

City of Osage Beach

Preventive Pavement Maintenance Plan



Prepared For:

City of Osage Beach,
Missouri

Prepared By:



July 2020

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Introduction

Road pavements gradually deteriorate due to weather and daily traffic loads. Once the condition of a pavement deteriorates beyond a certain point, reconstruction is the only means of repair. Before the pavement reaches that point, relatively inexpensive preventive maintenance techniques can cut short the cycle of deterioration, improve the pavement condition, and postpone the need for expensive reconstruction.

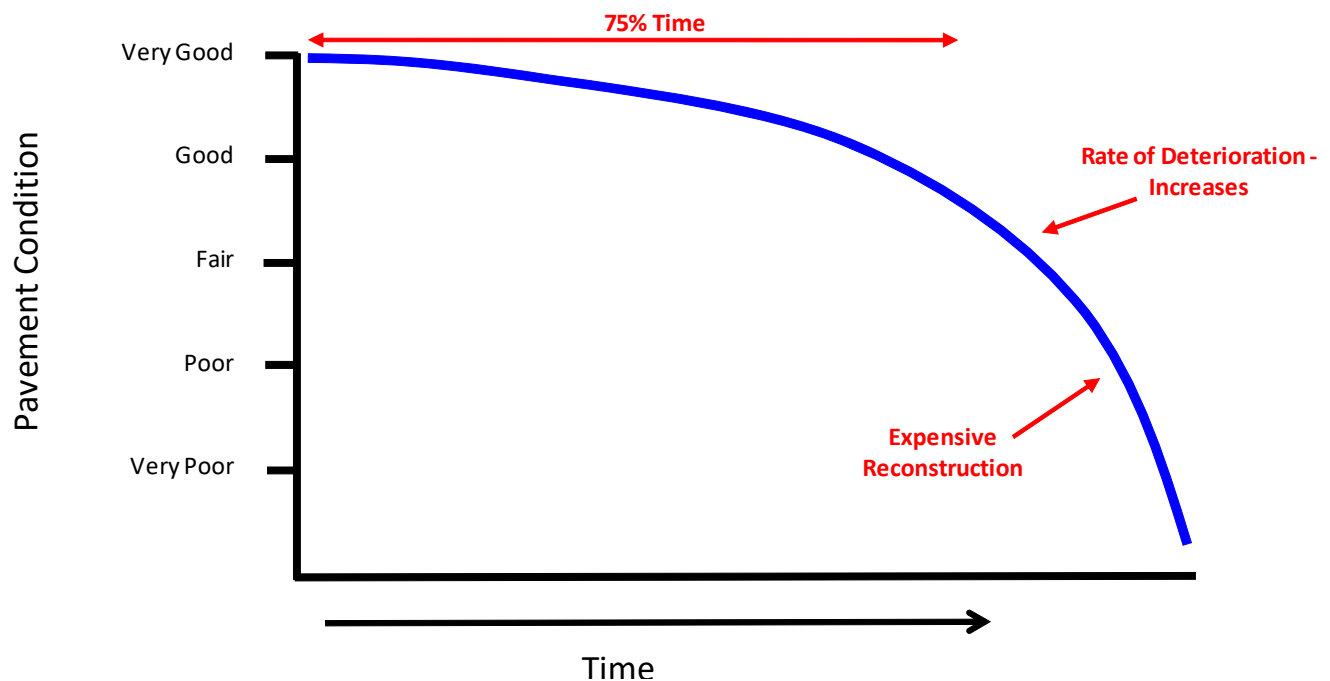


The goal of this Preventive Pavement Maintenance Program (PPMP) is to become pro-active with regard to pavement repairs, which will stop potholes before they start – thereby reducing regular maintenance costs – and stretch reconstruction dollars by extending the life of the pavement that has not yet deteriorated too severely. Ultimately, the program will not only improve the streets in City of Osage Beach, but help make better use of City funds as well.

Preventive Pavement Maintenance Program

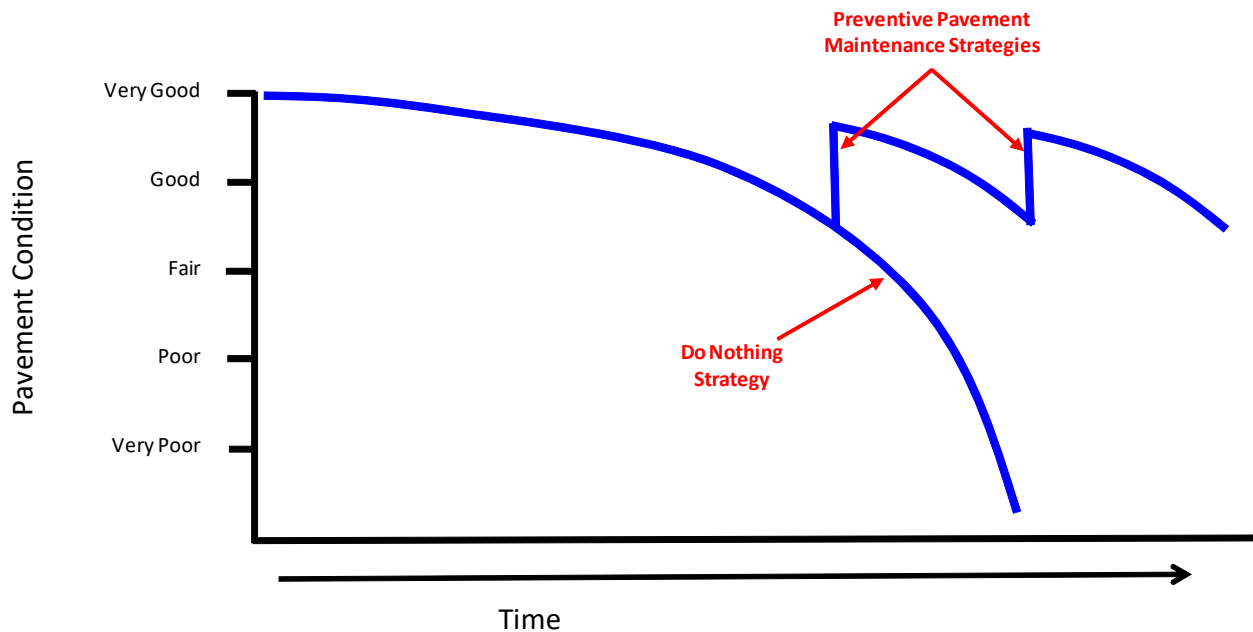
The figure below represents a pavement performance curve in terms of rehabilitation costs. You can see that rehabilitation costs increase by over 4 times if rehabilitation is deferred only 12% of a pavement's design life. For typical pavements, 12% amounts to only about 2 years. In view of this fact, deferred rehabilitation is very expensive. Good pavement maintenance management dictates that rehabilitation occur at a time so as to derive the greatest benefit (or extension of serviceability) possible. The problem becomes very complex since each different pavement structure has a different performance curve and on similar structures with similar curves different pavements will be at a different point in their service lives.

An important point can be concluded here. Unless a jurisdiction has all the money for rehabilitation, it is almost certainly a mistake to program rehabilitation on a "worst-first" basis. Maximum benefit cannot be derived from the limited public funds available if an agency binds itself to a "worst-first" programming philosophy.



Our proposed Preventive Pavement Maintenance Program establishes a guideline to preserve the structural integrity and extend the service life of the City's street network.

A preventive maintenance program is a systematic approach to using a series of preventive maintenance treatments over time. One treatment will improve the quality of the pavement surface and extend the pavement life, but the true benefits of pavement maintenance are realized when there is a consistent schedule for performing the preventive maintenance. The graphic below illustrates this process:



As a result, the performance of pavements depend upon the type, time of application, and quality of the maintenance it receives. Pavement maintenance can be classified into three types of pavement maintenance operations:

- **Routine maintenance** is the day-to-day maintenance activities that are scheduled or whose timing is within the control of our street maintenance personnel. Examples of routine maintenance include filling cracks in pavement as necessary, street sweeping, trash collection, and re-painting faded pavement markings.
- **Reactive Maintenance** are activities that must be done in response to events beyond the control of the City's Street Department. Some events require response as soon as possible to avoid serious consequences because a present or imminent danger exists. Reactive maintenance cannot be scheduled because they occur without warning and often must be immediately addressed. Examples of reactive maintenance activities include pothole patching, removing and patching pavement blowups.

