



Town of Avon

A Case Study in Pavement
Preservation



A Case Study in Pavement Preservation

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- Steve Moore, VS Engineering
- Shawn Strange, Schneider Engineering



Town of Avon

- Incorporated 1995
 - Population 2000- 6,248
 - Population 2010 – 12,446
 - Road mileage 2000 – 34.13
 - Road mileage 2013 – 94.45



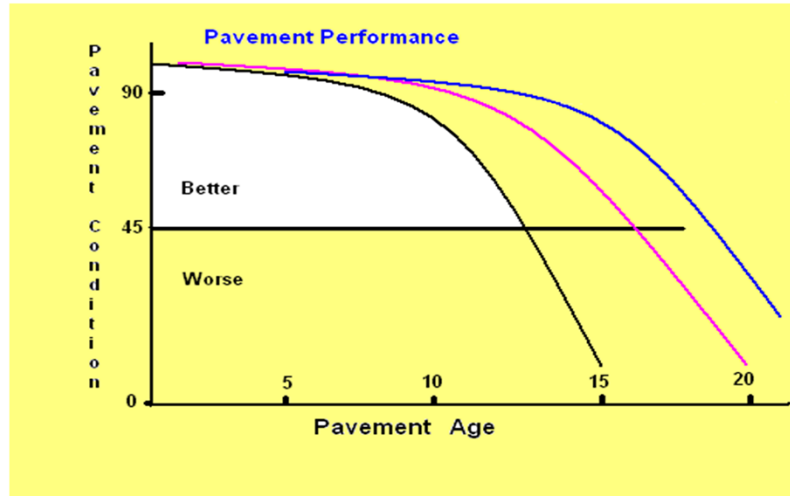


Limited Resources - \$





Pavements not reaching service life





Maintenance Improvement Plan

- Program Development
- Implementing Program
- Maintaining Program





Evaluating Streets

- Easy
- Repeatable



There are systems of pavement evaluation available that are comprehensive and very accurate. But it often takes an expert to conduct the ratings an expert to understand how to use the data, and it takes much more time and effort to implement some of these systems. If something is not easy to use, often it goes unused.

The other part of this is that it is repeatable; so it can be perpetual. If we can make the system so easy to understand that many generations from now the evaluations still have the same meaning, then we have created great value.



Evaluating Streets



PASER system for simple, uniform and repeatable ratings. I can take someone out and have them rating as I would within an hour or two. In 10 minutes they usually “get it”; but then it is a matter of discussing nuances, exceptions, and generalities. I believe that LTAP is going around the state this year presenting the PASER system.



Investigating Products and Trials

- Traditional
- Non-Traditional

- What has not worked here
- What has worked here
- What has worked elsewhere



Traditionally, we have crack filling, patching, chip seals, overlay, mill and overlay (mill and fill), and remove and replace.

Non-traditional includes all the different methods of in-place recycling, cold asphalt, hot asphalt, Cement, cement slurry, heater scarification, Reheat;

Pavement surface treatments, including preventive and restorative sealers, slurry seals, micro-surfacing, Cape Seal, NOVA seal, ultra thin overlays

Base repairs and treatments that include chemical soil modification, geotextiles, flowable fill

Paving geotextiles are used in all the different part of the pavement section

Paving materials are expanded to include pervious materials for drainage, roller compacted concrete and full depth recycled materials, etc.

So, the question should not be What HAS NOTworked here?, but rather, what HAS worked here or elsewhere.



THIS PHOTO IS NOT FROM AVON. I have heard “That doesn’t work” or “That didn’t work here”. Every road product currently on the market that I have seen works. Not a bold statement if I add this qualifier, if it is the right product, for the right pavement, applied at the right time, and done right.

This may have been the right material, applied to the right pavement at the right time, but it was not done right. I have not seen a paving geotextile that recommends less than 1.5 inches of mix over the geotextile, this has, or had ½ inch. It is not fair to say something does not work if it was not the right material for the situation, applied at the right time (pavements life and weather) and done right (installed per manufacture’s specifications).

TOWN OF AVON



Avon also tried restorative and preservative seals. They continue to have great success with preservative seals. As of now, all town roads have been sealed at least once. Preservative seals delay the need for overlays. Something you need to know about preservative seals is that it works, but it doesn't make your roads black again. So, unless you leave a section untreated, people can't see that the product actually worked.



Restorative Seal before - 2000





Restorative Seal – applied 2000





Preservative Sealing - 2001

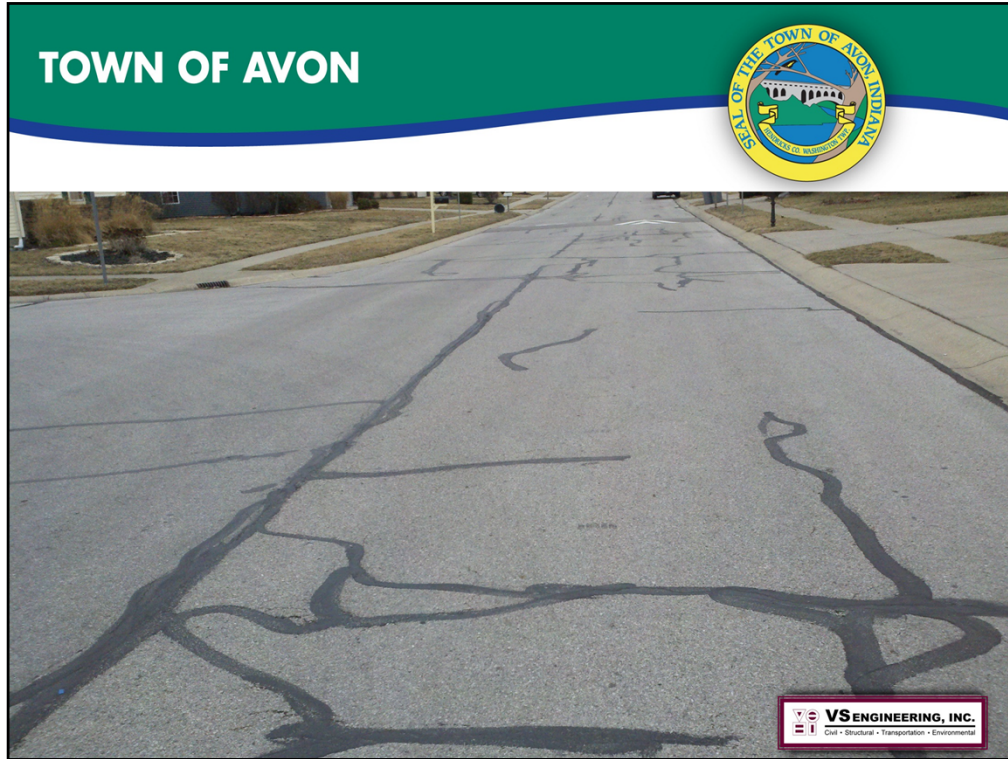


We used a strategy that wasn't recommended for this product. The recommendation is to use preservative sealers as soon as practical after paving; within the first couple of years. We decided we wanted to re-soften the surface and help it shed water better so it would buy us more time until we have to pave. We went after roads PASER rated 6 first, because we wanted to catch the roads before they became a 5. With the cost at \$1/SY, and lasting about 7 years, is about \$0.14/year. At the time overlay with milling was about \$4.5/SY, with a projected life of about 12 years or about \$0.37/SY and 4.5 times initial cost. We could do 4.5 times the area to help address more roadway immediately.



