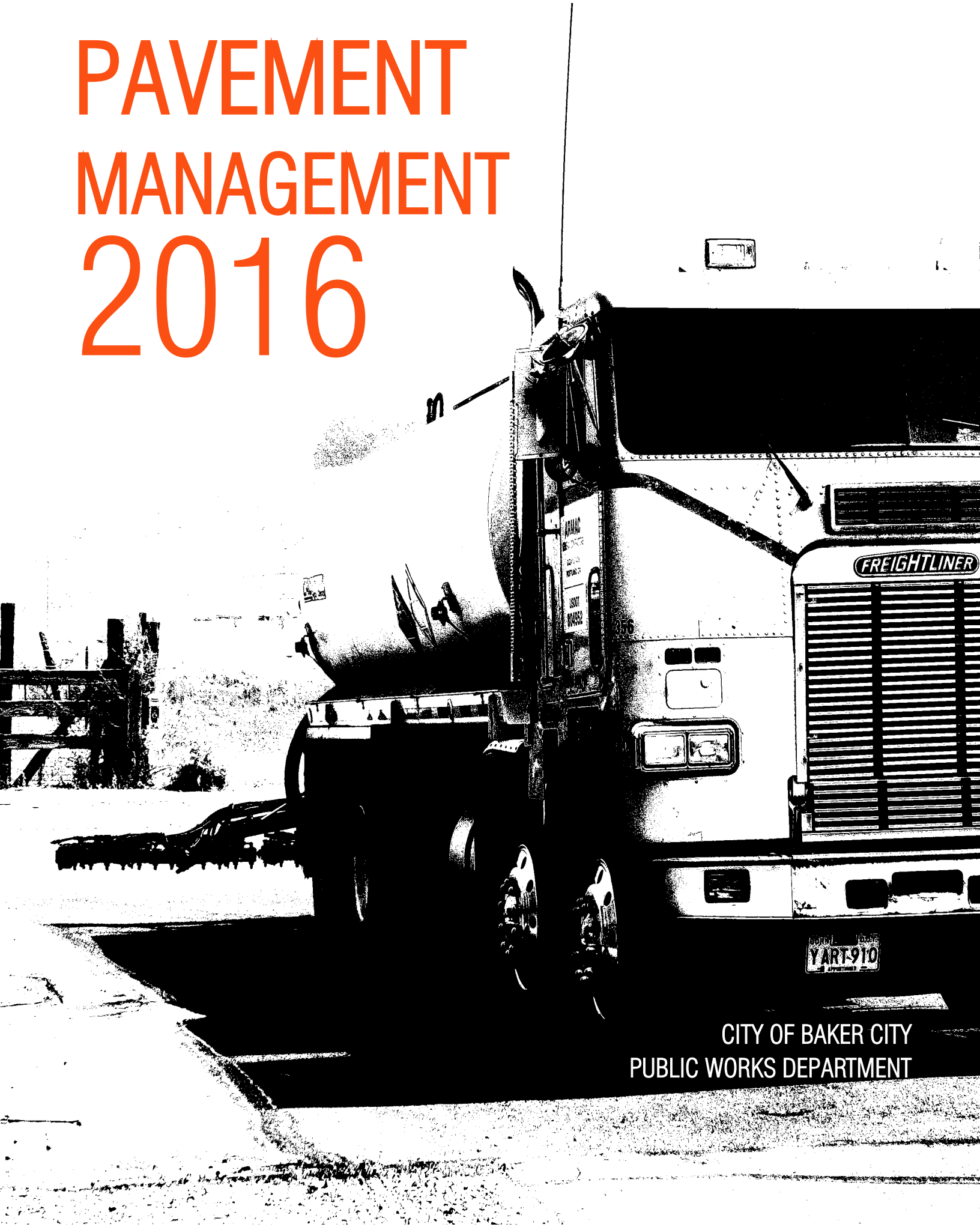
PAVEMENT MANAGEMENT 2016



CITY OF BAKER CITY
PUBLIC WORKS DEPARTMENT

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INTRODUCTION

City of Baker City, Oregon

P.O. Box 650
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Date: March 28, 2016
To: Baker City Public Works Advisory Committee (PWAC)
Subject: 2016 Pavement Management Plan

It is time once again to consider the annual Pavement Management Plan. Staff has tried to objectively evaluate each of the streets in Baker City and categorize their quality. It has become increasingly difficult to meet the goals of the pavement program due to stagnant funding and increasing maintenance costs. Once again this year you will notice the increase of lane miles moving from Good condition to Fair condition in the same years as the skyrocketing costs of asphalt products. The Street Fund revenue comes primarily from the State Gas Tax and from a portion of the Baker City property tax revenue. Neither the gas tax or property tax revenue stream is increasing at the same pace as the cost of street maintenance. The City Council has been presented in the past with options for adding a street user fee or a storm water fee in an effort to increase funding to the Street Fund, but neither option has been approved.

In 2015 a four-day chip seal project covered many streets, as noted on the map on Page 14. A fog seal of Resort Street, Best Frontage, E Street and L Street was also accomplished.

The 2016 projects include an asphalt grind and overlay on Auburn from Main to Fourth. In addition we plan to complete the same treatment on five short blocks between Resort Street and Main Street downtown, including Church, Baker, Madison, Broadway and Valley. In addition, staff will coordinate with ODOT and complete a removal and replacement of asphalt in patches along Cedar north of Campbell and along 17th Street. This strategy is in keeping with our need to focus on streets that are highly traveled and have the greatest impact in the community.

Staff also considered undertaking a chip seal project on Auburn from Fourth to Eighth Street, but the dollars are not available to meet all of the needs. This will need to be postponed until next year. We will continue to utilize every tool in our street maintenance toolbox to work towards meeting the Pavement Management Plan goals. Thank you for taking the time to be part of the Committee and assist the Public Works Department in maintaining our transportation network.

Sincerely,

Michelle Owen
Director of Public Works
mowen@bakercity.com
541-524-2031

We have to find a balance
between what our operating
costs are and how to best
maintain our community's
paved streets.
This can involve making
complex decisions:
How and when to resurface or
if other treatments should be
applied to keep the streets
performing at the levels
needed.

PROGRAM BACKGROUND

In the fall of each year an engineering technician drives each paved city street to conduct a street inspection.

The following street characteristics are analyzed and rated:

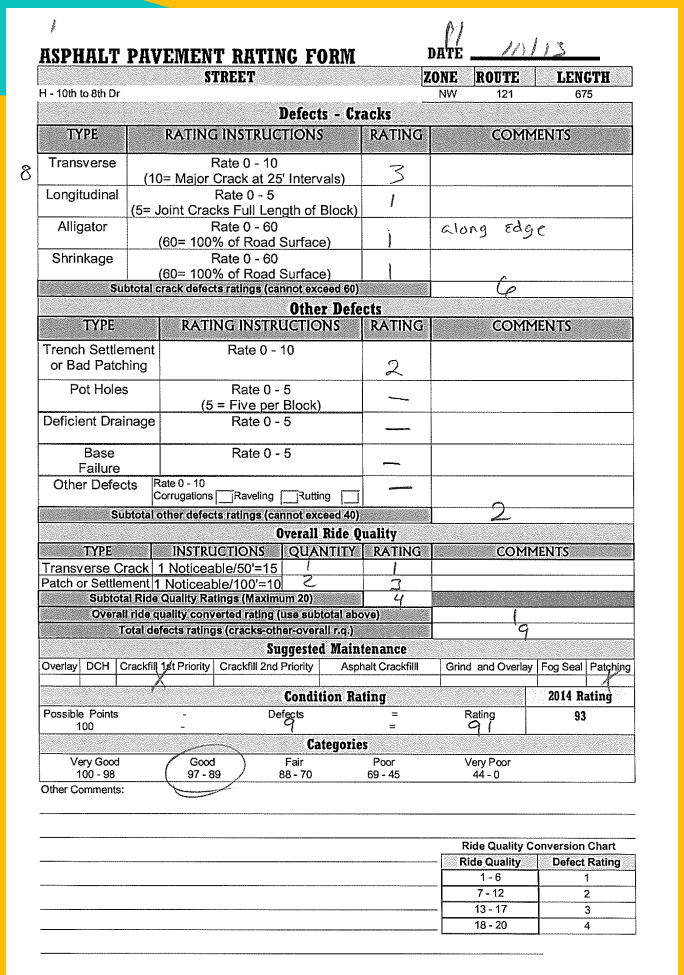
- The ride quality;
- Surface cracking;
- Trench settlement;
- Drainage issues; and
- Any other items that affect the street's structural integrity.

