City of Oak Hill
Pavement Management Program

October 2021

Contents

Table of Figures

Table of Tables

Appendix

1. INTRODUCTION

In April 2021, Kimley-Horn received authorization from the City of Oak Hill to proceed with the update to the existing pavement management program for the City of Oak Hill's roadway network. The project consisted of a roadway pavement inventory, an assessment of existing pavement conditions, and the preparation of a pavement management program for the City-maintained roadways. The pavement management program focuses on the approximately 44 miles of roadways that are currently maintained by the City of Oak Hill. The condition of an additional 3 miles of state roadways was assessed but excluded from the analysis because they are not City-maintained.

The pavement management program includes the preparation of pavement condition assessments and prioritized pavement maintenance activities. The results of this study will be used by the City for future fiscal year maintenance planning efforts. The pavement management program applied value engineering decisions in the development of budget planning. It serves as a tool for developing short- and long-term capital funding projections to keep the overall pavement network in an acceptable and operationally safe condition. The following report provides an overview of the pavement evaluations and network-wide work plan projections developed as part of the project.

2. PAVEMENT MANAGEMENT APPROACH

The primary goal of this pavement management program is to develop conceptual, network-wide work plans to help identify future repair and funding needs. Kimley-Horn's pavement management software, known as DRIVE, is used to assist in generating work plans. This program can be customized to fit the requirements and philosophies of the City of Oak Hill, as they may change in future years. This pavement management approach and acceptable operation conditions were developed with the City engineering staff.

2.1 Strategy

The basic philosophy of pavement management is to apply preventive maintenance treatments at appropriate times to slow the rate of pavement deterioration. Both preventive maintenance and rehabilitation techniques should be applied at times when they are cost-effective instead of allowing the pavement to deteriorate to failure, which requires more expensive reconstruction. Oak Hill's pavement management strategy follows this same philosophy.

A repair strategy that combines preventive maintenance, rehabilitation, and reconstruction, where necessary, is targeted. Numerous studies have shown that a strategy of only reconstruction of failed pavements, or reconstruction of pavements that do not require it, will cost significantly more than this combined approach throughout a defined analysis period. The reason for this is that properly applied preventive maintenance and rehabilitation treatments effectively extend the life of the pavement. When this approach is applied on a network-wide level, it frees up a considerable portion of the budget to spend on these cost-effective strategies that may have previously been dedicated to reconstruction of a much smaller percentage of the pavement network.

2.2 Program Inputs

The pavement management software, DRIVE, requires a significant amount of input information. Some of the input factors are easily defined, whereas others require some assumptions and interpretation of related technical data. Changes to any of the technical inputs or parameters will affect the results of the analysis. The inputs are selected based on field results, input from City staff, and engineering judgement. The program has the potential to be modified in the future to account for changing goals, varying budgets, or altering management philosophies as requested by the City. The following sections describe the key inputs to DRIVE.

2.2.1 Pavement Condition Index (PCI) and Pavement Surface Evaluation and Rating (PASER) System

One of the inputs to DRIVE is the existing condition of the pavement. The pavement condition is used to determine whether pavement segments need maintenance, repair, or reconstruction. The condition of the pavement is defined in terms of a Pavement Condition Index (PCI), which is based on the Pavement Surface Evaluation and Rating (PASER) System. PASER was developed by the University of Wisconsin-Madison, Department of Engineering Professional Development, in conjunction with the Federal Highway Administration (FHWA). The PASER system uses a simple 0-10 scale to rate pavements based on observed distresses without requiring quantification of each distress. The Asphalt PASER Manual is contained in Appendix B1. A modified PASER rating system was used, which uses a 0-100 scale, with 100 representing new pavement. The modified scale allows for more detailed ratings while using the same observed distress criteria. By using the PASER method, pavement segments can be rated in direct correlation to the type of repairs that should be performed. In addition to making the evaluation process simple, the PASER method makes the conceptual analysis more streamlined. The PCI rating scale corresponds with the modified PASER ratings for asphalt and are displayed in Table 1.

Table 1: Asphalt PASER Ratings

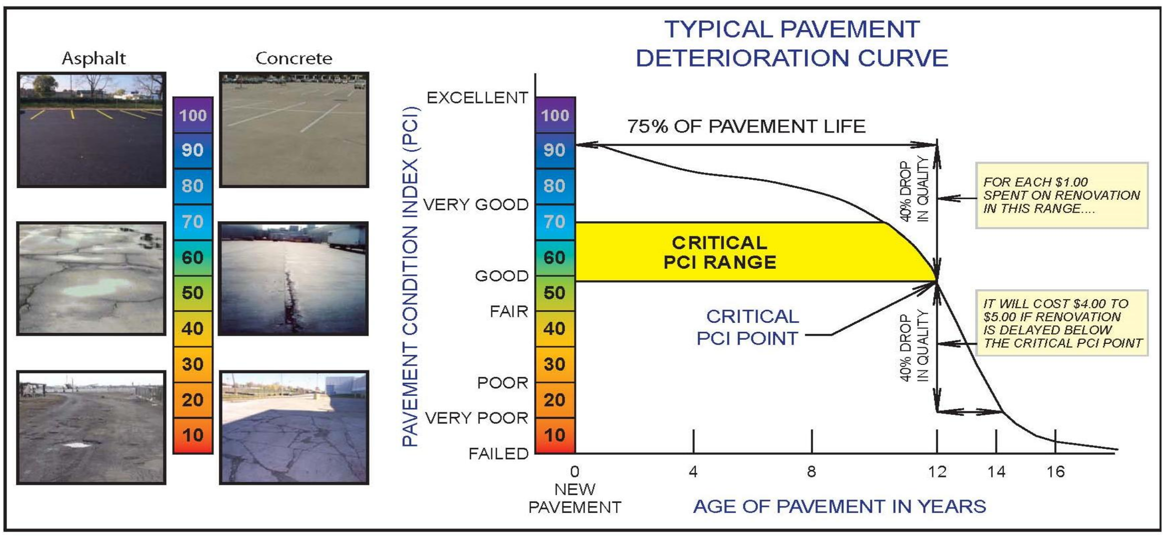
PCI Rating	Visible Distress
100 – New Pavement	None.
90 – Excellent	None.
80 – Very Good	No longitudinal cracks except reflection of paving joints. Occasional transverse cracks widely spaced (40' or greater). All cracks sealed or tight (open less than 1/4").
70 – Good+	Very slight or no raveling, surface shows some traffic wear. Longitudinal cracks (open 1/4") due to reflection or paving joints. Transverse cracks (open 1/4") spaced 10' or more apart, little or slight crack raveling. No patching or very few patches in excellent condition.
60 – Good	Slight raveling (loss of fines) and traffic wear. Longitudinal cracks (open 1/4"–1/2"), some spaced less than 10'. First sign of block cracking. Slight to moderate flushing or polishing. Occasional patching good condition.
50 – Fair+	Moderate to severe raveling (loss of fine and coarse aggregate). Longitudinal and transverse cracks (open 1/2") show first signs of slight raveling and secondary cracks. First signs of longitudinal cracks near pavement edge. Block cracking up to 50% of surface. Extensive to severe flushing or polishing. Some patching or edge wedging in good condition.
40 – Fair	Severe surface raveling. Multiple longitudinal and transverse cracking with slight raveling. Longitudinal cracking in wheel path. Block cracking (over 50% of surface). Patching in fair condition. Slight rutting or distortions (1/2" deep or less).
30 – Poor	Closely spaced longitudinal and transverse cracks often showing raveling and crack erosion. Severe block cracking. Some alligator cracking (less than 25% of surface). Patches in fair to poor condition. Moderate rutting or distortion (1" or 2" deep). Occasional potholes.
20 – Very Poor	Alligator cracking (More than 25% of surface). Severe distortions (More than 2" deep). Extensive patching in poor condition. Potholes.
10 – Failed	Severe distress with extensive loss of surface integrity.