Preservative Seal – 2001





One of the first things we did in Avon was start a crack filling program. This helps to reduce additional pavement damage. One part of Avon's program that is not always done is filling the interface of the road and curb. This helps to minimize infiltration of water at the curb line, and also minimizes vegetation growing at the interface.



Crack Sealing -2001





Full Depth Patching





2005 test – fabric vs overlay





TruPave®



In order to provide greater structural strength to roads without losing curbs, we milled 2 feet along the curb and used a fiberglass impregnated paving fabric. This fabric can be milled recycled with the pavement in the future, if necessary.



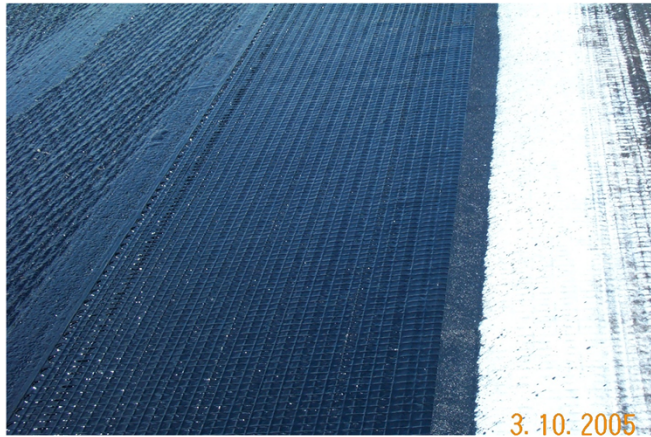
TruPave®





GlasGrid®

TruPave®



Galen Drive is a short commercial street that had severe deterioration. Again, due to budget constraints, replacement was not an option, so some patching was done, GlasGrid installed with a 1.5 inch overlay. This road is performing relatively well considering the original base failure and pavement distress.



The first paving fabric we used was Petromat. We had a heavily used commercial road that was severely deteriorated, but there wasn't sufficient budget to replace the road. We patched the worst areas, installed Petromat and then installed a 2.5 inch structural overlay with 1.0 inch surface. The road still looks good 12 years later.



Foam Bitumen Recycling - 2008





Foam Bitumen Recycling – 2004





Foam Bitumen Recycling - 2008





Reclamation – 2012

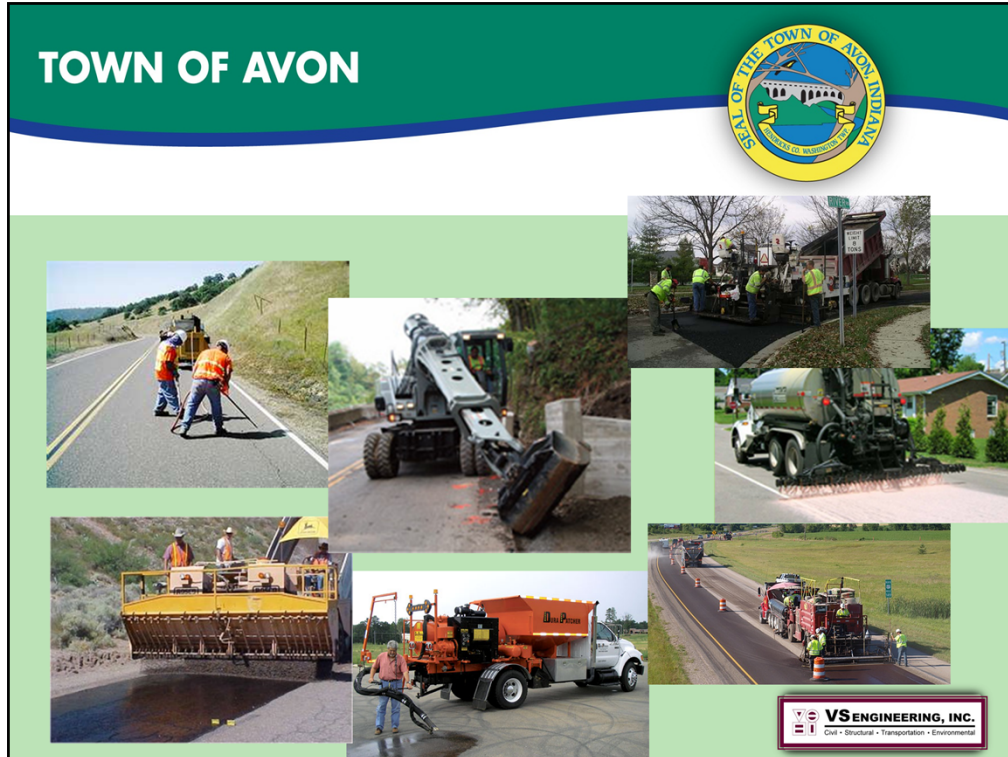




Reclamation – 2012



Full Depth Recycling (FDR). Avon first used the foamed bituminous method for a half mile section of CR 150 S, west of the new Avon High School complex.



Look at what you do successfully; look at what you or your predecessors used to do successfully;

Look at what others are doing successfully.

Select maintenance options that show a good return on investment.

Don't just consider what is cheap to do today, or do what has always been done, but perform some due diligence and try to determine which method or material is **less expensive over time (Lower Annualized Cost)**, and which also provides good service over time.



A should program was instituted to create positive drainage away from the road as much as for safety.

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Avon has completed many traditional overlay and mill and overlay projects.

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Pavement Preservation Methods

Nothing New...



Right Product, Right Place,
Right Time



The products some may consider “New” have really been around for years. Many methods have gotten better over time. Products and processes have been improved. Mistakes were learned from...hopefully. Bad experiences are not always the fault of the product, but sometimes an attempt to use a product for an application that it isn't well suited for; it may have been a guy just trying to make a sale, it may have been over-confidence, it may have been an experiment, it may have been an error in calculation, wrong application rate, wrong depth, bad traffic numbers, drainage...don't waste your money fixing a road without addressing drainage; Regardless of why something didn't work for you in the past, consider where that product is having success and if you have a similar condition that may benefit from that product. If you're not familiar with that product, don't just bring in the company that sells it, but also bring in people that have successfully used it and will tell you what it did for them and what it didn't do for them.

