

NOACA will STRENGTHEN regional cohesion, PRESERVE existing infrastructure and BUILD a sustainable multimodal transportation system to SUPPORT economic development and ENHANCE the quality of life in Northeast Ohio

# ROADWAY PAVEMENT MAINTENANCE REPORT



**CITY OF ELYRIA**

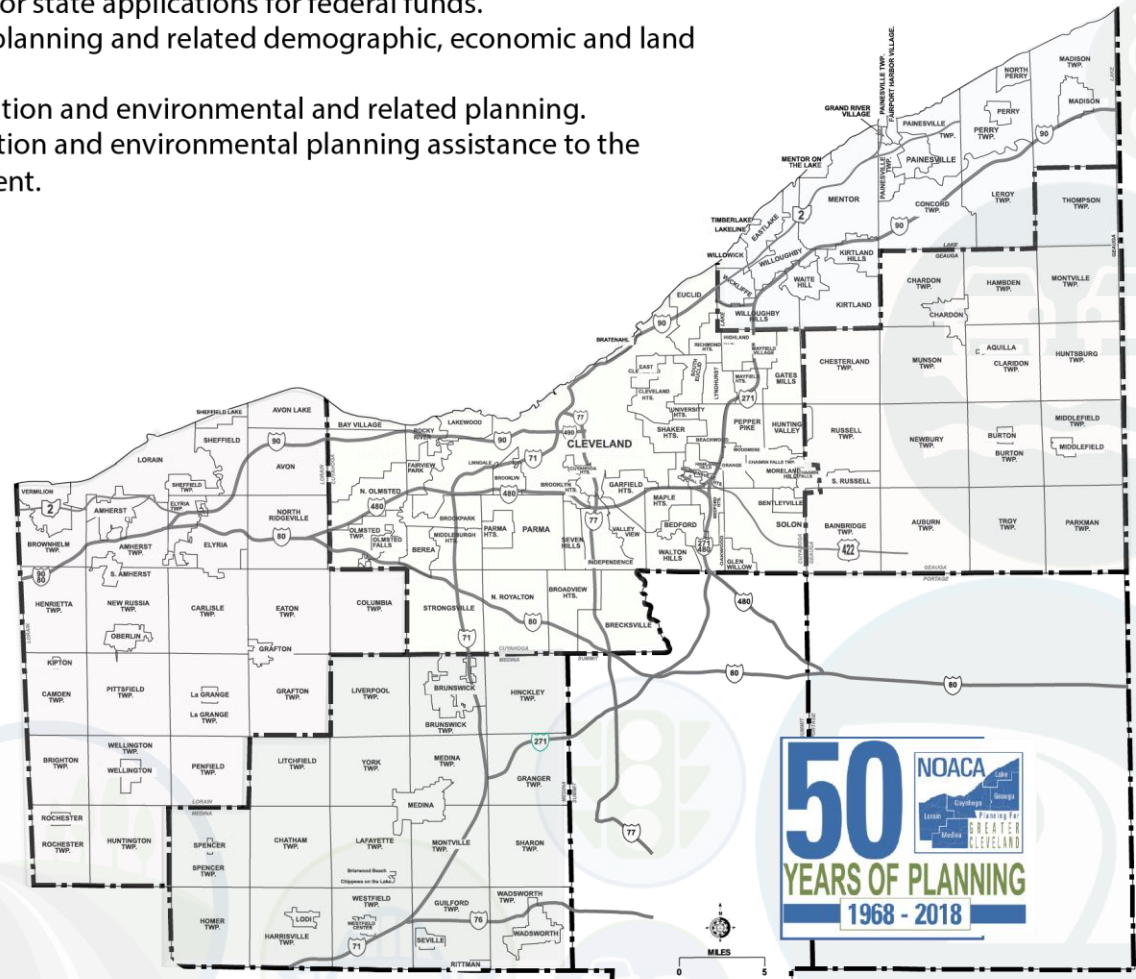


The **Northeast Ohio Areawide Coordinating Agency** (NOACA) is a public organization serving the counties of and municipalities and townships within Cuyahoga, Geauga, Lake, Lorain and Medina (covering an area with 2.1 million people). NOACA is the agency designated or recognized to perform the following functions:

- Serve as the Metropolitan Planning Organization (MPO), with responsibility for comprehensive, cooperative and continuous planning for highways, public transit, and bikeways, as defined in the current transportation law.
- Perform continuous water quality, transportation-related air quality and other environmental planning functions.
- Administer the area clearinghouse function, which includes providing local government with the opportunity to review a wide variety of local or state applications for federal funds.
- Conduct transportation and environmental planning and related demographic, economic and land use research.
- Serve as an information center for transportation and environmental and related planning.
- As directed by the Board, provide transportation and environmental planning assistance to the 172 units of local, general purpose government.

The NOACA Board of Directors is composed of 45 local public officials. The Board convenes quarterly to provide a forum for members to present, discuss and develop solutions to local and areawide issues and make recommendations regarding implementation strategies. As the area clearinghouse for the region, the Board makes comments and recommendations on applications for state and federal grants, with the purpose of enhancing the region's social, physical, environmental and land use/transportation fabric. NOACA invites you to take part in its planning process. Feel free to participate, to ask questions and to learn more about areawide planning.

For more information, call (216) 241-2414 or log on at <http://www.noaca.org>



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## EXECUTIVE SUMMARY

The 2016 Ohio Department of Transportation (ODOT) pavement database has 3,626 segment records for the Northeast Ohio Areawide Coordinating Agency (NOACA) region. The NOACA region has a total of 3,330 centerline miles of roadways including freeways and federal-aid highways which is equivalent to 8,561 lane-miles. The regional segment average Pavement Condition Ratings (PCR) is about 77.

The City of Elyria is the county seat of Lorain County and located at the forks of the Black River. There are 55.52 centerline miles of federal-aid roads, which are equivalent to 142.02 lane-miles within the city boundary that include US Route 20, the Ohio Turnpike, State Route 2 (SR 2), State Route 113 (SR 113), State Route 301 (SR 301), and State Route 57 (SR 57). The 2016 ODOT pavement database has 109 segment records for the City of Elyria roadway system. Each record comprises of several fields of various information and measures such as Street name, Length (miles), Lane-miles length, Number of Lanes, Function Class, Pavement Condition Ratings (PCR), etc.

According to the PCR measure, more than two thirds of the lane-miles pavement are currently in the “Good” condition and only a small percent of pavement is in the “Poor” status and demands some kind of immediate preventive maintenance and /or rehabilitation treatments.

This pavement study includes four parts:

- Part I: The 2016 pavement network condition,
- Part II: The 2018 backlog,
- Part III: The Maintenance and Rehabilitation (M&R) program,
- Part IV: The Comparative analysis.

Considering the five-year study period of 2018 – 2022, this pavement study focuses on the required preventive maintenance treatments and some rehabilitation techniques rather than reconstruction.

Part I of this study analyzes the 2016 pavement network condition and tabulates the important information of all the 109 road segments in the City of Elyria.

In Part II, the backlog is defined as the cost of pavement rehabilitation of all roads within one year (2018) and bringing the average network PCR to 80. Backlog is a “snapshot” or relative measure of outstanding rehabilitation work.

Part III introduces the optimal preventive maintenance and rehabilitation strategy for each segment and its recommended implementation year based on the NOACA maintenance decision tree.

Finally, Part IV compares the backlog and the “M&R” program with the NOACA transportation asset management strategies. All these strategies were compared regarding their costs, the average network PCR and percent of the lane-miles below the acceptable level.

## BACKGROUND

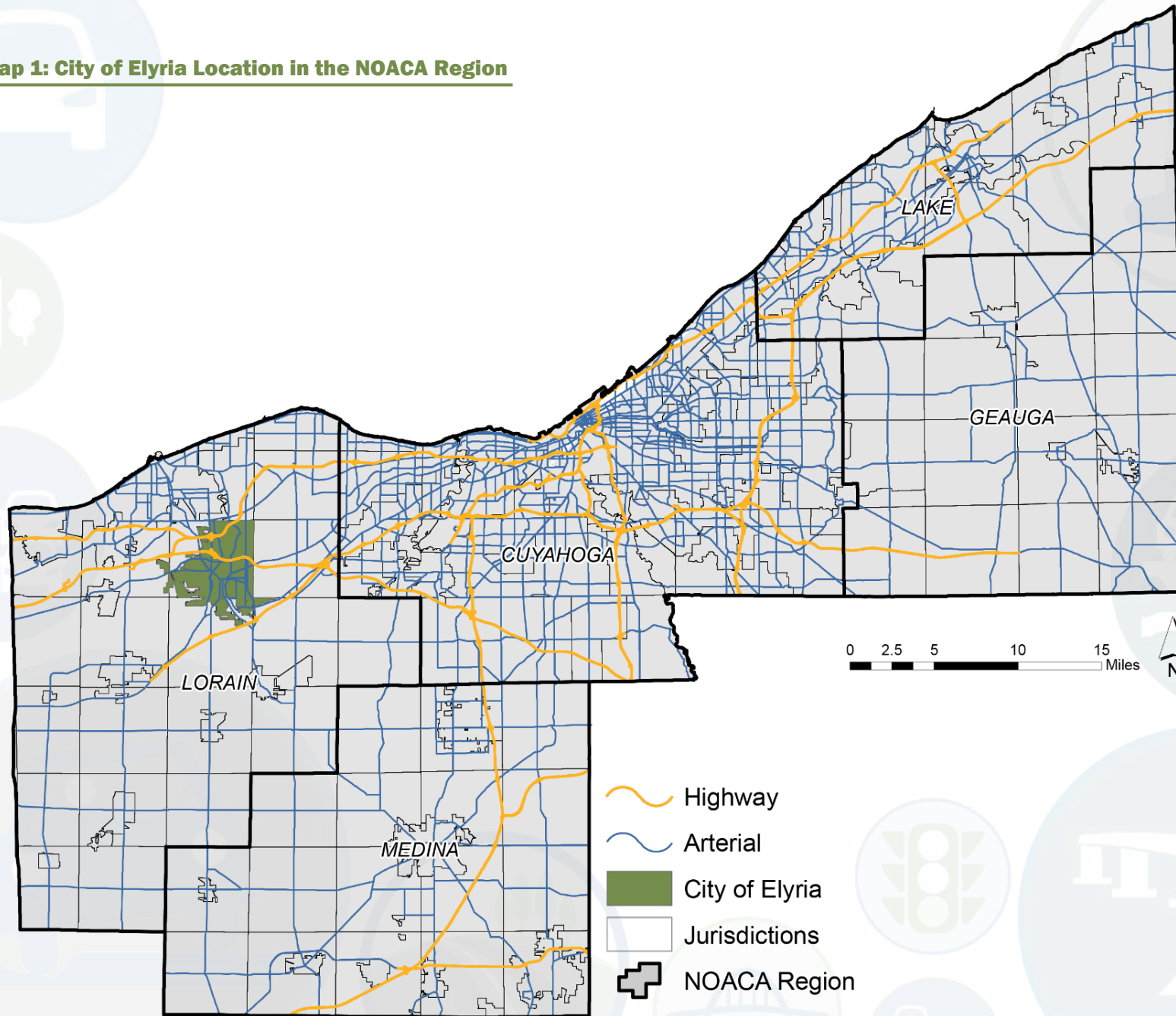
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The City of Elyria is the county seat of Lorain County and located at the forks of the Black River. The city is named for its founder, Herman Ely and is home to Lorain County Community College.

