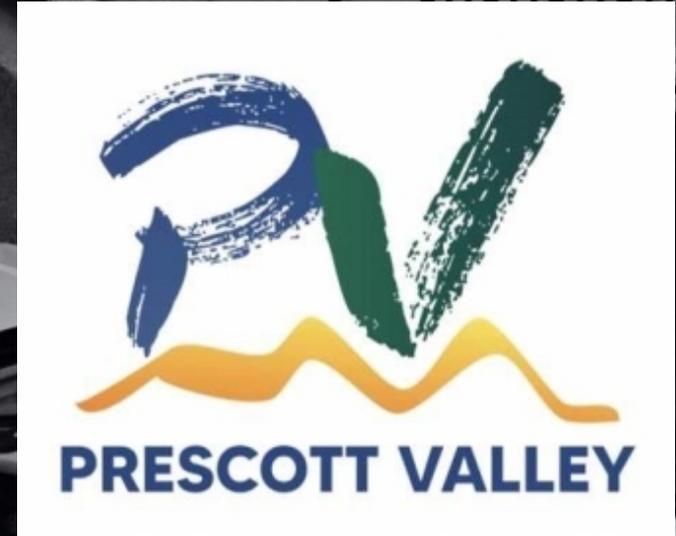




# PAVEMENT CONDITION EVALUATION RESULTS TOWN OF PRESCOTT VALLEY, AZ



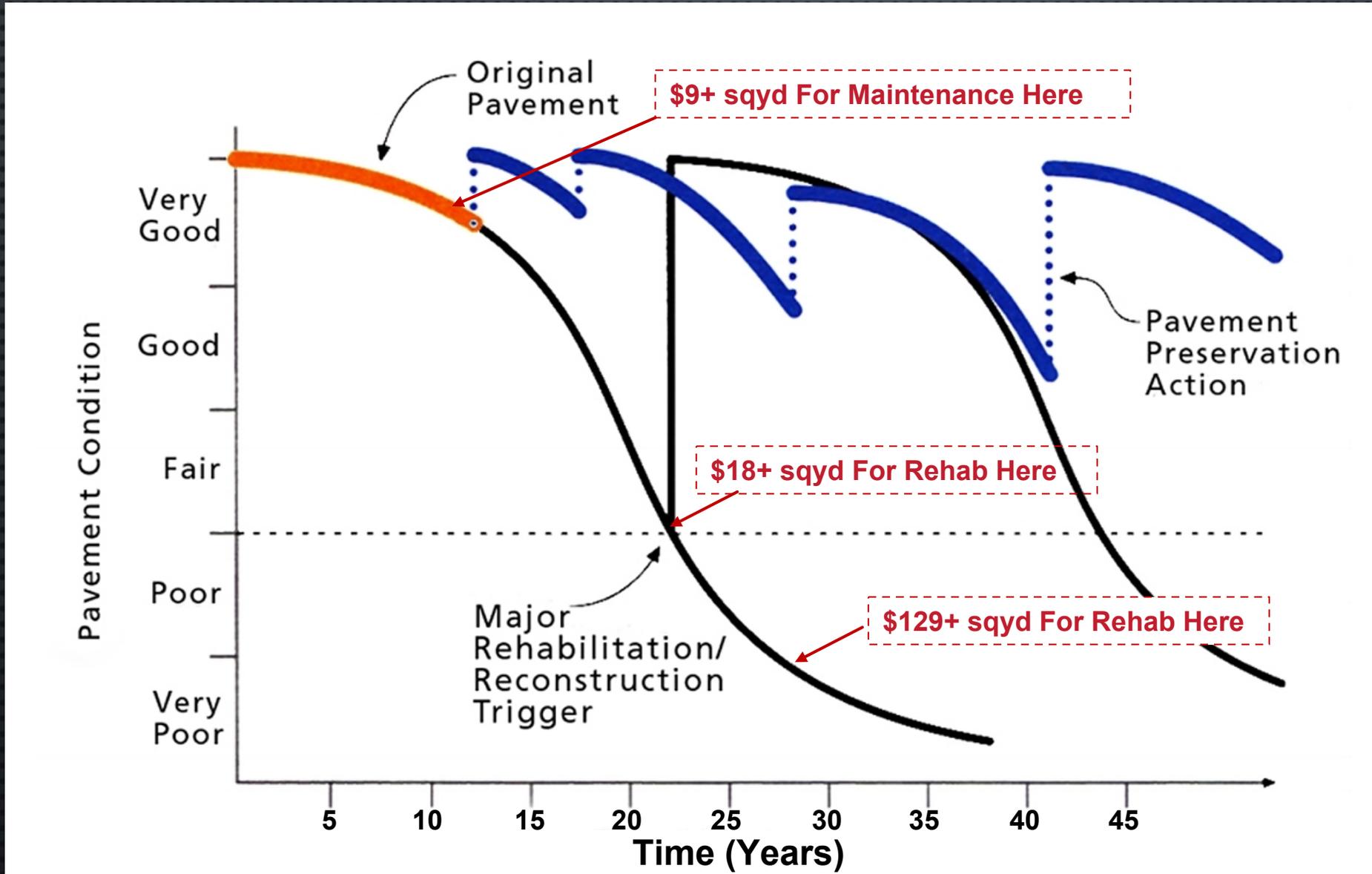


- **Centerline Miles** – Town maintains appx. 290 linear miles of paved roadway
- **Paved Area** – Over 4.46M SQYDS of pavement or enough material to pave a small two-lane road to San Diego California
- **Network Replacement Value** – Over a \$500M Dollar Asset (pavement only)
- **Pavement condition index (PCI)** – score 0 to 100
- **Preservation** – Light weight and cost-effective treatment to extend design life
- **ASTM D 6433** – National guideline for evaluation of pavements

Pavement Condition Index (PCI)	Condition Description
86 – 100	GOOD
71 – 85	SATISFACTORY
56 – 70	FAIR
41 – 55	POOR
26-40	VERY POOR
11-25	SERIOUS
0 – 10	FAILED

# System Statistics & Terminology

# Purpose of Pavement Management



## Benefits of Active Maintenance

- Extend pavement design life at lowest possible cost
- Reduce the cost of roadway ownership
- Improve the level of service over the roadway's life
- Delay costly rehabilitation for as long as possible

# Roadway Asset Collection Van

## Ladybug 360° Right-of-Way Camera

- Panoramic 360 degree video
- proven Ladybug camera technology
- 32 mega pixel resolution.
- Integrated with onboard DMI to increase relative accuracy
- Processed every 20 feet
- Utilized for asset extraction.