A lot of research and development occurred in the 1970's as a result of the “energy crisis”. Do you remember only being able to purchase gas on odd or even days depending on the first letter of your last name? And even on your day you were limited to 10 gallons?...unless you knew someone...Any way, that was followed by the oil surplus in the 1980's...so there was no longer the urgency to implement all the great products that were developed in the 70's. Well, over time those products have gained acceptance and as prices for construction and traditional maintenance items have gone up, popularity of alternative maintenance, repair and construction methods. Most items seem to gain acceptance in different parts of the country before they make their way to Indiana.

Reclamite has been in use in the United States since 1960. My definition of Reclamite is that it is a penetrating agent that improves elasticity and acts to repel moisture. It won't make your road better than it is today, but it slow the aging and deterioration process. I'm sure that any of you that have ever spoken to Rex have never heard that short of a description of Reclamite.

Crack Filling and Crack Sealing are done to keep moisture from entering your pavements. Crack filling is generally used for non-working cracks or for working cracks that you plan to overlay within a few years and Crack Sealing is generally used on working cracks that you are not planning to overlay in the next few years.

Micro-surfacing is a polymer-modified asphalt and aggregate mixture designed to protect the pavement and provide a skid-resistant wearing surface. The idea gained popularity in the 1960's, but really began to take off in the United States in the 1970's during the energy crisis.

If you have roads that are beyond preservation, the FDR might be an option to consider. Base stabilization, in various forms has been in use for thousands of years, records indicate use in the early Roman and Chinese empires. As different materials were tried in the base stabilization process, some were found to be more durable than others and were integrated into the pavement structure. With further development and marketing by equipment manufacturers and increased costs of fuel and pavement materials, IN-Place Recycling, more commonly known as Full Depth Recycling or FDR gained popularity. Technologies improved and the various forms of FDR are now generally accepted as viable alternatives.



Selection of Strategies

Let the road tell you what it wants



Both of these roads want the same thing. Had the road to the right been treated when it looked like the one to the left, it would look better than it does today. Did you ever notice the curb line of a street that is about 6 months old and hasn't been swept? Sometimes you'll see fine aggregate. Fine aggregate loss can begin soon after paving. If treated, there should be less aggregate loss and better shedding of water.



Determine Annualized Costs

ITEM	COST /SY	COST/MILE	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	Total
Crack Seal	\$ 0.20	\$ 2,581.33	\$ 2,581.33		\$ 2,581.33		\$ 2,581.33		\$ 2,581.33		\$ 2,581.33		\$ 12,906.67
Preservative Seal	\$ 1.10	\$ 14,197.33	\$ 14,197.33						\$ 14,197.33				\$ 28,394.67
MicroSurface	\$ 2.00	\$ 25,813.33	\$ 25,813.33										\$ 25,813.33
Chip Seal	\$ 1.50	\$ 19,360.00	\$ 19,360.00				\$ 19,360.00				\$ 19,360.00		\$ 58,080.00
Overlay	\$ 5.00	\$ 64,533.33	\$ 64,533.33										\$ 64,533.33
Mill/Overlay	\$ 7.00	\$ 90,346.67	\$ 90,346.67										\$ 90,346.67
Structural Overlay	\$ 17.00	\$ 219,413.33	\$ 219,413.33										\$ 219,413.33
FDR	\$ 25.00	\$ 322,666.67	\$ 322,666.67										\$ 322,666.67
Reconstruct	\$ 50.00	\$ 645,333.33	\$ 645,333.33										\$ 645,333.33

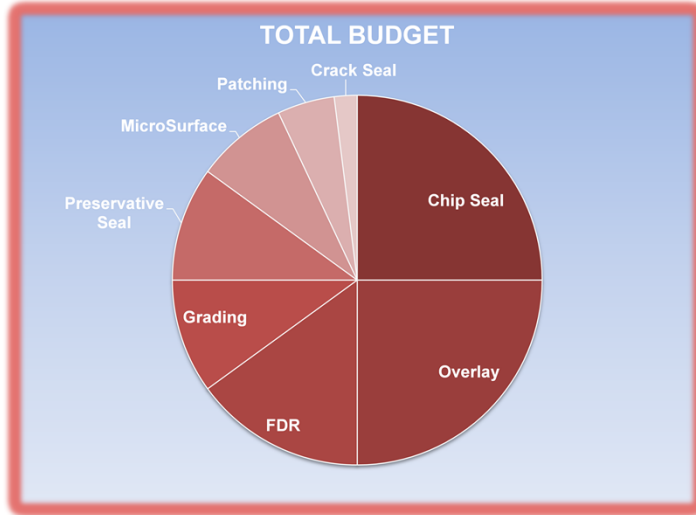
ITEM	COST /SY	COST/MILE	YEAR 11	YEAR 12	YEAR 13	YEAR 14	YEAR 15	YEAR 16	YEAR 17	YEAR 18	YEAR 19	YEAR 20	Total	Annualized Cost
Crack Seal	\$ 0.20	\$ 2,581.33	\$ 2,581.33		\$ 2,581.33		\$ 2,581.33		\$ 2,581.33		\$ 2,581.33		\$ 25,813.33	\$ 1,290.67
Preservative Seal	\$ 1.10	\$ 14,197.33			\$ 14,197.33						\$ 14,197.33		\$ 56,789.33	\$ 2,028.19
MicroSurface	\$ 2.00	\$ 25,813.33	\$ 25,813.33										\$ 51,626.67	\$ 2,581.33
Chip Seal	\$ 1.50	\$ 19,360.00			\$ 19,360.00				\$ 19,360.00				\$ 96,800.00	\$ 4,840.00
Overlay	\$ 5.00	\$ 64,533.33			\$ 64,533.33								\$ 129,066.67	\$ 5,377.78
Mill/Overlay	\$ 7.00	\$ 90,346.67						\$ 90,346.67					\$ 180,693.33	\$ 6,023.11
Structural Overlay	\$ 17.00	\$ 219,413.33											\$ 219,413.33	\$ 10,970.67
FDR	\$ 25.00	\$ 322,666.67											\$ 322,666.67	\$ 16,133.33
Reconstruct	\$ 50.00	\$ 645,333.33											\$ 645,333.33	\$ 32,266.67



Calculate your annualized costs for each treatment. Understanding that not all pavements are in the same condition, same age and support the same traffic, the item with the lowest annualized cost is not going to be the only item you use. But this will help you make decisions on which item to use for a certain situation.



Selection of Strategies



Address each major category cracks, pavements, drainage.

The formula is a balance between engineering decisions on maintaining the pavements and spreading the dollars around your locality so everyone can see you're doing something for them; perception is reality, if they don't think you are doing anything for them, they think you don't care.