As of the Northeast Ohio Areawide Coordinating Agency (NOACA) 2015 estimates, the city had a population of 53,990 and employment of 31,102. The City of Elyria includes US Route 20, the Ohio Turnpike, State Route 2 (SR 2), State Route 113 (SR 113), State Route 301 (SR 301), and State Route 57 (SR 57). Lorain County Transit is based in Elyria. The Elyria Amtrak Station provides train transportation and Greyhound bus service is also in the city. Cleveland-Hopkins International Airport is the nearest airport.

Map 1 illustrates the City of Elyria location in the NOACA region.

**Map 1: City of Elyria Location in the NOACA Region**



For the purpose of this study:

**Pavement Reconstruction** is defined as the replacement or reestablishment of the original pavement structural capacity by the placement of the equivalent or increased pavement structure. Reconstruction may utilize either new or recycle materials for the reconstruction of the complete pavement structure.

**Pavement Rehabilitation** is defined as resurfacing, restoration, and rehabilitation (3R) work consisting of structural enhancements that extend the service life of an existing pavement and/or improve its structural capacity. Rehabilitation techniques include restoration treatments and/or structural overlays. This may include partial recycling of the existing pavement, placement of additional surface materials, and/or other work necessary to return an existing pavement to a condition of structural or functional adequacy.

**Preventive Maintenance** is considered as cost effective treatments to an existing roadway system and its appurtenances that preserves the system, delays future deterioration, and maintains or improves the functionality condition of the system without increasing structural capacity. Projects that address deficiencies in the pavement structure or increase the structural capacity of the facility are not considered preventive maintenance.

Maintaining the roadways in a state of good repair is essential and experience has shown that, over time it is less expensive to invest in preventive maintenance and/or rehabilitation in an ongoing basis rather than in reconstruction of pavement that has deteriorated to a poor condition.

This pavement study analyzes the current status of the Elyria pavement network condition and considers the five-year study period of 2018-2022. It mainly focuses on the required roadway pavement preventive maintenance treatments and some rehabilitation techniques rather than reconstruction. The 2016 Ohio Department of Transportation (ODOT) pavement database was used as the input data and RoadMatrix software was utilized as the NOACA Pavement Management platform.

Seven roadway pavement preventive maintenance and rehabilitation treatments were considered in the Elyria pavement network analysis for the study period and Table 1 illustrates the selected treatment and their associated planning level costs.

**Table 1: Selected Pavement Treatments and Their Planning Level Costs**

Maintenance Treatment Type	Cost per SQ FT (2016\$)	Estimated Cost per 12-FT lane-Mile (2016\$)
Crack Fill	0.08	5,100
Joint Repair	0.24	15,200
Crack Fill and Slurry	0.4	25,300
Preventive Maintenance Minor	0.5	31,700
Micro – Pave Type    Surface Treatment	0.722	45,700
Selective Patch, Mill and 1.5” O/L	1.5	95,000
2.0 inch Hot Mix Mill and Overlay	1.9	120,400

**Pavement Maintenance Treatment Definitions**

**Crack Fill:** it is the placement of asphalt emulsion into non-working cracks to reduce water infiltration and to reinforce the adjacent pavement.

**Slurry Seal:** a mixture of fine aggregate, asphalt emulsion, water, and mineral filler, used when the primary problem is excessive oxidation and hardening of the existing surface. Slurry seals are used to retard surface raveling, and improve surface friction.

**Joint Repair:** used to remove deteriorated concrete pavement long joint/crack repairs. It minimizes infiltration of surface water and incompressible material into the joint system.

**Preventive Maintenance (Minor):** typically applied to pavements in good condition having significant remaining service life. Examples of minor preventive treatments include asphalt crack sealing, chip sealing, slurry or micro-surfacing, thin and ultra-thin hot-mix asphalt overlay, and concrete joint sealing.

**Micro – Pave (Type II Surface Treatment):** consist of the application of a mixture of water, asphalt emulsion, aggregate (very small crushed rock), and chemical additives. It is used to treat surfacing and rut filling on roads that get moderate to heavy levels of traffic.

**2.0in Hot Mix Mill & Overlay:** applied as a maintenance treatment. Thin overlays should only be placed on structurally sound pavements. That is because they offer little structural improvement, but they can renew the surface in terms of functional performance (i.e., ride quality).

**Selective Patching, Mill & 1.5 O/L:** it is primarily done to extend the life of a roadway. Patch mill and overlay projects are designed to remove damaged portions of the roadway and replace it with new smooth pavement.

This report includes the following four parts:

- I. The 2016 status of the Elyria pavement network condition,
- II. The 2018 “backlog” treatment list,
- III. The optimal preventive maintenance and rehabilitation strategies, and
- IV. The comparative analysis.

**PART I: 2016 PAVEMENT CONDITION**

In order to provide an accurate assessment of the current status and further pavement analyses, the pavement network is required to be divided into homogeneous discrete sections in terms of surface distress, traffic volumes, pavement structure, etc. The 2016 ODOT pavement database has 109 segment records for the City of Elyria roadway system. Each record comprises of several fields of various information and measures such as Street name, Length (miles), Lane-miles length, Number of Lanes, Function Class, Pavement Condition Ratings (PCR), etc.

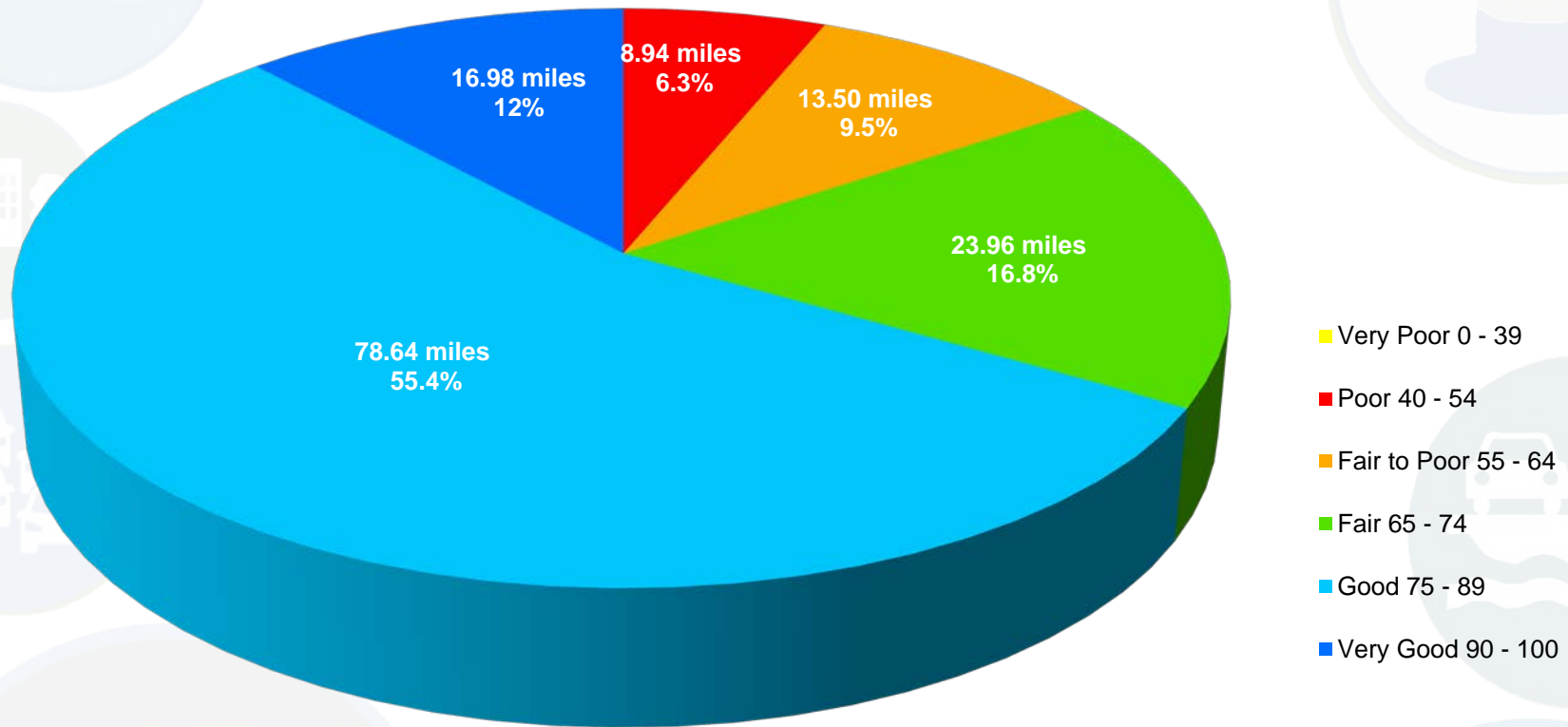
Based on the utilized ODOT database, there are 55.52 centerline miles of federal-aid eligible roads which are equivalent to 142.02 lane-miles in the City of Elyria. The total area of roadway is 9,436,888 Sq. Ft.

The PCR measure is a qualitative description of the structural state of the pavement. The PCR values span a spectrum of descriptive narrative ranging from “Very Good” to “Very Poor”. Each roadway segment is scored from 0 to 100 with 0 representing completely distressed pavement and 100 indicating perfect pavement condition. The lane-mile weighted average of the City of Elyria segment PCRs is about 78. Table 2 and Figure 1 summarize the 2016 Elyria pavement network conditions by percentages of roadway lane-miles length.

**Table 2: 2016 Elyria Pavement Network Condition**

Pavement Condition	PCR Range	Lane-Miles	Percent of Lane-Miles
Very Poor	0 - 39	0	0%
Poor	40 - 54	8.94	6.3%
Fair to Poor	55 - 64	13.50	9.5%
Fair	65 - 74	23.96	16.8%
Good	75 - 89	78.64	55.4%
Very Good	90 - 100	16.98	12%