The illustration below is an example of the rating form used by staff when conducting the inspection.

It is through this inspection that each paved street is rated. This rating system assists staff in determining what maintenance techniques, if any, will be recommended.

Each street is placed into a category by rating the defects found in each section of pavement. A street starts with a rating value of 100. The number of defects found, based on the inspection, are subtracted from 100 to arrive at the rating value for that street section.

After the street is rated, it is placed in the appropriate condition category based upon the rating value. There are five street condition categories: Very Good, Good, Fair, Poor, and Very Poor.



ASPHALT PAVEMENT RATING FORM DATE 10/13

STREET	ZONE	ROUTE	LENGTH
H - 10th to 8th Dr	NW	121	675

Defects - Cracks

TYPE	RATING INSTRUCTIONS	RATING	COMMENTS
Transverse	Rate 0 - 10 (10= Major Crack at 25' Intervals)	3	
Longitudinal	Rate 0 - 5 (5= Joint Cracks Full Length of Block)	1	
Alligator	Rate 0 - 60 (60= 100% of Road Surface)	1	along edge
Shrinkage	Rate 0 - 60 (60= 100% of Road Surface)	1	
Subtotal crack defects ratings (cannot exceed 60)			6

Other Defects

TYPE	RATING INSTRUCTIONS	RATING	COMMENTS
Trench Settlement or Bad Patching	Rate 0 - 10	2	
Pot Holes	Rate 0 - 5 (5 = Five per Block)	1	
Deficient Drainage	Rate 0 - 5	—	
Base Failure	Rate 0 - 5	—	
Other Defects	Rate 0 - 10 Corrugations ☐ Raveling ☐ Rutting ☐	—	
Subtotal other defects ratings (cannot exceed 40)			2

Overall Ride Quality

TYPE	INSTRUCTIONS	QUANTITY	RATING	COMMENTS
Transverse Crack	1 Noticeable/50'=15	1	1	
Patch or Settlement	1 Noticeable/100'=10	2	3	
Subtotal Ride Quality Ratings (Maximum 20)			4	
Overall ride quality converted rating (use subtotal above)				
Total defects ratings (cracks-other-overall r.q.)				9

Suggested Maintenance

Overlay	DCH	Crackfill 1st Priority	Crackfill 2nd Priority	Asphalt Crackfilll	Grind and Overlay	Fog Seal	Patching
		X					✓

Condition Rating — 2014 Rating

Possible Points	-	Defects	=	Rating	93
100	-	9	=	91	

Categories

Very Good	Good	Fair	Poor	Very Poor
100 - 98	97 - 89	88 - 70	69 - 45	44 - 0

Other Comments:

Ride Quality Conversion Chart

Ride Quality	Defect Rating
1 - 6	1
7 - 12	2
13 - 17	3
18 - 20	4

Street Condition: "Very Good"

Rating Range: 98-100

With no more than the occasional crack, streets within this category have stable, excellent ride qualities. The "Very Good" category generally only includes streets which have been recently overlaid or constructed.

Recommended treatments: Fog seal, 1/4"-#10 chip seal to prevent oxidation, and possible minor crack filling.

Best Frontage Road

Located within the Commercial-General Zone east of the freeway, this street connects East Campbell Street to H Street, then continues north to gain access to I-84. The development of Best Frontage Road encourages potential economic development in this area.

Constructed: 2014

Ratings:
2015: 100

E Street (442' West of 17th Street)

Constructed sixteen years ago, this street was privately developed to serve the surrounding industrial property. Currently E Street receives an extremely low volume of vehicle traffic, generally used only by vehicles accessing the driveway approach to the Settlers' Park assisted living facility.

Constructed: 1999

Ratings:
2015: 98 2014: 99 2013: 99 2012: 99

9.14% of our City Streets are in the "Very Good" Category
117,947.2 yds.^{2}

Street Condition: "Good"

Rating Range: 89-97

A "Good" street rating generally includes stable ride qualities. Distress characteristics may include: gray or light-colored appearance (due to oxidation), some transverse and longitudinal cracking, and possible isolated trench settlement.

Recommended treatments: Crack filling, fog seal, chip seal, and possible thin overlay.

Campbell Street (17th St.-RR Tracks)

Similar to other sections of Campbell Street, this street section serves as a collector street because it receives a moderate volume of traffic which connects commercial, industrial, and residential properties. This street section was overlaid in 1997 and chip sealed in 2011.

Constructed: 1955

Ratings:
2015: 94 2014: 95 2013: 96 2012: 97

Ash Street (Spring Garden-Auburn Ave.)

Ash Street primarily serves citizens residing in the area. It received chip seal applications in 2010 and 1985. It received fog seal applications in 1998, 1992, and 1983.

Constructed: 1976

Ratings:
2015: 93 2014: 94 2013: 94 2012: 95

49.49% of our City Streets are in the "Good" Category
582,070.3 yds.^{2}

Street Condition: "Fair"

Rating Range: 70-88

The "Fair" street category includes streets which are considered to be generally stable, although minor areas of structural weakness may be evident. Ride qualities are good to fair. Distress characteristics may include: transverse, longitudinal and some alligator cracking; trench settlement or drainage deficiencies.

Recommended treatments: Extensive patching and chip seal application or thin overlay.

Plum Street (Madison St.-Campbell St.)

This section of Plum Street receives a fairly high volume of vehicle traffic due to its proximity to Campbell Street. It is used by varying sizes of vehicles, including semi-trucks, for access to the adjacent truck service facilities. It was chip sealed in 2007, and fog sealed in 1996 and 1989.

Constructed: 1980

Ratings:
2015: 70 2014: 75 2013: 81 2012: 84

11th Street (S. Side Estes St.-Auburn Ave.)

Vehicles utilizing 11th Street in this area can gain access to Hillcrest Drive or Auburn Avenue. This section of 11th Street is surrounded by residentially-zoned properties. Previous maintenance has included: chip seal in 2009 and 1987, double chip seal in 1993, and fog seal in 1998.

Constructed: 1979

Ratings:
2015: 87 2014: 89 2013: 89 2012: 92

40.37% of our City Streets are in the "Fair" Category
503,128.2 yds.^{2}

Street Condition: "Poor"

Rating Range: 45-69

A street receiving the rating of "Poor" is a street which has areas of instability with evidence of structural deficiency. Ride qualities range from fair to poor. Distress characteristics may include transverse, longitudinal, alligator, and shrinkage cracking. Trench settlement and drainage deficiencies will also be evident. To alleviate settlement and drainage issues, extensive crack filling and patching would need to be accomplished. If the street base is in such condition that rehabilitation is possible, an overlay is recommended; otherwise street reconstruction is necessary.

Clifford Street (Washington St. South)

Clifford Street is a dead-end street which serves approximately twelve homes. Clifford Street's ratings have placed it in the "Poor" category three times. It was fog sealed in 1996, 1991, and 1982. A chip seal application was applied in 1986. Asphalt patching was completed in 2014 which slightly boosted its annual rating.

Constructed: 1975

Ratings:
2015: 50 2014: 46 2013: 40 2012:42

Mitchell Avenue (Hwy. 7-4th St.)

This is the first year that Mitchell Avenue has been included within the "Poor" rating category. Mitchell Avenue is one of only a few residential streets that connect to Highway 7 in the South Baker area. Fog seal applications were applied in 2005, 1998, and 1990.