2.2.2 Pavement Deterioration Curves

Another input into DRIVE is the pavement deterioration curve that is associated with each section of pavement. A typical pavement deterioration curve, shown in Figure 1, below, demonstrates how the deterioration rate can vary depending on the Pavement Condition Index (PCI) throughout the lifecycle of a pavement segment.

Deterioration rates are dependent upon several factors, including original pavement structural design, quality of original construction, subgrade condition, traffic loadings, climate, and the quality and extent of the maintenance program in place. Pavement deterioration can fluctuate significantly depending on these factors. As pavement condition reaches the critical range; loadings, moisture intrusion, and other environmental conditions can cause the pavement to deteriorate from good condition (PCI 60-80) to poor condition (PCI 10-30) in a relatively short time frame.

Figure 1: Typical Pavement Deterioration Curve



Typical pavement deterioration follows a curve with a critical PCI range that is generally considered to be between a modified PASER PCI rating of 62 and 57 on the curve. The "critical point" of 57 on the curve is considered the threshold where preventive maintenance measures become less cost-effective. Some form of rehabilitation is required for the pavement to restore serviceability when pavement falls below the critical point and typically requires costlier repairs. Upon further deterioration, the end of the useful life is reached when the pavement is considered a safety hazard. At this point, more costly and extensive reconstruction repairs are required to restore the service condition. A modified PASER PCI rating of less than 25 is viewed as the end of the pavement's useful life.

None of the roadways evaluated and maintained by the City are near the end of useful life PCI rating. Typically, roads at the end of useful life would be recommended for heavy rehabilitation and/or reconstruction during the pavement management program work plan. Evaluation of the pavement on a consistent basis will optimize capital expenditures by providing the most cost-effective repairs relative to the type and extent of distresses in inspected or projected pavement.

When the network-wide average PCI is significantly more than the approximate critical point of 57 on the deterioration curve, the best management strategy will focus primarily on preventive maintenance while providing required rehabilitation and reconstruction repairs where needed. Alternatively, a network with an average PCI much lower than the approximate critical point will require a management strategy focusing on heavy rehabilitation and reconstruction while providing preventive maintenance where needed.

2.2.3 Pavement Surface Type

Pavement surface types are also an input into DRIVE. The pavement surface type defines the types of pavement that make up a roadway. Each type of pavement performs differently under variable loading conditions. For this project, the only pavement surface type classified was asphalt concrete (AC) pavement.

2.2.4 Repair Activities and Cost

There are inputs relating to the repair strategies and costs. The cost inputs used in this updated pavement management program are opinions of probable costs based on bid information submitted by multiple contractors for recent pavement repair projects similar in regional locality and nature to the repairs anticipated throughout the City.

2.2.5 Network Priority Ranking

DRIVE utilizes a prioritization approach that focuses on a parameter called Cost-Benefit Value (CBV). Once treatments are selected for each segment based on condition, CBV is calculated to prioritize segments based on need and overall network impact. A higher CBV value indicates a higher priority. For a given budget scenario, projects are selected sequentially starting at the highest CBV until no budget remains for the specified year.

Several factors are included in the CBV formula, such as traffic, rank, treatment annualized unit cost, pavement condition, and consequence of deferral. The equation is defined as follows:

$$\boldsymbol{CBV} = \frac{\boldsymbol{IF} * \frac{\boldsymbol{TF}}{\boldsymbol{RF}}}{\boldsymbol{EAC} * (\boldsymbol{\Delta PCI} + \mathbf{1})}$$

- *CBV = Cost-Benefit Value. A logarithmic translation converts the formulaic output to reported CBV's in the range of approximately 0-25.*
- *IF = Immediacy Factor. This term aims to prioritize segments that may become more costly if the applicable treatment is not applied in the given year. A value is assigned depending on how close a segment is to dropping into the next-worse treatment category.*
- *TF = Traffic Factor (AADT: Annual Average Daily Traffic). If AADT is not provided, AADT is assumed based on functional classification.*
- *RF = Rank Factor. RF is assigned based on rank as follows: Primary = 1, Secondary = 2, Tertiary = 3.*

- *EAC = Equivalent Annualized Unit Cost, calculated as treatment unit cost ($/SF) per year of estimated life extension.*
- ***Δ****PCI = Difference in segment's PCI condition and PCI remaining in treatment band.*

3. DATA COLLECTION

3.1 Field Assessments

Kimley-Horn performed field investigations, with roadways divided into individual segments from intersection to intersection. Where Kimley-Horn observed changes in PCI of at least 10 points, a new segment was created. Where PCI ratings on adjacent pavements, but within the same block, varied by less than 10 PCI points, these sections were combined into one segment with the PCI rating averaged over the entire area. Determining the segments in the manner described above allows future sorting on condition as well as location.