## Global Positioning System (GPS)

## Laser Crack Measuring System (LCMS-2)

- two 1-millimeter resolution line scan cameras.
- 1mm resolution is equivalent to over 4,000 dedicated laser points.
- 32MP HD imagery
- 100% contiguous survey & processing
- Objective ASTM D6433 assessment

## Internal Inertial Measuring Unit (IMU)

## Distance Measuring Instrument (DMI)

## TTI Certified 3-Laser Profiler -Roughness -Rutting



# High Quality ROW Images



# Road TRIP

## Technical Rating Intelligence Program

The screenshot displays the Road TRIP software interface, which is used for processing sensor data to detect and classify road distresses. The interface is divided into several sections:

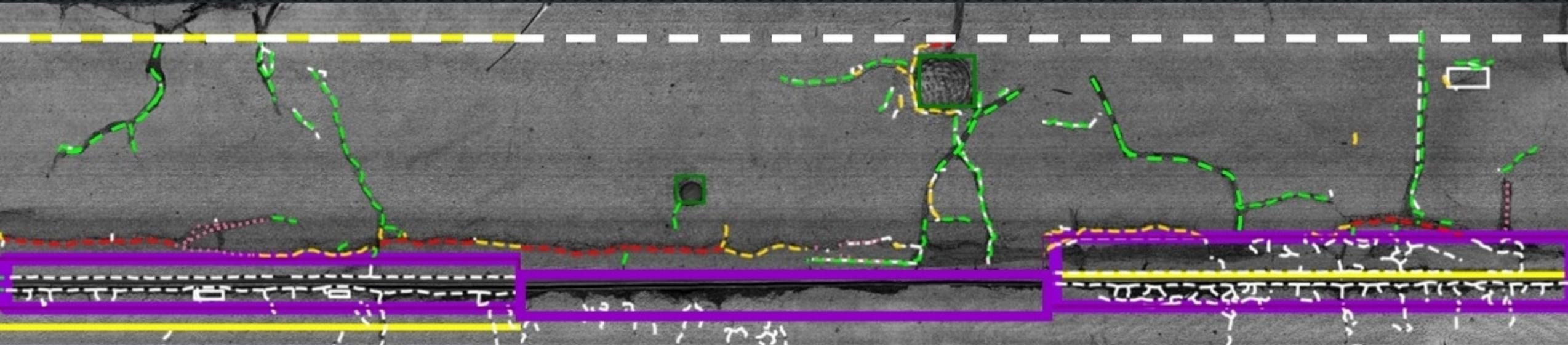
- Top Left:** Project information (712, 64.8) and a list of detected distresses with their severity and quantity.
- Top Center:** A sensor data plot showing distance (0 to 6000) versus a metric (0 to 4000).
- Top Right:** A street view image of a residential road with detected distresses overlaid.
- Bottom Left:** A detailed list of distresses with columns for Distress, Severity, ASTM Code, Quantity, Density, and Defect.
- Bottom Center:** A GIS map showing the road's location and a legend for distress severity levels (1 - Good to 5 - Serious).
- Bottom Right:** A summary table of distress types and their quantities, densities, and defect counts.

Distress	Quantity	Density	Defect
Alligator High	0.3	0.1	12.0
Alligator Low	1.5	0.5	6.0
Alligator Mod	0.8	0.3	12.0
Long Trans Low	50.4	5.2	11.3
Long Trans Mod	2.3	0.2	0.8
Patch Mod	3.6	1.2	10.7
Rut Low	3.7	1.3	9.7
Weathering High	0.0	0.0	0.0
Weathering Low	294.5	100.0	5.8
Weathering Mod	0.0	0.0	0.0

- Sensor processing to detect, classify, and quantify ASTM D6433 distresses
- Detected distresses measured and overlaid on images
- Distresses classified based upon geometry and density algorithm
- GIS coordinates for each distress ties to images for location
- Images available for QC and verification
- **Calculated an ASTM D6433 PCI score for every segment of road**

# Onsite Pilot Field Review

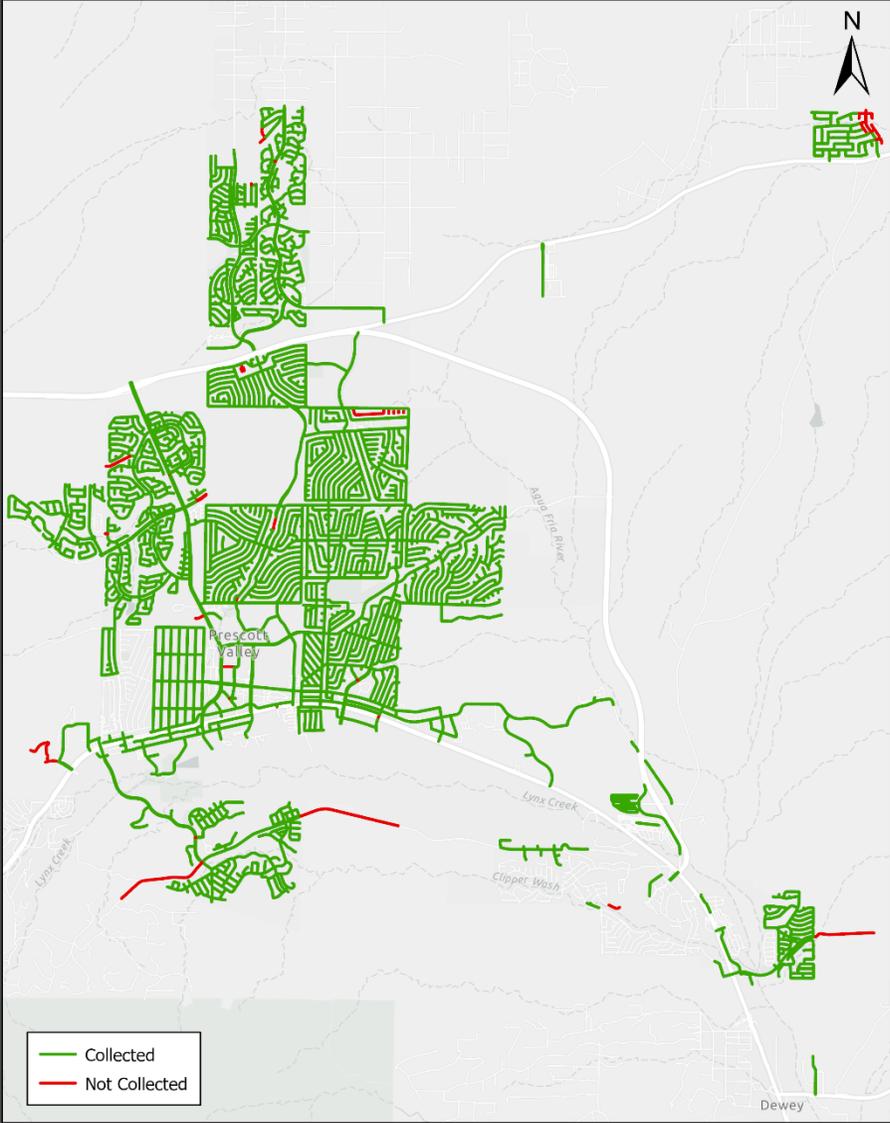
- Perform field visit with Town staff to review pilot data and results
- 100% Linear Survey
- Automated processing evolution
  - Block cracking vs Alligator cracking
- Select Good / Fair / Poor roads for pilot
  - Perform QC on collected data in the field
- Discuss conditions and expectations with Staff