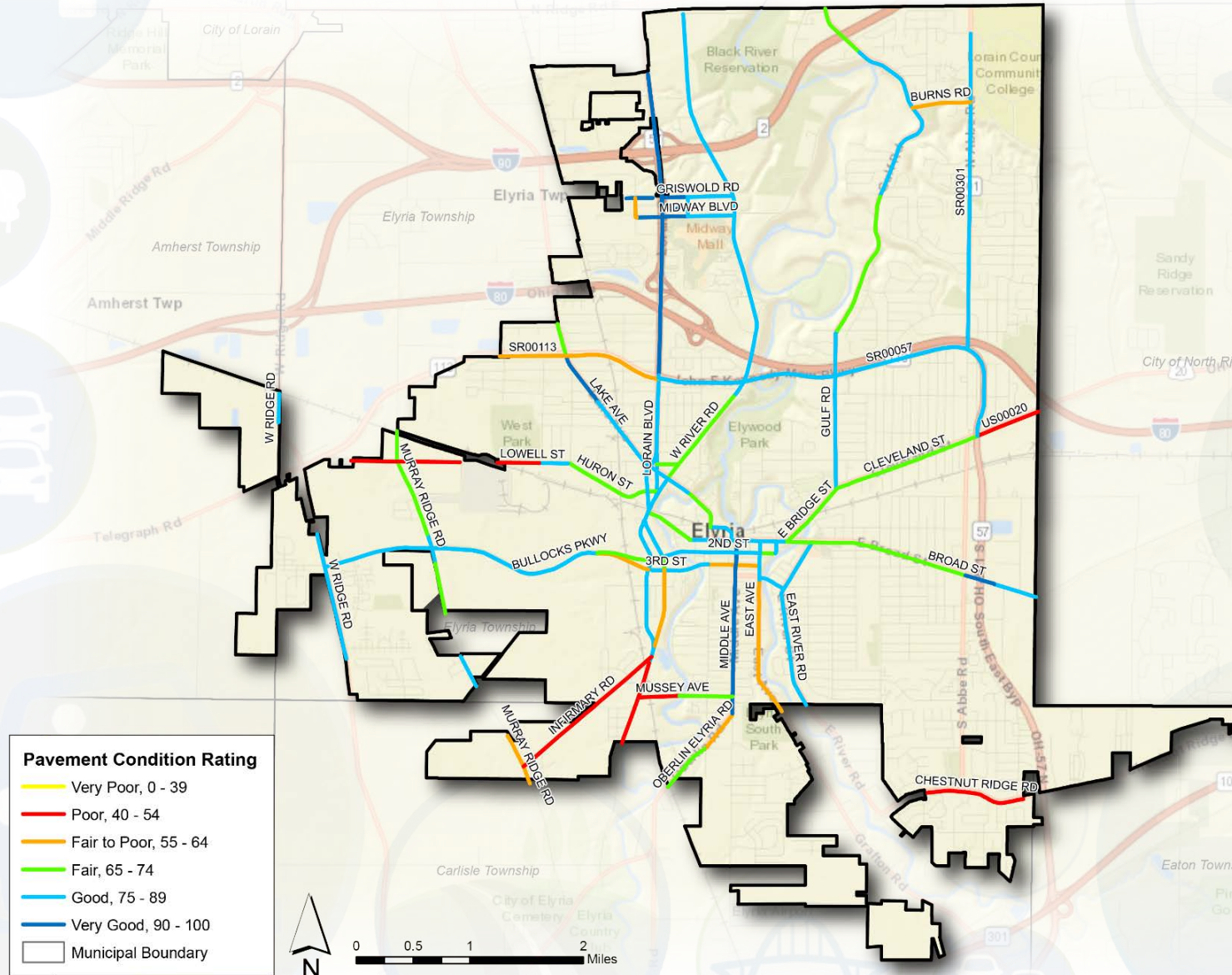
**Figure 1: 2016 Elyria Pavement Network Condition Chart by Lane-Miles**



As indicated, more than two thirds of the lane-miles pavement are currently in the “Good” condition and the lane-mile weighted average PCR also represents a “Good” condition. A small percent of pavement is in the “Poor” status and demands some kind of immediate maintenance and rehabilitation treatments.

Map 2 illustrates the 2016 Elyria roadway pavement condition for each segment record and Table 3 tabulates the 2016 Elyria pavement condition listing.

Map 2: 2016 City of Elyria Pavement Condition



**Table 3: 2016 City of Elyria Pavement Condition Listing**

ROAD NAME	FROM	TO	FUNCTION CLASS	LANE-MILES	PCR
15TH ST	WEST AVE	MIDDLE AVE	MAJOR COLLECTOR	0.34	69
2ND ST	CEDAR ST	EAST AVE	MINOR ARTERIAL	0.40	74
2ND ST	EAST AVE	MIDDLE AVE	MINOR ARTERIAL	0.64	79
2ND ST	MIDDLE AVE	WEST AVE	MAJOR COLLECTOR	0.34	79
2ND ST	WEST AVE	S GATEWAY BLVD	MAJOR COLLECTOR	1.60	86
3RD ST	S GATEWAY BLVD	WEST AVE	MAJOR COLLECTOR	0.80	88
3RD ST	WEST AVE	EAST AVE	MAJOR COLLECTOR	0.68	56
49TH ST	0.17 MILES W of TILLOTSON ST	TILLOTSON ST	MAJOR COLLECTOR	0.68	98
4TH ST	EAST AVE	EAST RIVER RD	MAJOR COLLECTOR	0.72	77
BROAD ST	ABBE RD	EAST OF US 20	MAJOR COLLECTOR	0.40	90
BROAD ST	CEDAR ST	EAST BRIDGE ST	MINOR ARTERIAL	0.36	79
BROAD ST	E BROAD ST	WEST AVE	MINOR ARTERIAL	0.40	76
BROAD ST	EAST BRIDGE ST	EAST RIVER ST	MAJOR COLLECTOR	0.68	66
BROAD ST	EAST OF US 20	ELYRIA ECL	MINOR ARTERIAL	0.58	83
BROAD ST	EAST RIVER ST	PROSPECT ST	MAJOR COLLECTOR	1.84	66
BROAD ST	LAKE AVE	CEDAR ST	MINOR ARTERIAL	0.60	77
BROAD ST	PROSPECT ST	ABBE RD	MAJOR COLLECTOR	1.18	66
BROAD ST	WEST BRIDGE ST	LAKE AVE	MAJOR COLLECTOR	1.12	81
BULLOCKS PKWY	LEO BULLOCKS PKWY	S GATEWAY BLVD	MAJOR COLLECTOR	0.72	61

**Table 3: 2016 City of Elyria Pavement Condition Listing (Continued)**

ROAD NAME	FROM	TO	FUNCTION CLASS	LANE-MILES	PCR
BULLOCKS PKWY	MURRAY RIDGE RD	W 3RD ST	MAJOR COLLECTOR	2.32	85
BULLOCKS PKWY	W 3RD ST	MURRAY RIDGE RD	MAJOR COLLECTOR	2.32	85
BURNS RD	GULF RD	SR 301 (ABBE RD)	MAJOR COLLECTOR	0.78	55
CEDAR ST	2ND ST	E BROAD ST	MINOR ARTERIAL	0.32	75
CHESTNUT RIDGE RD	AUGUSTA DR	DEFIANCE AVE	MAJOR COLLECTOR	1.32	44
CLEVELAND ST	GULF ST	US 20 / SR 57	MINOR ARTERIAL	3.96	70
E BRIDGE ST	EAST BROAD ST	GULF RD / CLEVELAND ST	MINOR ARTERIAL	1.92	65
EAST AVE	16TH ST	4TH ST	MINOR ARTERIAL	3.60	58
EAST AVE	4TH ST	EAST BROAD ST	MINOR ARTERIAL	1.00	81
EAST RIVER RD	4TH ST	EAST BROAD ST	MAJOR COLLECTOR	0.72	88
EAST RIVER RD	ELYRIA SCL	4TH ST	MAJOR COLLECTOR	1.60	84
FREMONT ST	GATEWAY BLVD	WEST RIVER RD	MAJOR COLLECTOR	0.36	72
FREMONT ST	HURON ST	GATEWAY BLVD	MAJOR COLLECTOR	0.24	72
GRISWOLD RD	LEONA ST	SR 57 (LORAIN BLVD)	MAJOR COLLECTOR	0.68	98
GRISWOLD RD	SR 57 (LORAIN BLVD)	TILLOTSON ST	MAJOR COLLECTOR	0.26	98
GRISWOLD RD	TILLOTSON ST	WEST RIVER RD	MAJOR COLLECTOR	0.60	76
GULF RD	BURNS RD	WINDBROOK CT	MAJOR COLLECTOR	1.22	80
GULF RD	CLEVELAND ST	HILLIARD RD / BERKLEY DR	MAJOR COLLECTOR	4.20	84
GULF RD	CRESTVIEW DR	BURNS RD	MAJOR COLLECTOR	1.26	84

**Table 3: 2016 City of Elyria Pavement Condition Listing (Continued)**

ROAD NAME	FROM	TO	FUNCTION CLASS	LANE-MILES	PCR
GULF RD	HILLIARD RD / BERKLEY DR	CRESTVIEW DR	MAJOR COLLECTOR	1.92	68
GULF RD	WINDBROOK CT	ELYRIA NCL	MAJOR COLLECTOR	0.76	67
HURON ST	LOWELL ST	TUSCARAWAS ST	MAJOR COLLECTOR	0.78	72
HURON ST	TUSCARAWAS ST	FREMONT ST	MAJOR COLLECTOR	0.14	67
INFIRMARY RD	MURRAY RIDGE RD	WEST RIVER RD	MAJOR COLLECTOR	2.24	41
LAKE AVE	ERIE ST	OAK ST	MINOR ARTERIAL	1.72	83
LAKE AVE	FURNACE ST	LORAIN BLVD	MINOR ARTERIAL	1.04	83
LAKE AVE	LORAIN BLVD	ERIE ST	MINOR ARTERIAL	0.64	83
LAKE AVE	OAK ST	SR 113 (JFK MEMORIAL PKWY)	MINOR ARTERIAL	1.48	94
LAKE AVE	PARKVIEW CT	FURNACE ST	MINOR ARTERIAL	0.72	71
LAKE AVE	SR 113 (JFK MEMORIAL PKWY)	PARMELY AVE	MINOR ARTERIAL	0.44	70
LEONA ST	MIDWAY BLVD	GRISWOLD RD	MAJOR COLLECTOR	0.52	56
LORAIN BLVD	ERIE ST	SR 57 / SR 113	MINOR ARTERIAL	1.00	88
LORAIN BLVD	FREMONT ST	LAKE AVE	MINOR ARTERIAL	0.56	88
LORAIN BLVD	LAKE AVE	ERIE ST	MINOR ARTERIAL	0.44	88
LORAIN BLVD	SR 57 / SR 113	ERIE ST	MINOR ARTERIAL	1.00	86
LORAIN BLVD	WEST RIVER RD	FREMONT ST	MINOR ARTERIAL	0.12	88
LOWELL ST	ELYRIA TWP ECL	PENFIELD AVE	MAJOR COLLECTOR	0.56	49
LOWELL ST	ELYRIA WCL	ELYRIA / ELYRIA TWP CORP LINE	MAJOR COLLECTOR	1.44	48

**Table 3: 2016 City of Elyria Pavement Condition Listing (Continued)**

ROAD NAME	FROM	TO	FUNCTION CLASS	LANE-MILES	PCR
LOWELL ST	LORAIN BLVD	WEST RIVER RD	MINOR ARTERIAL	0.30	71
LOWELL ST	PENFIELD AVE	HURON ST	MAJOR COLLECTOR	0.38	84
MIDDLE AVE	16TH ST	3RD ST	MINOR ARTERIAL	1.84	94
MIDDLE AVE	3RD ST	E BROAD ST	MINOR ARTERIAL	0.68	94
MIDDLE AVE	3RD ST	16TH ST	MINOR ARTERIAL	1.84	97
MIDDLE AVE	OBERLIN ELYRIA RD / 17TH ST	16TH ST	MINOR ARTERIAL	0.28	94
MIDWAY BLVD	LEONA ST	SR 57 (LORAIN BLVD)	MAJOR COLLECTOR	0.56	98
MIDWAY BLVD	SR 57 (LORAIN BLVD)	TILLOTSON ST	MAJOR COLLECTOR	0.32	98
MIDWAY BLVD	TILLOTSON ST	WEST RIVER RD	MAJOR COLLECTOR	0.58	80
MURRAY RIDGE RD	0.1 MILES N OF LEO BULLOCKS PKWY	0.2 MILES NORTH OF LOWELL ST	MAJOR COLLECTOR	1.44	73
MURRAY RIDGE RD	ELYRIA / ELYRIA TWP CORP LINE	APOLLO DR	MAJOR COLLECTOR	0.44	75
MURRAY RIDGE RD	ELYRIA TWP NCL	LEO BULLOCKS PKWY	MAJOR COLLECTOR	0.68	72
MURRAY RIDGE RD	INFIRMARY RD	ELYRIA NCL	MAJOR COLLECTOR	0.70	64
MURRAY RIDGE RD	LEO BULLOCKS PKWY	0.1 MILES N OF LEO BULLOCKS PKWY	MAJOR COLLECTOR	0.40	76
MUSSEY AVE	0.18 MILES WEST OF WEST AVE	WEST AVE	MAJOR COLLECTOR	0.36	67
MUSSEY AVE	WEST RIVER RD	0.18 MILES WEST OF WEST AVE	MAJOR COLLECTOR	0.54	54
N GATEWAY BLVD	ERIE ST	LAKE AVE	MINOR ARTERIAL	0.16	79
N GATEWAY BLVD	LAKE AVE	WEST RIVER RD	MINOR ARTERIAL	0.62	81
OBERLIN ELYRIA RD	CARLISLE TWP / ELYRIA CORP LINE	WEST AVE	MINOR ARTERIAL	1.40	66