Each segment of pavement for each roadway was assigned a unique Segment ID for later input into DRIVE. A consistent method was used when assigning Segment IDs to individual pavement segments. Each Segment ID describes the road that it represents, and was created by taking the road name, adding an underscore, and including a numerical number; starting at "001" and counting consecutively through the segments alphabetically; to assist with the data linking to the GIS system.

For example, the Segment ID "Caldwell_18" would represent the road Caldwell Lane, and after being sorted alphabetically, this segment is 18th in the database.

The City provided GIS mapping data for each roadway. The roadways were segmented, and color coded to graphically represent each segment's current PCI. A color-coded map is included in Appendix C1.

3.1.1 Network Conditions

There is a total of approximately 5,758,879 square feet of City-maintained pavement in the city's network. The weighted average PCI for the City-maintained roads within the pavement network is 70.77.

The following two charts, Figure 2 and Figure 3, display the pavement conditions by total area and percentage distribution. Approximately 93.2% of the pavement assets currently have an PCI of 55 or greater and are, at a minimum, in "good" condition. The remaining 6.8% of pavement assets have an PCI between 35 and 55 and are considered "fair" condition.

Figure 2: Network Pavement Condition Areas

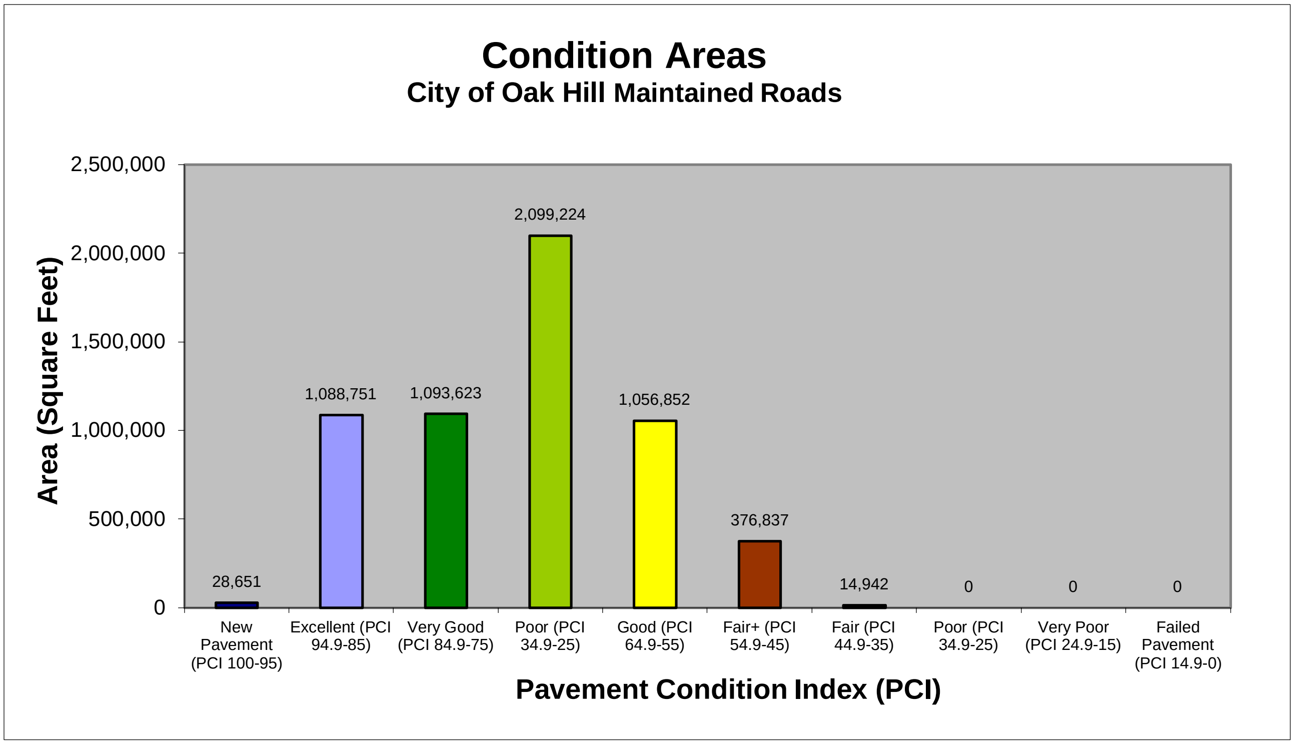
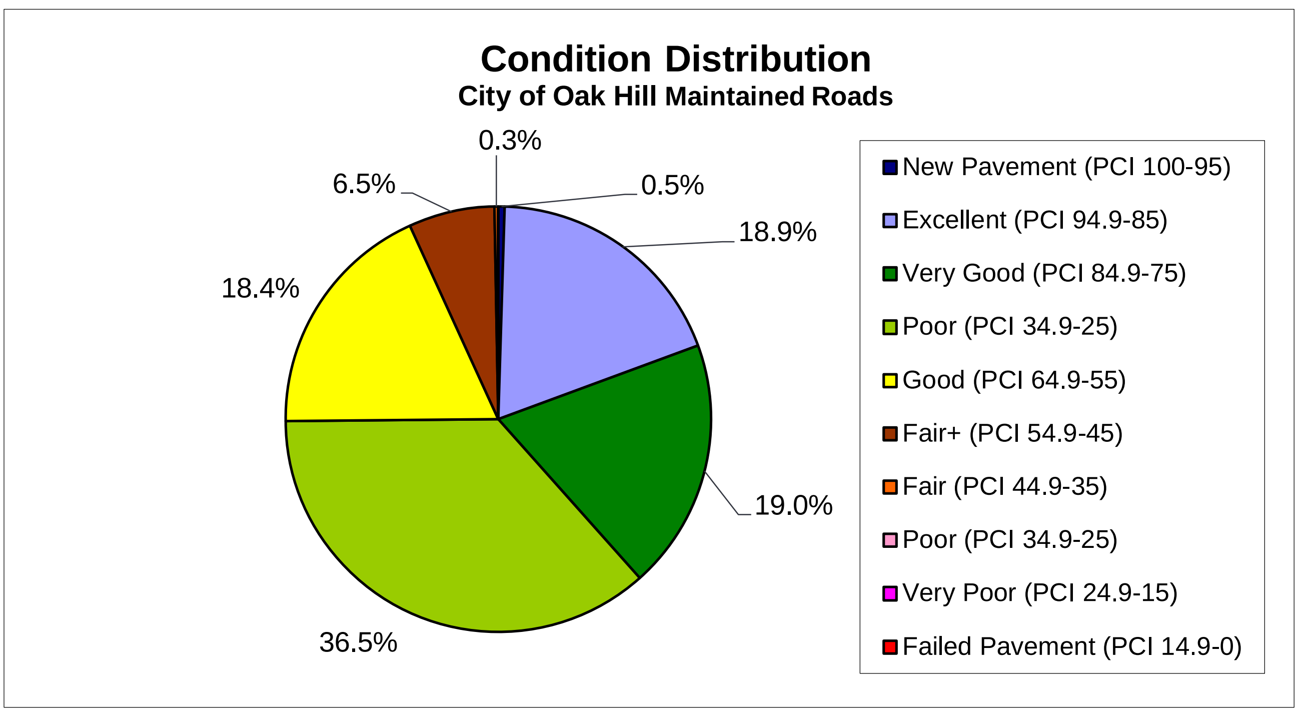