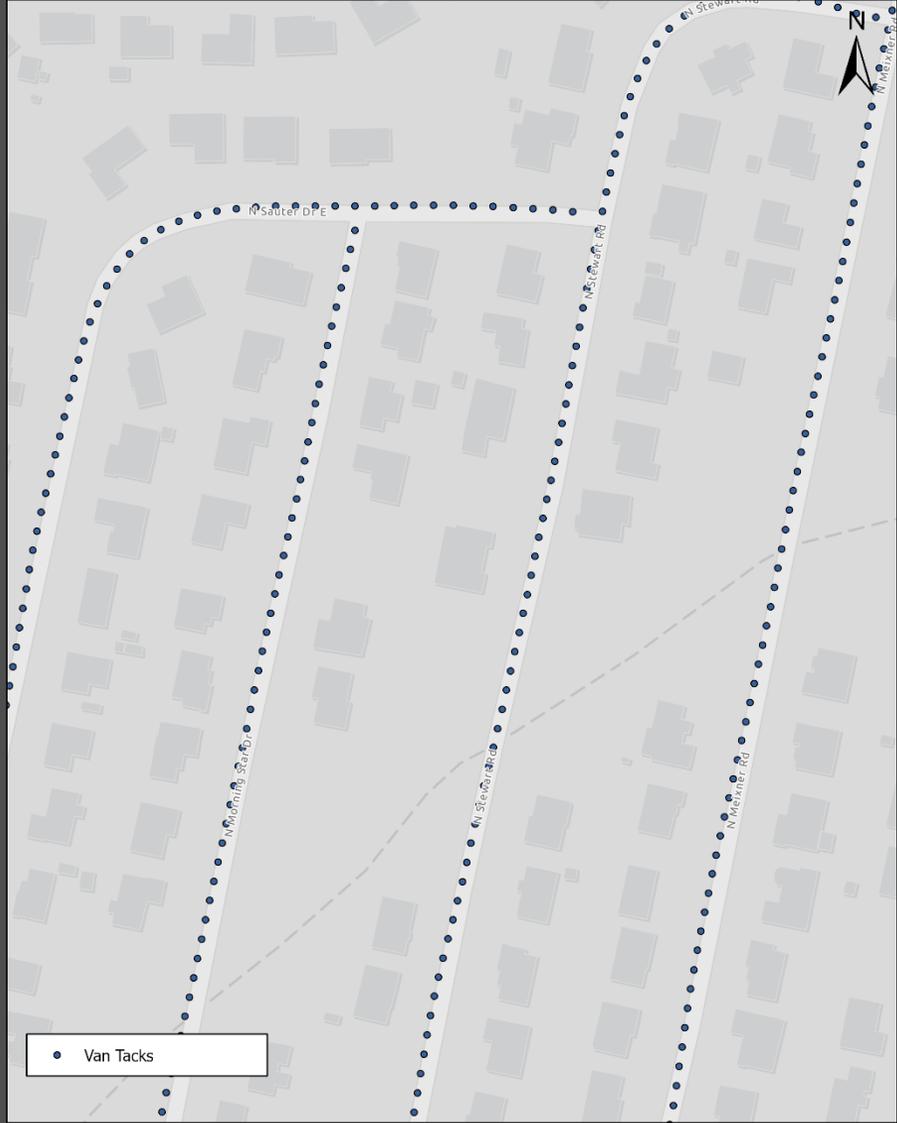
# CENTERLINE FILE VERIFICATION



Collection Status | Prescott Valley, AZ



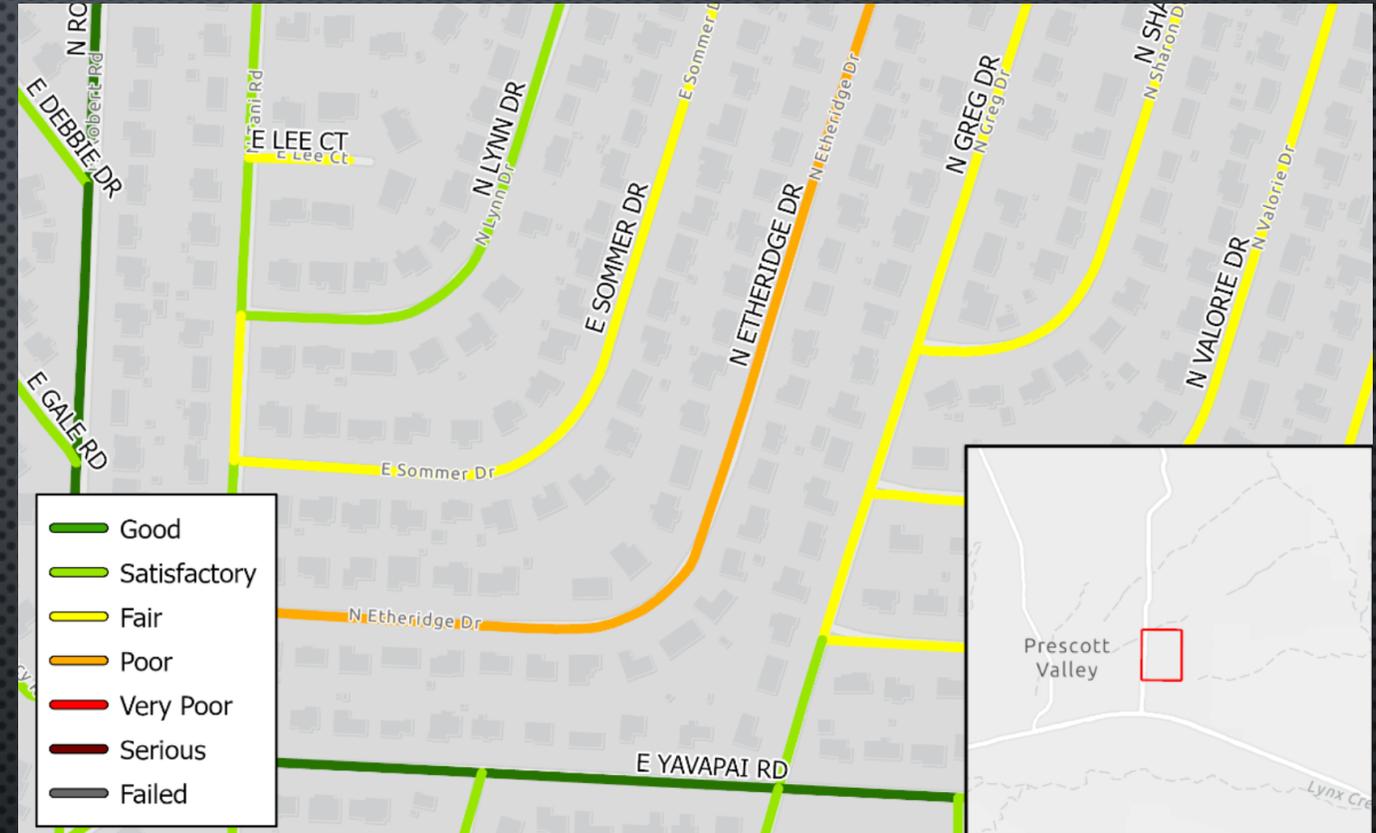
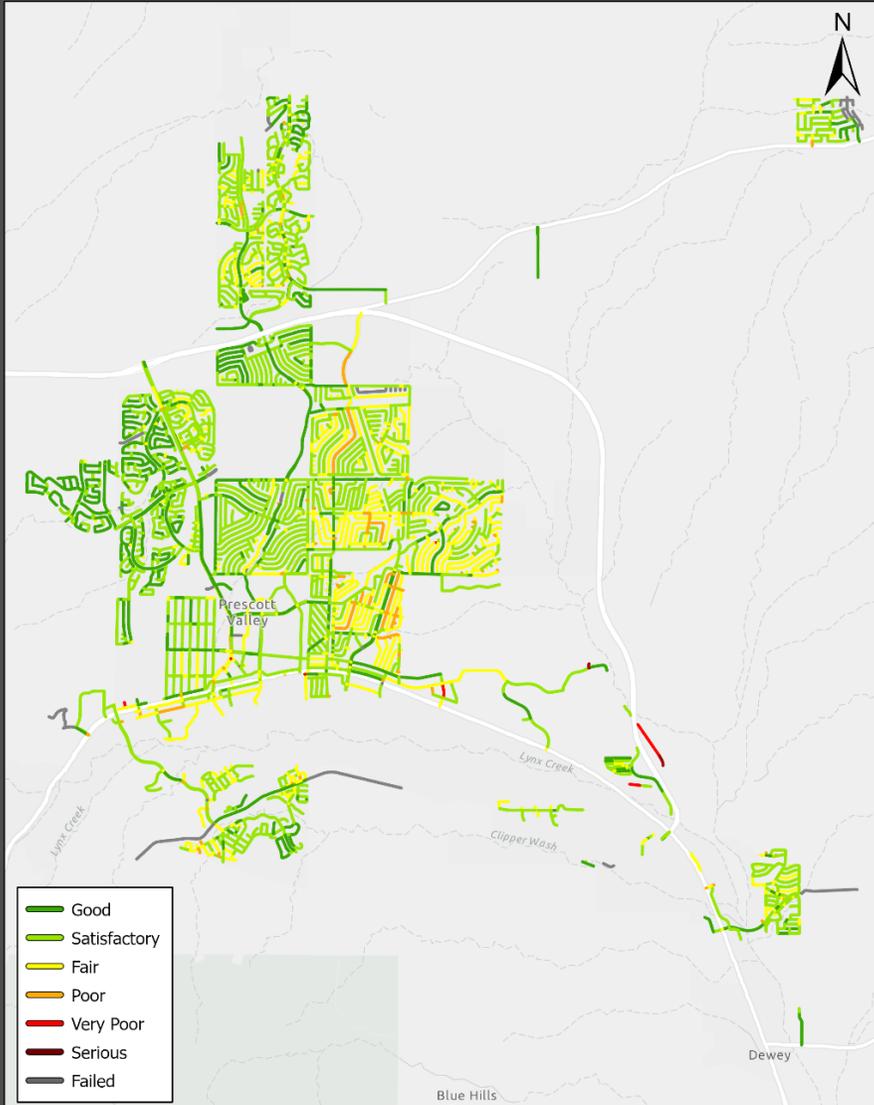
Network Coverage Example | Prescott Valley, AZ



# PAVEMENT CONDITION RESULTS



OCI Distribution | Prescott Valley, AZ



Pavement Condition Index (OCI) Range	Condition Description	Total Area Yd2	Total Distance (Centerline Miles)	Percent of Asphalt Miles
86 - 100	Good	1,073,236	62.82	24.05%
71 - 85	Satisfactory	2,441,478	158.56	54.70%
56 - 70	Fair	821,659	54.25	18.41%
41 - 55	Poor	112,966	7.19	2.53%
0- 40	Very Poor	11,602	0.79	0.26%
11-25	Serious	2,505	0.17	0.06%
0-10	Failed	0	0	0.00%
<b>Total of Rated Segments</b>		<b>4,463,446</b>	<b>283.78</b>	<b>100%</b>

# Pavement Condition Results & Health Metrics



## Network Average PCI

The national average we see is a 65-75. Less than 1 in 10 score above a 75 and less than 1 in 20 above an 80