Implementing Program

- Development of 5 Year plan
- Education
- Evaluate Success and Failure





Development of 5 yr plan

- NOT Worst First, but last
- Keep Good Roads Good



NOT worst first, but last, unless reason, economic development, political, etc.
Save 6's first –
6's are on the threshold of needing major repairs.
Budget for/address each maintenance item.

TOWN OF AVON



Development of 5 Year Plan

Street	From	To	Priority	Adjusted PASEER Rating	Class	Type	Width	Condition	Programmed 1	Programmed 2	Programmed 3	Notes	2013, Priority 1 & 2	2014, Priority 3	2015, Priority 4	2016, Priority 5	2017, Priority 6	FUTURE
													\$44,817	\$0	\$59,843	\$0	\$0	\$43,363
2915T ST	CDRP LIMITS	CDRP LIMITS	1	5.6	P	Asphalt	19	in Poor	Restorative Seal				\$1,084					
2915T ST	KAST	US 31	1	4.9	P	Asphalt	22	in Serious	Restorative Seal				\$9,412					
2915T ST	US 31	TOMLUNSON	4	6.3	P	Asphalt	19	in Fair	Preservative Seal						\$9,545			
2915T ST	TOMLUNSON	HORTON	4	6.3	P	Asphalt	19	in Fair	Preservative Seal						\$18,580			
2919D ST	GRASSY BRANCH	BEND IN ROAD	1	2.9	P	Asphalt	16	in Imminent Failure	Seal Coat				\$27,385					
TOWNE RD	146TH	151ST	4	6.7	P	Asphalt	20	in Satisfactory	Preservative Seal						\$7,017			
TOWNE RD	151ST	156TH	1	3.9	P	Asphalt	20	in Critical	PO Patch	Restorative Seal		SK180 PATCH SB EOP	\$2,970					
TOWNE RD	151ST	156TH	4	6	P	Asphalt	20	in Fair	Preservative Seal						\$7,033			
TOWNE RD	156TH	159TH	4	6	P	Asphalt	20	in Fair	Preservative Seal						\$4,872			
TOWNE RD	159TH	161ST	4	6	P	Asphalt	20	in Fair	Preservative Seal						\$3,329			
TOWNE RD	161ST	166TH	4	6	P	Asphalt	20	in Fair	Preservative Seal						\$7,039			
TOWNE RD	166TH	LITTLE EAGLE CREEK	1	3.9	P	Asphalt	20	in Critical	PO Patch	Preservative Seal	Overlay	SK180 HMA PATCH NB LANE	\$4,488					\$42,383
TOWNE RD	166TH	LITTLE EAGLE CREEK	4	6	P	Asphalt	20	in Fair	Preservative Seal						\$9,727			



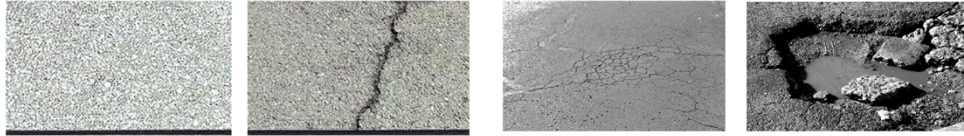
Weighted average of Paser Rating, Drainage Rating, Road Class used to yield a modified Paser Rating.



Education/Public Relations

- Town Council
 - Presentations
 - Measure and show benefit
- Citizens (flyers, door hangers)
 - Explain, educate and justify

TOWN OF AVON



Town of Avon

A Case Study in Pavement
Preservation – Evaluating Success
and Failure





What is Pavement Preservation?





Implementing Program

How to Evaluate Success and Failure

- KNOW YOUR LIFE CYCLE COSTS
 - INPUTS FOR CITY STREETS
 - HMA Rejuvenator= \$16,000 per mile (Lasts 3-5 years)
 - HMA Chip Seal = \$33,000 per mile (Lasts 5-7 years)
 - HMA Milling and Overlay = \$187,000 per mile (Lasts 10-12 years)
 - HMA Full Depth Reconstruction = \$550,000 per mile (Lasts 20 Years)
 - A 500 mile Local Road Network has a current worth of \$175,000,000!





Evaluate Your Roads

- Start with a Simple System like PASER (Pavement Surface Evaluation and Rating)
 - 1-10 Rating
 - Catalog Types of Distresses and Severity
- Set up specific rules for rating pavement using the end goal of “What will a score tell me about what maintenance activity will be needed.”

I 
PASER





Plan for What Your Rating Will Mean

- Set a cutoff between
 - Preventative Maintenance (Rejuvenator, Chip Seal, Crack Seal)
 - Functional Maintenance (Patch, Mill and/or Overlay) and
 - Structural Maintenance (Pavement Replacement)
- End Goal is to set up three programs with three budgets. This keeps your new pavement new and brings your bad pavement up to good standards





Organize the Results from the Field

- GIS – We Use Arcview or Arcpad to gather the data and Beacon to Display the Results
- Evaluate Data
 - Rating #'s + Distress Type = Specific Treatment



TOWN OF AVON



Organize the Data You Have & Display- Avon

The screenshot displays the Beacon GIS application interface for the Town of Avon, IN. The main map area shows a street grid with various colored overlays representing different data layers. On the left side, there is a 'Layer List' panel with the following categories and options:

- Basemap
- Safety911
- Utility
- Environmental
- Transportation
 - MIP Update
 - Traffic Signs
 - Town Roads
 - Bike and Pedestrian Trails
- Cadastral
 - Annexations
 - GIS Sections
 - Parcels
 - Right of Way
 - Zoning
 - County Zoning
 - Zoning Ordinance
 - Corporate Boundary
 - Legal Drain Assessments
- Planning
- Aerial Imagery

On the right side, there is an 'Info' panel with the following information:

-
- Town of Avon, IN
- <http://www.avongov.org/>
- Planning Director: (317) 272-0948
- Public Works Director: Ryan Cannon (317) 272-0948

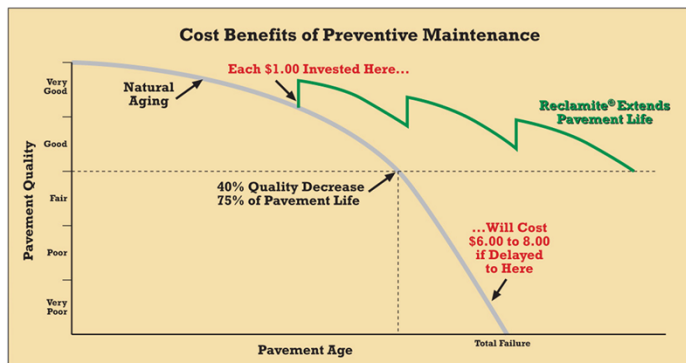
At the bottom of the interface, there are 'Announcements' and a 'Last Data Update' timestamp: 2/21/2013 9:29:40 AM.