Constructed: 1982

Ratings:
2015: 68 2014: 74 2013: 76 2012: 80

1% of our City Streets are in the "Poor" Category
11,877 yds.^{2}

Street Condition: "Very Poor"

Rating Range: 0-44

Streets within the "Very Poor" category have many areas of instability with obvious structural deficiencies. Ride qualities are poor. Distress characteristics generally include alligator and shrinkage cracking with potholes, extensive trench settlement, and drainage deficiencies. The cost of maintaining the pavement in an acceptable condition would exceed the maintenance funds available.

Recommended treatment: Although the recommended treatment would be to perform emergency maintenance only and to schedule reconstruction as soon as possible, with current funding constraints we now have to look at other factors such as traffic flow, balancing the need vs. utilizing funds to perform preventative maintenance work on arterial or collector streets.

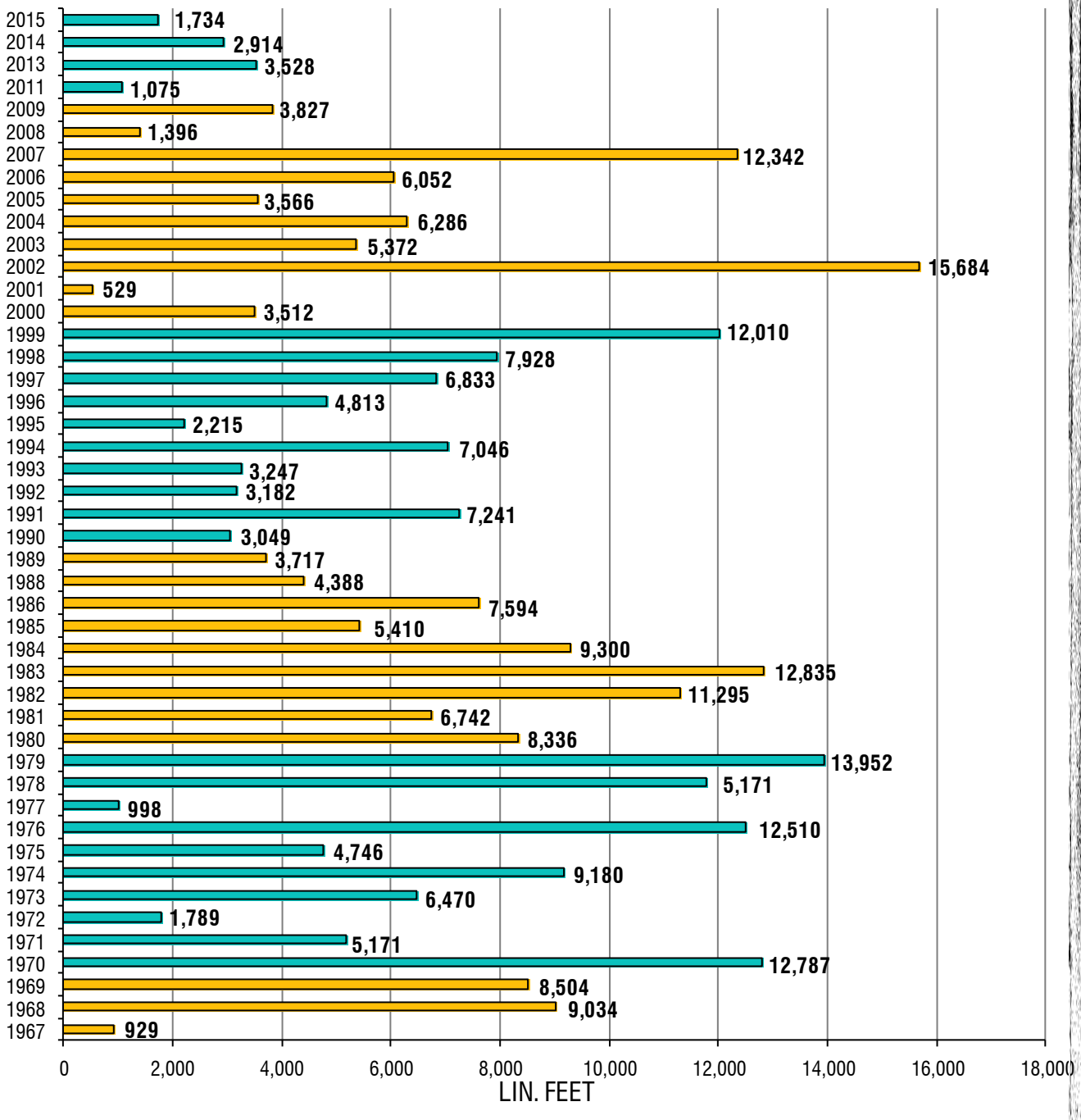
Clifford Street has been the only street ever placed within the "Very Poor" category. Its ratings left it within that category from 2011-2013. Public Works crews performed extensive asphalt patching in 2014 which addressed some of the alligator cracks and areas of settlement within the street. Clifford Street currently is in the lower range of the "Poor" category.

0% of our City Streets are in the "Very Poor" Category

New Asphalt Applied 1966 - 2015

This chart illustrates how many feet of new asphalt (streets that were recently constructed or a thin overlay was completed) were applied in each calendar year for the last 50 years. Chip seal and/or fog seal treatments are not considered to be substantial asphalt surface treatments. The absence of a year indicates that no new asphalt was applied that year, which is the case for the year 1966.

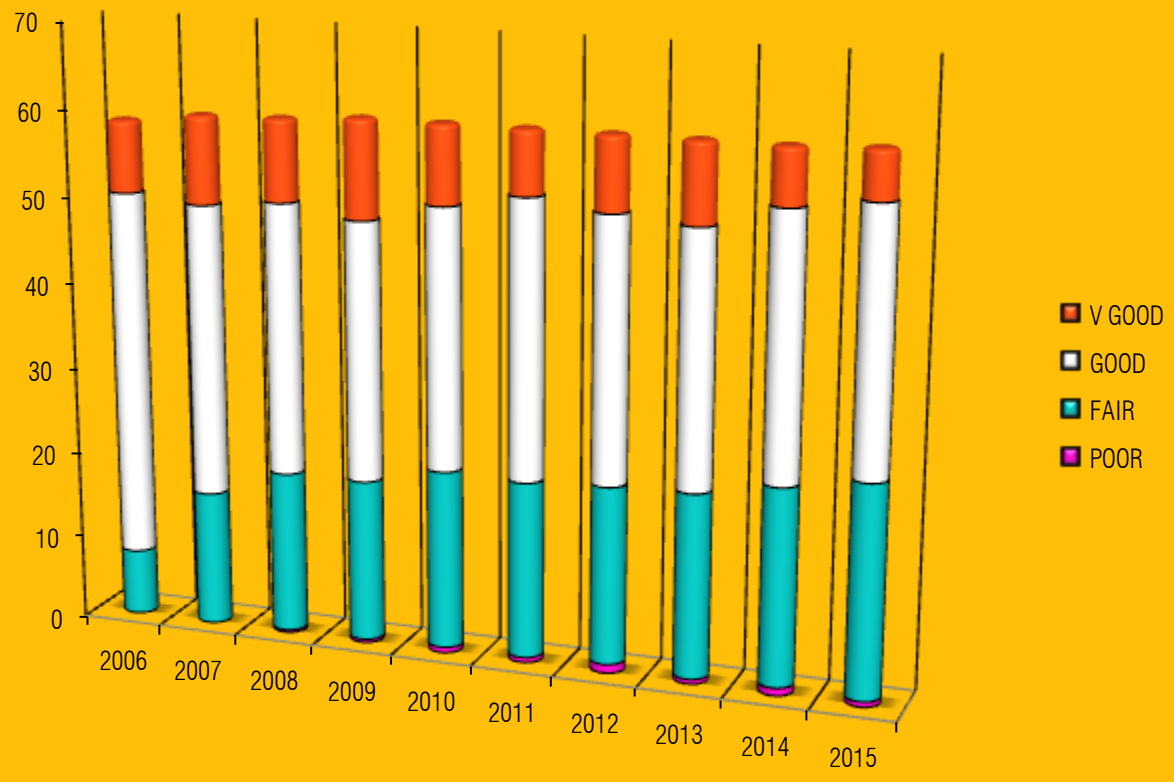
In 1970 12,787 feet (2.42 miles) of streets were paved. Since that time, two of the nineteen street sections paved in 1970 have received an overlay. The average life expectancy of an asphalt street is 20-25 years, depending upon the time of construction, the type of street base used, etc.