- **Preventive Maintenance** is the planned strategy of cost-effective treatments to an existing roadway system that preserves the system, retards future deterioration and maintains or improves the functional condition of the system without significantly increasing structural capacity. In essence, preventive maintenance activities protect the pavement and decrease the rate of deterioration. Preventive maintenance should be performed on pavements that have oxidized (i.e. surface skin of oil has worn off), but not when significant cracking and joint separation is exhibited.



All types of maintenance are needed in a comprehensive pavement maintenance program. However, emphasizing preventive maintenance may prevent a pavement from requiring reactive maintenance. Although all three types of maintenance are important, we have created this PPMP to cost-effectively prolong the pavement service life of Osage Beach City streets.

In Summary:

Delays in preventive maintenance increase the quantity of pavement defects and their severity so that, when corrected, the cost is much greater. The purpose of our PPMP is to protect the pavement structure, slow the rate of pavement deterioration and correct pavement surface deficiencies. As an aid to assess the effectiveness of the PPMP, a yearly review should be conducted on all City owned and maintained streets.

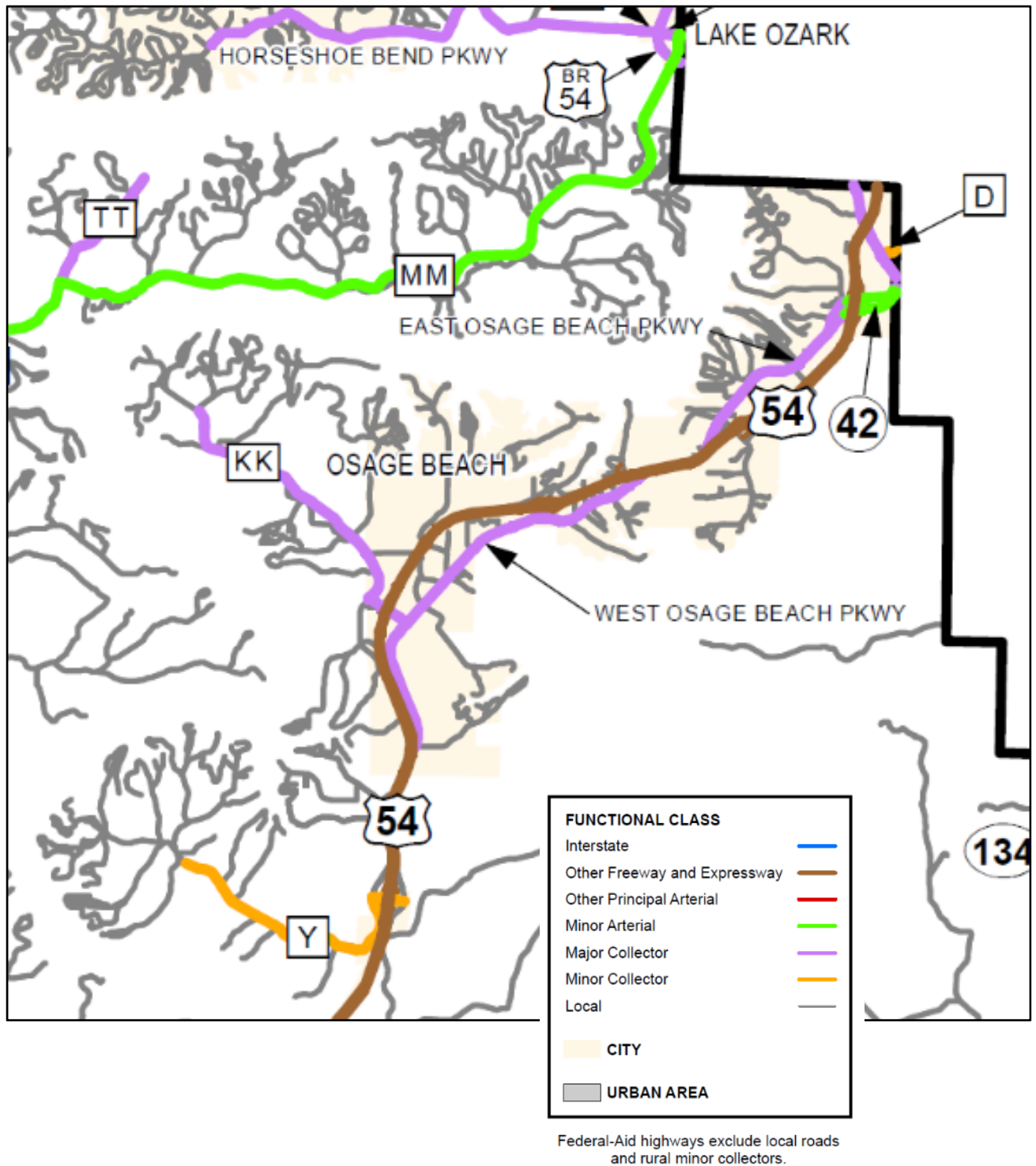
Framework and Strategy – Program Development

It is important to note that City representatives and Cochran staff met numerous times to: a) integrate ideas from different perspectives; and b) work together to create an implementation plan that made sense from a public perception standpoint and City budgeting perspective.

Both parties learned from each other and worked together to develop the plan. As a result, we developed this plan based on the following issues and circumstances, which were specific to the Osage Beach street network system.

1. **Existing Pavement Conditions** - we assessed the pavement conditions of all of the streets and determined the appropriate levels of maintenance that were/could be warranted.
2. **Classification by Roadway Type** - we grouped and clustered the roadways by type/characteristic. Specifically, we identified roadways into four categories: a) residential asphalt streets; b) arterial asphalt roadways; c) concrete roadways; and d) roadways that qualify for federal funding.
3. **Roads Eligible for Federal Funding** - the Missouri Department of Transportation (MoDOT) maintains a master list of roadways eligible for federal funding. MoDOT is responsible for maintaining and updating the region's Roadway Functional Classification System mandated under federal law. Roadways are classified according to their urban or rural setting and the type of service they provide based on considerations such as: connectivity, mobility, accessibility, vehicle miles traveled, average annual daily traffic, and abutting land use. The purpose of roadway functional classification is to describe how travel is channelized through the roadway network and to determine project eligibility for inclusion in the Long Range Plan and short-range Transportation Improvement Program (TIP). A roadway must already be classified at minimum as a planned or existing Urban Collector or Rural Major Collector in order to be eligible for federal funds allocated in the TIP. The map on the following pages shows the current status of roadways eligible in the City of Osage Beach.

The roadways that are colored are currently eligible for federal funding in Osage Beach.



4. **Group Concept** - we determined that it would be more cost effective from a bid pricing standpoint to combine roads in grouped areas. This would save extra mobilization costs and minimize disruption to the residents. This group concept would eliminate the need for the paving contractor to jump to three different areas in the City during a paving operation. It makes more sense to group streets together for maintenance/rehabilitation from a cost and mobilization standpoint. In addition, this idea would help prevent construction trucks driving over pavements that were resurfaced the year before.
5. **Construction Cost Estimating** – we quantified and estimated the cost of each street’s proposed treatment.
6. **Program Budget** - the program was developed in a way that the City could plan and budget to make the plan work. It is important to take into consideration of the City’s budget regarding when the streets would be treated. We assumed an approximately \$1,000,000 allocation of funds for the preventive pavement maintenance program.
7. **Pavement Treatment Selection** - final development of the plan based on the cost and performance of the preferred pavement treatments as described in the next section.

Preferred Pavement Treatment Types

This PPMP utilizes surface treatments as categories of work. These surface treatments are targeted at pavement surface defects primarily caused by the environment and vehicular loads. Preventive maintenance treatments used to protect the pavement structure and slow the rate of pavement deterioration include the following:

- Crack and Joint Sealing
- Slurry Seal
- Microsurfacing – **not recommended**
- Nova Chip – Ultra Thin Asphalt
- Surface Milling, Paving Fabric, and Asphalt Overlay
- Full Depth Pavement Replacement

Crack and Joint Sealing

Description: Crack and joint sealing consists of cleaning the crack in the pavement surface and placing the specified materials into and above the crack to substantially reduce infiltration of water and to reinforce the adjacent pavement. The fill method consists of cutting the desired reservoir shape at the working crack in the existing surface, cleaning the cut surfaces and placing the specified materials into the cavity to prevent the intrusion of water and incompressibles into the crack.