Look at History

- Town of Avon has been doing this program since 1999.
- PASER ratings have been done in 1999, 2005, 2008, and 2012
- Does the Output Look Like This?



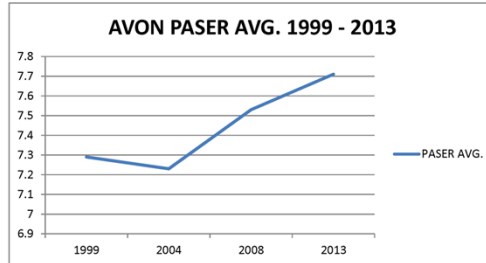


Look at Avon's Data

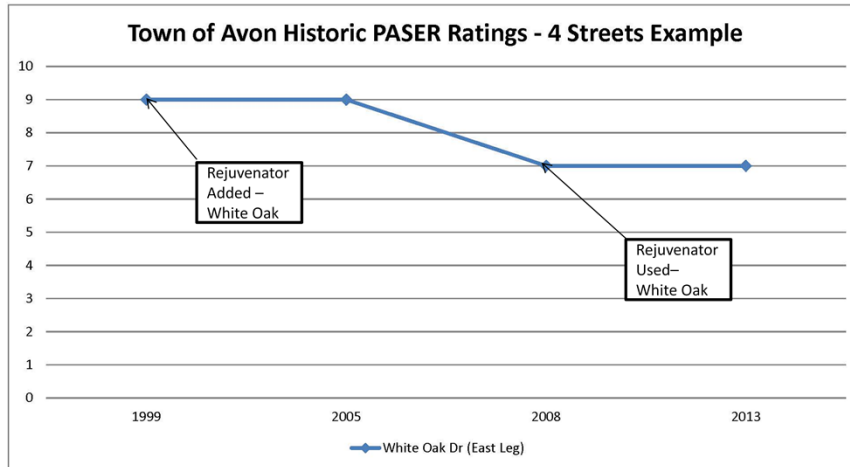
- When it was started in 1999, budget was limited and maintenance activities were trial and error experiments.
- By 2003, processes were fine tuned and by 2005 results started to look positive.

PASER AVERAGES 1999-2013

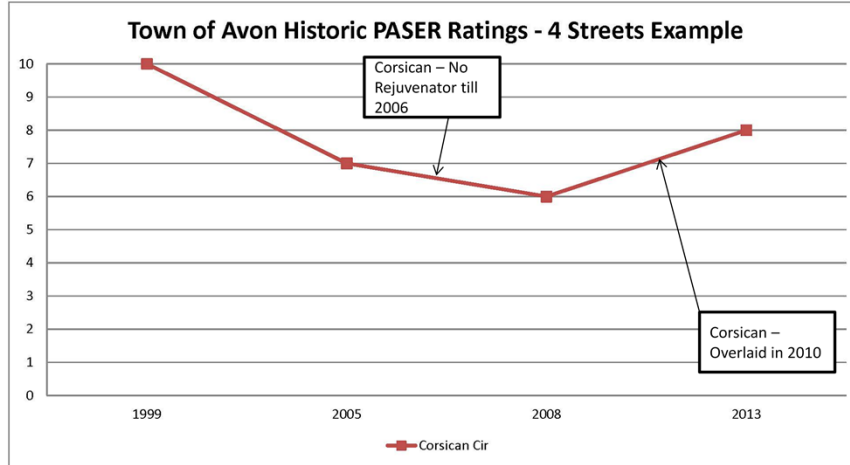
PASER 1999 – 7.29
PASER 2004 – 7.23
PASER 2008 – 7.53
PASER 2013 – 7.71



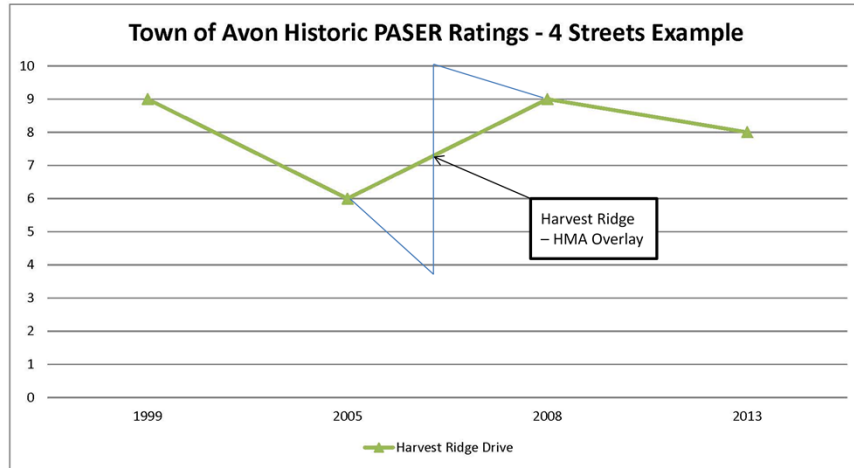
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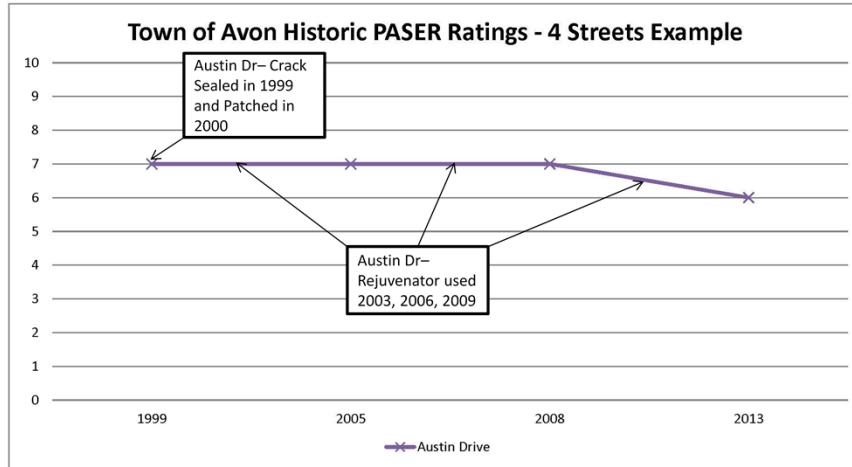
TOWN OF AVON