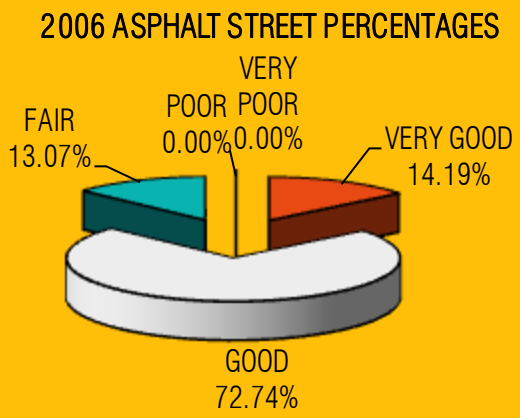


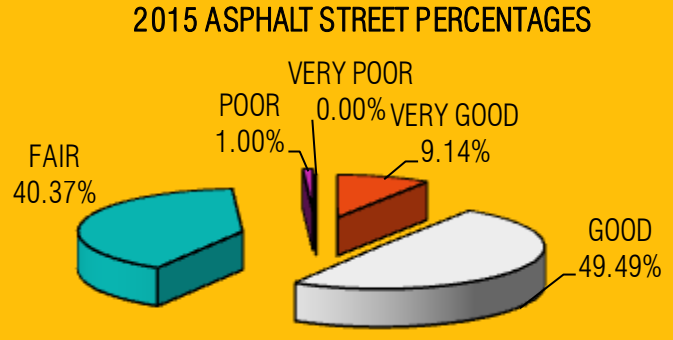
Asphalt Condition Ratings 2006 - 2015

As you can see, our street infrastructure continues to age, and with age there is a steady decline in every street's overall ride quality and structural integrity. With the costs of routine maintenance perpetually increasing, we can assume that the number of streets within the "Fair" street rating category will continue to increase while the streets within the "Good" street rating category will steadily decrease.

Since 2006, an additional 2.1 miles of paved streets have been added to our street infrastructure.



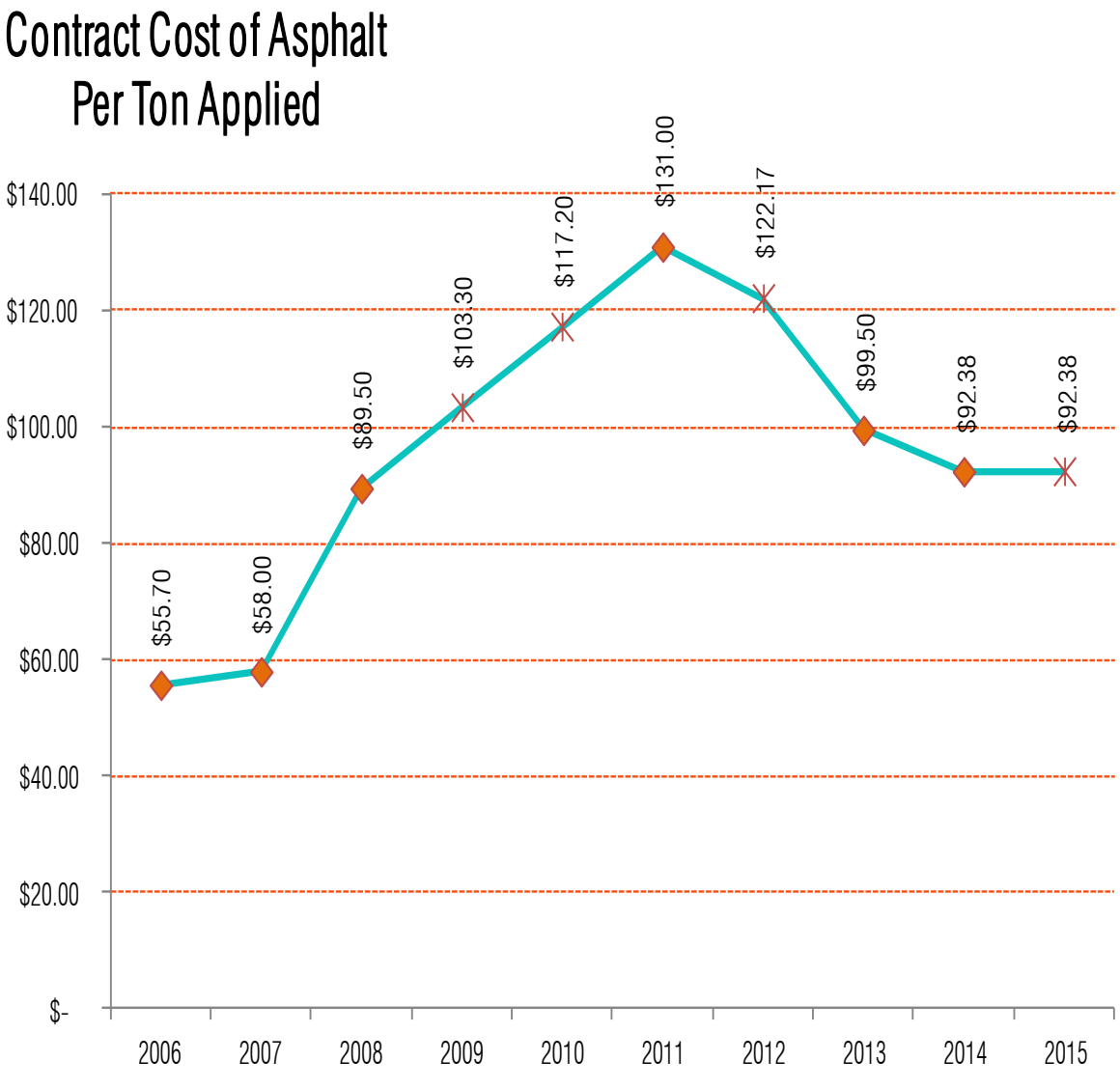




As illustrated in the graph below, we continue to see a trend in decreasing asphalt costs.

Baker City did not overlay streets in 2009, 2010 and 2012. The costs reflected for these years were derived by using the average costs from surrounding years.