## Percent of Good Roads

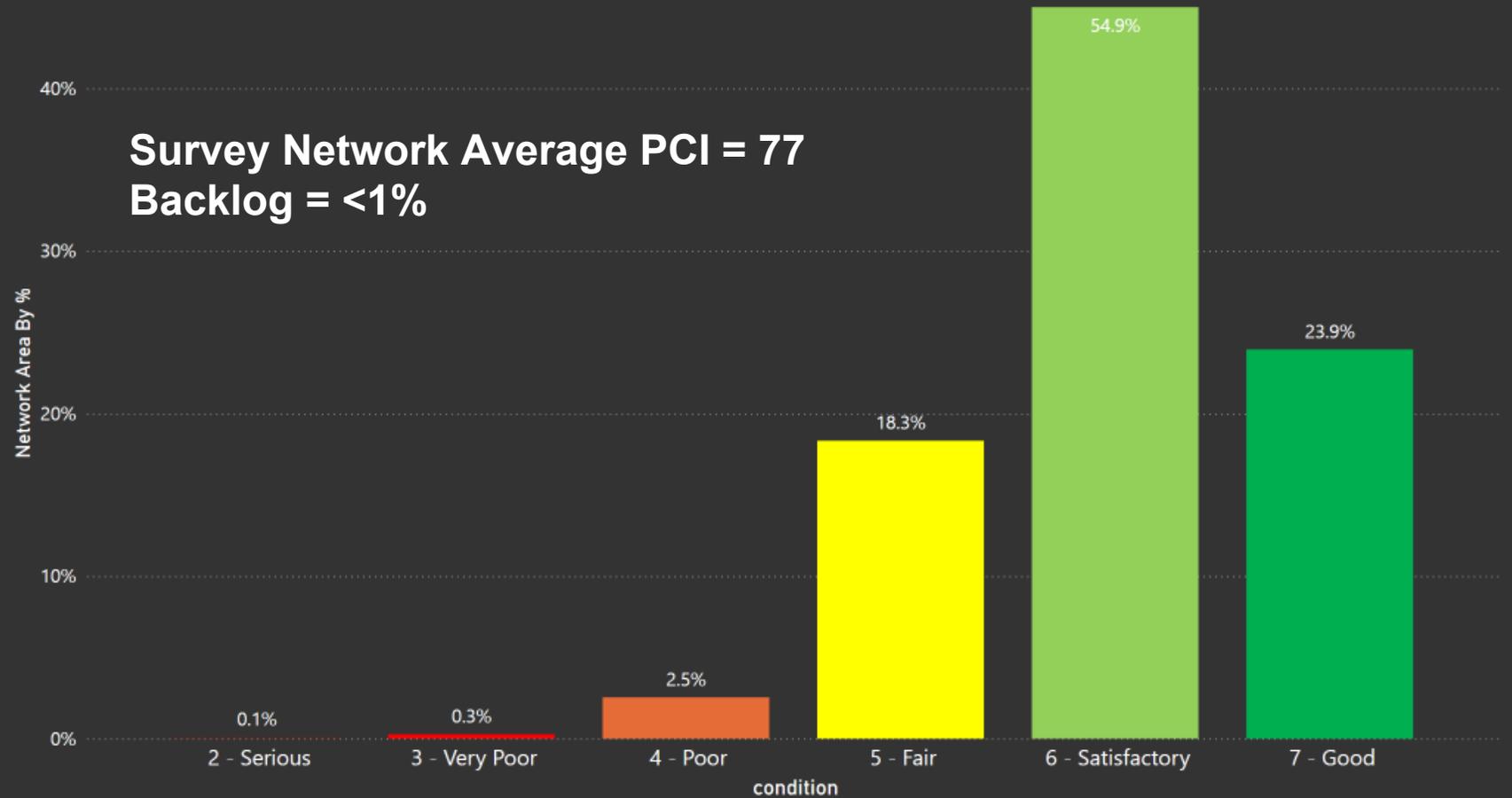
20% is about the average we see across the nation



## Percent of Backlog

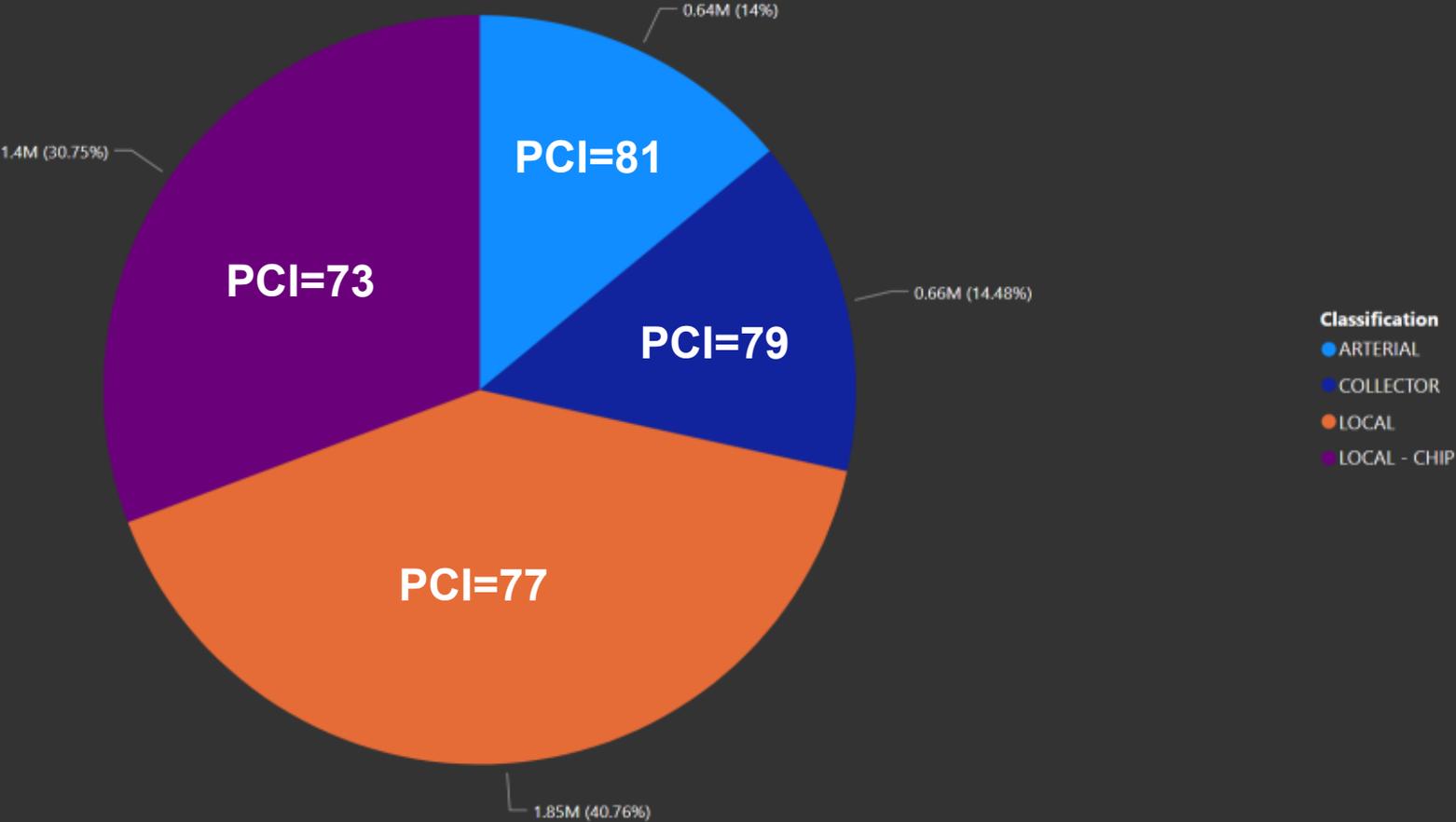
These are the Very Poor, Serious, & Failed roads. Less than 10% is ideal and 15% is a maximum recommended mark. 20% and greater is difficult to catch up from