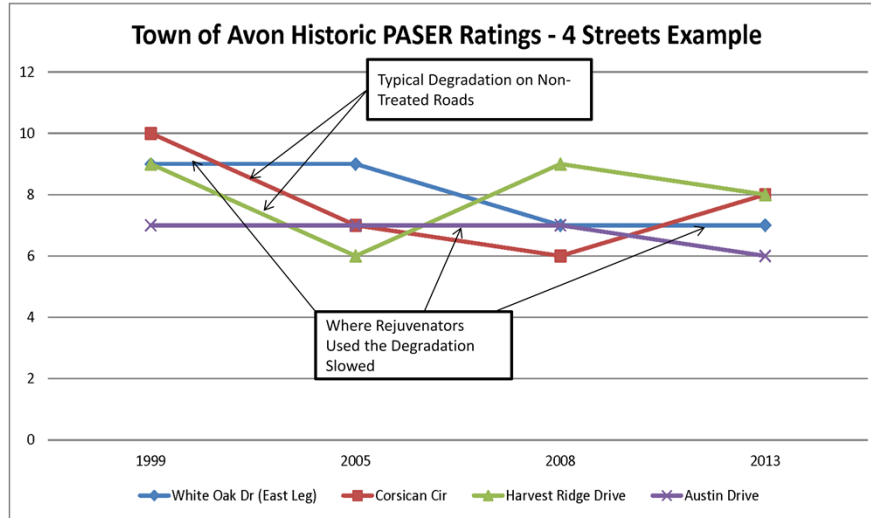
TOWN OF AVON



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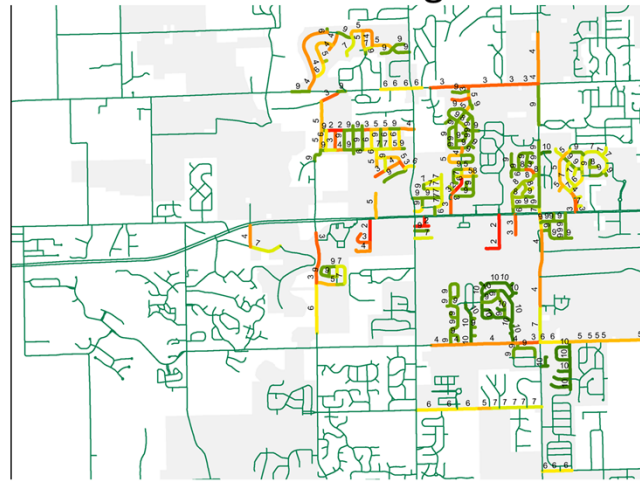


TOWN OF AVON



1999 Initial PASER Ratings

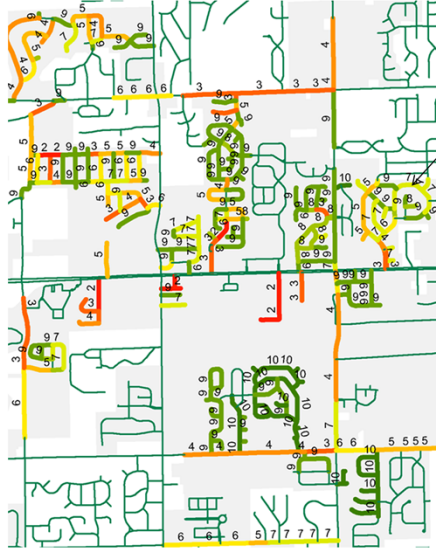
- Road_Review**
— <all other values>
- 1999 Paser Rating**
- 10
 - 9
 - 8
 - 7
 - 6
 - 5
 - 4
 - 3
 - 2
- 2013 Avon Town Boundary



TOWN OF AVON



1999 Initial PASER Ratings – Blow-up



Austin Drive
Never gets
overlaid – but
gets regular
doses of
Rejuvenator.



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2005 PASER Ratings

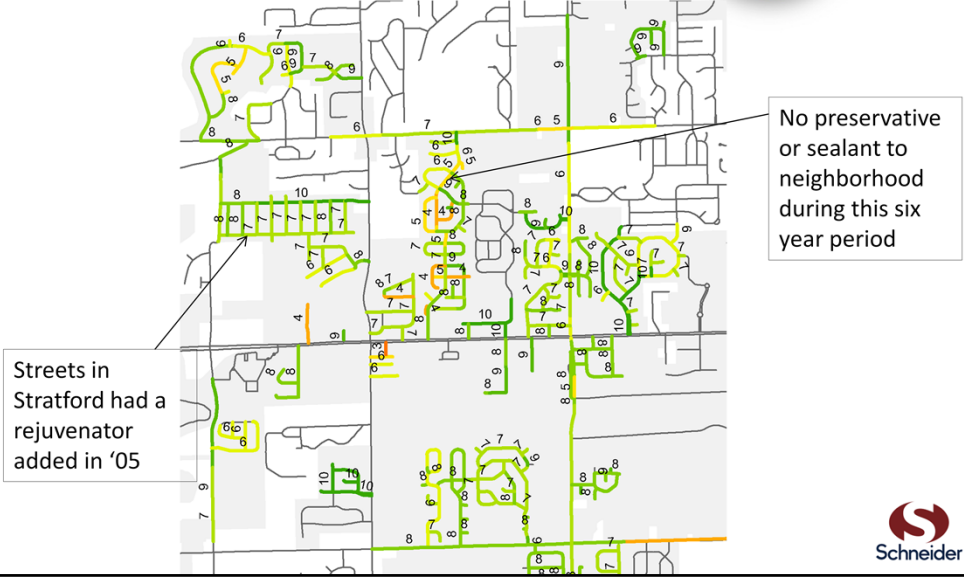
- Road Review**
- <all other values>
- 2005 Paser Rating**
- 10
 - 9
 - 8
 - 7
 - 6
 - 5
 - 4
 - 3
 - 2
 - 1
- 2013 Avon Town Boundary