Figure 3: Network Pavement Condition Distribution



4. WORK PLAN DEVELOPMENT

The pavement management program develops a conceptual, network-wide work plan to help predict future repairs and funding needs for the network. The work plan uses a budget based on the City's projected funding allocations, and then distributes the funds for preventive maintenance, rehabilitation, and reconstruction repairs based on the input parameters for each pavement segment. DRIVE reevaluates each segment in every year of the plan. For each year, a current PCI condition is determined based on the deterioration curve and any repairs that may have been assigned to a segment in a previous plan year. The system then prioritizes the overall network to determine which segments receive funding that year, how much funding is received, and how the conceptual repairs will improve the overall network PCI. The steps taken to develop the work plan are listed below and described in detail in the following sections.

- Define program parameters
- Establish prioritization system
- Define repair activities and costs
- Analyze scenarios

4.1 Program Parameters

The budget and parameter inputs into DRIVE were developed with City staff. The City provided budget information to use in the model based on feedback from the City Board of Commissioners. The Board of Commissioners reviewed funding scenarios and provided City staff direction to maintain roads based on an annual budget $400,000 per year. While Kimley-Horn did use this budget provided by City staff, Kimley-Horn also reviewed network performance using several other budget values to evaluate the effectiveness of various options for the City of Oak Hill to meet the goals of maintaining an overall acceptable network PCI.

It was determined that a 5-year work plan could provide the City with a future projection that was realistic. To better show longer-term network trends, extended work plan data (up to ten years) can be found in Appendix A1, however, as with any model that makes future projections, the results become more conceptual the further into the future projections are made. The analysis results presented in this report are based on a 5-year duration plan.

The target overall network PCI was set between 65 and 75, which is above the critical point of a pavement condition network. In a network with an overall PCI around or above the critical point (57 to 60), most of the work will be more cost-effective repairs, such as preventive maintenance and rehabilitation, with occasional reconstruction type repairs.

DRIVE can also adjust the inflation rates for the plan period. For the network analysis, the inflation rate was set at 5.1% to account for the increase in repair activity costs in future years.

4.2 Prioritization

To determine the order in which repairs will be completed, a prioritization system must be established. Based on discussions with City staff, no factors other than the PCI of the road segments were considered for determining the prioritization of repair projects. The City staff requested that the condition of the roadways determined during the Kimley-Horn field assessments solely dictate which roads receive priority. Therefore, this pavement management program utilizes a "worst first" scenario approach in which the lowest PCI conditioned pavements are given the highest priority for repair. The advantage to using the "worst first" scenario is that it prevents pavement from deteriorating to extremely low conditions. The disadvantage is that repairs may not be identified at the earliest time possible in the lifecycle, leading to pavements with moderate conditions requiring more extensive repairs as distresses worsen. Alternatively, the City could consider assigning the highest PCI conditioned pavements the highest priority for repair, a "best first" scenario. The advantage to using the best first scenario is that the newest pavement is extended to the longest possible life since smaller distresses will be tended to before the conditions require more costly repairs. The disadvantage is that the poorest pavement segments will continue to drop to unacceptable PCI levels, with costs increasing significantly as each year passes. During discussions with City staff, it was determined that the worst first scenario aligns more closely with current practices of the City as well as with the goals of preventing roads from deteriorating to a "poor" or "failed pavement" condition. Therefore, the worst first scenario was applied to the pavement program.

To assure better conditioned pavement segments still received some maintenance dollars, despite this "worst first" approach, repair strategy budgets were developed to promote more balanced prioritization management practices in the program. Defining separate repair strategy budget categories also helps assure that the appropriate funding levels are being applied to areas of need in a cost-effective way, as the most important goal in prioritization is performing the correct repair strategies at the optimal times. A percentage of the annual budget in each plan year was set by Kimley-Horn for preventive maintenance repairs, rehabilitation repairs, and reconstruction repairs. It is important to note that while the benefit to cost value is much higher for preventive maintenance repairs, these repair types are also much less expensive per square-foot of pavement. Therefore, it takes a much smaller percentage of the budget to complete these types of repairs across a larger percentage of the overall pavement network when compared to rehabilitation and reconstruction type repairs. In this case, much of the budget is reserved for the rehabilitation repair strategy. The repair strategy budget breakdown is shown in Table 2, below.

Table 2: Repair Strategy Budget Plan

Maintenance Type	Allocation
Reconstruction (PCI 0-24)	20%
Rehabilitation (PCI 25-64)	70%
Preventive Maintenance (PCI 65-84)	10%
Total	100%

4.3 Repair Activities

The next step in developing the work plans is to determine the appropriate repair activities at each point in a pavement's lifecycle and the cost associated with that repair. Repair activities and associated costs were determined from industry research as well as bid information submitted by several contractors for recent pavement repair projects similar in locale and nature to the repairs anticipated throughout the City.