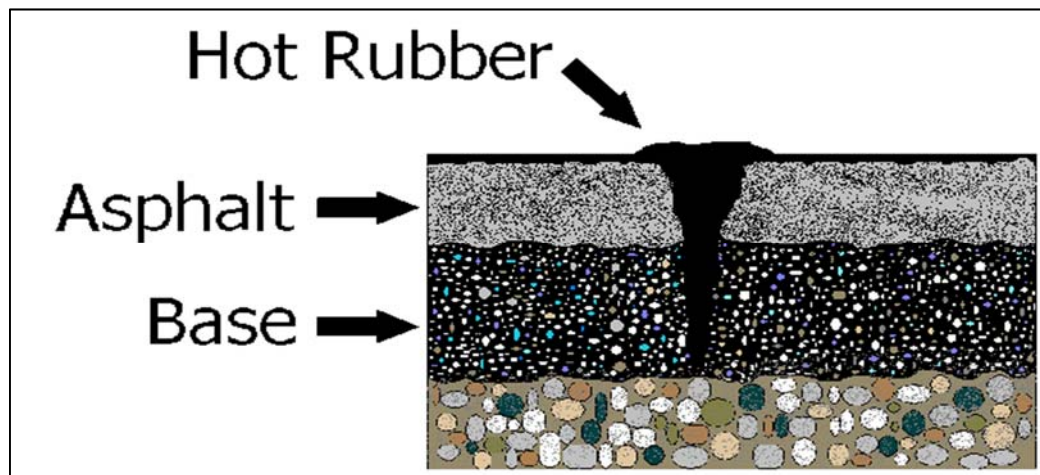
Purpose: The purpose of sealing and filling cracks in the pavement surface is to prevent water and incompressibles from entering the pavement structure.

Existing pavement condition: Concrete pavements should have cracks filled every two years. On asphalt pavements, crack filling should begin two to four years after resurfacing, and on a composite pavement, one to two years old. The visible surface distress may include: fairly straight open longitudinal and transverse cracks with slight secondary cracking and slight raveling at the crack face, and no patching or very few patches in excellent condition.

Existing pavement surface preparation: None.

Performance: The effectiveness of the seal will greatly depend upon the width of crack being sealed and the movement of the pavement structure at the crack.

Life Extension: This treatment is not a one shot operation. In order to maintain the sealed pavement surface, a routine maintenance crack sealing and filling operation should follow up this treatment, as additional cracks develop.



Slurry Seal

Description: A Slurry Seal is a cold, mixed asphalt slurry. It consists of emulsified asphalt, graded fine aggregate and additives. It is a hard wearing surfacing for pavement preservation. Mixing and spreading are accomplished in one continuous operation. The surface may be reopened to travel within a few hours.

Purpose: The purpose of Slurry Seal is to extend the life of the existing pavement by protecting it from oxidation and deterioration. This process creates an even-textured surface. Slurry Seals treat aged and raveled pavements by filling minor cracks, replacing lost surface aggregate, restoring skid resistance and restoring aesthetic appeal. It may be used on freeways, residential streets, parking lots and any area that needs the pavement to be preserved.

- Protects the road structure
- Perfect for residential/low traffic roads
- Good skid resistance

Existing pavement condition: The existing pavement should exhibit a uniform cross section and a good base. The visible distress may include slight cracking, rutting, minor surface irregularities, flushed or polished surface.

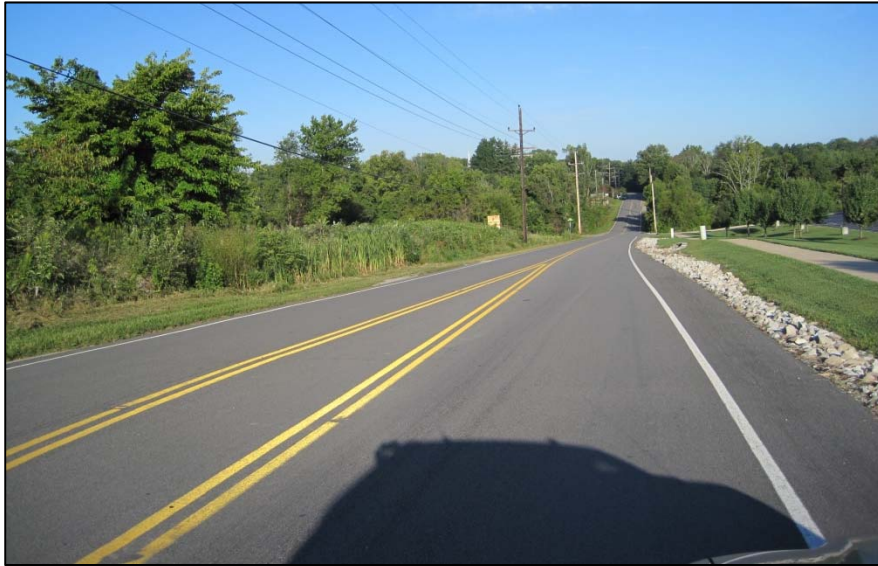
Performance: A slurry seal performs well on roadways to correct pavement surface conditions described above.

Life Extension: We expect that slurry seal applied at warranted conditions will provide a life extension of 4 years on arterial streets and 5 years on residential/low volume streets.



Micro-surfacing

Description: Micro-Surfacing is a mixture of polymer modified asphalt emulsion, mineral aggregate, mineral filler, water, and other additives, properly proportioned, mixed, and placed on a paved surface.



Purpose: A single course micro-surfacing will retard oxidation and improve skid resistance in the pavement surface. A multiple course micro-surfacing is used to correct certain pavement surface deficiencies including severe rutting, minor surface profile irregularities, polished aggregate or low skid resistance and light to moderate raveling. Micro-surfacing is typically used on flexible or composite pavements and can perform under all traffic volumes.

Existing pavement condition: The existing pavement should exhibit a uniform cross section and a good base. The visible distress may include slight cracking, rutting, minor surface irregularities, flushed or polished surface and/or moderate raveling.

Existing pavement surface preparation: Surface preparation typically includes crack fill, bump removal if necessary, removal of thermoplastic pavement markings and seal patching for large voids and potholes.

Performance: A micro-surface performs well on roadways to correct pavement surface conditions described above.

Life Extension: We expect that micro-surfacing applied at warranted conditions will provide a life extension of 5 years on arterial streets and 6 years on residential/low volume streets.

Performance Limitations: A standard micro-surfacing formulation should not be used on a pavement with moderate to heavy surface cracks. Due to its brittle nature, it is a poor crack sealer. Because micro-surfacing mixes require warm to moderate temperatures for curing, the City should plan to only perform this work in the middle of the summer.

Not Recommended: Unfortunately, numerous micro-surfacing projects throughout the area have exhibited extensive stripping from the existing pavement. As a result, after three to five years, the aesthetic look of the striped micro-surfacing pavements is criticized by residents and public officials. Therefore, we do not recommend this preventive pavement maintenance treatment for the City of Osage Beach.



Nova Chip

Description: The Nova Chip (Ultra Thin Asphalt) paving process places a thin, coarse aggregate hot mix over a special asphalt membrane, on an existing asphalt surface. NovaChip combines a surface seal with a hot mix level-paving surface and the flexibility of a thin maintenance treatment, which results in a durable surface



Purpose: The special NovaBond membrane prevents water leakage and provides a superior bond to the old asphalt or concrete surface.

Existing pavement condition: NovaChip can be used as preventative maintenance or as a surface rehabilitation treatment. The NovaChip results in a thinner surface than hot mix, making it suitable where over height clearance and drainage profile problems may occur. It's good for high traffic areas because the process moves quickly and all in one pass. This means the road will be opened sooner resulting in less traffic delays.

Existing pavement surface preparation: Surface preparation typically includes minor milling at commercial entrances, bump removal if necessary, removal of thermoplastic pavement markings and patching for large voids and potholes.

Performance: This type of treatment will protect the remaining pavement structure, slow the rate of deterioration and improve the ride quality.

Life Extension: We expect that NovaChip applied at warranted conditions will provide a life extension of 6-8 years on arterial streets and 7-9 years on residential/low volume streets.

Performance Limitations: This treatment should not be used on an existing pavement that shows evidence of a weak base.



Surface Milling with Bituminous Overlay

Description: The removal of an existing bituminous surface by the cold milling method, placement of paving fabric, and the placement of a dense graded bituminous mixture. In most streets in Osage Beach, we recommend the MoDOT BP-2 mixture of asphalt.

Purpose:

Milling - The cold milling operation is used to: (1) correct specific existing surface deficiencies, and (2) correct the shape of the existing cross section. The cold milling operation is used to correct rutting in the existing bituminous surface layer where the rutting is not caused by a weak base and when the condition of the existing pavement has deteriorated to a point where it is not practical to correct the problem by a more economical treatment. The cold milling operation is also used to remove an existing bituminous course that is debonding and to remove the existing bituminous surface to retain the existing curb face.