TOWN OF AVON



2005 PASER Ratings – Blow-up





2008 PASER Ratings

Town of Avon Road Review

Road Review

<all other values>

2008 Paser Rating

11

10

9

8

7

6

5

4

3

2

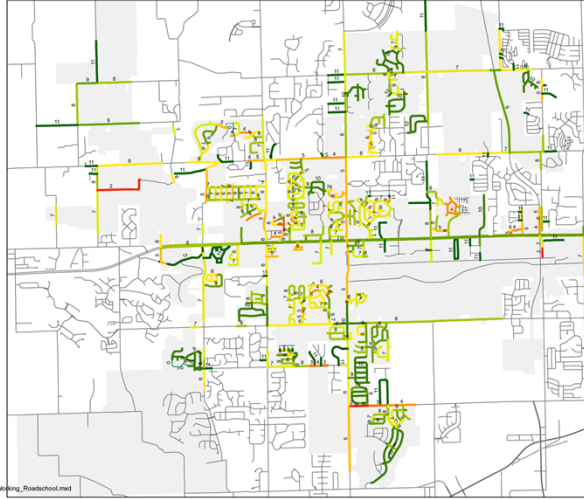
2013 Avon Town Boundary



1 inch = 3,000 feet

Date: 2/25/2013

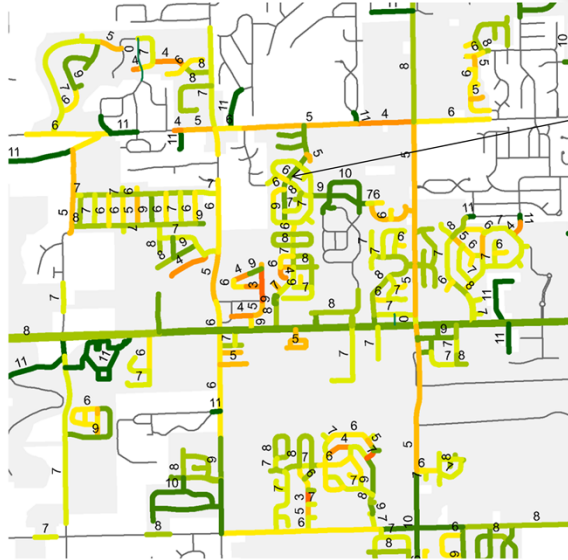
Document Path: T:\1610278\2013 MMP\2013 GIS\2013 MMP_Working_Roads\Road.mxd



TOWN OF AVON



2008 PASER
Ratings –
Blow-up



Rejuvenator added in 2006 on the main street in Harvest Ridge Stopped or slowed the oxidation and cracking.



TOWN OF AVON




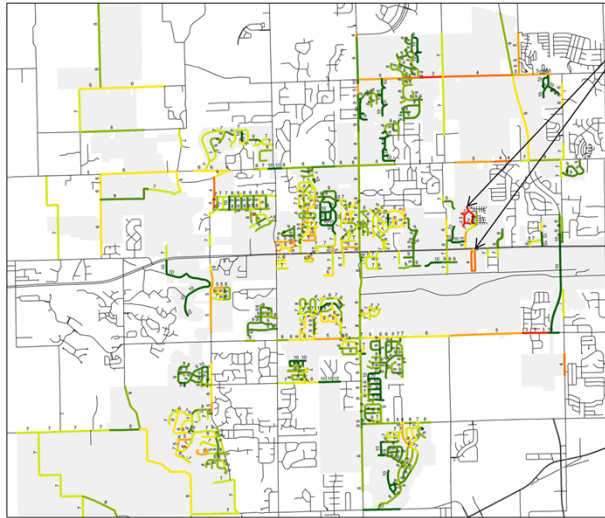
2013 PASER Ratings

Town of Avon Road Review



Road Review	
—	All other roads
2013 Paser Rating	
10	Green
9	Light Green
8	Yellow-Green
7	Yellow
6	Orange
5	Red-Orange
4	Red
3	Dark Red
—	2013 Town of Avon Boundary

 1 inch = 3,000 feet
Date: 2/27/2013
Document Path: \\110108\2013_MRF\2013 GIS\2013_MRF_Working_Roads\Road.mxd



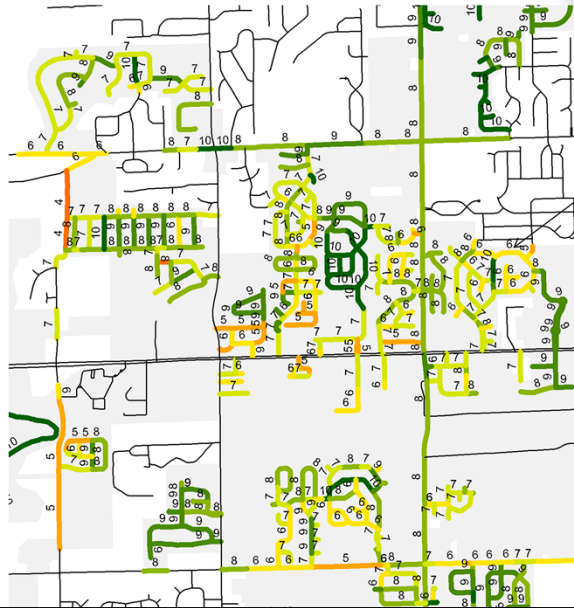
Private
Streets – No
Pavement
Maintenance



TOWN OF AVON



2013 PASER
Ratings –
Blow-up



Austin Drive started at a 7 in 1999 and has had 3 treatments of Rejuvenator since. It has never been repaved and is at a 6 today.



TOWN OF AVON



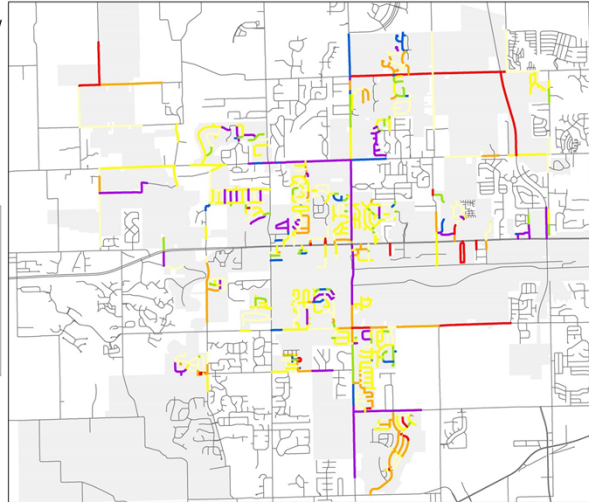
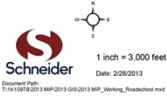
PASER Improvement in 2013 vs. 2008 Analysis

Town of Avon Road Review



2008 to 2013 decomposition
DC13vs08

Red	-1 to -5
Orange	0
Yellow	1
Light Green	2
Green	3
Dark Green	4
Purple	5 to 12
Grey outline	2013 Avon Town Boundary



These results are derived from formula and field observed degradation of non-treated pavement when compared to treated pavement. For Example, a Yellow means you have about 4 years of additional pavement life and a green means 6 additional years, etc.

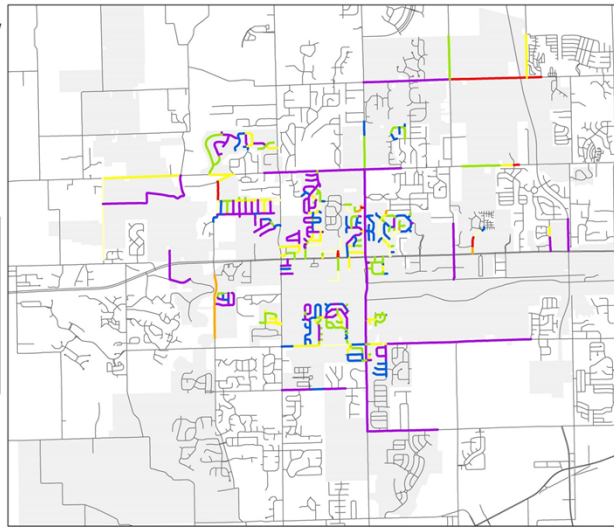
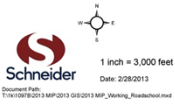
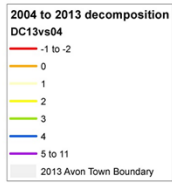


TOWN OF AVON



PASER Improvement in 2013 vs. 2005 Analysis

Town of Avon Road Review



Over this 8 year period you see a gain of about 6+ years of pavement life.