Condition Summary By Category



# Types of Roadways in Prescott Valley

Sum of Area (yd2) by Classification



# Programmed Maintenance & Rehabilitation Activities

**PAVEMENT TYPE**  **CLASSIFICATION**  **STRENGTH**  **ACTIVE**

Pavement Type	Classification	Strength	Active	Code	Treatment	Min OCI	Critical OCI	Max OCI	\$/yd2	Priority	Reset Type	Reset Value
Asphalt	ARTERIAL	Strong	N	0	Do Nothing	85	88	100	0.00	500	absolute	0
Asphalt	ARTERIAL	Strong	Y	100	Microsurfacing	70	73	85	9.78	300	relative	10
Asphalt	ARTERIAL	Strong	Y	110	Cape Seal + Patching	60	63	70	10.22	200	relative	15
Asphalt	ARTERIAL	Strong	Y	200	Mill & Overlay	40	43	60	16.78	100	absolute	95
Asphalt	ARTERIAL	Strong	Y	300	Full Depth Reconstruction	0	25	40	129.00	400	absolute	99

**A few enhancements:**

*Treat each classification separately*

*Arterials – Collectors – Locals – Locals w/chip*

*Preservation activities included (i.e. slurry, Micro, Cape, etc.)*

*Mill & Overlay and Full Depth Reconstruction included*

**PAVEMENT TYPE**  **CLASSIFICATION**  **STRENGTH**  **ACTIVE**

Pavement Type	Classification	Strength	Active	Code	Treatment	Min OCI	Critical OCI	Max OCI	\$/yd2	Priority	Reset Type	Reset Value
Asphalt	LOCAL	Strong	N	0	Do Nothing	85	88	100	0.00	500	relative	0
Asphalt	LOCAL	Strong	Y	140	Slurry Seal	70	73	85	9.78	300	relative	10
Asphalt	LOCAL	Strong	Y	101	Microsurfacing + Patching	60	63	70	9.78	200	relative	15
Asphalt	LOCAL	Strong	Y	200	Mill & Overlay	40	43	60	16.78	100	absolute	95
Asphalt	LOCAL	Strong	Y	300	Full Depth Reconstruction	0	25	40	129.00	400	absolute	99

# Why This Road and Not That One???

**WHAAAAA?!?!?**



Let's define selection criteria commonly used:

**Prioritization** = Order of Priority  
Arrange from highest to lowest

**Financial Optimization** = Maximum Financial Benefit  
Arrange from maximum to minimum

# PRIORITY

**Prioritization** = Order of Priority  
Arrange from highest to lowest



**CRITICAL** – Roads that will drop into a more costly rehabilitation category next year

**Pavement Type** – Asphalt typically a higher priority as it deteriorates more rapidly

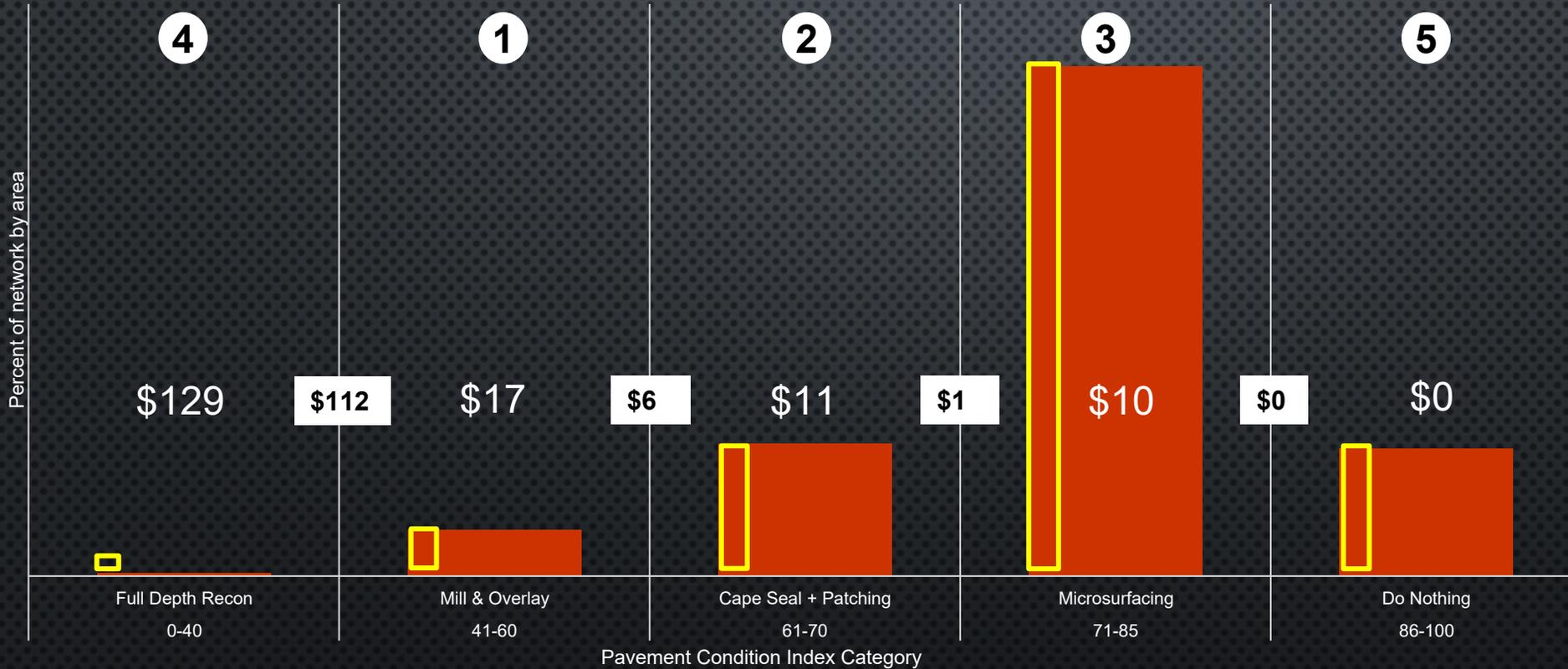
**Traffic/Classification** – Higher volume roadways have higher priority