**Table 3: 2016 City of Elyria Pavement Condition Listing (Continued)**

ROAD NAME	FROM	TO	FUNCTION CLASS	LANE-MILES	PCR
OBERLIN ELYRIA RD	WEST AVE	MIDDLE AVE	MINOR ARTERIAL	1.16	62
S GATEWAY BLVD	WEST RIVER RD / FILBERT ST	WEST RIVER RD	MINOR ARTERIAL	1.66	82
SR 113	CLEMENS AVE	SR 57 (LORAIN BLVD)	MINOR ARTERIAL	2.16	62
SR 113	SR 57 (LORAIN BLVD)	CLEMENS AVE	MINOR ARTERIAL	2.16	63
SR 301	SR 57	ANTIOCH DR	MINOR ARTERIAL	8.32	85
SR 57	0.15 MILES NORTH OF BEECHWOOD DR	SR 113	PRINCIPAL ARTERIAL-OTHER	3.98	100
SR 57	CLEVELAND ST / US 20	SR 113	PRINCIPAL ARTERIAL-OTHER	5.42	84
SR 57	SR 113	0.15 MILES NORTH OF BEECHWOOD DR	PRINCIPAL ARTERIAL-OTHER	3.98	100
SR 57	SR 113	CLEVELAND ST / US 20	PRINCIPAL ARTERIAL-OTHER	5.42	81
TILLOTSON ST	MIDWAY BLVD	GRISWOLD BLVD	MAJOR COLLECTOR	0.52	78
TURNER BLVD	BRUNSWICK DR	MURRAY RIDGE RD	MAJOR COLLECTOR	2.16	85
TURNER BLVD	WEST RIDGE RD	BRUNSWICK DR	MAJOR COLLECTOR	0.38	78
US 20	CLEVELAND ST/US 20	EAST BROAD ST	PRINCIPAL ARTERIAL-OTHER	4.12	79
US 20	EAST BROAD ST	CLEVELAND ST / US 20	PRINCIPAL ARTERIAL-OTHER	4.12	79
US 20	US 20 / SR 57	ELYRIA ECL	PRINCIPAL ARTERIAL-OTHER	1.72	41
W 3RD ST	3RD ST	S GATEWAY BLVD	MAJOR COLLECTOR	0.72	66
W RIDGE RD	FOX CHASE DR	ELYRIA NCL	MINOR ARTERIAL	1.68	84
W RIDGE RD	OLD WEST RIDGE RD	ELYRIA NCL	MINOR ARTERIAL	0.38	82
W RIVER RD	2ND ST	S GATEWAY BLVD	MINOR ARTERIAL	0.52	81

**Table 3: 2016 City of Elyria Pavement Condition Listing (Continued)**

ROAD NAME	FROM	TO	FUNCTION CLASS	LANE-MILES	PCR
W RIVER RD	3RD ST	2ND ST	MINOR ARTERIAL	0.18	71
W RIVER RD	CARLISLE TWP NCL	INFIRMARY RD	MINOR ARTERIAL	1.12	53
W RIVER RD	FLORADALE ST / LOUISIANA AVE	SR 57 (JFK MEMORIAL PKWY)	MAJOR COLLECTOR	0.52	78
W RIVER RD	FREMONT ST	LAKE AVE	MAJOR COLLECTOR	0.16	84
W RIVER RD	FURNACE ST	FLORADALE ST / LOUISIANA AVE	MAJOR COLLECTOR	0.74	72
W RIVER RD	GRISWOLD RD	FACKLER AVE	MAJOR COLLECTOR	5.04	86
W RIVER RD	INFIRMARY RD	S GATEWAY BLVD	MINOR ARTERIAL	0.48	78
W RIVER RD	LAKE AVE	FURNACE ST	MINOR ARTERIAL	0.70	68
W RIVER RD	N GATEWAY BLVD	FREMONT ST	MINOR ARTERIAL	0.60	84
W RIVER RD	S GATEWAY BLVD	HURON ST / N GATEWAY BLVD	MINOR ARTERIAL	0.36	86
W RIVER RD	S GATEWAY BLVD	3RD ST	MINOR ARTERIAL	1.02	64
W RIVER RD	SR 57 (JFK MEMORIAL PKWY)	GRISWOLD RD	MAJOR COLLECTOR	4.96	81
WEST BRIDGE ST	WEST RIVER RD	EAST BROAD ST	MAJOR COLLECTOR	1.32	74
WEST ST	KERSTELLER WAY	PARKVIEW CT	MINOR ARTERIAL	0.44	71

## PART II: 2018 CURRENT BACKLOG

The backlog is defined as the cost of pavement rehabilitation of all roads within the current year (2018) and bringing the average network PCR to 80. Backlog is a “snapshot” or relative measure of outstanding rehabilitation work. The backlog not only represents how far behind the pavement network is in terms of its present physical condition, but also its cost value serves as a benchmark to measure the impact of various funding strategies. Additionally, the current backlog offers a basis for comparison to future and/or past year’s backlogs.

The backlog strategy does not utilize any pavement preventive maintenance treatments, but instead considers rehabilitation or reconstruction treatments. This strategy achieves the average network PCR 80, and also maintains all the pavement conditions above the minimum acceptable level. In this study, the minimum acceptable PCR for the arterial roadway function class is 55 and for the major and minor collector is 50.

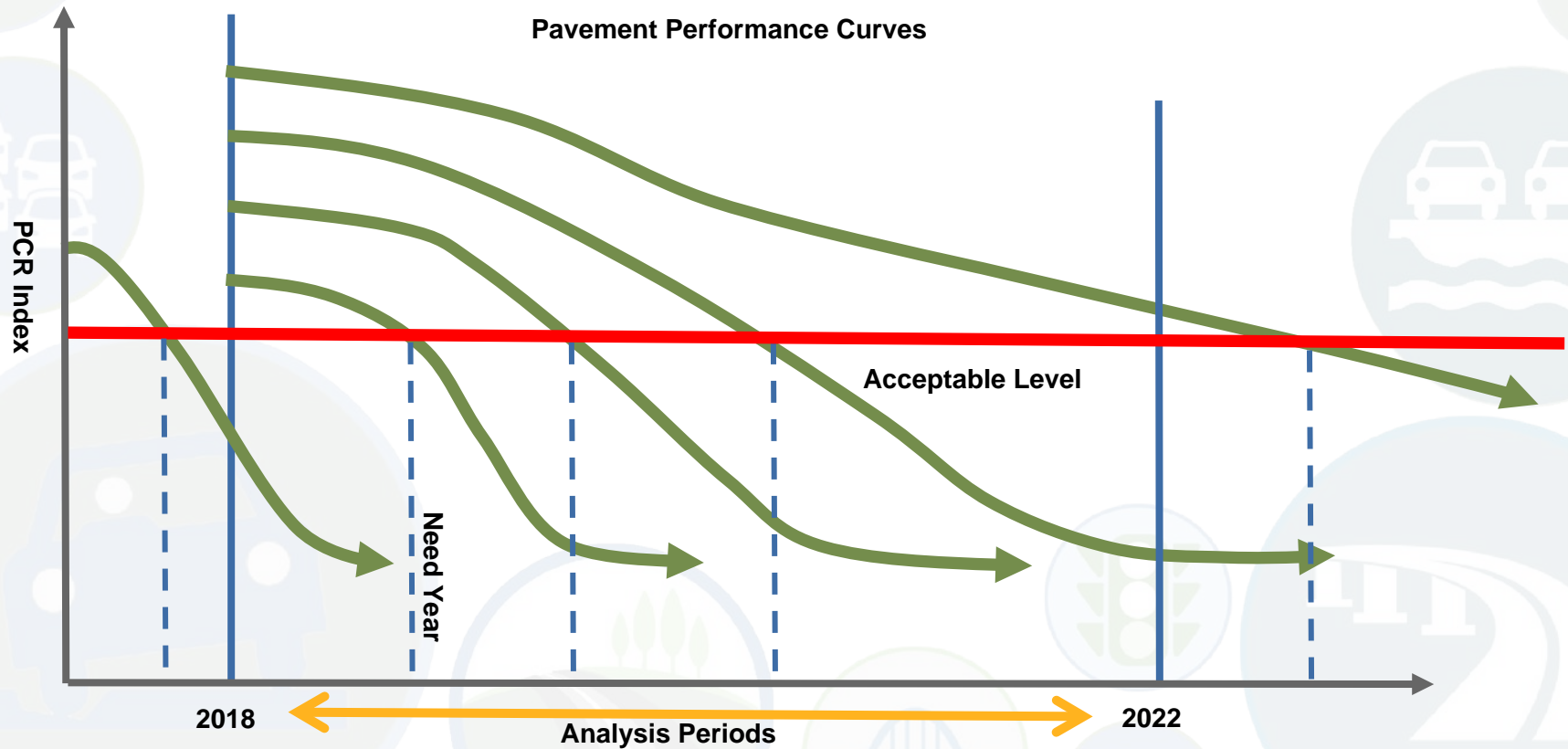
The Appendix includes all the backlog pavement treatments. As illustrated, the 2018 backlog treatment list includes segments which their 2018 PCRs are below the minimum acceptable level and are recommended with various reconstruction treatments. There are 11 segments in the 2018 backlog list with the total of 16 lane miles. The 2018 backlog cost of the recommended treatments is over 15 million dollars.

**PART III: MAINTENANCE & REHABILITATION (M&R) PROGRAM**

In order to estimate the preventive maintenance and rehabilitation requirements of a pavement network over a period of time, the first step is to determine the “Need Year” or when a pavement segment requires rehabilitation. The “Need Year” of a pavement is defined as the year in which the pavement condition falls below a critical level. Pavement condition of a road segment deteriorates under traffic, climate, etc. and consequently its PCR value is reduced. Without any treatments and depending on the deteriorating factors, pavements perform differently and Figure 2 depicts the typical acceptable level and “Need Year” relation for several road segments. As shown, the definition of the acceptable level is a critical factor in determining the “Need Year” for any road segment.

In this study, the critical level is set by the minimum acceptable PCR. As mentioned earlier, In the NOACA region, the minimum acceptable PCR for the arterial roadway function class is 55 and for the major and minor collector is 50.

**Figure 2: The PCR Acceptable Level and “Need Year” Relation**





## PART IV: COMPARATIVE ANALYSIS

The current NOACA transportation asset management policy includes two strategies

- Maintain 15% Deficiency: this strategy attempts to maintain the total lane-miles with PCR below the acceptable level no more than 15%.
- Maintain an Average Network PCR of 80: applies a set of maintenance treatments in order to keep the roadway network average PCR more than, or equal to 80 over the study period.

This section compares the discussed backlog and the “M&R” program treatments with the NOACA transportation asset management strategies.