Paving Fabric - The paving fabric is used as a water proofing membrane and increases pavement life in three ways:

1. Substantially eliminates the number one cause of pavement deterioration, water intrusion through the asphalt.
2. Slows reflective cracking from existing asphalt or concrete pavements. FHWA studies show that cracks as small as 1/8 inch will allow 97% of the water striking the pavement to pass through to the base. Slight movements associated with old cracks or joints are dissipated by the membrane. More importantly, even if the crack reflects through, the membrane remains intact and continues to waterproof.
3. Studies show that paving fabrics increase the fatigue life by 100% to 300%. Asphalt is a flexible pavement and research has shown that pavements with a paving fabric can flex two to three times more before fatigue failure.



Asphaltic Surface Course - The bituminous overlay replaces the bituminous material that is removed.



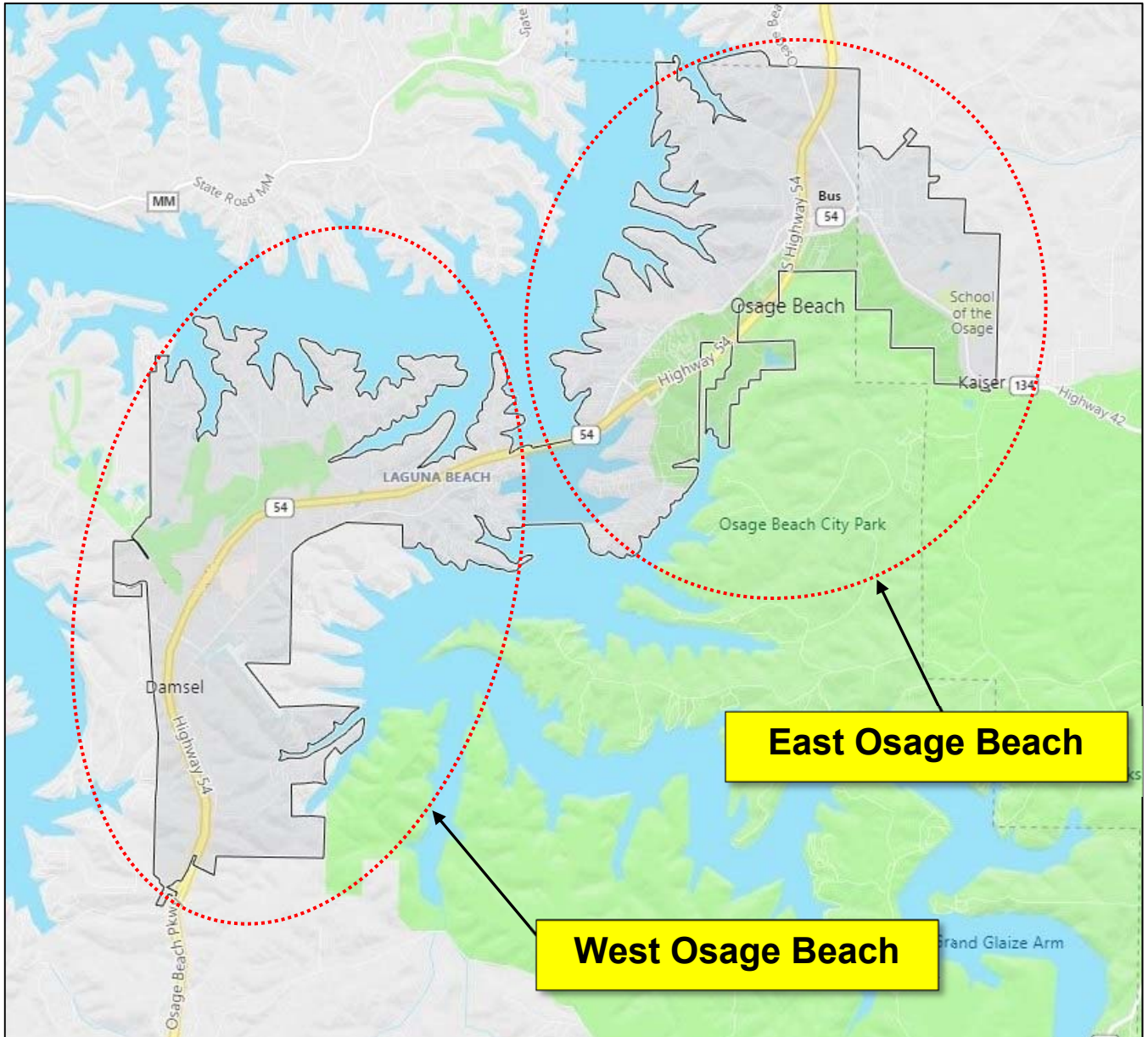
Existing Pavement Condition: The existing pavement should exhibit a good base condition. The visible surface distress may include: severe surface raveling, multiple longitudinal and transverse cracking with slight raveling, a small amount of block cracking, patching in fair condition, debonding surface and slight to moderate rutting.

Performance: This type of treatment will protect the remaining pavement structure, slow the rate of deterioration and improve the ride quality.



Performance Limitations: This treatment should not be used on an existing pavement that shows evidence of a weak base.