4.3.1 Repair Activity Types

Repair activities are intended to increase the pavement life expectancy. Repairs in the preventive maintenance category, such as crack sealing and surface sealing, are intended to slow the deterioration of the pavement, as opposed to dramatically increasing the pavement condition. Although rehabilitation or reconstruction will be needed eventually, the preventive maintenance activities provide the most cost-effective way to increase life expectancy. Once a pavement reaches the point where rehabilitation repairs are required, the associated costs rise exponentially as the condition deteriorates. Repairs such as cut and patching, overlays, and partial depth milling and replacement, increase the pavement condition rating and extend the life significantly, but at a greater cost than applying preventive maintenance. The repairs associated with reconstruction are the most extreme scenario. They start the lifecycle over by increasing the condition rating to 100, but at the highest expense. The effects of different repairs on the pavement life expectancy are shown in Table 3, on the following page. This information obtained from the FHWA estimates the number of years of benefit to the pavement, not for the treatments themselves. It is important to understand that these are estimated values, as the actual gains depend on numerous factors such as original construction quality, varying traffic loadings, sub-grade type, and climate conditions.

Table 3: Extended Service Life Gains for Pavement Treatments

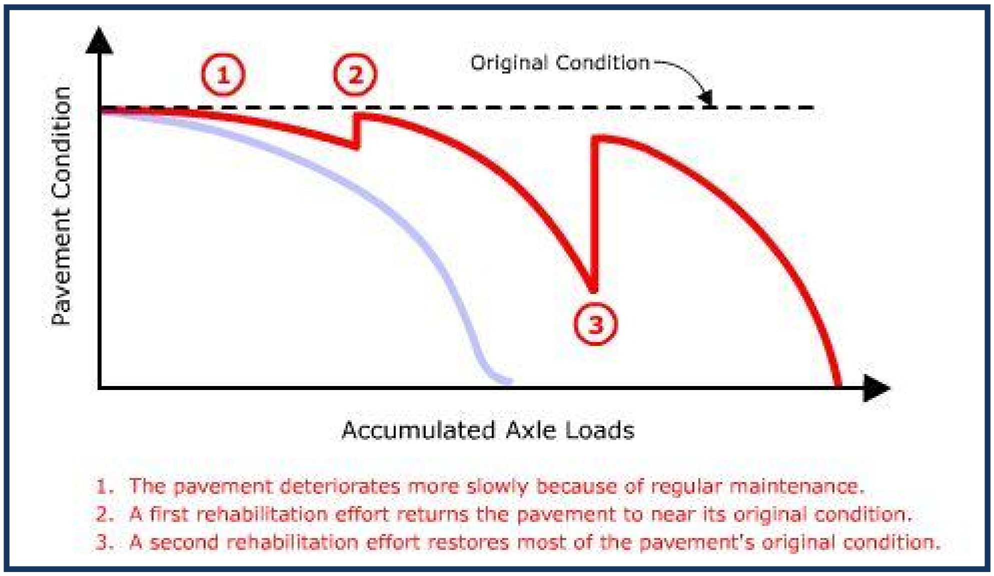
Repair Activity	Pavement Type	Extended Service Life (Years)
Overband Crack Sealing	Flexible	Up to 2
	Composite	Up to 2
Crack Sealing	Flexible	Up to 3
	Composite	Up to 3
	Rigid	Up to 3
Single Chip Seal	Flexible	3 to 6
	Composite	NA*
Double Chip Seal	Flexible	4 to 7
	Composite	3 to 6
Slurry Seal	Flexible	NA*
	Composite	NA*
Micro-surfacing (Single Course)	Flexible	3 to 5**
	Composite	NA*
Micro-surfacing (Multiple Course)	Flexible	4 to 6**
	Composite	NA*
Ultrathin Asphalt Overlay (0.75")	Flexible	3 to 5**
	Composite	3 to 5**
Asphalt Overlay (1.5")	Flexible	5 to 10
	Composite	4 to 9
Mill and Overlay (1.5")	Flexible	5 to 10
	Composite	4 to 9
Mill and Overlay (2.0")	Flexible	7 to 12
	Composite	7 to 12
Pulverization and Overlay	Flexible	8 to 14
	Composite	8 to 14
Full Reconstruction	Flexible	15 to 40
	Composite	15 to 40
Joint Resealing	Rigid	3 to 5
Spall Repair	Rigid	Up to 5
Full-depth Concrete Repairs	Rigid	3 to 10
Diamond Grinding	Rigid	3 to 5**
Dowel-bar Retrofit	Rigid	2 to 3**
Concrete Pavement Restoration	Rigid	7 to 15**
Full Reconstruction	Rigid	15 to 50

*Sufficient data is not available to determine life-extending value

**Additional information is necessary to quantify the extended life more accurately

Figure 4, below, demonstrates the effects on pavement condition that preventive maintenance, rehabilitation, and reconstruction have throughout the lifecycle.

Figure 4: Repair Effects of Pavement Deterioration with Time



Source: http://classes.engr.oregonstate.edu/cce/winter2012/ce492/Modules/11_pavement_management/11-2_body.htm#effect

4.3.2 Repair Activity Schedule

Pavement deterioration rates are dependent on several different factors. Despite the rate of deterioration, it has become a well adopted concept proven continuously in the field that the deterioration of a pavement can be offset, and the life of a pavement greatly extended by properly performing maintenance and repair strategies at the appropriate times during the life-cycle of a pavement. As the life of a pavement is extended by performing less costly preventive maintenance and rehabilitation repairs, rather than constantly allowing a pavement to deteriorate to the point where more costly reconstruction is required, the more cost efficient the pavement lifecycle will be. Over an entire pavement network, performing these typical repairs can yield significant long-term cost savings. While every pavement will require its own assessment to determine the best repair at the best time, there have been several studies performed to try to determine the typical preventive maintenance and rehabilitation schedule during the life of a pavement. Table 4, on the following page, shows the results of one study completed by the Minnesota Department of Transportation (MnDOT). While the typical MnDOT pavement segment might vary from that of a Tennessee pavement segment due to differing environmental conditions, the repair schedule still generally provides great scheduling insight for the City.

MnDOT has studied the typical pavement repair cycle for multiple scenarios, such as for asphalt pavement and concrete pavement, and for high traffic loading and low traffic loading. Table 4 is for an asphalt surface type with lower traffic counts. It is important to note that the time shown for each repair assumes that all previous preventive maintenance and rehabilitation repairs have been performed. For example, the first mill and overlay can be expected somewhere around year 20 of the pavement life. This assumes that proper crack sealing was performed when needed and a surface treatment, such as a seal coat, was also performed when needed. If no work was done prior, it should be anticipated that the mill and overlay would be required significantly sooner than year 20 of the pavement life.