In addition to the above strategies, this comparative analysis considers another scenario as the minimum benchmark. The “Maintain Lowest Standard PCR” treatment strategy is based on the minimum PCR thresholds of 55 for arterials and 50 for collectors and a set of annual budget constraints. The annual budget constraints are calculated in three steps: First, the segments with the “M&R” recommended implementation in each specific analysis year are selected. Second, a subset of the selected segments which their “Need Years” are in the analysis period are identified. It should be noted that the selected segments with the “Need Year” beyond the analysis period are excluded from the budget constraint calculation. Third, the “M&R” treatment costs for the identified segments in the second step, are added together to provide an annual budget constraint for this scenario.

As discussed, all the above scenarios apply a decision tree approach to determine technically feasible maintenance and rehabilitation strategies for each segment requiring rehabilitation during the five-year period.

Table 4 summarizes the comparison results of all the above scenarios over the five-year period for the City of Elyria. In this table, the “5-Year Total Required Dollars” column shows the accumulation of the annual costs over five years calculated based on inflation-adjusted dollars for each strategy. Also, the Network average PCR is the lane-mile weighted average.

**Table 4: Performance Comparison of the Constraint Scenarios**

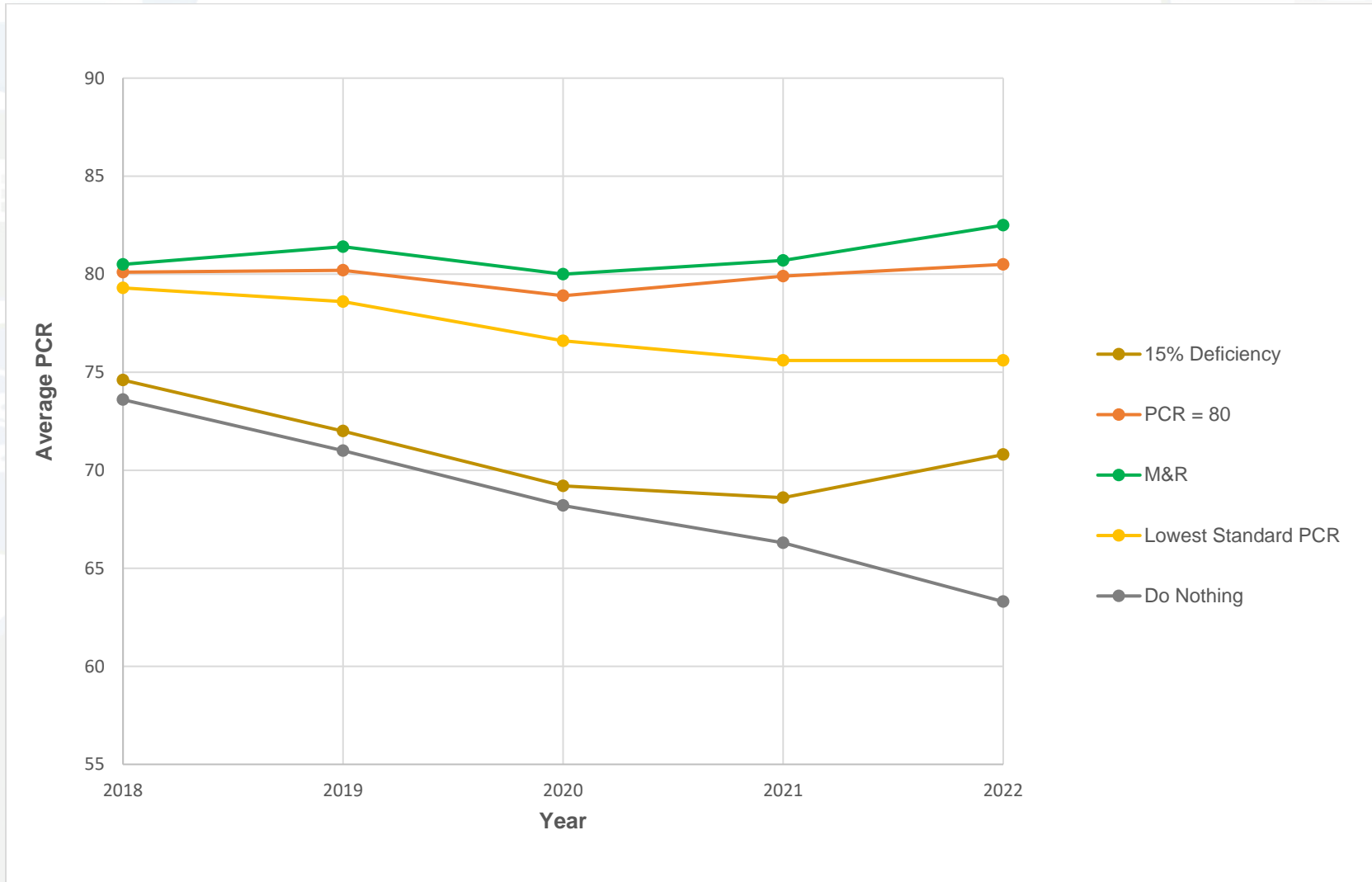
Maintenance Strategy	Strategy Group	5-Year Total Required Dollars	Network Average PCR	Network PCR at the End of the 5-Year Period	Percent of Pavement below the Minimum PCR
2018 Current Backlog	2018 Backlog	15,514,520	80.6	-	0%
Maintain 15% Deficiency	NOACA Transportation Asset Management Targets	2,027,302	71	70.8	13.8%
Maintain an Average Network PCR of 80		4,766,853	79.9	80.5	5.4%
M&R Program	Scenarios	5,355,308	81	82.5	1.3%
Maintain Lowest Standard PCR		3,518,351	77.1	75.6	1.9%

Note: The backlog required budget is for the year of 2018 only.

The Appendix lists all the treatments with their implementation years in the period of 2018 to 2022 for the above maintenance strategies.

Figure 3 illustrates the annual network average PCR for the discussed maintenance and rehabilitation strategies. It should be noted that the backlog scenario has only one value of 80.6 for 2018.

**Figure 3: Average PCR Comparison by the Constraint Scenarios and by Year**



As expected, the treatments of the “M&R” program maintain the pavement network condition with the highest network average PCR. This strategy requires a budget of over five million dollars during the analysis period.

The “Maintain an Average Network PCR of 80” scenario provides almost the same level of condition with a similar high budget requirement. The “Maintain Lowest Standard PCR” requires about two million dollars budget less than that of the “M&R” program. About two percent of pavements will be below the minimum PCR with the suggested treatment options in the “Maintain Lowest Standard PCR” treatment strategy.

In contrary to the above high costs scenarios, one other low budget scenario of “Maintain 15% deficiency” maintains the network pavement conditions in an acceptable level with almost 40 percent of the required budget for the “M&R” program. However, about 14 percent of the network pavement conditions will be below the minimum acceptable PCR.

It should be noted that the backlog cost as the benchmark is three times more than the “M&R” program cost and both strategies have a similar network average PCR. This comparison indicates that the annual maintenance investment provides a better pavement management policy with much smaller budget than the reconstruction treatments with high costs.

APPENDIX

2018 Current Backlog

**Pavement Treatment List**

ROAD NAME	FROM	TO	RECOMMENDATION TREATMENT	LANE-MILES	TREATMENT COST
BURNS RD	GULF RD	SR 301 (ABBE RD)	MINOR REHAB WITHOUT REPAIRS (AC)	0.78	397,922
CHESTNUT RIDGE RD	AUGUSTA DR	DEFIANCE AVE	MAJOR REHAB/RECONSTRUCTION	1.32	1,756,705
EAST AVE	16TH ST	4TH ST	MAJOR REHAB/RECONSTRUCTION	3.60	2,395,498
INFIRMARY RD	MURRAY RIDGE RD	WEST RIVER RD	MAJOR REHAB/RECONSTRUCTION	2.24	2,235,792
LEONA ST	MIDWAY BLVD	GRISWOLD RD	MINOR REHAB WITHOUT REPAIRS (AC)	0.52	259,512
LOWELL ST	ELYRIA TWP ECL	PENFIELD AVE	MAJOR REHAB/RECONSTRUCTION	0.56	698,687
LOWELL ST	ELYRIA WCL	ELYRIA/ELYRIA TWP CORP LINE	MAJOR REHAB/RECONSTRUCTION	1.44	1,676,852
MUSSEY AVE	WEST RIVER RD	0.18 MILES W OF WEST AVE	MAJOR REHAB/RECONSTRUCTION	0.54	673,734
SR 113	CLEMENS AVE	SR 57 (LORAIN BLVD)	MAJOR REHAB/RECONSTRUCTION	2.16	2,155,955
US 20	US 20 / SR 57	ELYRIA ECL	MAJOR REHAB/RECONSTRUCTION	1.72	2,145,967
W RIVER RD	CARLISLE TWP NCL	INFIRMARY RD	MAJOR REHAB/RECONSTRUCTION	1.12	1,117,896
<b>REQUIRED BACKLOG BUDGET (2018\$)</b>					<b>\$15,514,520</b>

**Maintain 15% Deficiency**

**Pavement Treatment List**

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2021\$)	YEAR
BROAD ST	ABBE RD	EAST OF US 20	CRACK FILL & SLURRY	0.40	14,323	2021
E BRIDGE ST	EAST BROAD ST	GULF RD / CLEVELAND ST	SELECTIVE PATCH, MILL & 1.5" O/L	1.92	171,879	2021
GRISWOLD RD	TILLOTSON ST	WEST RIVER RD	JOINT REPAIR	0.60	12,032	2021
LAKE AVE	FURNACE ST	LORAIN BLVD	PREVENTATIVE MAINTENANCE MINOR	1.04	29,482	2021
OBERLIN ELYRIA RD	CARLISLE TWP / ELYRIA CORP LINE	WEST AVE	SELECTIVE PATCH, MILL & 1.5" O/L	1.40	175,459	2021
SR 113	CLEMENS AVE	SR 57 (LORAIN BLVD)	2.0IN. HOT MIX MILL & OVERLAY	2.16	293,913	2021
<b>THE 2021 REQUIRED BUDGET FOR THE "MAINTAIN 15% DEFICIENCY" STRATEGY</b>					<b>\$697,088</b>	

**Maintain 15% Deficiency**

**Pavement Treatment List (Continued)**

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2022\$)	YEAR
BROAD ST	EAST RIVER ST	PROSPECT ST	SELECTIVE PATCH, MILL & 1.5" O/L	1.84	143,481	2022
BROAD ST	PROSPECT ST	ABBE RD	SELECTIVE PATCH, MILL & 1.5" O/L	1.18	140,729	2022
CLEVELAND ST	GULF ST	US 20 / SR 57 (JFK MEMORIAL PKWY)	SELECTIVE PATCH, MILL & 1.5" O/L	3.96	363,291	2022
LAKE AVE	SR 113 (JFK MEMORIAL PKWY)	PARMELY AVE	SELECTIVE PATCH, MILL & 1.5" O/L	0.44	72,659	2022
SR 113	SR 57 (LORAIN BLVD)	CLEMENS AVE	2.0IN. HOT MIX MILL & OVERLAY	2.16	301,202	2022
SR 57	0.15 MILES N OF BEECHWOOD DR	SR 113	CRACK FILL & SLURRY	3.98	107,103	2022
SR 57	SR 113	0.15 MILES N OF BEECHWOOD DR	CRACK FILL & SLURRY	3.98	107,103	2022
W RIVER RD	SR 57 (JFK MEMORIAL PKWY)	GRISWOLD RD	JOINT REPAIR	4.96	94,646	2022
<b>THE 2022 REQUIRED BUDGET FOR THE "MAINTAIN 15% DEFICIENCY" STRATEGY</b>					<b>\$1,330,214</b>	