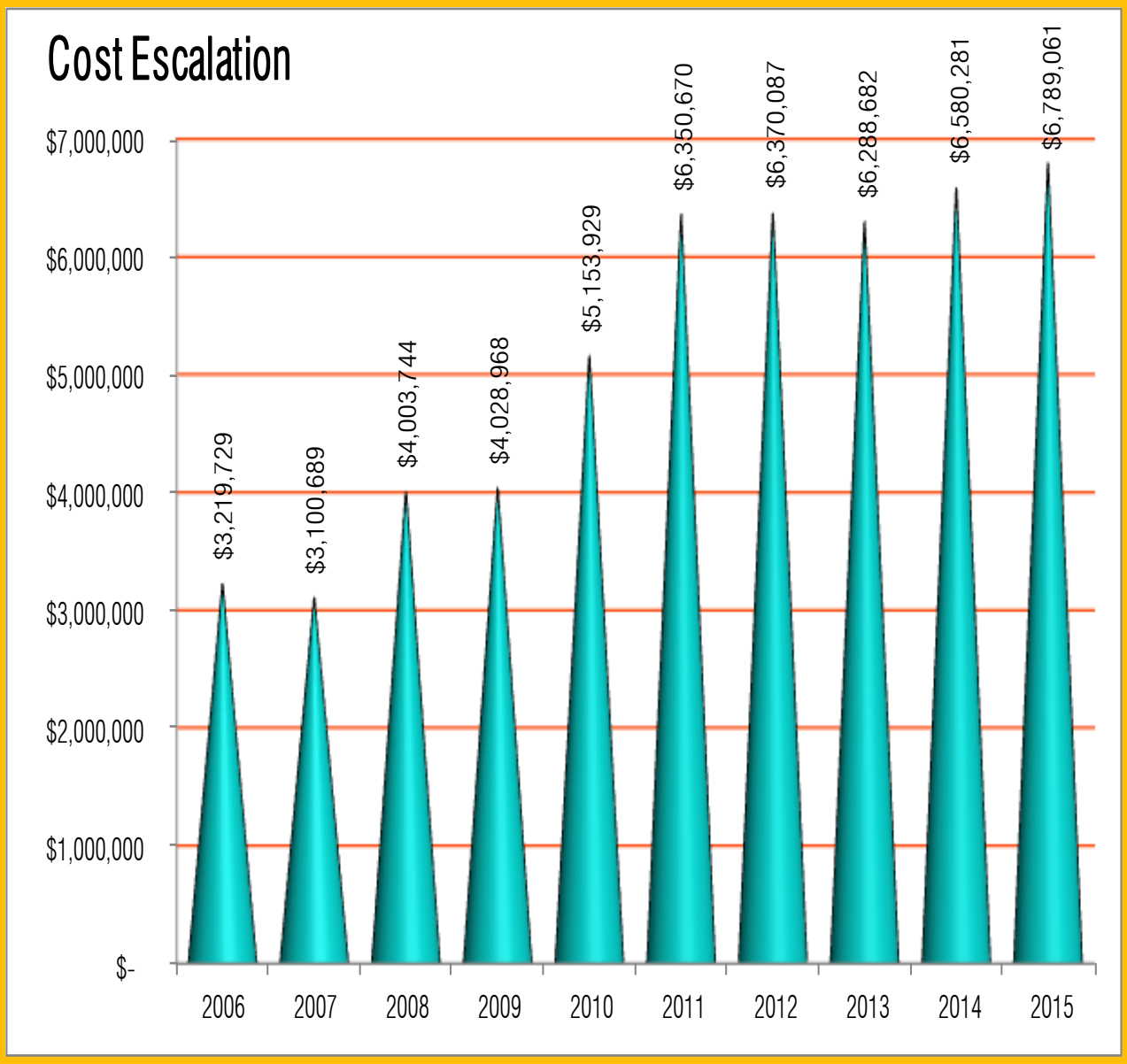
Baker City also did not do an overlay project in 2015. Because the construction of Best Frontage Road was not completed at the time the 2015 Pavement Management Plan was created, asphalt costs for the previous year have been carried forward. The Pocahontas Road overlay project and Best Frontage Road construction were completed at the same period of time in 2014, allowing us to purchase asphalt at a lower per-ton cost.



Deferred Maintenance... Continued

The graph below illustrates the approximate cost to treat every paved street with the recommended treatment for its condition category, further demonstrating the level of maintenance needed, but not funded, for each of the represented years.

As you can see, the costs associated with deferred street maintenance have continued to rise through the majority of prior years.



Street Condition Ratings By Mileage

Table Notes:

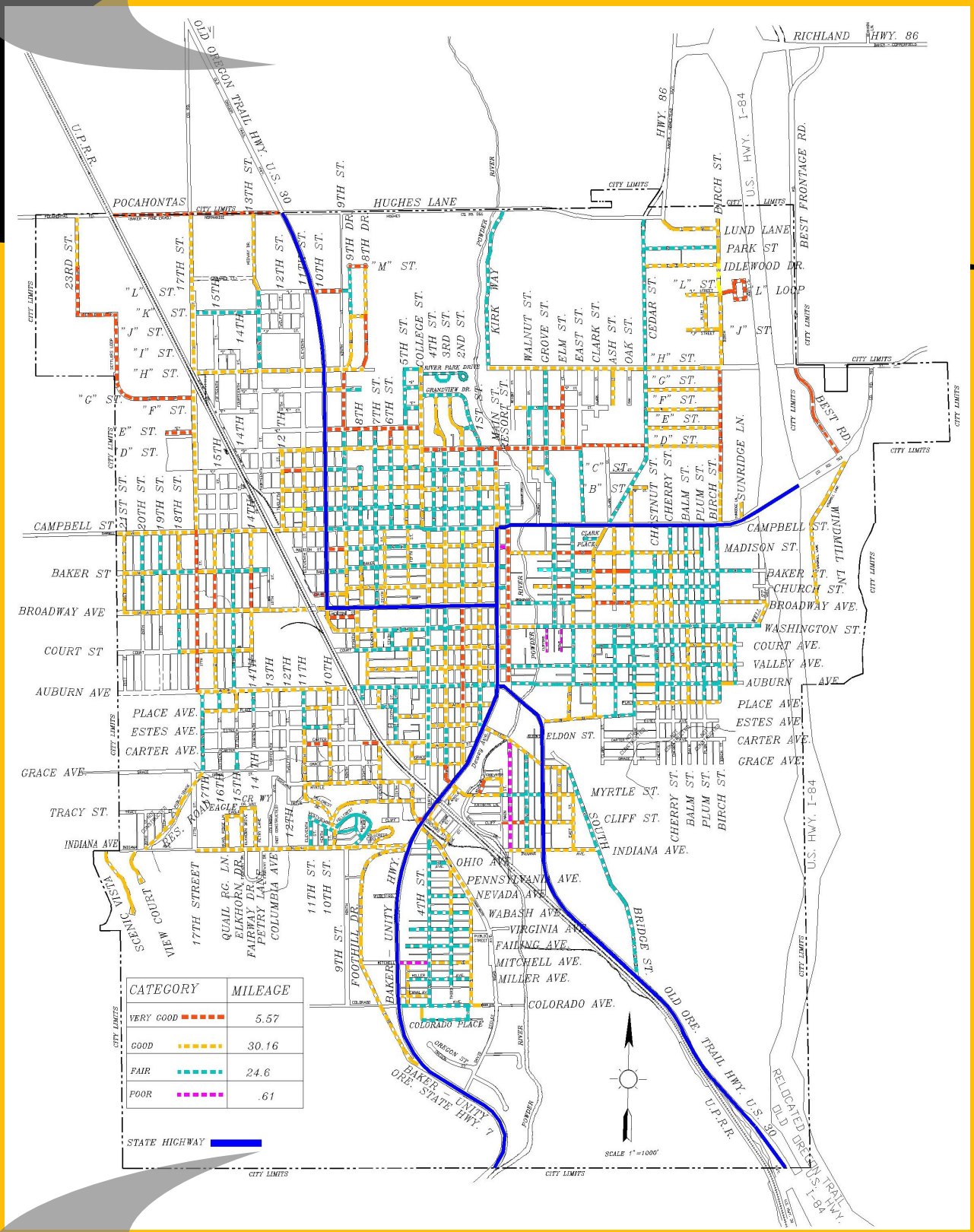
- Due to weather conditions in 2001, the annual inspection was not completed. Partial inspection showed some degradation.
- In order to conform to the 1996 Transportation Plan, some gravel streets were reclassified at that time.