Table 4 provides great insight and can help in planning future repairs for this program; however, it should be noted that the years shown are approximate, and that each pavement segment could require preventive maintenance or rehabilitation repairs sooner or later than the years provided below.

Table 4: Typical Preventive Maintenance and Rehabilitation Schedule

Bituminous Pavement with 20-year ESALs* less than 7 million
Year 0 – Initial construction
Year 6 – Rout and seal cracks
Year 10 – Surface treatment
Year 20 – Mill and overlay
Year 23 – Rout and seal cracks
Year 27 – Surface treatment
Year 35 – Mill and overlay
Year 38 – Rout and seal cracks
Year 43 – Surface treatment
Year 50 – End of analysis (no residual value)

* ESAL = Equivalent Single Axle Load.

4.3.3 Repair Activity Inputs to DRIVE

Pavement repair activities were developed for planning and budgeting purposes. The type of repair activity is set up to be chosen based on the PCI and pavement surface type. For example, an “AC-50” repair activity is applied if the segment is asphalt and the PCI falls within the range of 45 and 54. Since the activities are intended to address multiple segments that may fall into a particular PCI range due to varying distresses, they are setup to account for multiple repair actions instead of a single action for one particular distress. For example, an “AC-40” activity likely consists of a partial-depth mill and replace of the asphalt surface throughout a segments entire area. Before maintenance is performed on a specific segment, a detailed evaluation of this segment needs to be performed. Based on this project-level analysis, it may be determined that an alternative approach, such as isolated patching with a thick asphalt overlay, is more desirable based on field conditions. Further detail for specific repairs on each segment will be determined on a yearly basis in the project-level analysis and subsequent design process. Some repair types are intended to repeat on a normal schedule but are not necessary year after year. These repairs are typically those associated with preventive maintenance, like crack filling segments on a periodic basis, such as every few years, which is typically recommended. These general repair activities were created for each pavement surface type throughout the condition spectrum. The only exceptions are for pavements with an PCI above 85. Pavements with these ratings generally require no action be taken because they are in new or excellent condition.

The unit costs for repair activities used in the program greatly affect the plan results, and in this case, were modeled to parallel bid results from recent, actual City projects. Where data could not be gathered from information sent by the City, unit costs from other recent projects, performed for other clients, in local areas, were used. Each activity has a specific unit cost and budget type associated with it. Table 5, below, outlines the DRIVE asphalt repair activities used in the work plan.

Table 5: DRIVE Asphalt Repair Activities

Repair Activity	Budget Type	Pavement Surface Type	Typical Repairs	**Average Cost ($/ SF)
AC-80 (PCI 84.99-75)	Preventive Maintenance	Asphalt	Crack sealing	$0.15
AC-70 (PCI 74.99-65)	Preventive Maintenance	Asphalt	Crack sealing (some cracks may require routing)	$0.30
AC-60 (PCI 64.99-55)	Rehabilitation	Asphalt	Crack sealing (requires routing) Crack repairs (partial-depth milling and patching) Cut and patch (up to 3% of area) Surface seal (seal coat or slurry seal) Re-stripe	$1.10
AC-50 (PCI 54.99-45)	Rehabilitation	Asphalt	Crack sealing (requires routing) Cut and patch or isolated mill and replace (up to 10% of area) Surface seal (slurry seal or microsurface) Thin asphalt overlay Re-stripe	$1.92
AC-40 (PCI 44.99-35)	Rehabilitation	Asphalt	Cut and patch or isolated mill and replace (up to 20% of area) Thick overlay or partial-depth mill and replace (shallow-depth or profile) entire area Re-stripe	$2.95
AC-30 (PCI 34.99-25)	Rehabilitation	Asphalt	Partial-depth mill and replace entire area Proof-roll and perform incremental milling and replacement or full depth repairs where required Repair isolated distress areas and overlay entire segment depending on existing site conditions Re-stripe	$3.96
AC-20 (PCI 24.99-15)	Reconstruction	Asphalt	Remove existing asphalt with full-depth milling or pulverization 20% base repair with undercutting to strengthen sub-grade Addition of sub-base as needed Install replacement asphalt section Re-stripe	$5.70
AC-10 (PCI 14.99-0)	Reconstruction	Asphalt	Full-depth asphalt and base reconstruction required Re-stripe	$8.35

** Average cost associated with a series of repairs anticipated for the designated condition.

4.4 Deterioration Curves

Pavement deterioration curves are used to predict the deterioration cycles of the pavement segments found within the City's pavement network. The deterioration curve should consider construction factors such as pavement type, pavement thickness (surface layer and base layer, if applicable), aggregate base thickness, and subgrade composition. Other environmental factors such as pavement use, traffic volumes (car volumes and heavy vehicle volumes), and drainage conditions also affect the rate of deterioration.

To help continuously improve the accuracy of the deterioration curves, it is recommended that scheduled inspections of each roadway be performed to compare the actual pavement deterioration and condition ratings with the predicted ratings of the model. Each time an inspection is performed on a segment, PCI ratings should be updated within the DRIVE database and the deterioration curve(s) should be reevaluated. Over time, as more and more data is obtained from these periodic site inspections, additional deterioration curves can be added, and the existing predicted deterioration curves can be modified, to allow for even greater accuracy in the prediction of the deterioration for each pavement segment. These condition updates and deterioration curve adjustments are a necessary, standard application for all pavement management programs.

4.5 Analyze Scenarios

After the inputs were entered into DRIVE, the final step in developing the work plan is to run the analysis. Several analyses were run for the roadways to evaluate a variety of scenarios and determine the most appropriate approach for future pavement maintenance activities. These scenarios are described in the following sections.

4.5.1 No-Funding Scenario

The no-funding scenario projects the future condition of the pavement network when there is no funding and no repairs made. For this analysis, a 5-year duration was analyzed. The no-funding scenario provides an indication of the rate of pavement deterioration when no action is taken. This scenario was provided to show the consequences of not performing the appropriate repairs on an annual basis.