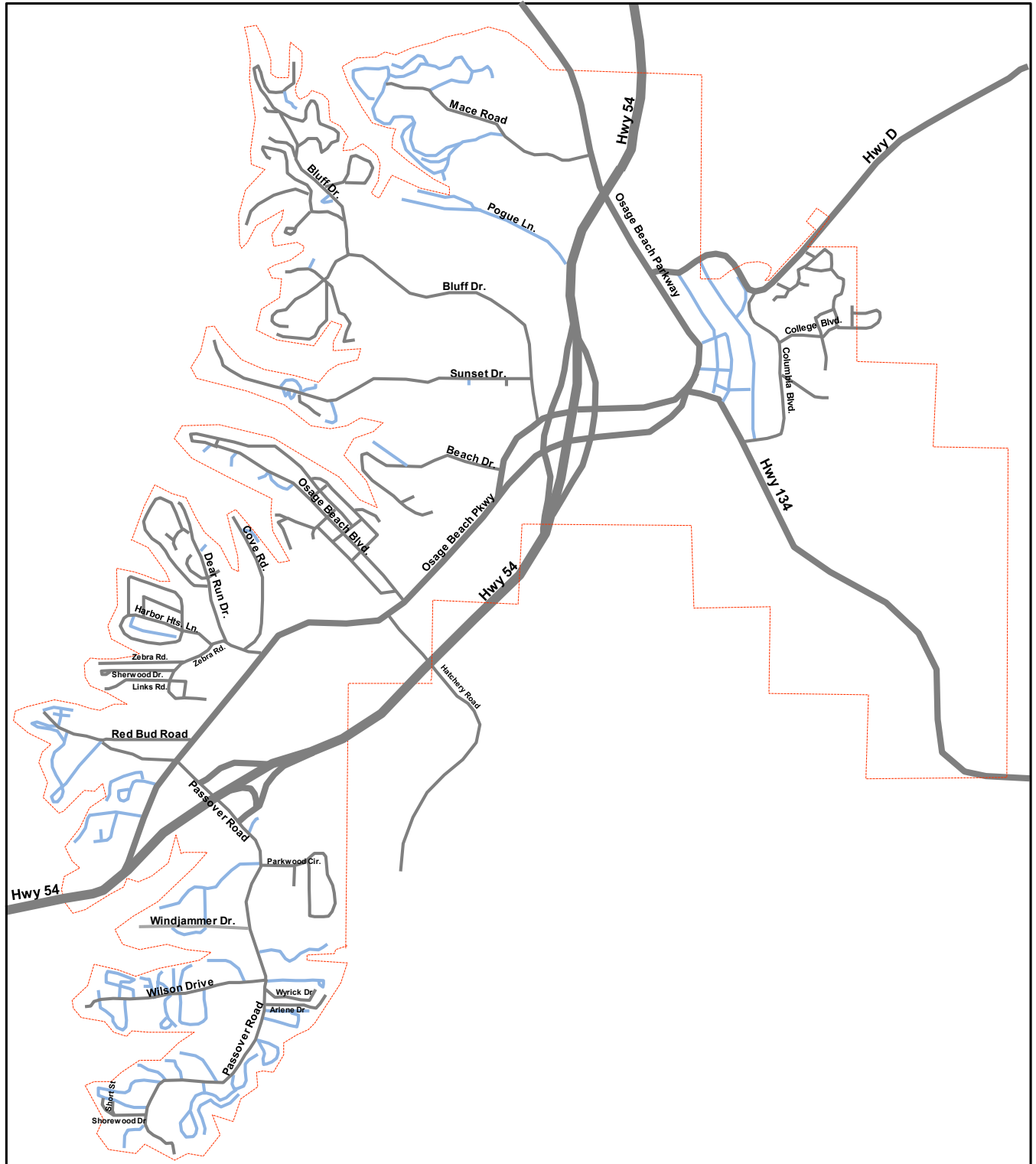


Map Showing Osage Beach





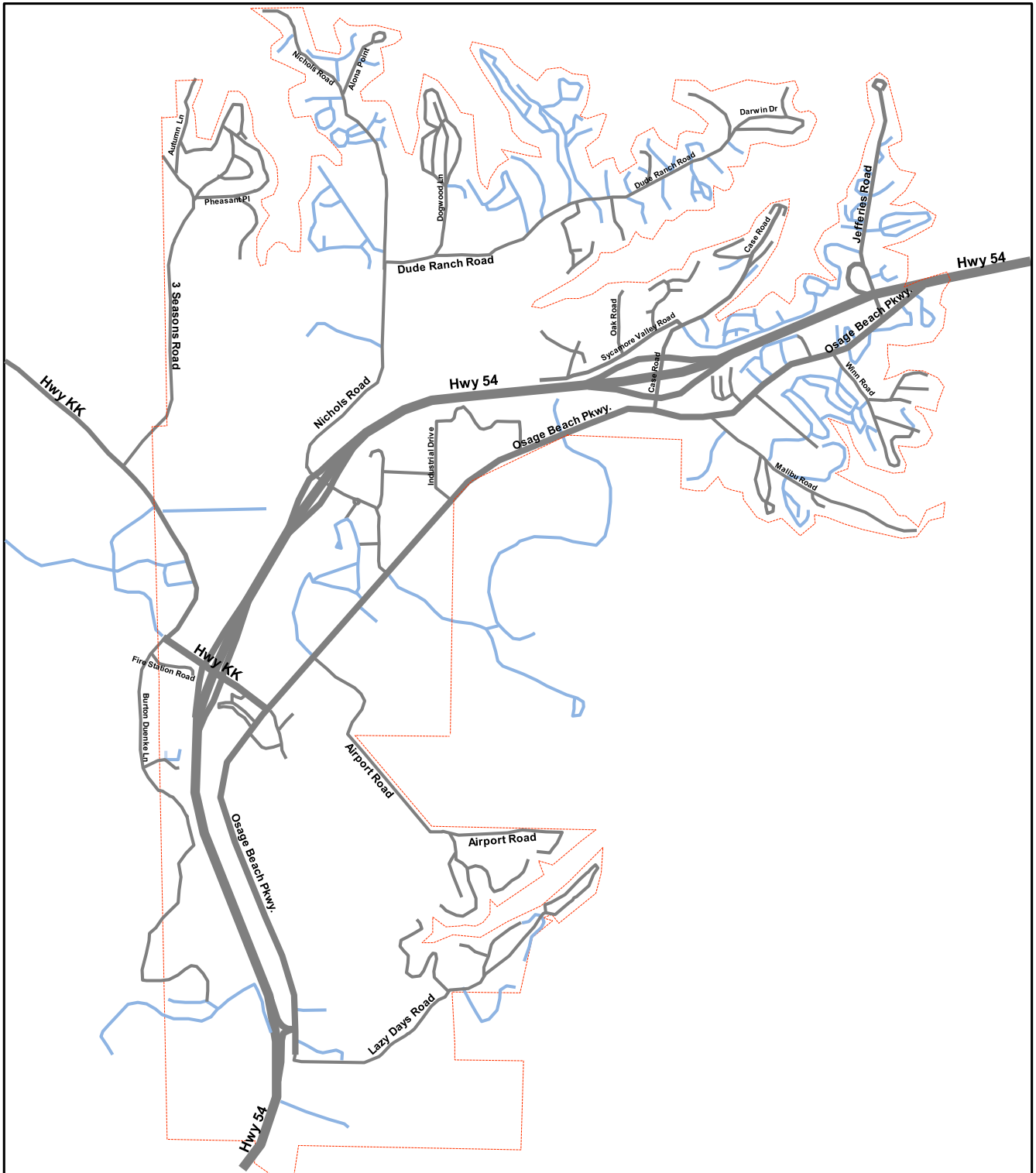
Street Map – East Osage Beach

Public Roadways 
Private Roadways 



Street Map – West Osage Beach

Public Roadways 
Private Roadways 



Group Concept – as discussed above, we determined that it would be more cost effective from a bid pricing standpoint to combine certain roads into grouped areas. This would save extra mobilization costs and minimize disruption to the residents. This group concept would eliminate the need for the paving contractor to jump to three different areas in the City during a paving operation. It makes more sense to group streets together for maintenance/rehabilitation from a cost and mobilization standpoint. In addition, this idea would help prevent construction trucks driving over pavements that were resurfaced the year before.

East Side Groupings:

Bluff Drive Group

- Pogue Hollow Circle
- Huff and Puff Lane
- Gwen Lane
- Cedar Village Road
- Castle Court
- Hamrock Lane
- Ski Drive
- Gerrard Lane
- Bondard Lane
- Ash Lane



Sunset Drive Side Streets

- Dorothy Lane
- Rock Lane

Osage Beach Road Group

- Osage Beach Road
- Camden Ave
- Church Drive
- Gutridge Ln
- Guenther Ln
- Shady Ln
- Lakehurst Cir
- Proctor Dr.
- Goodfellow Ave
- Lakeshore Drive
- Sky Harbor Drive
- Elm Street
- Fairland Ave
- Griswold Lane



Dear Run Group

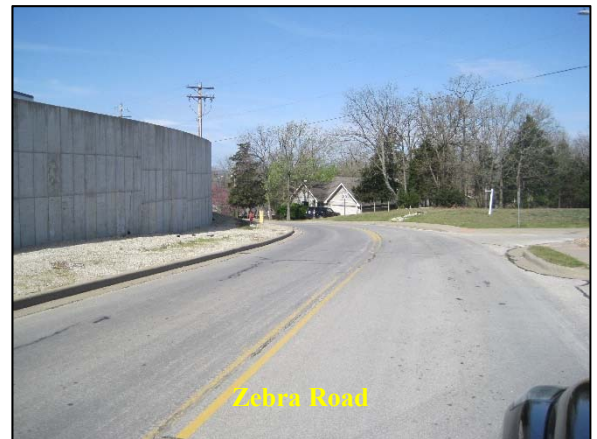
- Dear Run Road
- Park Lane
- Doe Lane
- Summit Circle
- Explorer Ct.
- Scout Street
- Frontier Lane

**Harbor Heights Group**

- Harbor Height Lane
- Greenwood Circle
- Inlet Lane
- Coral Lane

Zebra Road Group

- Zebra Road
- Stewart Drive
- Links Road
- Jayhawk Street

**Wilson Hollow Cove Group**

- Parkwood Circle
- Windjammer Drive
- Wilson Drive
- Jordan Drive
- Wyrick Drive
- Arlene Drive
- Shorewood Drive
- Short Street

College Blvd Group

- College Blvd
- Meadow Lane
- Azalea Ct.
- Honneysuckle Court
- Bentwood Drive
- Maple Tree Circle
- Brookfield Lane
- Larkspur Ct.
- Bradford Dr
- Aspen Ct.



West Side Groupings:

City Hall Group

- City Pkwy
- Progress Blvd.
- Chapel Ln
- Armory Drive

Dude Ranch Road Group

- Dude Ranch Road
- Cayman Drive
- Pebble Lane
- Hampton Ct.
- Silver Leaf Lane (Concrete)
- Darwin Drive
- Spindrifter Court
- Hickory Lane



Dogwood Lane Group

- Dogwood Lane
- Cherry Blossom Ln
- Peach Blossom Ln
- Apple Blossom Circle



Case Road Group

- Case Road
- Shore Acres Dr
- Lois Ln
- Melody Lane

Sycamore Valley Rd. Group

- Sycamore Valley Road
- Rowan Road
- Oak Rd
- Leaf Ct.
- Broadwater Lane
- Raintree Ct.
- Locust Ct.
- Bayview Ct.