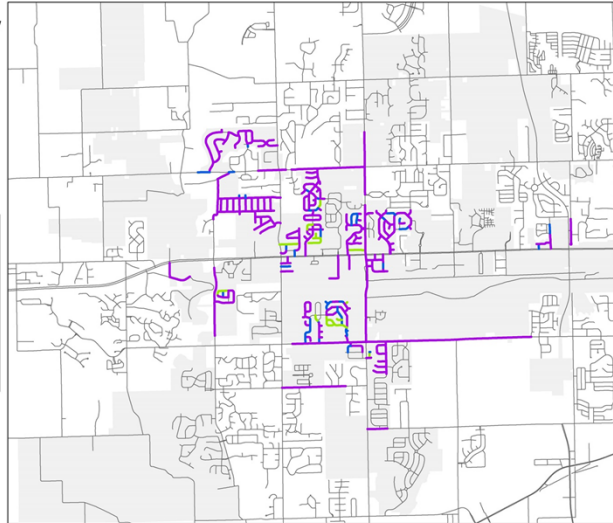
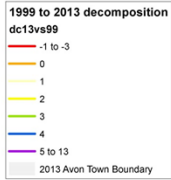


TOWN OF AVON



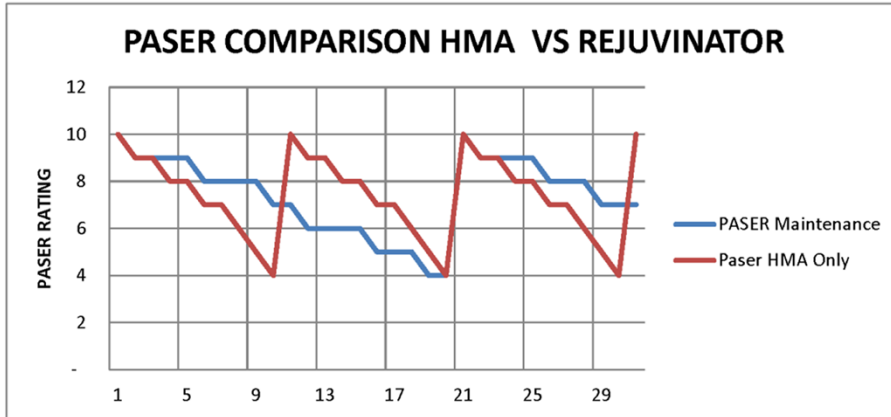
PASER Improvement in 2013 vs. 1999 Analysis

Town of Avon Road Review



Over this 13 year period you see a gain of about 8-10 years of pavement life.







Net Present Cost of Repave vs. Rejuvenator

- Assume 4% Rate of Return

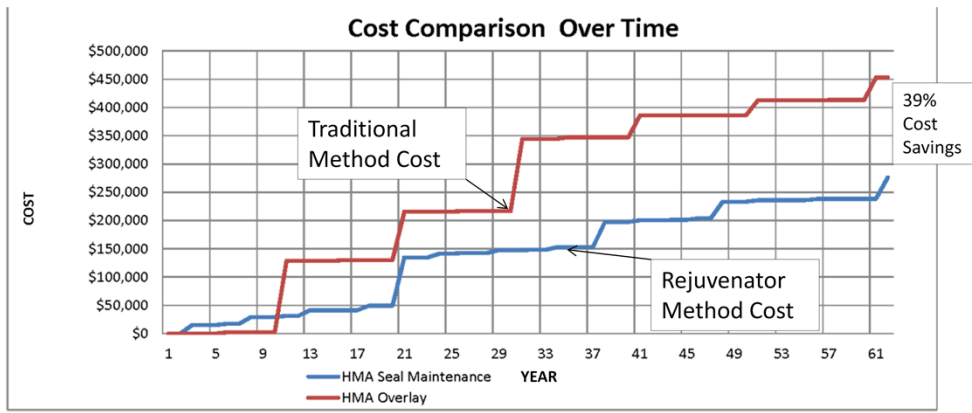
NPC to Rejuvenate Roads _____ = 0.61

NPC to Overlay and Repave Roads

- This Means a 39% Reduction in Cost!



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Reprioritize & Reevaluate

- Given budgets and fluctuating material costs what you wanted to do last year may not be possible this year.
- Use GIS to move plans around to recalculate and help plan for next year
- Keep track of what works for you!
- These tools help you plead your case to decision makers
 - Avoid short term gain for long term costs





Evaluate What Works

- Test New Products – Rejuvenator No. 1



• Control Side

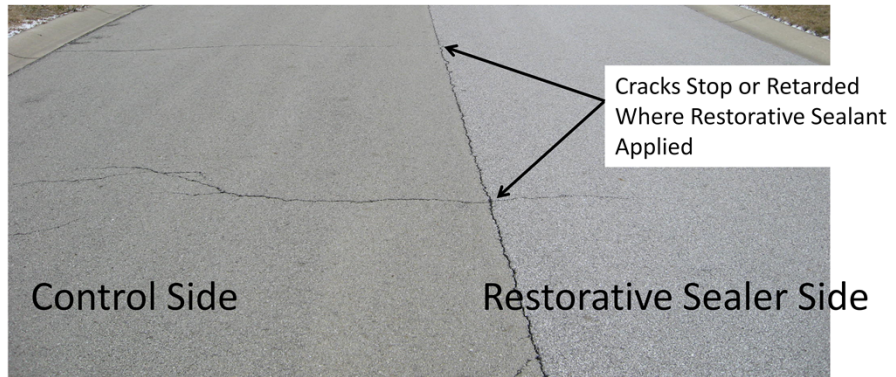
Restorative Sealer Side





Evaluate What Works

Test New Products – Rejuvenator #2





Commitment to Process and Program

- Stay the course and keep consistent records
 - Savings start to really materialize the further down the road you get
- Make the output available to constituents to show the programs value.
 - Convert the public to believers
- Use that output to make the case for continuing that program
 - Happy public = happy voters!





Conclusion

- Track Your Pavement Conditions and Treatments
- Reprioritize and reevaluate yearly
- Stay committed to process and program – it will pay off!



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QUESTIONS?





Contacts

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- Steve Moore 317-293-3542

- Beacon Website –