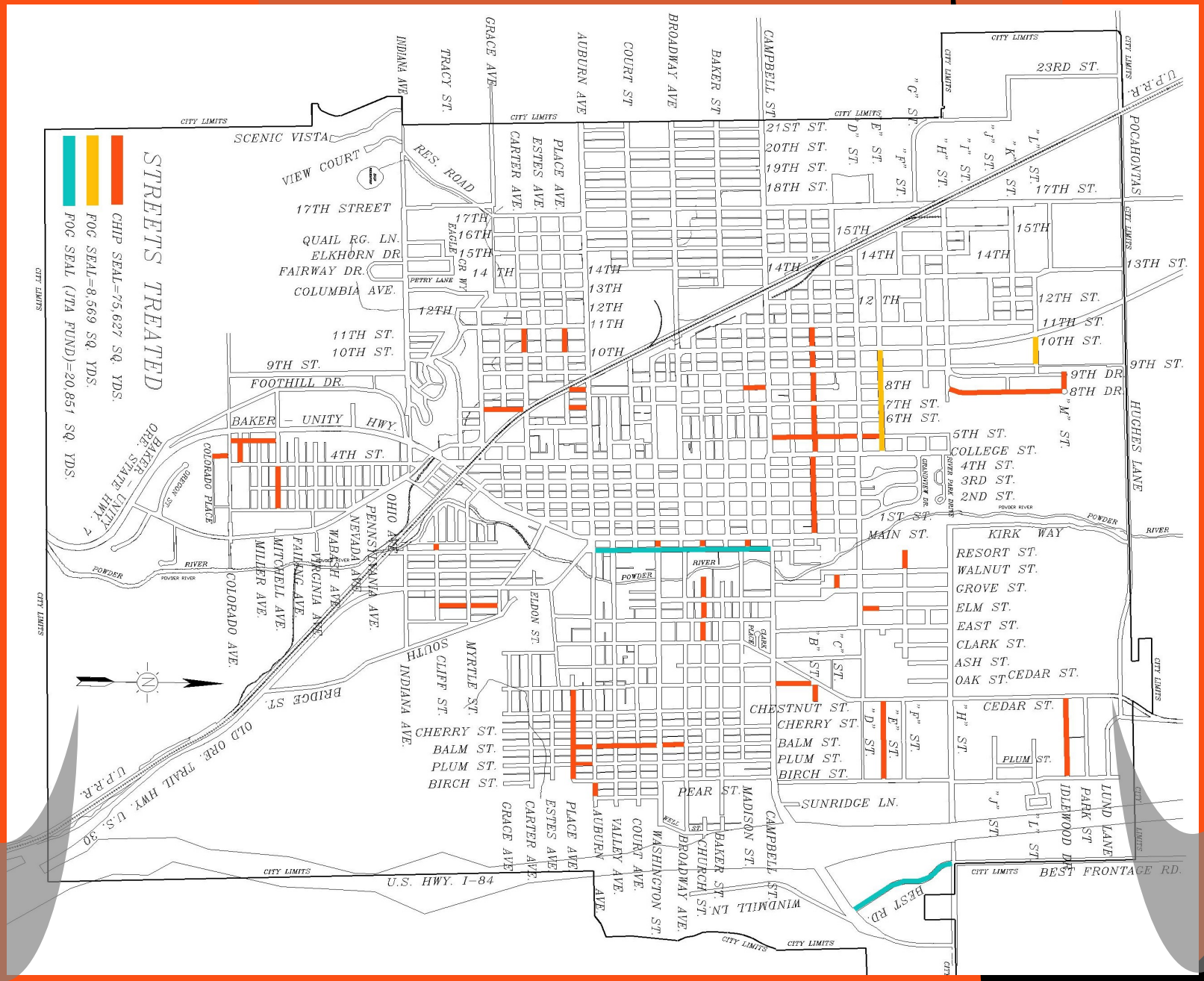
* The variation in total asphalt street mileage from 2012 to 2013 was due to a correction made in M Street's dimensions as well as the modified dimensions of newly-constructed Resort Street.

**The total asphalt street mileage reflected for 2015 includes the construction of Best Frontage Road as well as the addition of dimensions for E Street (N. 2nd St.-Grandview Ave.). This section of E Street has not previously been included in our street rating data.

Year	Very Good	Good	Fair	Poor	Very Poor	Total Miles Asphalt Streets	Gravel Double Chip	Gravel Collector	Gravel Local	Total Miles Gravel Streets	Total Miles Unopened Streets	Total Miles All Streets
2015	5.57	30.16	24.6	0.61	0	60.94**	0.82	1.01	7.81	9.64	11.47	82.05
2014	6.48	30.39	22.83	0.88	0	60.58	0.82	1.01	7.81	9.64	11.47	81.69
2013	9.22	29.43	21.33	0.54	0.08	60.58*	0.82	1.01	7.81	9.64	11.47	81.69
2012	8.52	30.44	20.57	1.00	0.08	60.61	0.82	1.01	7.81	9.64	11.47	81.72
2011	7.38	32.13	20.44	0.58	0.08	60.61	0.82	1.01	7.81	9.64	11.47	81.72
2010	9.09	30.18	20.71	0.63	0.00	60.61	0.82	1.01	7.81	9.64	11.47	81.72
2009	11.39	30.05	18.81	0.36	0.00	60.61	0.82	1.14	8.06	10.02	11.70	82.33
2008	9.46	31.46	18.80	0.28	0.00	60.00	0.82	1.14	8.06	10.02	11.70	81.72
2007	10.16	33.93	15.69	0.00	0.00	59.78	0.82	1.14	7.95	9.91	11.80	81.49
2006	8.33	42.69	7.67	0.00	0.00	58.69	0.82	1.14	7.95	9.91	11.98	80.58
2005	8.72	42.54	7.25	0.00	0.00	58.51	0.82	1.14	7.95	9.91	11.98	80.40
2004	9.93	43.06	5.52	0.00	0.00	58.51	0.82	1.14	7.95	9.91	11.98	80.40
2003	9.35	45.96	2.54	0.00	0.00	57.85	0.82	1.27	7.95	10.04	11.98	79.87
2002	9.21	46.84	1.13	0.00	0.00	57.18	0.82	1.27	7.95	10.04	11.98	79.20
2000	7.30	47.20	2.76	0.00	0.00	57.26	New Category Added in 2002	1.77	8.19	9.96	11.98	79.20
1999	6.18	49.81	1.16	0.00	0.00	57.15		1.77	8.19	9.96	11.98	79.09
1998	6.81	48.78	0.90	0.00	0.00	56.49		2.10	8.19	10.29	12.13	78.91
1997	5.33	50.72	0.17	0.00	0.00	56.22		2.18	8.24	10.42	12.00	78.64
1996	6.04	49.38	0.55	0.00	0.00	55.97		2.18	8.24	10.42	12.00	78.39
1995	5.58	48.34	1.41	0.00	0.00	55.33		4.50	6.20	10.70	12.28	78.31

Street Condition Ratings 2015





Streets Treated in 2015

Water Mainline Break - Court Street (1st St. to Main St.)

Sewer Lateral Repair - Grandview Ave.

Curb Repair - Cliff St.

Objectives[1]

1. Keep most of Baker City's paved streets in the "Very Good" or "Good" categories.
2. Do not allow any street to remain in the "Poor" category for more than 2 years.
3. Do not allow any paved street to deteriorate below the "Poor" category.
4. Increase the percentage of paved streets in the "Very Good" category.
5. Monitor deterioration patterns. Recognize future needs and plan to minimize their impact.

[1] A detailed explanation of the pavement rating system can be found on pages 3-7.

Review of Achievements Toward Objectives

1. The program continues to meet objective number one. Currently nearly 59% of Baker City's paved streets are in the "Very Good" and "Good" categories. Our ongoing analysis continues to demonstrate that band-aid treatments, like the single chip seal, temporarily elevate or maintain ratings on streets that are otherwise showing a steady decline.

2. There are currently five street sections in the "Poor" category, totaling .61 mile. Last year there was .88 mile of paved streets within this category. This is the first year that Mitchell Street (Hwy. 7 to 4th St.) received a "Poor" rating. Madison Street made its way back into the "Poor" category this year after being out of it for the previous two years.

3. Pavement conditions continue to decline, with the overall deterioration continuing to overwhelm the available resources needed to address the appropriate maintenance. There are currently no street sections within the "Very Poor" category. Clifford Street is currently our lowest-rated street section with a rating of "50".