Nichols Road Group

- Nichols Road
- Alona Point
- Lakeview Cir

Lazy Days Group

- Lazy Days Road
- Indian Trace
- Hawthorn Dr.
- Cherokee Lane

Three Seasons Group

- Three Seasons Road
- Pheasant Place
- Golfview Lane
- Mockingbird Lane
- Bluebird Circle
- Cardinal Circle
- Wulle Lane
- Quail Drive
- Autumn Lane

**Winn Road Group**

- Winn Road
- Drasky Lane
- Palmer Lane
- Aqua Drive
- Parish Lane

Malibu Road Group

- Malibu Road
- Conway Lane
- Gamble Circle

**Parkside Village Group**

- Parkside Village Blvd
- Parkside Village Court
- Parkside Village Lane

Airport Road Group

- Airport Road
- Arrow Drive
- Fawn Ct.
- Sleepy Hollow

KK Drive Group

- KK Drive
- Mayer Court
- Virginia Ave



- Palisades Blvd - a portion is concrete

Burton Duenke Group

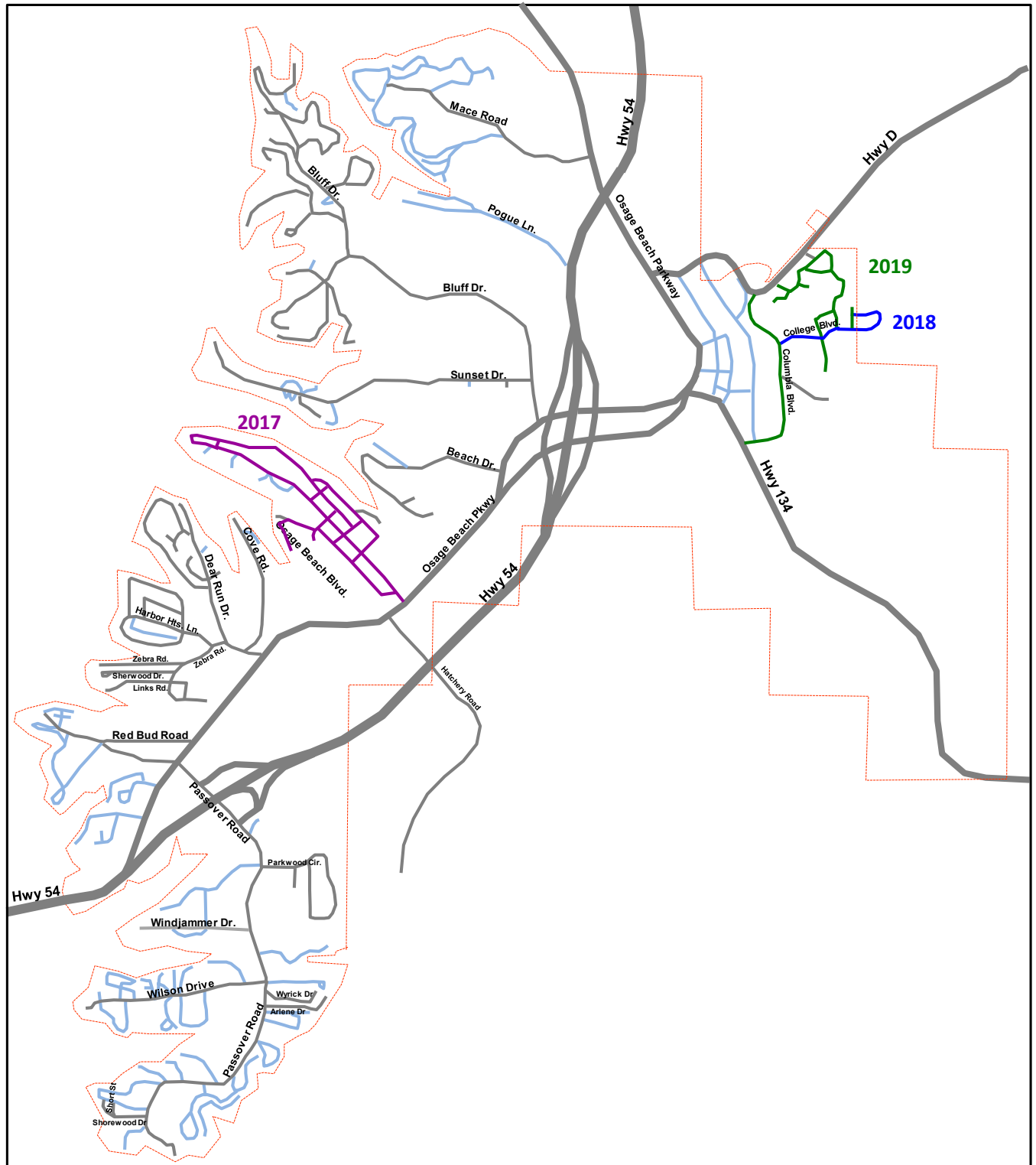
- El Terra Road
- Burton Duenke Ln
- Swiss Village Road
- Fire Station Road

History - Previous Pavement Treatments – the following table shows the past several years of the City's pavement treatments.

	2017	2018	2019	2020
Project Description				
Arterials:				
Osage Beach Parkway (East)			Microsurfacing	
Columbia Blvd			Slurry Seal	
Osage Beach Parkway (West)		Microsurfacing		
East Side Streets:				
Mace Road				2A - \$1,133,234
Osage Beach Road Group	Slurry Seal			
College Blvd Group		Slurry Seal	Slurry Seal	
West Side Streets:				
Dude Ranch Road Group		Slurry Seal		
Dogwood Lane Group		Slurry Seal		
Case Road Group			Slurry Seal	
Sycamore Valley Rd. Group			Slurry Seal	
Nichols Road Group		Slurry Seal	Slurry Seal	
Lazy Days Group			Slurry Seal	
Three Seasons Group			Slurry Seal	
Jefferies Road				Slurry Seal
Winn Road Group				Slurry Seal
Forrester Road				Slurry Seal
Murphy Road				Slurry Seal
Malibu Road Group				Slurry Seal
Mariner Circle				Slurry Seal
Parkside Village Group				Slurry Seal
Airport Road Group		Slurry Seal		Slurry Seal
KK Drive Group			Slurry Seal	Slurry Seal
Totals	\$76,810	\$600,136	\$474,825	\$1,287,122