**Note: The "Maintain 15% Deficiency" strategy does not have any pavement maintenance treatments with the recommended implementation years of 2018, 2019, and 2020.**

**Maintain an Average Network PCR of 80**

**Pavement Treatment List**

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2018\$)	YEAR
BROAD ST	E BROAD ST	WEST AVE	PREVENTATIVE MAINTENANCE MINOR	0.40	15,526	2018
BROAD ST	LAKE AVE	CEDAR ST	PREVENTATIVE MAINTENANCE MINOR	0.60	28,280	2018
CHESTNUT RIDGE RD	AUGUSTA DR	DEFIANCE AVE	2.0IN. HOT MIX MILL & OVERLAY	1.32	222,516	2018
EAST AVE	16TH ST	4TH ST	SELECTIVE PATCH, MILL & 1.5" O/L	3.60	239,550	2018
INFIRMARY RD	MURRAY RIDGE RD	WEST RIVER RD	2.0IN. HOT MIX MILL & OVERLAY	2.24	283,200	2018
LOWELL ST	ELYRIA TWP ECL	PENFIELD AVE	SELECTIVE PATCH, MILL & 1.5" O/L	0.56	69,869	2018
LOWELL ST	ELYRIA WCL	ELYRIA / ELYRIA TWP CORP LINE	SELECTIVE PATCH, MILL & 1.5" O/L	1.44	167,685	2018
MUSSEY AVE	WEST RIVER RD	0.18 MILES WEST OF WEST AVE	SELECTIVE PATCH, MILL & 1.5" O/L	0.54	67,373	2018
SR 57	CLEVELAND ST / US 20	SR 113	PREVENTATIVE MAINTENANCE MINOR	5.42	180,328	2018
SR 113	CLEMENS AVE	SR 57 (LORAIN BLVD)	SELECTIVE PATCH, MILL & 1.5" O/L	2.16	215,595	2018
W 3RD ST	3RD ST	S GATEWAY BLVD	JOINT REPAIR	0.72	10,540	2018
W RIVER RD	CARLISLE TWP NCL	INFIRMARY RD	SELECTIVE PATCH, MILL & 1.5" O/L	1.12	111,790	2018
<b>THE 2018 REQUIRED BUDGET FOR THE "MAINTAIN AN AVERAGE NETWORK PCR OF 80" STRATEGY</b>					<b>\$1,612,252</b>	

**Maintain an Average Network PCR of 80**

**Pavement Treatment List (Continued)**

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2019\$)	YEAR
2ND ST	EAST AVE	MIDDLE AVE	PREVENTATIVE MAINTENANCE MINOR	0.64	18,184	2019
2ND ST	WEST AVE	S GATEWAY BLVD	CRACK FILL & SLURRY	1.60	40,006	2019
3RD ST	WEST AVE	EAST AVE	SELECTIVE PATCH, MILL & 1.5" O/L	0.68	98,538	2019
4TH ST	EAST AVE	EAST RIVER RD	PREVENTATIVE MAINTENANCE MINOR	0.72	21,481	2019
BROAD ST	CEDAR ST	EAST BRIDGE ST	PREVENTATIVE MAINTENANCE MINOR	0.36	10,229	2019
BURNS RD	GULF RD	SR 301 (ABBE RD)	SELECTIVE PATCH, MILL & 1.5" O/L	0.78	76,461	2019
MURRAY RIDGE RD	0.1 MILES NORTH OF LEO BULLOCKS PKWY	0.2 MILES NORTH OF LOWELL ST	PREVENTATIVE MAINTENANCE MINOR	1.44	49,098	2019
MURRAY RIDGE RD	ELYRIA / ELYRIA TWP CORP LINE	APOLLO DR	PREVENTATIVE MAINTENANCE MINOR	0.44	15,002	2019
MURRAY RIDGE RD	LEO BULLOCKS PKWY	0.1 MILES NORTH OF LEO BULLOCKS PKWY	PREVENTATIVE MAINTENANCE MINOR	0.40	13,638	2019
N GATEWAY BLVD	ERIE ST	LAKE AVE	PREVENTATIVE MAINTENANCE MINOR	0.16	8,183	2019
OBERLIN ELYRIA RD	WEST AVE	MIDDLE AVE	SELECTIVE PATCH, MILL & 1.5" O/L	1.16	138,429	2019
SR 113	SR 57 (LORAIN BLVD)	CLEMENS AVE	SELECTIVE PATCH, MILL & 1.5" O/L	2.16	220,942	2019
W RIVER RD	GRISWOLD RD	FACKLER AVE	CRACK FILL & SLURRY	5.04	183,300	2019
W RIVER RD	INFIRMARY RD	S GATEWAY BLVD	PREVENTATIVE MAINTENANCE MINOR	0.48	17,048	2019
W RIVER RD	S GATEWAY BLVD	HURON ST / N GATEWAY BLVD	CRACK FILL & SLURRY	0.36	10,843	2019
<b>THE 2019 REQUIRED BUDGET FOR THE "MAINTAIN AN AVERAGE NETWORK PCR OF 80" STRATEGY</b>					<b>\$921,382</b>	

**Maintain an Average Network PCR of 80**

**Pavement Treatment List (Continued)**

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2020\$)	YEAR
2ND ST	MIDDLE AVE	WEST AVE	PREVENTATIVE MAINTENANCE MINOR	0.34	9,900	2020
3RD ST	S GATEWAY BLVD	WEST AVE	CRACK FILL & SLURRY	0.80	26,090	2020
EAST RIVER RD	4TH ST	EAST BROAD ST	CRACK FILL & SLURRY	0.72	25,158	2020
LEONA ST	MIDWAY BLVD	GRISWOLD RD	SELECTIVE PATCH, MILL & 1.5" O/L	0.52	51,102	2020
TILLOTSON ST	MIDWAY BLVD	GRISWOLD BLVD	PREVENTATIVE MAINTENANCE MINOR	0.52	16,656	2020
TURNER BLVD	WEST RIDGE RD	BRUNSWICK DR	PREVENTATIVE MAINTENANCE MINOR	0.38	21,023	2020
W RIVER RD	FLORADALE ST / LOUISIANA AVE	SR 57 (JFK MEMORIAL PKWY)	PREVENTATIVE MAINTENANCE MINOR	0.52	18,169	2020
W RIVER RD	S GATEWAY BLVD	3RD ST	SELECTIVE PATCH, MILL & 1.5" O/L	1.02	106,921	2020
WEST BRIDGE ST	WEST RIVER RD	EAST BROAD ST	PREVENTATIVE MAINTENANCE MINOR	1.32	34,592	2020
<b>THE 2020 REQUIRED BUDGET FOR THE "MAINTAIN AN AVERAGE NETWORK PCR OF 80" STRATEGY</b>					<b>\$309,611</b>	

**Maintain an Average Network PCR of 80**

**Pavement Treatment List (Continued)**

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2021\$)	YEAR
BROAD ST	ABBE RD	EAST OF US 20	CRACK FILL & SLURRY	0.40	14,323	2021
BROAD ST	WEST BRIDGE ST	LAKE AVE	PREVENTATIVE MAINTENANCE MINOR	1.12	46,789	2021
BULLOCKS PKWY	LEO BULLOCKS PKWY	S GATEWAY BLVD	SELECTIVE PATCH, MILL & 1.5" O/L	0.72	70,901	2021
E BRIDGE ST	EAST BROAD ST	GULF RD / CLEVELAND ST	SELECTIVE PATCH, MILL & 1.5" O/L	1.92	171,879	2021
EAST AVE	16TH ST	4TH ST	CRACK FILL	3.60	13,750	2021
EAST AVE	4TH ST	EAST BROAD ST	PREVENTATIVE MAINTENANCE MINOR	1.00	29,840	2021
GRISWOLD RD	TILLOTSON ST	WEST RIVER RD	JOINT REPAIR	0.60	12,032	2021
GULF RD	BURNS RD	WINDBROOK CT	PREVENTATIVE MAINTENANCE MINOR	1.22	50,967	2021
LAKE AVE	FURNACE ST	LORAIN BLVD	PREVENTATIVE MAINTENANCE MINOR	1.04	29,482	2021
LAKE AVE	LORAIN BLVD	ERIE ST	PREVENTATIVE MAINTENANCE MINOR	0.64	25,782	2021
LORAIN BLVD	FREMONT ST	LAKE AVE	CRACK FILL & SLURRY	0.56	13,368	2021
LORAIN BLVD	WEST RIVER RD	FREMONT ST	CRACK FILL & SLURRY	0.12	2,865	2021
LOWELL ST	ELYRIA TWP ECL	PENFIELD AVE	CRACK FILL	0.56	4,011	2021
LOWELL ST	ELYRIA WCL	ELYRIA / ELYRIA TWP CORP LINE	CRACK FILL	1.44	9,625	2021
MIDWAY BLVD	TILLOTSON ST	WEST RIVER RD	PREVENTATIVE MAINTENANCE MINOR	0.58	32,884	2021
MUSSEY AVE	WEST RIVER RD	0.18 MILES W OF WEST AVE	CRACK FILL	0.54	3,867	2021
N GATEWAY BLVD	LAKE AVE	WEST RIVER RD	PREVENTATIVE MAINTENANCE MINOR	0.62	22,201	2021
OBERLIN ELYRIA RD	CARLISLE TWP / ELYRIA CORP LINE	WEST AVE	SELECTIVE PATCH, MILL & 1.5" O/L	1.40	175,459	2021

**Maintain an Average Network PCR of 80**

**Pavement Treatment List (Continued)**

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2021\$)	YEAR
S GATEWAY BLVD	WEST RIVER RD / FILBERT ST	WEST RIVER RD	PREVENTATIVE MAINTENANCE MINOR	1.66	66,872	2021
SR 113	CLEMENS AVE	SR 57 (LORAIN BLVD)	CRACK FILL	2.16	12,375	2021
SR 301	SR 57	ANTIOCH DR	PREVENTATIVE MAINTENANCE MINOR	8.32	359,990	2021
W RIDGE RD	OLD WEST RIDGE RD	ELYRIA NCL	PREVENTATIVE MAINTENANCE MINOR	0.38	14,741	2021
W RIVER RD	2ND ST	S GATEWAY BLVD	PREVENTATIVE MAINTENANCE MINOR	0.52	21,723	2021
W RIVER RD	CARLISLE TWP NCL	INFIRMARY RD	CRACK FILL	1.12	6,417	2021
W RIVER RD	LAKE AVE	FURNACE ST	SELECTIVE PATCH, MILL & 1.5" O/L	0.70	87,730	2021
<b>THE 2021 REQUIRED BUDGET FOR THE "MAINTAIN AN AVERAGE NETWORK PCR OF 80" STRATEGY</b>					<b>\$1,299,873</b>	