4. Maintaining this objective is largely influenced by community growth and streets being constructed through new development or with the assistance of grant program funding. Without new construction, additions to the "Very Good" category are the result of overlay projects or chip sealing of higher-rated "Good" streets. Raising the percentage by adding new streets is more indicative of current community growth than success of the "Pavement Management Plan". New streets incorporated into the system add increased pavement maintenance responsibilities to the program. Since 2006, approximately 2.57 miles of paved public streets have been constructed or overlaid.

5. We continue to monitor and analyze deterioration patterns in our pavement system. Current and future needs have been identified in past reports. We continue to systematically set priorities and utilize available resources to provide the best use of the taxpayer dollar.

2016 Maintenance Tasks[2]

Focusing on Program Objectives 1 – 4 outlined on the previous page, street maintenance this year will involve overlaying 9,047 yd^2 and performing a grind and inlay on 963 yd^2 of city streets.

Factors considered when selecting streets for chip seal:

- The street has not been chip sealed since 2007; and
- The street is rated in the lower range of the "Good" category. The "Good" category consists of ratings in the 89 - 97 range; or
- The street is rated in the mid-"Fair" category. The "Fair" category includes ratings in the 70 - 88 range.
- The street sees higher daily traffic demands than similarly rated streets.

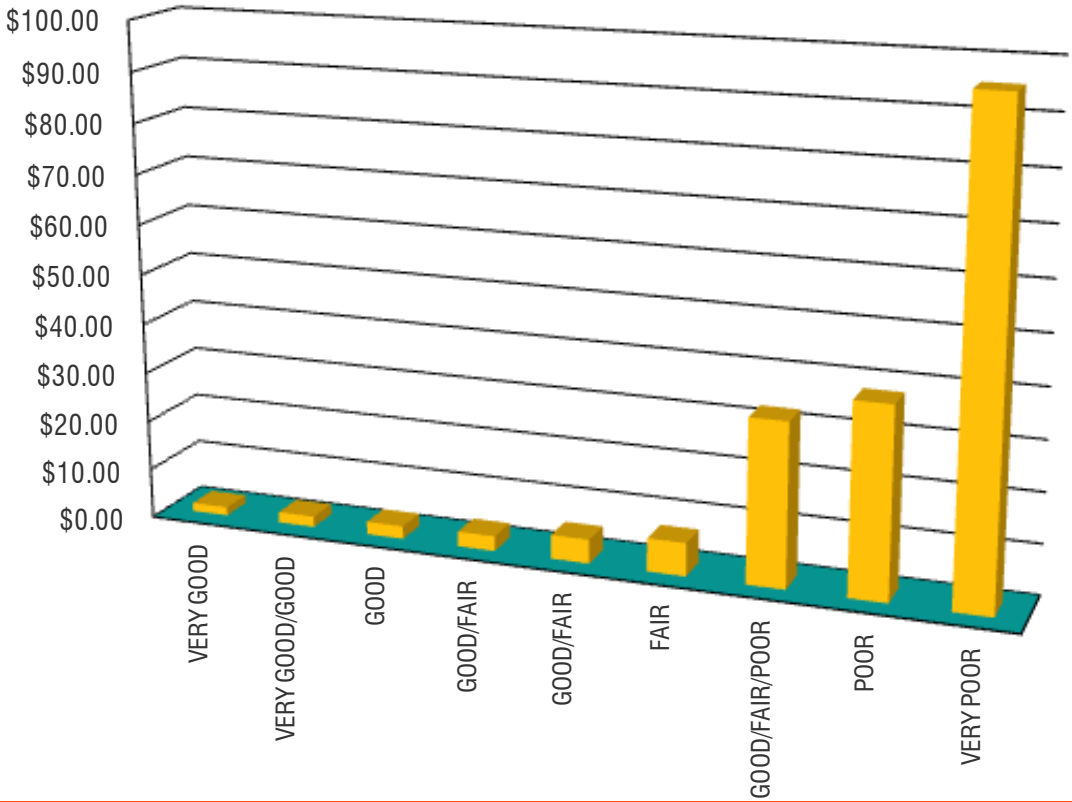
Fog seal is generally applied to recently constructed streets because it seals the asphalt.

[2] See pages 19-20 for a detailed explanation of maintenance procedures.

Chip Seal - B Street (College to E. Side 1st St.)

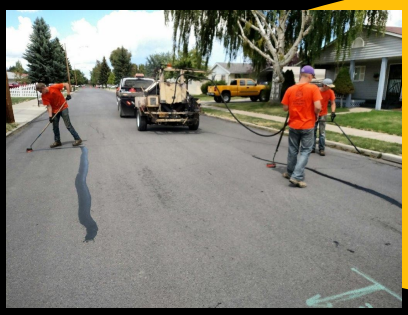
2016 Pavement Management Cost Curve

This graph represents the very foundation upon which the Pavement Management Plan was developed: Maintaining streets in the “Fair”, “Good”, and “Very Good” categories. This provides the citizens of Baker City with the most cost-effective transportation system.



STREET CATEGORY	COST PER SQUARE YARD	TYPE OF MAINTENANCE
VERY GOOD	$1.69	FOG SEAL (NO PREP)
VERY GOOD/GOOD	$2.15	1/4"-10 SINGLE CHIP (NO PREP)
GOOD	$2.55	FOG SEAL (INCLUDING PATCHING)
GOOD/FAIR	$3.00	3/8"-1/4" SINGLE CHIP SEAL (SOME PREP)
GOOD/FAIR	$4.80	DOUBLE CHIP SEAL (SOME PATCHING)
FAIR	$6.64	DOUBLE CHIP SEAL (CONSIDERABLE PATCHING)
GOOD/FAIR/POOR	$32.59	THIN OVERLAY (MINOR PATCHING)
POOR	$37.93	THIN OVERLAY (CONSIDERABLE PATCHING)
VERY POOR	$95.40	REBUILD

Crack Fill



Filling existing narrow cracks with hot liquid asphalt compound or emulsified asphalt sealer. This seals the crack and keeps moisture from penetrating the asphalt and street base. Wide cracks are filled with a 1/4" mix of hot asphalt compacted into and overlapping the cracks. Sealant is then applied to the surface to effectively fill the crack.

Thin Overlay

Placing a thin asphalt mat, generally 2"-2 1/2" thick, on an existing asphalt street. An asphalt pre-level mat may be applied prior to the top mat with a motor grader or paving machine. Geosynthetic fabric is often used beneath the overlay to prevent cracks from projecting into the new overlay.

Various combinations of patching, crack filling, grinding, and other rehab work is completed prior to the application. A fog seal or 1/4"-#10 chip seal is applied within two years of the overlay to seal the new asphalt. The degree of surface preparation for an overlay is dependent on the condition and type of the existing pavement. Generally, the existing pavement should be structurally sound, level, clean and capable of bonding to the overlay.

Milling (also called grinding) can be used to smooth pavement prior to overlays. Rather than filling in low spots, milling removes the high points in an existing pavement to produce a relatively smooth surface. Milling can help eliminate varying compaction problems. After milling, new asphalt is inlaid at the original asphalt grade, eliminating the need to raise adjacent curbs, sidewalks, and driveways.

"Fair" or "Good" category streets with solid bases are generally targeted for thin overlays.

Fog Seal

Emulsified asphalt coating applied to existing asphalt surfaces. The coating seals and rejuvenates the existing asphalt. Used as preventative maintenance to extend the operational life of a street.

"Good" and "Very Good" rated streets and newly-constructed or overlaid streets are fog sealed. Products used in the past: HFE-901-S, CRF with a sand blotter as well as GSB-88.

1/4”-#10 Single Chip Seal

An application of emulsified asphalt and a single layer of graded aggregate. The aggregate is usually 1/4”-#10 in size. Patching and crack filling are generally not necessary prior to the chip seal application.

Streets in the “Very Good” and “Good” categories are targeted for this treatment.

3/8”-1/4” Single Chip Seal

An application of emulsified asphalt and a single layer of graded aggregate. The aggregate is usually 3/8”-1/4” in size. Patching and crack filling are completed in preparation of the application.