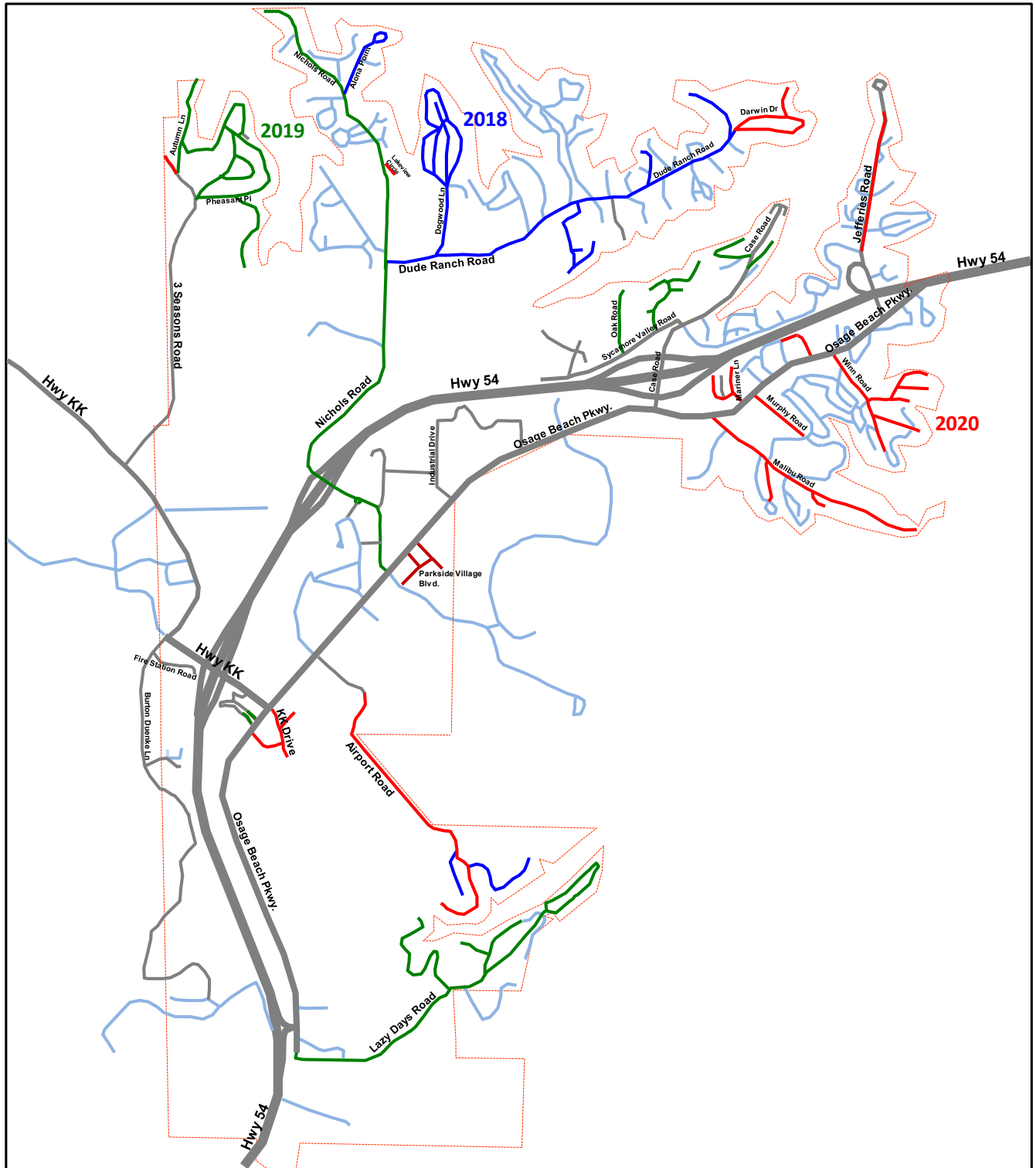
Slurry Seal History – East Osage Beach

2020	█
2019	█
2018	█
2017	█



Slurry Seal History – West Osage Beach

2020 █
2019 █
2018 █



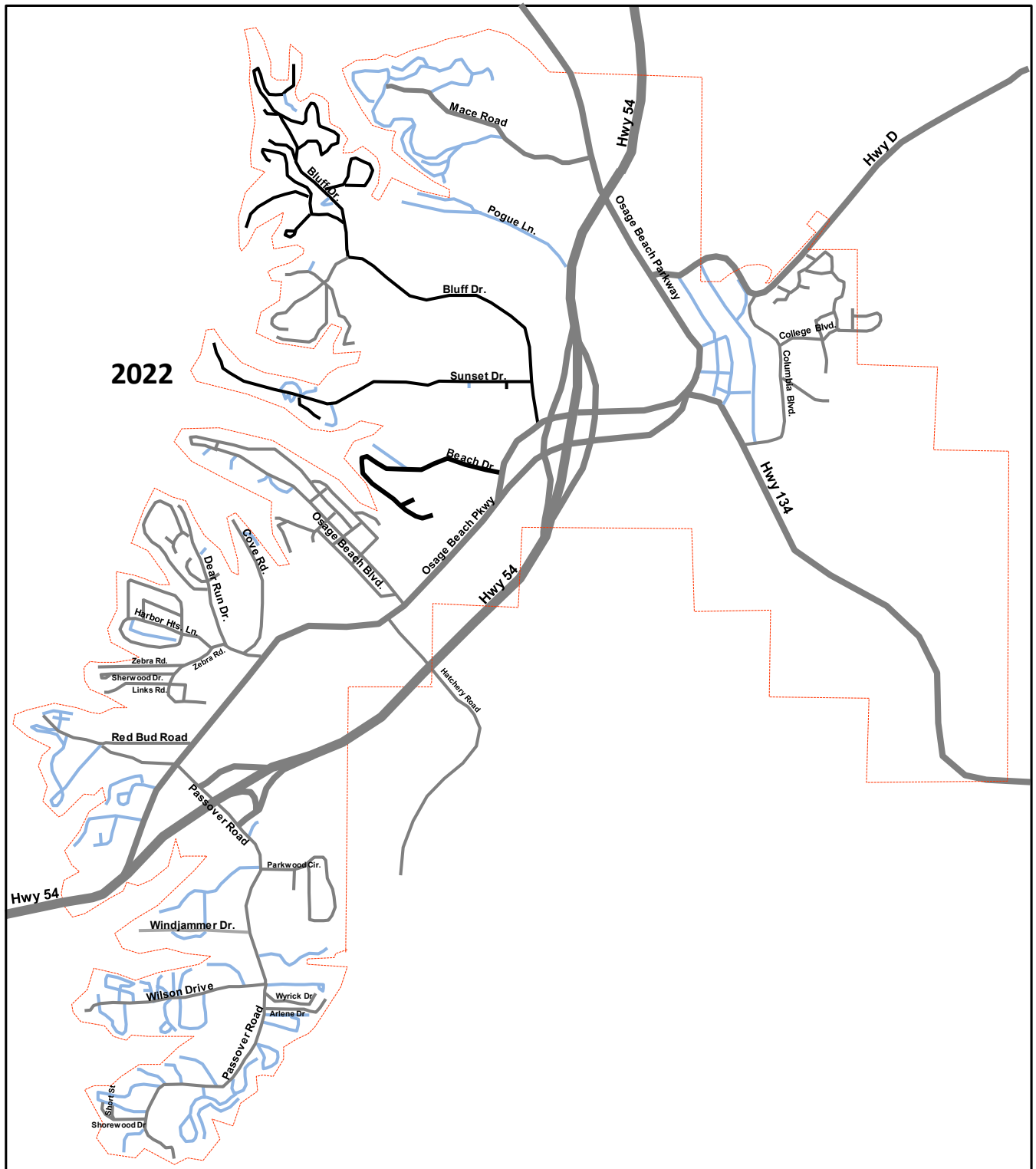
Pavement Resurfacing Schedule – all budget estimates are present value

	2021		2022		2023		2024		2025		2026	
Project Description		Cost		Cost		Cost		Cost		Cost		Cost
Arterials:												
Osage Beach Parkway (East)	CF	city crew			CF	city crew			NC	\$727,500		
Barry Prewitt Memorial Dr.	CF	city crew			CF	city crew			NC	\$100,800		
Columbia Blvd	CF	city crew			CF	city crew			NC	\$130,000		
Osage Beach Parkway (West)	CF	city crew			CF	city crew			NC	\$1,188,005		
East Side Streets:												
Mace Road	2B	\$890,509										
Beach Drive			A	\$146,489			CF	city crew			CF	city crew
- Carie Lane			A	\$22,044			CF	city crew			CF	city crew
Bluff Drive			NC	\$211,600			CF	city crew			CF	city crew
Bluff Drive Group			SS	\$99,867			CF	city crew			CF	city crew
Sunset Drive			NC	\$112,000			CF	city crew			CF	city crew
Sunset Drive Side Streets			SS	\$6,533			CF	city crew			CF	city crew
Osage Beach Road Group	CF	city crew			SS	\$96,369			CF	city crew		
Cove Road	CF	city crew			SS	\$18,400			CF	city crew		
Dear Run Group	CF	city crew			SS	\$50,617			CF	city crew		
Harbor Heights Group	CF	city crew			SS	\$51,670			CF	city crew		
Red Bud Road	CF	city crew			SS	\$19,200			CF	city crew		
Hatchery Road	CF	city crew			SS	\$9,333			CF	city crew		
Zebra Road Group			CF	city crew			SS	\$53,573			CF	city crew
Wilson Hollow Cove Group			CF	city crew			SS	\$65,167			CF	city crew
College Blvd Group			CF	city crew			SS	\$52,200			CF	city crew
Passover Road	CF	city crew			CF	city crew					NC	\$273,000
Wilson Drive	CF	city crew			CF	city crew					NC	\$54,000
West Side Streets:												
Airport Road Entrance	A	\$45,000			CF	city crew			CF	city crew		
Industrial Drive	Eng.	\$103,011	ROW	\$50,000	FD	\$1,107,371			CF	city crew		
City Hall Group			CF	city crew			A	\$276,800			CF	city crew
Dude Ranch Road Group			CF	city crew			SS	\$102,833			CF	city crew
Dogwood Lane Group			CF	city crew			SS	\$50,250			CF	city crew
Case Road Group			CF	city crew			SS	\$55,572			CF	city crew
Sycamore Valley Rd. Group			CF	city crew			SS	\$58,458			CF	city crew
Nichols Road Group			CF	city crew			SS	\$115,592			CF	city crew
Lazy Days Group			CF	city crew			SS	\$72,020			CF	city crew
Three Seasons Group			CF	city crew			SS	\$117,253			CF	city crew
Jefferies Road			CF	city crew			CF	city crew			SS	\$25,667
Winn Road Group			CF	city crew			CF	city crew			SS	\$30,800
Forrester Road			CF	city crew			CF	city crew			SS	\$2,767
Murphy Road			CF	city crew			CF	city crew			SS	\$10,000
Malibu Road Group			CF	city crew			CF	city crew			SS	\$35,713
Mariner Circle			CF	city crew			CF	city crew			SS	\$21,533
Parkside Village Group			CF	city crew			CF	city crew			SS	\$15,067
Airport Road Group			CF	city crew			CF	city crew			SS	\$55,707
KK Drive Group			CF	city crew			CF	city crew			SS	\$31,017
Burton Duenke Group			CF	city crew			CF	city crew				
Totals		\$1,038,520		\$655,067		\$1,352,960		\$1,019,718		\$2,146,305		\$555,270

A - Mill/Overlay; CF - Street Dept. Crack Filling; STP - Federal Aid; NC - Nova Chip; SS - Slurry Seal; FD - Full Depth Pavement Replacement

Paving Schedule – East Osage Beach

2022



Cost Estimates – Full Depth Pavement Replacement Projects

Bartlett & West

Engineer's Estimate of Probable Cost

Mace Road Improvements Project (Phase 2B)

Station 83+00 to 95+75 (approx.)