**Maintain an Average Network PCR of 80**

**Pavement Treatment List (Continued)**

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2021\$)	YEAR
3RD ST	WEST AVE	EAST AVE	CRACK FILL	0.68	5,656	2022
BROAD ST	EAST RIVER ST	PROSPECT ST	SELECTIVE PATCH, MILL & 1.5" O/L	1.84	143,481	2022
BROAD ST	PROSPECT ST	ABBE RD	SELECTIVE PATCH, MILL & 1.5" O/L	1.18	140,729	2022
BURNS RD	GULF RD	SR 301 (ABBE RD)	CRACK FILL	0.78	4,389	2022
OBERLIN ELYRIA RD	WEST AVE	MIDDLE AVE	CRACK FILL	1.16	7,946	2022
SR 57	0.15 MILES NORTH OF BEECHWOOD DR	SR 113	CRACK FILL & SLURRY	3.98	107,103	2022
SR 57	SR 113	0.15 MILES NORTH OF BEECHWOOD DR	CRACK FILL & SLURRY	3.98	107,103	2022
SR 113	SR 57 (LORAIN BLVD)	CLEMENS AVE	CRACK FILL	2.16	12,682	2022
W RIVER RD	SR 57 (JFK MEMORIAL PKWY)	GRISWOLD RD	JOINT REPAIR	4.96	94,646	2022
<b>THE 2022 REQUIRED BUDGET FOR THE "MAINTAIN AN AVERAGE NETWORK PCR OF 80" STRATEGY</b>					<b>\$623,735</b>	

**M&R Program**

**Pavement Treatment List**

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2018\$)	YEAR
BROAD ST	E BROAD ST	WEST AVE	PREVENTATIVE MAINTENANCE MINOR	0.40	15,526	2018
BROAD ST	LAKE AVE	CEDAR ST	PREVENTATIVE MAINTENANCE MINOR	0.60	28,280	2018
CHESTNUT RIDGE RD	AUGUSTA DR	DEFIANCE AVE	2.0IN. HOT MIX MILL & OVERLAY	1.32	222,516	2018
EAST AVE	16TH ST	4TH ST	SELECTIVE PATCH, MILL & 1.5" O/L	3.60	239,550	2018
GRISWOLD RD	TILLOTSON ST	WEST RIVER RD	JOINT REPAIR	0.60	11,179	2018
INFIRMARY RD	MURRAY RIDGE RD	WEST RIVER RD	2.0IN. HOT MIX MILL & OVERLAY	2.24	283,200	2018
LOWELL ST	ELYRIA TWP ECL	PENFIELD AVE	SELECTIVE PATCH, MILL & 1.5" O/L	0.56	69,869	2018
LOWELL ST	ELYRIA WCL	ELYRIA / ELYRIA TWP CORP LINE	SELECTIVE PATCH, MILL & 1.5" O/L	1.44	167,685	2018
MURRAY RIDGE RD	0.1 MILES N OF LEO BULLOCKS PKWY	0.2 MILES NORTH OF LOWELL ST	PREVENTATIVE MAINTENANCE MINOR	1.44	47,910	2018
MURRAY RIDGE RD	ELYRIA / ELYRIA TWP CORP LINE	APOLLO DR	PREVENTATIVE MAINTENANCE MINOR	0.44	14,639	2018
MUSSEY AVE	WEST RIVER RD	0.18 MILES WEST OF WEST AVE	SELECTIVE PATCH, MILL & 1.5" O/L	0.54	67,373	2018
SR 113	CLEMENS AVE	SR 57 (LORAIN BLVD)	SELECTIVE PATCH, MILL & 1.5" O/L	2.16	215,595	2018
SR 57	CLEVELAND ST / US 20	SR 113	PREVENTATIVE MAINTENANCE MINOR	5.42	180,328	2018
W 3RD ST	3RD ST	S GATEWAY BLVD	JOINT REPAIR	0.72	10,540	2018
W RIVER RD	CARLISLE TWP NCL	INFIRMARY RD	SELECTIVE PATCH, MILL & 1.5" O/L	1.12	111,790	2018
WEST BRIDGE ST	WEST RIVER RD	EAST BROAD ST	PREVENTATIVE MAINTENANCE MINOR	1.32	32,938	2018
<b>THE 2018 REQUIRED BUDGET FOR THE "M&amp;R" PROGRAM</b>					<b>\$1,718,918</b>	

**M&R Program**

**Pavement Treatment List (Continued)**

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2019\$)	YEAR
2ND ST	EAST AVE	MIDDLE AVE	PREVENTATIVE MAINTENANCE MINOR	0.64	18,184	2019
3RD ST	WEST AVE	EAST AVE	SELECTIVE PATCH, MILL & 1.5" O/L	0.68	98,538	2019
4TH ST	EAST AVE	EAST RIVER RD	PREVENTATIVE MAINTENANCE MINOR	0.72	21,481	2019
BROAD ST	CEDAR ST	EAST BRIDGE ST	PREVENTATIVE MAINTENANCE MINOR	0.36	10,229	2019
BULLOCKS PKWY	LEO BULLOCKS PKWY	S GATEWAY BLVD	SELECTIVE PATCH, MILL & 1.5" O/L	0.72	67,511	2019
BURNS RD	GULF RD	SR 301 (ABBE RD)	SELECTIVE PATCH, MILL & 1.5" O/L	0.78	76,461	2019
LEONA ST	MIDWAY BLVD	GRISWOLD RD	SELECTIVE PATCH, MILL & 1.5" O/L	0.52	49,865	2019
MURRAY RIDGE RD	LEO BULLOCKS PKWY	0.1 MILES NORTH OF LEO BULLOCKS PKWY	PREVENTATIVE MAINTENANCE MINOR	0.40	13,638	2019
N GATEWAY BLVD	ERIE ST	LAKE AVE	PREVENTATIVE MAINTENANCE MINOR	0.16	8,183	2019
OBERLIN ELYRIA RD	WEST AVE	MIDDLE AVE	SELECTIVE PATCH, MILL & 1.5" O/L	1.16	138,429	2019
SR 113	SR 57 (LORAIN BLVD)	CLEMENS AVE	SELECTIVE PATCH, MILL & 1.5" O/L	2.16	220,942	2019
W RIVER RD	INFIRMARY RD	S GATEWAY BLVD	PREVENTATIVE MAINTENANCE MINOR	0.48	17,048	2019
W RIVER RD	SR 57 (JFK MEMORIAL PKWY)	GRISWOLD RD	JOINT REPAIR	4.96	87,940	2019
<b>THE 2019 REQUIRED BUDGET FOR THE "M&amp;R" PROGRAM</b>					<b>\$828,449</b>	

**M&R Program**

**Pavement Treatment List (Continued)**

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2020\$)	YEAR
2ND ST	MIDDLE AVE	WEST AVE	PREVENTATIVE MAINTENANCE MINOR	0.34	9,900	2020
3RD ST	S GATEWAY BLVD	WEST AVE	CRACK FILL & SLURRY	0.80	26,090	2020
EAST RIVER RD	4TH ST	EAST BROAD ST	CRACK FILL & SLURRY	0.72	25,158	2020
TILLOTSON ST	MIDWAY BLVD	GRISWOLD BLVD	PREVENTATIVE MAINTENANCE MINOR	0.52	16,656	2020
TURNER BLVD	WEST RIDGE RD	BRUNSWICK DR	PREVENTATIVE MAINTENANCE MINOR	0.38	21,023	2020
W RIVER RD	FLORADALE ST / LOUISIANA AVE	SR 57 (JFK MEMORIAL PKWY)	PREVENTATIVE MAINTENANCE MINOR	0.52	18,169	2020
W RIVER RD	S GATEWAY BLVD	3RD ST	SELECTIVE PATCH, MILL & 1.5" O/L	1.02	106,921	2020
<b>THE 2020 REQUIRED BUDGET FOR THE "M&amp;R" PROGRAM</b>					<b>\$223,917</b>	

**M&R Program**

**Pavement Treatment List (Continued)**

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2021\$)	YEAR
BROAD ST	ABBE RD	EAST OF US 20	CRACK FILL & SLURRY	0.40	14,323	2021
BROAD ST	WEST BRIDGE ST	LAKE AVE	PREVENTATIVE MAINTENANCE MINOR	1.12	46,789	2021
E BRIDGE ST	EAST BROAD ST	GULF RD / CLEVELAND ST	SELECTIVE PATCH, MILL & 1.5" O/L	1.92	171,879	2021
EAST AVE	16TH ST	4TH ST	CRACK FILL	3.60	13,750	2021
EAST AVE	4TH ST	EAST BROAD ST	PREVENTATIVE MAINTENANCE MINOR	1.00	29,840	2021
GULF RD	BURNS RD	WINDBROOK CT	PREVENTATIVE MAINTENANCE MINOR	1.22	50,967	2021
LAKE AVE	FURNACE ST	LORAIN BLVD	PREVENTATIVE MAINTENANCE MINOR	1.04	29,482	2021
LAKE AVE	LORAIN BLVD	ERIE ST	PREVENTATIVE MAINTENANCE MINOR	0.64	25,782	2021
LORAIN BLVD	FREMONT ST	LAKE AVE	CRACK FILL & SLURRY	0.56	13,368	2021
LORAIN BLVD	WEST RIVER RD	FREMONT ST	CRACK FILL & SLURRY	0.12	2,865	2021
LOWELL ST	ELYRIA TWP ECL	PENFIELD AVE	CRACK FILL	0.56	4,011	2021
LOWELL ST	ELYRIA WCL	ELYRIA / ELYRIA TWP CORP LINE	CRACK FILL	1.44	9,625	2021
MIDWAY BLVD	TILLOTSON ST	WEST RIVER RD	PREVENTATIVE MAINTENANCE MINOR	0.58	32,884	2021
MUSSEY AVE	WEST RIVER RD	0.18 MILES WEST OF WEST AVE	CRACK FILL	0.54	3,867	2021
N GATEWAY BLVD	LAKE AVE	WEST RIVER RD	PREVENTATIVE MAINTENANCE MINOR	0.62	22,201	2021
OBERLIN ELYRIA RD	CARLISLE TWP / ELYRIA CORP LINE	WEST AVE	SELECTIVE PATCH, MILL & 1.5" O/L	1.40	175,459	2021
S GATEWAY BLVD	WEST RIVER RD / FILBERT ST	WEST RIVER RD	PREVENTATIVE MAINTENANCE MINOR	1.66	66,872	2021

**M&R Program**

**Pavement Treatment List (Continued)**

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2021\$)	YEAR
SR 113	CLEMENS AVE	SR 57 (LORAIN BLVD)	CRACK FILL	2.16	12,375	2021
SR 301	SR 57	ANTIOCH DR	PREVENTATIVE MAINTENANCE MINOR	8.32	359,990	2021
W RIDGE RD	OLD WEST RIDGE RD	ELYRIA NCL	PREVENTATIVE MAINTENANCE MINOR	0.38	14,741	2021
W RIVER RD	2ND ST	S GATEWAY BLVD	PREVENTATIVE MAINTENANCE MINOR	0.52	21,723	2021
W RIVER RD	CARLISLE TWP NCL	INFIRMARY RD	CRACK FILL	1.12	6,417	2021
W RIVER RD	LAKE AVE	FURNACE ST	SELECTIVE PATCH, MILL & 1.5" O/L	0.70	87,730	2021
<b>THE 2021 REQUIRED BUDGET FOR THE "M&amp;R" PROGRAM</b>					<b>\$1,216,940</b>	