**Strength** – Weak roads have a higher priority than strong roads

**PCI / Condition** – Absolute PCI values are then used as a tie breaker

# What Does Cost of Deferral Prioritization Look Like?

## PCI DISTRIBUTION GRAPH



## Illustration Legend



Cost of maintenance in this PCI range per SQYD



Critical roads at risk of costing more next year



Cost of deferred maintenance per SQYD



Selection sequence using financial optimization

\*Sample Illustration Using Rounded Prescott Valley Unit Rates for the Arterial Roadway Network

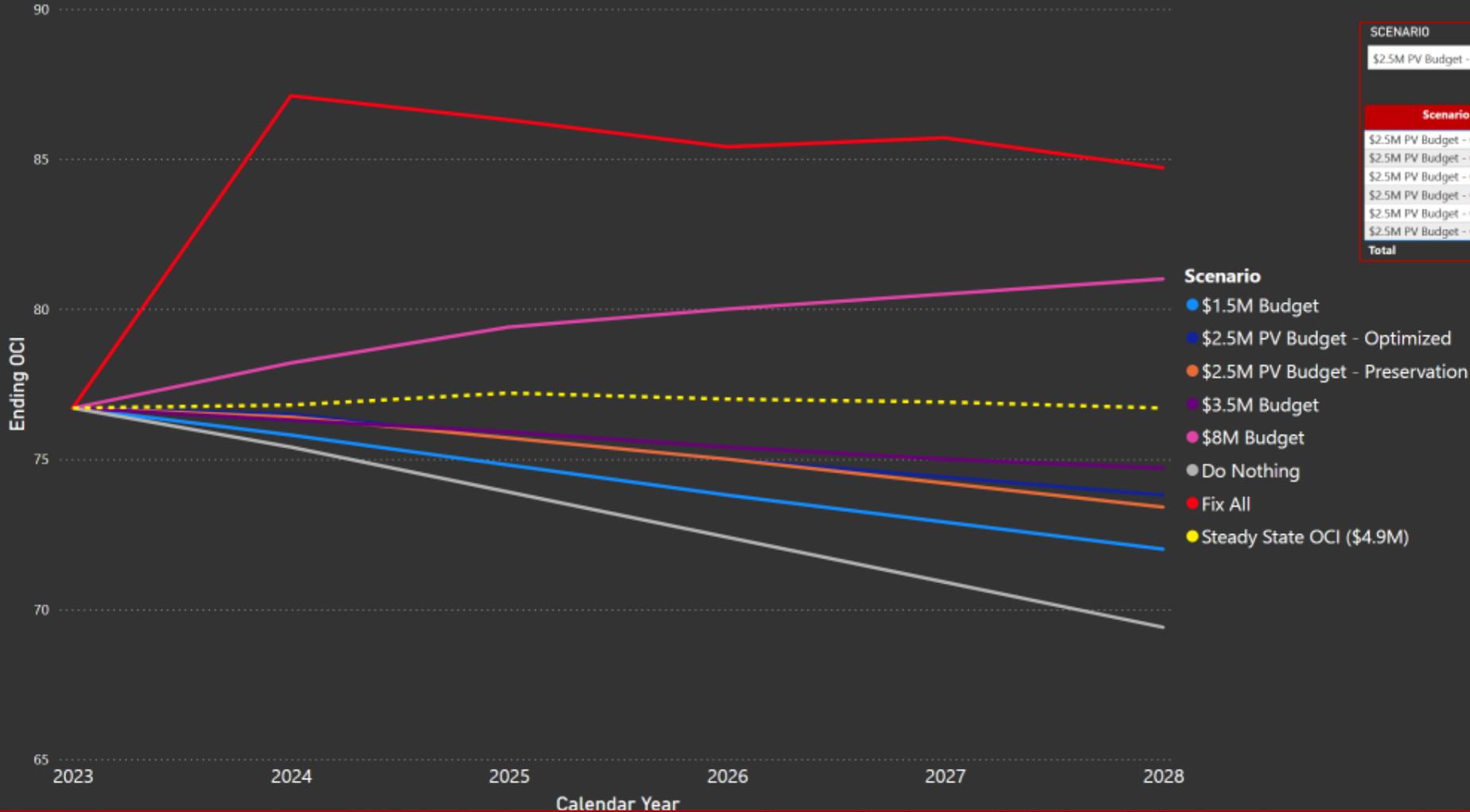
# Unlimited Funding - TODAY'S Needs Of The Network

Pavement Type	Treatment Code	Treatment	Area (yd2)	% By Area	Unit Rate	Selected	% By Cost	Segment Cost
Asphalt	100	Microsurfacing	2,775,622	6.24%	9.78	Y	7.05%	\$4,941,548.51
Asphalt	100	Microsurfacing	123,087	0.28%	10.27	Y	0.43%	\$300,457.72
Asphalt	101	Microsurfacing + Patching	932,897	2.10%	9.78	Y	2.55%	\$1,788,392.97
Asphalt	101	Microsurfacing + Patching	2,292	0.01%	10.27	Y	0.03%	\$23,541.55
Asphalt	102	Microsurfacing + Patching x1	4,125,175	9.28%	10.78	Y	7.93%	\$5,561,620.17
Asphalt	102	Microsurfacing + Patching x1	152,538	0.34%	11.32	Y	0.72%	\$501,702.34
Asphalt	110	Cape Seal + Patching	22,506	0.05%	10.22	Y	0.09%	\$65,820.10
Asphalt	110	Cape Seal + Patching	187	0.00%	10.73	Y	0.00%	\$2,006.25
Asphalt	111	Cape Seal + Patching x1	281,665	0.63%	11.22	Y	1.30%	\$910,088.06
Asphalt	112	Cape Seal + Patching x2	71,449	0.16%	12.22	Y	0.69%	\$480,454.27
Asphalt	120	Chip Seal + FOG	6,243,441	14.05%	9.44	Y	15.51%	\$10,871,530.91
Asphalt	120	Chip Seal + FOG	672,251	1.51%	9.91	Y	1.35%	\$948,293.93
Asphalt	121	Chip Seal + FOG + Patching x1	3,132,240	7.05%	10.44	Y	9.19%	\$6,439,809.57
Asphalt	130	Chip Seal + FOG+ Patching x1	346,063	0.78%	9.78	Y	0.91%	\$640,965.70
Asphalt	130	Chip Seal + FOG+ Patching x1	1,473	0.00%	10.27	Y	0.02%	\$15,123.87
Asphalt	131	Chip Seal + FOG+ Patching x2	2,403,727	5.41%	10.78	Y	8.05%	\$5,645,257.59
Asphalt	131	Chip Seal + FOG+ Patching x2	99,080	0.22%	11.32	Y	0.29%	\$203,807.15
Asphalt	140	Slurry Seal	14,638,667	32.93%	9.78	Y	23.67%	\$16,597,305.60
Asphalt	140	Slurry Seal	956,005	2.15%	10.27	Y	1.52%	\$1,067,464.77
Asphalt	141	Slurry Seal + Patching x1	669,905	1.51%	10.78	Y	1.39%	\$971,642.43
Asphalt	200	Mill & Overlay	43,648	0.10%	16.78	Y	0.72%	\$502,029.67
Asphalt	200	Mill & Overlay	20,073	0.05%	17.62	Y	0.35%	\$243,022.14
Asphalt	201	Mill & Overlay + Patching x1	5,366,520	12.07%	0.00	Y	0.00%	\$0.00
Asphalt	201	Mill & Overlay + Patching x1	223,602	0.50%	17.78	Y	1.84%	\$1,288,681.52
Asphalt	201	Mill & Overlay + Patching x1	66,928	0.15%	18.67	Y	0.56%	\$389,998.24
Asphalt	202	Mill & Overlay + Patching x2	622,198	1.40%	18.78	Y	5.58%	\$3,909,073.29
Asphalt	202	Mill & Overlay + Patching x2	264,473	0.59%	19.72	Y	1.86%	\$1,304,124.57
Asphalt	300	Full Depth Reconstruction	38,741	0.09%	129.00	Y	2.81%	\$1,968,668.46
Asphalt	301	Full Depth Reconstruction	156,197	0.35%	90.00	Y	3.60%	\$2,525,028.96
<b>Total</b>			<b>44,452,650</b>	<b>100.00%</b>			<b>100.00%</b>	<b>\$70,107,460.31</b>