City of Osage Beach, Missouri

Date: November 27, 2019

Project No. 19090.001

Item No.	Description	Quantity	Unit	Engineer's Estimate	
				Unit Price	Total Cost
	Roadway Items				
109-99.01	Force Account	1	LS	15,000.00	\$15,000.00
201-99.01	Clearing and Grubbing	1	LS	15,000.00	\$15,000.00
202-20.10	Removal of Improvements	1	LS	30,000.00	\$30,000.00
203-50.00	Unclassified Excavation	1,542	CY	20.00	\$30,838.00
203-99.07	Embankment	202	CY	15.00	\$3,034.50
304-05.04	Type 5 Aggregate for Base (4 in Thick)	1,387	SY	6.00	\$8,322.00
304-05.06	Type 5 Aggregate for Base (6 in Thick)	3,667	SY	8.00	\$29,336.00
310-50.03	4 in. - Gravel (A) or Crushed Stone (B)	59	SY	10.00	\$590.00
401-99.05	Bituminous Pavement Mixture, PG64-22 (BP-1), 2 in	3,667	SY	15.00	\$55,005.00
401-99.35	Bituminous Pavement Mixture, PG64-22 (Base), 4 in	3,667	SY	20.00	\$73,340.00
401-99.xx	Bituminous Pavement, 6 in (driveways)	1,921	SY	25.00	\$48,025.00
607-99.03	72 in Wooden Privacy Fence	75	LF	100.00	\$7,500.00
608-10.12	Truncated Domes	10	SF	30.00	\$300.00
608-10.10	Concrete Curb Ramps and Landings, 6in.	18	SY	100.00	\$1,800.00
608-60.04	Concrete Sidewalk, 4 in	563	SY	40.00	\$22,520.00
608-99.05	Concrete Sidewalk Stairs	0	SY	100.00	
608-99.25	6 in PCC Driveway	347	SY	60.00	\$20,820.00
608-99.35	6 in PCC Pad	14	SY	60.00	\$840.00
609-99.03	Barrier Curb & Gutter	713	LF	22.00	\$15,686.00
609-99.23	Roll-Back Curb & Gutter	1,839	LF	22.00	\$40,458.00
611-99.07	MoDOT Type II Rock Blanket (24 in. thick)	0	CY	100.00	
616-99.01	Maintenance of Traffic	1	LS	20,000.00	\$20,000.00
618-10.00	Mobilization	1	LS	50,000.00	\$50,000.00
620-00.15	Preformed Thermoplastic Pavement Marking, 24 in. White	24	LF	25.00	\$600.00
620-00.45	Preformed Thermoplastic Pavement Marking, LT / RT Fish Hook Arrow	4	EA	800.00	\$3,200.00
620-60.00C	6 in. White Standard Waterborne Pavement Marking Paint (Type P Beads)	198	LF	1.00	\$198.00
620-60.01C	4 in. Yellow Standard Waterborne Pavement Marking Paint (Type P Beads)	2,526	LF	1.00	\$2,526.00
626-99.01	Permanent Signage	1	LS	1,500.00	\$1,500.00
627-40.00	Contractor Furnished Surveying and Staking	1	LS	7,500.00	\$7,500.00
726-99.15	15" dia. CMP Pipe	435	LF	75.00	\$32,625.00
726-99.18	18" dia. CMP Pipe	253	LF	85.00	\$21,505.00
726-99.30	30" dia. CMP Pipe	0	LF	100.00	
731-99.01	4' x 3'-3" Curb Inlet	6	EA	3,050.00	\$18,300.00
731-99.03	5' x 4' Curb Inlet	0	EA	3,700.00	
731-99.04	4' dia. Eccentric Storm Sewer Manhole	1	EA	3,500.00	\$3,500.00
732-99.30	End section, CMP, 30"	0	EA	400.00	
805-99.01	Seeding, Fertilizing and Mulch	0.3	AC	6,000.00	\$1,800.00
806-10.07A	Inlet Check	6	EA	150.00	\$900.00
806-10.19	Silt Fence	397	LF	3.00	\$1,191.00
	Temporary Roadway Connection	0	LS	50,000.00	
	Roadway Subtotal				\$583,759.50

Mace Road Improvements Phase 2B - continued

Item No.	Description	Quantity	Unit	Engineer's Estimate	
				Unit Price	Total Cost
	Waterline Items				
	Abandonments, Removals, and Locating Existing Water Lines	1	LS	15,000.00	\$15,000.00
	Line Flushing, Pigging, and Testing	1	LS	1,500.00	\$1,500.00
	New Water Main - Size and Material to be Determined. Cost Basis is 6-inch AWWA C900 PVC (INCLUDES ROCK TRENCHING AND GRAVEL BACKFILL)	525	LF	80.00	\$42,000.00
	Fittings, Valves, and Hydrants	1	LS	5,000.00	\$5,000.00
	Reconnect Existing Service Meter	4	EA	2,000.00	\$8,000.00
	Water Service Line	160	LF	40.00	\$6,400.00
	Waterline Subtotal				\$77,900.00
	Sanitary Sewer Items				
	New Force Main - Size and Material to be Determined. Cost Basis is 2-inch ASTM D2241 PR200 PVC (INCLUDES ROCK TRENCHING AND GRAVEL BACKFILL)	525	LF	60.00	\$31,500.00
	Connect new Force Main to Existing Force Main with Flexible Coupling	1	EA	350.00	\$350.00
	Sanitary Sewer Abandonments & Removals	1	LS	5,000.00	\$5,000.00
	Bypass Pumping	1	LS	8,000.00	\$8,000.00
	Sanitary Subtotal				\$44,850.00
	Lighting	1	LS	110,000.00	\$110,000.00
	Contingency			10%	\$74,000.00
	Total Construction Cost (Phase 2B)				\$890,509.50
	Total Project Construction Cost (Phase 2A & 2B)				\$1,945,008.00

This project cost opinion was prepared using bid tabulation information available at the time of preparation and is prepared in good faith using engineer's judgment and experience. The engineer makes no guarantee as to the actual costs for construction.

PROJECT COST ESTIMATE

City of Osage Beach - Industrial Drive Road Improvement Project

Item No.	Item Description	Unit	Plan Quantity	Unit Price (\$)	Total (\$)
1	Removal of Improvements	LS	1	55,000.00	55,000
2	Linear Grading	STA	17	1,500.00	25,500
3	Driveway Entrances	SF	8,400	6.00	50,400
4	Concrete Sidewalk - one side	SF	10,500	5.00	52,500
5	Subbase Repair	SY	333	40.00	13,333
6	Type 5 Aggregate for Base	SY	5,056	6.00	30,333
7	New Full Depth Pavement	SY	5,056	60.00	303,333
8	Concrete Curb and Gutter	LF	3,300	25.00	82,500
9	Storm Sewer	LF	1,700	60.00	102,000
10	Street Lighting	EA	12	6,000.00	72,000
11	Pavement Striping	LF	7,000	0.55	3,850
12	Restoration	LS	1	25,000.00	25,000
13	Construction Mobilization	LS	1	70,000.00	70,000
14	Construction Traffic Control	LS	1	10,000.00	10,000
General Notes: 1. Osage Beach Pkwy to City Pkwy (cul-de-sac) 2. Approximate Length = 0.35 Miles 3. Pavement width - existing @ 20', proposed 26' 4. ROW @ 40'		Construction Totals			895,750
		15% Contingency			134,363
		Surveying/Design Engineering Services			103,011
		Const. Admin./Inspection/Testing			77,258
		Project Total Cost =			1,210,382