**M&R Program**

**Pavement Treatment List (Continued)**

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2022\$)	YEAR
2ND ST	EAST AVE	MIDDLE AVE	CRACK FILL & SLURRY	0.64	15,657	2022
3RD ST	WEST AVE	EAST AVE	CRACK FILL	0.68	5,656	2022
BROAD ST	EAST BRIDGE ST	EAST RIVER ST	SELECTIVE PATCH, MILL & 1.5" O/L	0.68	62,383	2022
BROAD ST	EAST OF US 20	ELYRIA ECL	PREVENTATIVE MAINTENANCE MINOR	0.58	23,057	2022
BROAD ST	EAST RIVER ST	PROSPECT ST	SELECTIVE PATCH, MILL & 1.5" O/L	1.84	143,481	2022
BROAD ST	PROSPECT ST	ABBE RD	SELECTIVE PATCH, MILL & 1.5" O/L	1.18	140,729	2022
BULLOCKS PKWY	LEO BULLOCKS PKWY	S GATEWAY BLVD	CRACK FILL	0.72	3,875	2022
BURNS RD	GULF RD	SR 301 (ABBE RD)	CRACK FILL	0.78	4,389	2022
CLEVELAND ST	GULF ST	US 20 / SR 57 (JFK MEMORIAL PKWY)	SELECTIVE PATCH, MILL & 1.5" O/L	3.96	363,291	2022
LAKE AVE	ERIE ST	OAK ST	PREVENTATIVE MAINTENANCE MINOR	1.72	55,228	2022
LAKE AVE	SR 113 (JFK MEMORIAL PKWY)	PARMELY AVE	SELECTIVE PATCH, MILL & 1.5" O/L	0.44	72,659	2022
LEONA ST	MIDWAY BLVD	GRISWOLD RD	CRACK FILL	0.52	2,862	2022
MURRAY RIDGE RD	0.1 MILES N OF LEO BULLOCKS PKWY	0.2 MILES NORTH OF LOWELL ST	PREVENTATIVE MAINTENANCE MINOR	1.44	52,842	2022
MURRAY RIDGE RD	INFIRMARY RD	ELYRIA NCL	SELECTIVE PATCH, MILL & 1.5" O/L	0.70	89,905	2022
OBERLIN ELYRIA RD	WEST AVE	MIDDLE AVE	CRACK FILL	1.16	7,946	2022
SR 113	SR 57 (LORAIN BLVD)	CLEMENS AVE	CRACK FILL	2.16	12,682	2022
SR 57	0.15 MILES NORTH OF BEECHWOOD DR	SR 113	CRACK FILL & SLURRY	3.98	107,103	2022

**M&R Program**

**Pavement Treatment List (Continued)**

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2022\$)	YEAR
SR 57	SR 113	0.15 MILES NORTH OF BEECHWOOD DR	CRACK FILL & SLURRY	3.98	107,103	2022
W RIDGE RD	FOX CHASE DR	ELYRIA NCL	PREVENTATIVE MAINTENANCE MINOR	1.68	71,925	2022
W RIVER RD	N GATEWAY BLVD	FREMONT ST	PREVENTATIVE MAINTENANCE MINOR	0.60	24,311	2022
<b>THE 2022 REQUIRED BUDGET FOR THE "M&amp;R" PROGRAM</b>					<b>\$1,367,084</b>	

**Maintain Lowest Standard PCR**

**Pavement Treatment List**

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2018\$)	YEAR
BROAD ST	EAST BRIDGE ST	EAST RIVER ST	PREVENTATIVE MAINTENANCE MINOR	0.68	18,853	2018
BULLOCKS PKWY	LEO BULLOCKS PKWY	S GATEWAY BLVD	PREVENTATIVE MAINTENANCE MINOR	0.72	21,959	2018
BURNS RD	GULF RD	SR 301 (ABBE RD)	MICRO - PAVE (TYPE II SURF. TR.)	0.78	35,912	2018
CHESTNUT RIDGE RD	AUGUSTA DR	DEFIANCE AVE	2.0IN. HOT MIX MILL & OVERLAY	1.32	222,516	2018
EAST AVE	16TH ST	4TH ST	SELECTIVE PATCH, MILL & 1.5" O/L	3.60	239,550	2018
INFIRMARY RD	MURRAY RIDGE RD	WEST RIVER RD	2.0IN. HOT MIX MILL & OVERLAY	2.24	283,200	2018
LEONA ST	MIDWAY BLVD	GRISWOLD RD	MICRO - PAVE (TYPE II SURF. TR.)	0.52	23,421	2018
LOWELL ST	ELYRIA TWP ECL	PENFIELD AVE	SELECTIVE PATCH, MILL & 1.5" O/L	0.56	69,869	2018
LOWELL ST	ELYRIA WCL	ELYRIA / ELYRIA TWP CORP LINE	SELECTIVE PATCH, MILL & 1.5" O/L	1.44	167,685	2018
MUSSEY AVE	WEST RIVER RD	0.18 MILES WEST OF WEST AVE	SELECTIVE PATCH, MILL & 1.5" O/L	0.54	67,373	2018
SR 113	SR 57 (LORAIN BLVD)	CLEMENS AVE	MICRO - PAVE (TYPE II SURF. TR.)	2.16	103,773	2018
W 3RD ST	3RD ST	S GATEWAY BLVD	JOINT REPAIR	0.72	10,540	2018
W RIVER RD	CARLISLE TWP NCL	INFIRMARY RD	SELECTIVE PATCH, MILL & 1.5" O/L	1.12	111,790	2018
<b>THE 2018 REQUIRED BUDGET FOR THE "MAINTAIN LOWEST STANDARD PCR" STRATEGY</b>					<b>\$1,376,441</b>	

**Maintain Lowest Standard PCR**

**Pavement Treatment List (Continued)**

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2019\$)	YEAR
15TH ST	WEST AVE	MIDDLE AVE	PREVENTATIVE MAINTENANCE MINOR	0.34	9,661	2019
3RD ST	WEST AVE	EAST AVE	SELECTIVE PATCH, MILL & 1.5" O/L	0.68	98,538	2019
E BRIDGE ST	EAST BROAD ST	GULF RD / CLEVELAND ST	MICRO - PAVE (TYPE II SURF. TR.)	1.92	78,775	2019
HURON ST	TUSCARAWAS ST	FREMONT ST	MICRO - PAVE (TYPE II SURF. TR.)	0.14	8,616	2019
MURRAY RIDGE RD	INFIRMARY RD	ELYRIA NCL	MICRO - PAVE (TYPE II SURF. TR.)	0.70	40,208	2019
OBERLIN ELYRIA RD	WEST AVE	MIDDLE AVE	SELECTIVE PATCH, MILL & 1.5" O/L	1.16	138,429	2019
SR 113	CLEMENS AVE	SR 57 (LORAIN BLVD)	SELECTIVE PATCH, MILL & 1.5" O/L	2.16	220,942	2019
W RIVER RD	S GATEWAY BLVD	3RD ST	MICRO - PAVE (TYPE II SURF. TR.)	1.02	50,219	2019
<b>THE 2019 REQUIRED BUDGET FOR THE "MAINTAIN LOWEST STANDARD PCR" STRATEGY</b>					<b>\$645,388</b>	
ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2020\$)	YEAR
MUSSEY AVE	0.18 MILES WEST OF WEST AVE	WEST AVE	MICRO - PAVE (TYPE II SURF. TR.)	0.36	22,705	2020
OBERLIN ELYRIA RD	CARLISLE TWP / ELYRIA CORP LINE	WEST AVE	MICRO - PAVE (TYPE II SURF. TR.)	1.40	82,411	2020
<b>THE 2020 REQUIRED BUDGET FOR THE "MAINTAIN LOWEST STANDARD PCR" STRATEGY</b>					<b>\$105,116</b>	

**Maintain Lowest Standard PCR**

**Pavement Treatment List (Continued)**

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2021\$)	YEAR
BROAD ST	EAST RIVER ST	PROSPECT ST	MICRO - PAVE (TYPE II SURF. TR.)	1.84	67,391	2021
BURNS RD	GULF RD	SR 301 (ABBE RD)	SELECTIVE PATCH, MILL & 1.5" O/L	0.78	80,300	2021
EAST AVE	16TH ST	4TH ST	CRACK FILL	3.60	13,750	2021
LEONA ST	MIDWAY BLVD	GRISWOLD RD	SELECTIVE PATCH, MILL & 1.5" O/L	0.52	52,369	2021
LORAIN BLVD	WEST RIVER RD	FREMONT ST	CRACK FILL & SLURRY	0.12	2,865	2021
LOWELL ST	ELYRIA TWP ECL	PENFIELD AVE	CRACK FILL	0.56	4,011	2021
LOWELL ST	ELYRIA WCL	ELYRIA / ELYRIA TWP CORP LINE	CRACK FILL	1.44	9,625	2021
MUSSEY AVE	WEST RIVER RD	0.18 MILES WEST OF WEST AVE	CRACK FILL	0.54	3,867	2021
SR 113	SR 57 (LORAIN BLVD)	CLEMENS AVE	SELECTIVE PATCH, MILL & 1.5" O/L	2.16	232,037	2021
W RIVER RD	3RD ST	2ND ST	MICRO - PAVE (TYPE II SURF. TR.)	0.18	10,859	2021
W RIVER RD	CARLISLE TWP NCL	INFIRMARY RD	CRACK FILL	1.12	6,417	2021
<b>THE 2021 REQUIRED BUDGET FOR THE "MAINTAIN LOWEST STANDARD PCR" STRATEGY</b>					<b>\$483,491</b>	

**Maintain Lowest Standard PCR**

**Pavement Treatment List (Continued)**

ROAD NAME	FROM	TO	RECOMMENDED TREATMENT	LANE-MILES	IMPLEMENTATION	
					COST (2022\$)	YEAR
3RD ST	WEST AVE	EAST AVE	CRACK FILL	0.68	5,656	2022
BROAD ST	PROSPECT ST	ABBE RD	SELECTIVE PATCH, MILL & 1.5" O/L	1.18	140,729	2022
CLEVELAND ST	GULF ST	US 20 / SR 57 (JFK MEMORIAL PKWY)	SELECTIVE PATCH, MILL & 1.5" O/L	3.96	363,291	2022
GULF RD	HILLIARD RD / BERKLEY DR	CRESTVIEW DR	MICRO - PAVE (TYPE II SURF. TR.)	1.92	118,695	2022
GULF RD	WINDBROOK CT	ELYRIA NCL	MICRO - PAVE (TYPE II SURF. TR.)	0.76	48,662	2022
LAKE AVE	PARKVIEW CT	FURNACE ST	MICRO - PAVE (TYPE II SURF. TR.)	0.72	31,793	2022
LAKE AVE	SR 113 (JFK MEMORIAL PKWY)	PARMELY AVE	SELECTIVE PATCH, MILL & 1.5" O/L	0.44	72,659	2022
LOWELL ST	LORAIN BLVD	WEST RIVER RD	MICRO - PAVE (TYPE II SURF. TR.)	0.30	15,897	2022
OBERLIN ELYRIA RD	WEST AVE	MIDDLE AVE	CRACK FILL	1.16	7,946	2022
SR 113	CLEMENS AVE	SR 57 (LORAIN BLVD)	CRACK FILL	2.16	12,682	2022
W RIVER RD	LAKE AVE	FURNACE ST	SELECTIVE PATCH, MILL & 1.5" O/L	0.70	89,905	2022
<b>THE 2022 REQUIRED BUDGET FOR THE "MAINTAIN LOWEST STANDARD PCR" STRATEGY</b>					<b>\$907,915</b>	

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**NOACA will STRENGTHEN regional cohesion, PRESERVE existing infrastructure, and BUILD a sustainable multimodal transportation system to SUPPORT economic development and ENHANCE the quality of life in Northeast Ohio NOACA will STRENGTHEN regional cohesion, PRESERVE existing infrastructure, and BUILD a sustainable multimodal transportation system to SUPPORT economic development and ENHANCE the quality of life in Northeast Ohio**