# Budget Requirements & Needs

## Town Budget = \$4.9M (pavements only)

Ending OCI by Calendar Year and Scenario



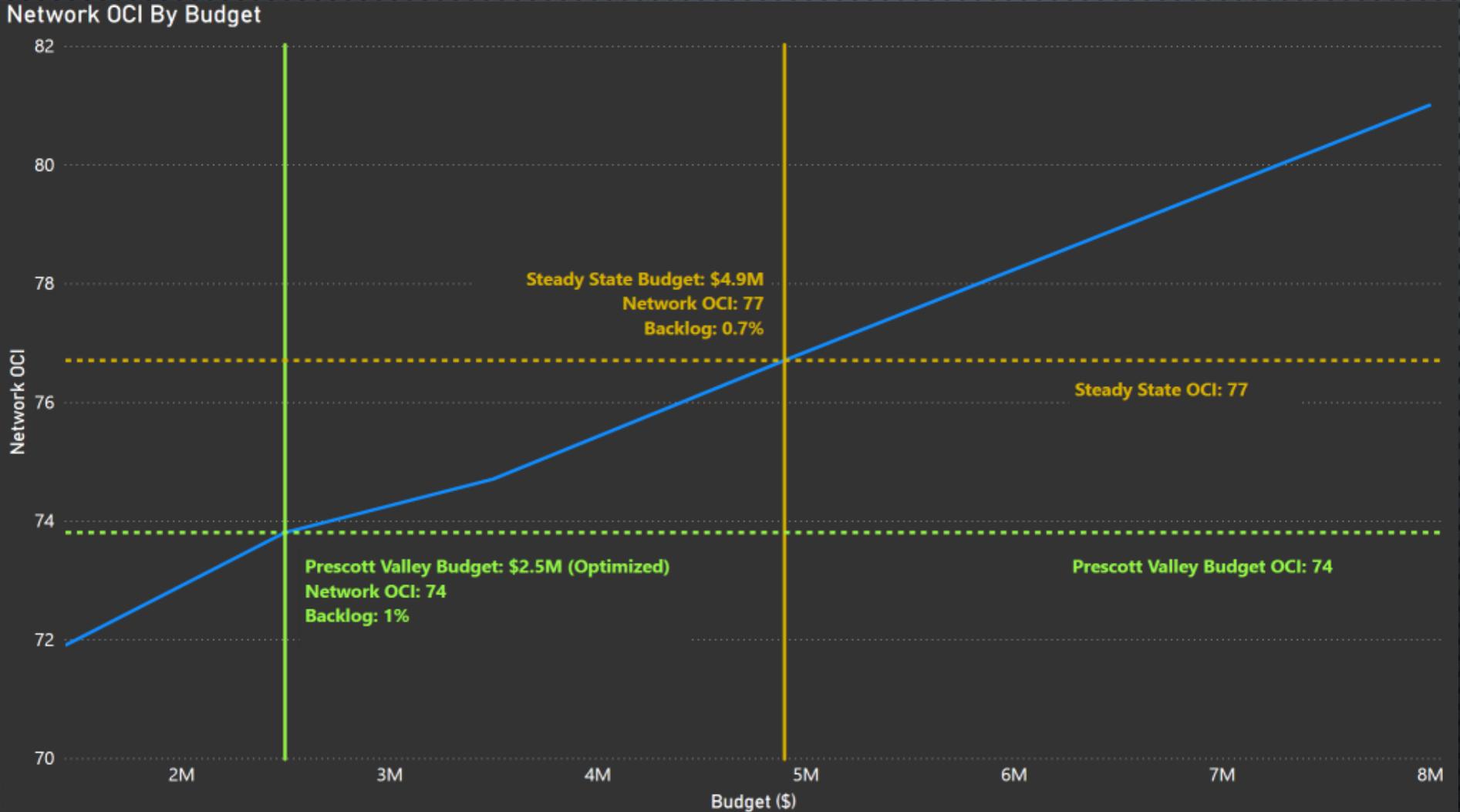
SCENARIO

\$2.5M PV Budget - Optimized

Scenario	Budget	Calendar Year	Fiscal Year	Ending OCI	Ending Backlog (%)
\$2.5M PV Budget - Optimized	0	2023	2025	76.70	0.30
\$2.5M PV Budget - Optimized	2,500,000	2024	2025	76.50	0.40
\$2.5M PV Budget - Optimized	2,500,000	2025	2026	75.70	0.40
\$2.5M PV Budget - Optimized	2,500,000	2026	2027	75.00	0.40
\$2.5M PV Budget - Optimized	2,500,000	2027	2028	74.40	0.90
\$2.5M PV Budget - Optimized	2,500,000	2028	2029	73.80	0.90
<b>Total</b>	<b>12,500,000</b>				

Approximately \$4.9M per year is needed to maintain a Network PCI of 77.

# Budget Requirements & Needs...



## Pavements Only

\$4.9M is for pavements only and does not include:

- Utility paving
- Future bonds
- Growth
- Drainage concerns
- Additional width
- Signage, striping, etc.

# QUESTIONS