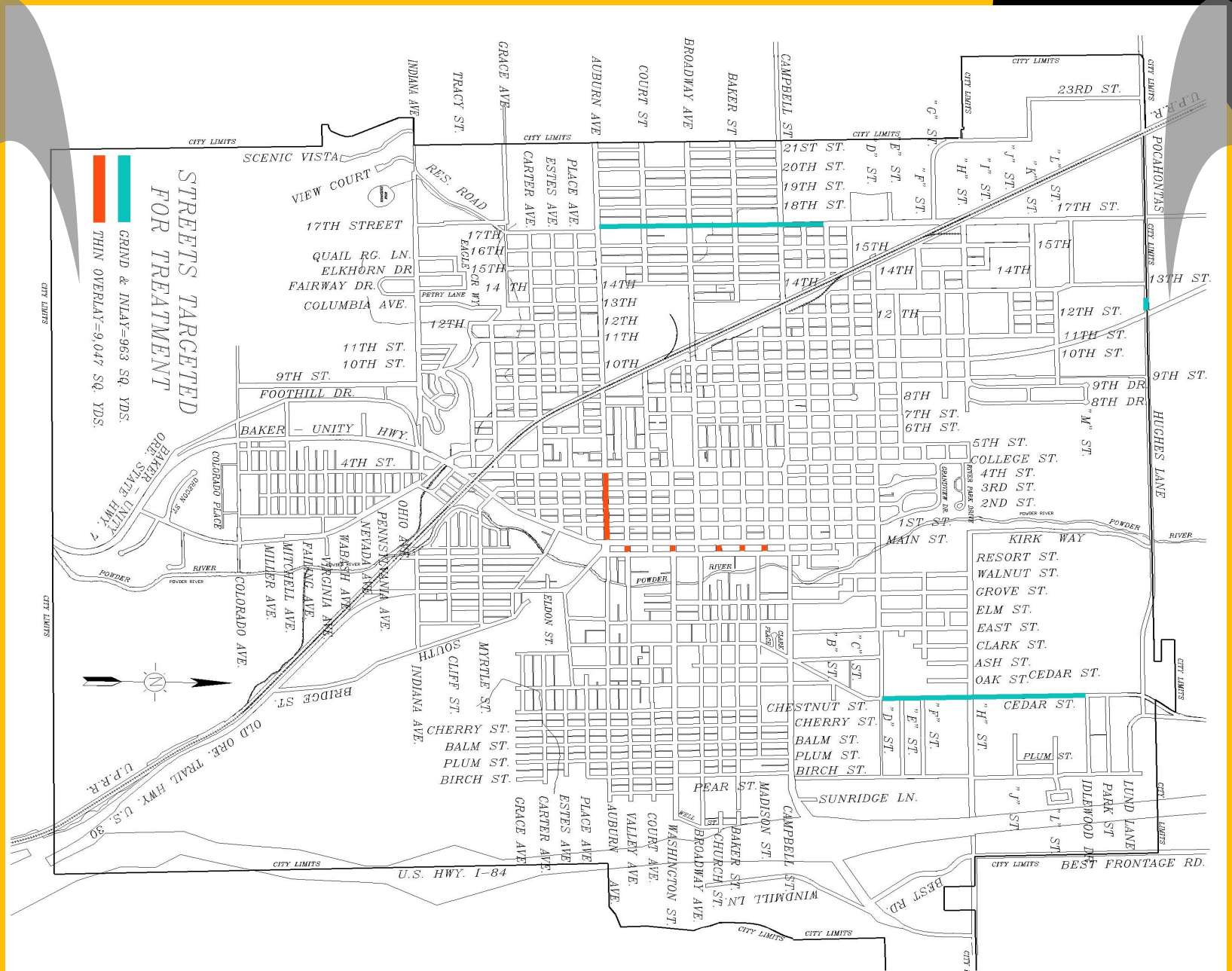
Streets in the “Good” and “Fair” categories traditionally receive this treatment.

Double Chip Seal

Similar to a single chip seal application, emulsified asphalt is applied, a 3/8”-1/4” chip aggregate is applied, loose rock is swept up, then another coat of emulsified asphalt and 1/4”-#10 chip aggregate is applied over the 3/8”-1/4” layer. Extensive patching is completed prior to the chip seal application.

Streets in the “Good” and “Fair” categories are generally selected to receive this treatment.

2016 Streets Selected for Treatment



Revenue for pavement maintenance work comes from the Surface Transportation Program (STP) and Serial Management Levy (now a portion of the tax base). The crack filling and asphalt patching necessary to prep streets for treatment are funded in the Street Maintenance Department of the State Tax Street Fund and not the Preventative Maintenance Department.

Although it is necessary to complete both stormwater and ADA improvements at the time a thin overlay project is accomplished, funding for such work will be paid for through the Street Maintenance and Stormwater Maintenance budgets.

Estimated Street Maintenance Costs 2016

Asphalt Thin Overlay

Application to City Streets	9,047 yd^2@$26.17/$yd^2$	$236,760.00
Stormwater System Improvements		$11,700.00
Prep, Patch, Misc.		$87,012.00
ADA Required Improvements		$48,886.00
Subtotal of Asphalt Thin Overlay Application and Prep:		**$384,358.00**

Grind and Inlay

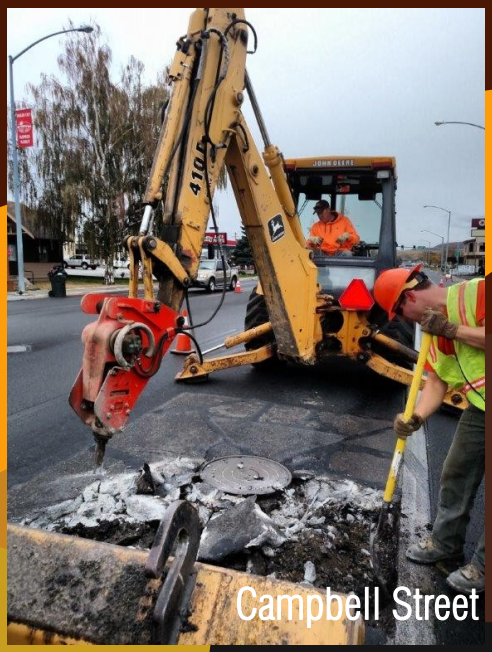
Application to City Streets	963 yd^2@$28.25/$yd^2$	$27,205.00
Subtotal of Grind and Inlay Application and Prep:		**$27,205.00**

Total Estimated Cost

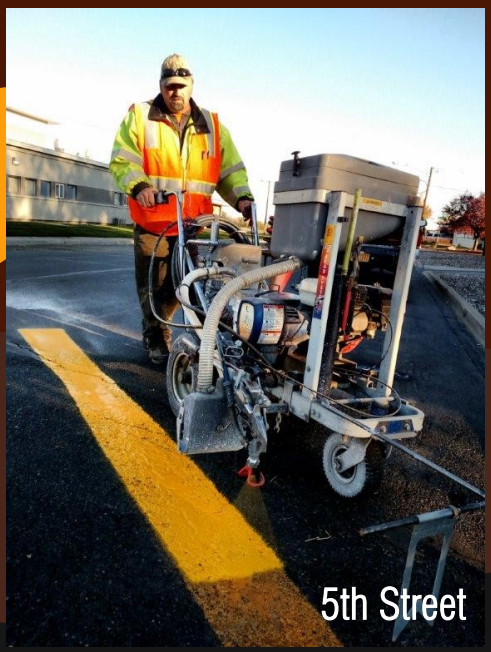
Total Thin Overlay and Grind/Inlay Application:	$411,563.00
Engineering (10%)	$41,156.30
Administration (8.4%)	$38,028.42
Contingency (10%)	$49,074.77
2016 Total Preventative Maintenance Estimated Cost:	**$539,822.49**

Crack Fill - 8th Drive

6th Street



Campbell Street



5th Street

Asphalt Patch - 11th Street (C St. to D St.)

2016

PAVEMENT MANAGEMENT PLAN