4.5.2 PCI-Driven Scenario

PCI-driven analysis predicts the repairs and costs that will be required to keep the overall pavement network at a user-specified PCI level. The PCI-driven scenario was provided to aid in developing an appropriate annual budget for its network. Although these are only projections, they provide an additional conceptual assessment of where the network stands based on current conditions, quantity of pavement, and other potential funding scenarios. This analysis was evaluated over a 5-year duration with a target PCI that would maintain existing conditions for the entire network at 71.0.

4.5.3 Budget-Driven Scenario

Budget-driven analysis predicts the repairs and resulting pavement network conditions in future years using predetermined budget allocations. The calculation of the budget-driven work plan involved DRIVE running detailed analysis while accounting for the previously discussed program inputs. DRIVE determines the Cost-Benefit Value (CBV) of each segment and then determines what repair activities can be performed within the allocated annual budget, giving the segments with the highest CBV first priority to receive repairs within each budget scenario. The program selects segments to repair until the annual budget allocations are gone or until no additional segments meet the criteria for a repair activity within a certain budget type. It will progress down the CBV ranking until it finds a suitable project that will raise the network PCI while also minimizing costs.

DRIVE adds any activities that were not completed because of lack of funds to the next plan year.

For the City's pavement network, the budget-driven scenario was run with an annual budget of $400,000 over a 5-year period for City-maintained roads only.

4.5.4 Unlimited Funding Scenario

For comparison purposes, a scenario with unlimited budget funding was run to help determine the approximate budget that would bring the network up to the maximum condition rating level within the parameters of the other inputs. In the unlimited funding scenario, each segment of roadway received any repair necessary to increase the overall PCI. Although this is an extreme comparison, it demonstrates where the current repair budget is compared to the "best-case" scenario and shows how the difference in the budgets impact the overall network PCI throughout the 5-year plan.

5. ANALYSIS RESULTS

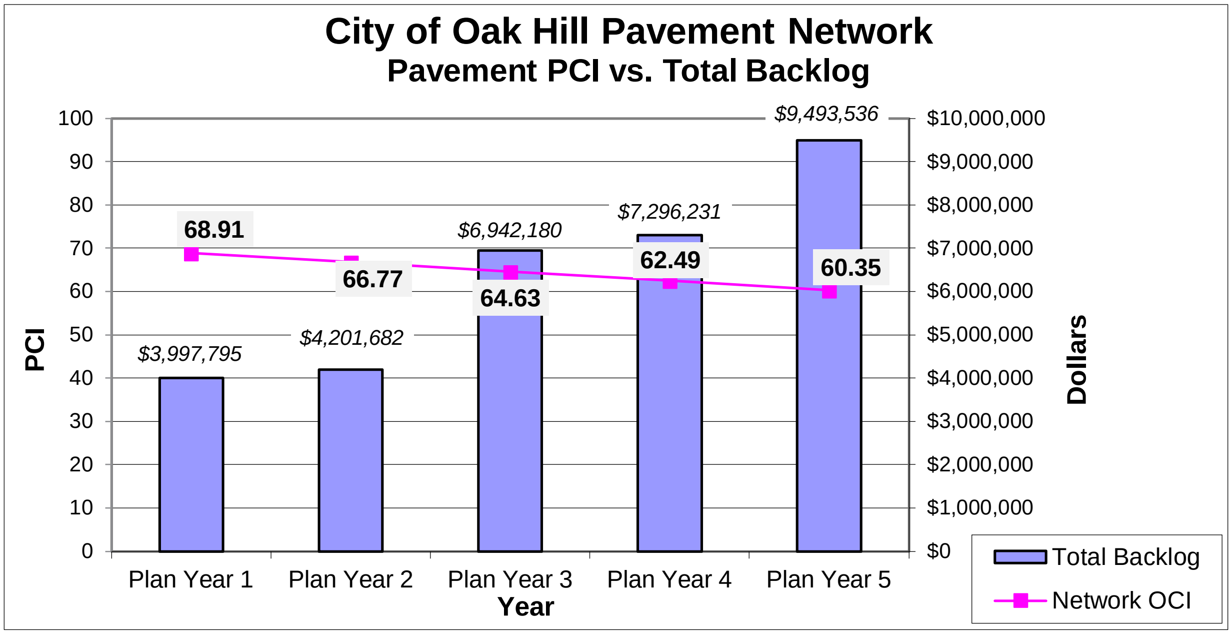
As discussed in the previous section, several analyses were run on the pavement network using DRIVE software. The purpose of the analyses is to provide a projection on the future condition of the pavement network under different budget and PCI constraints. The results of the analyses are presented in the following sections. The budget summary for the recommended street segments from DRIVE are contained in Appendix A1.

5.1 No-Funding Scenario

The no-funding scenario was evaluated over a 5-year period. The DRIVE results show that in a scenario where no funding is applied to the network, the PCI drops from a current level of 68.91 to a level of 60.35 at the end of the 5-year period.

Each year that no repair work is performed on the network, the value of the work backlog, or accumulation of needed repairs, steadily increases as the pavement conditions decrease. Plan Year 1 shows that the network currently has a work backlog of approximately $4,000,000, showing the extensive amount of maintenance and repair work needed for the network's existing conditions. If no work is undertaken for 5 consecutive years, the average pavement condition at the end of plan year 5 is expected to fall to a PCI of 60.35 with a substantially high backlog of approximately $9,493,000 as shown in Figure 5 on the following page. Each year that repairs are delayed, the cost of pushing the repair later in the work plan will directly increase the overall spending needed to achieve the target network-wide average PCI rating. This backlog scenario demonstrates the costly consequences of not performing appropriate repairs on an annual basis.

Figure 5: Pavement PCI versus Network Backlog Comparison



5.2 PCI-Driven Scenario

A PCI-driven scenario was provided to aid in developing an appropriate budget for the network. In the PCI-driven scenario, DRIVE determines the CBV of each segment of the network. DRIVE then picks the optimal repair for each segment starting at the highest CBV (regardless of project cost) until the chosen repairs allow the overall network PCI to meet or exceed the target PCI. As soon as the target PCI is met, DRIVE performs no more repairs during the plan year. With the current network wide PCI already above the critical point of 57, an PCI-driven scenario was performed for the City of Oak Hill to determine funding to maintain the current PCI of 71. The information in Table 6 summarizes the results of the PCI-driven scenario with a target PCI of 71.

Table 6: Summary of PCI-Driven Budget Scenario

Year	Target PCI	Annual Expenditures	Network PCI
Plan Year 1	71.00	$787,000.00	70.97
Plan Year 2	71.00	$346,000.00	70.97
Plan Year 3	71.00	$392,000.00	70.85
Plan Year 4	71.00	$387,000.00	70.85
Plan Year 5	71.00	$603,000.00	70.83
Scenario Type	**Total 5-Year Cost**	**Equivalent Annual Budget**	**Network PCI (end of Year 5)**
PCI-Driven			
Target PCI 71.00	$2,515,000	$503,000.00	70.89

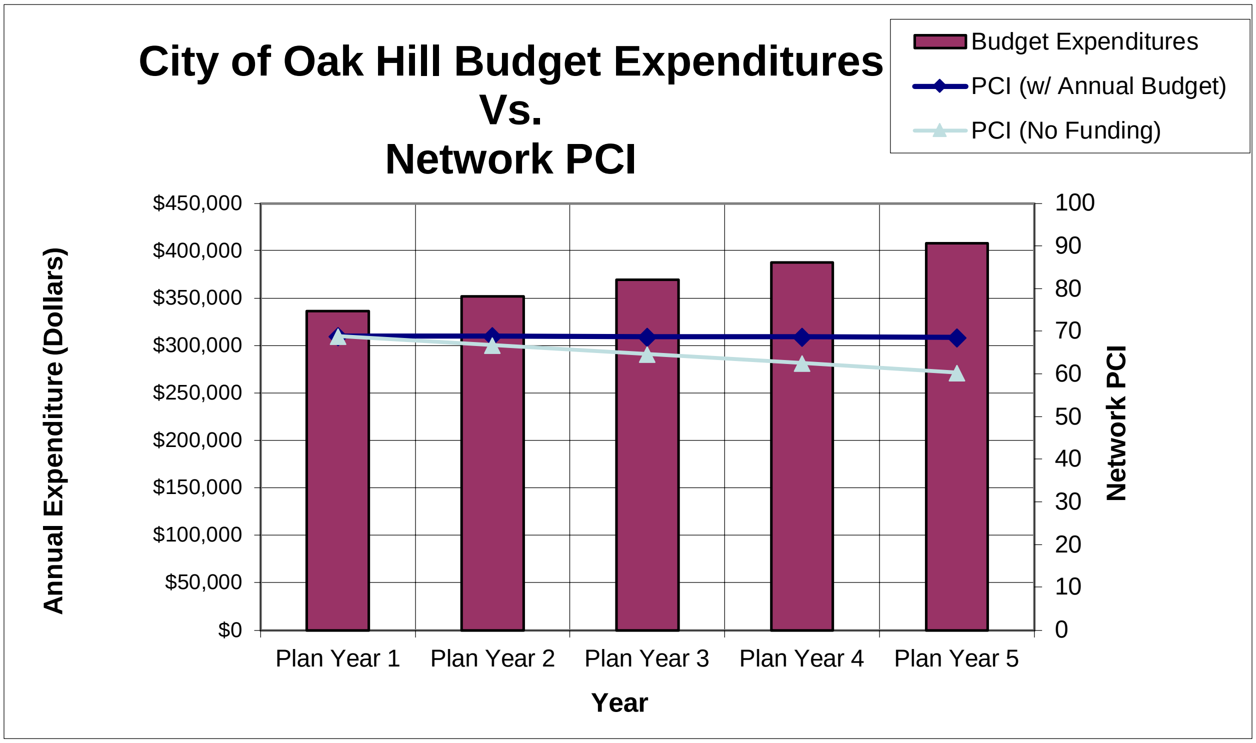
In the PCI-driven scenario, the total 5-year cost for a target network PCI of 71.00 is approximately $2,515,000, with the average annual budget equal to $503,000 per year. This value can be utilized as a target annual budget for the Budget-driven scenario discussed in the following section. Although these PCI-driven scenarios are only projections, they provide additional conceptual assessments of where the network stands based on current conditions, quantity of pavement, and other potential funding scenarios.

5.3 Budget-Driven Scenario

A $400,000 budget-driven scenario was implemented as an annual budget to analyze the results this funding level would have on its pavement network over 5-years. The target annual budget of $400,000 per year was chosen based on the PCI-Driven Scenario results discussed in the previous section 5.2 and per discussions with City officials. The results of the 5-year plan analysis indicate that the network PCI would slightly decrease from 68.9 in plan year 1 to 68.6 in plan year 5. Assuming the proper and optimal maintenance and repair projects are chosen and completed in each year of the pavement management program, the results indicate that a $400,000 estimated annual budget to is needed sustain a network condition of around 69. This is further shown in the data provided in Appendix A1, where the data is extended to ten years. The PCI remains at or above 69 throughout the 10 years. However, as described previously in section 5.1, if yearly repairs are delayed, the $400,000 budget may no longer suffice to maintain the target network PCI and will lead to increased yearly budgets to accommodate repair backlog.

Figure 6 shows the results of the 5-year, $400,000 work plan on the network level PCI, compared to the network PCI in the scenario where no funding is applied to the network. Over the 5-year work plan, a total of approximately $1,852,784 (including inflation) is expended, with a network PCI at the end of year 5 at 68.6. In the scenario where no funding is applied to the network, the PCI drops to a level of 60.35 at the end of the 5-year period. As discussed in section 5.1, the no-funding scenario would result in almost $9.5 million in backlog work. By applying specific repair strategies under the recommended $400,000 budget, the pavement condition will remain considerably higher than the no funding scenario, assisting in meeting the City’s goals.

Figure 6: City of Oak Hill Budget Expenditures versus Network PCI



When a similar budget-driven scenario is run in DRIVE with a $300,000 annual budget, the average PCI declines each year from 68.91 in plan year 1 to 66.54 in plan year 5. Furthermore, examining the extended forecast shows that the PCI continues to decline past year 5, and approaches a network PCI of 63. A funding level of $300,000 annually is not sufficient to maintain the current PCI condition and is not adequate for meeting the City's goals.

5.4 Unlimited Funding Scenario

The information in Table 7, on the following page, summarizes the results of the unlimited funding scenario. The majority of expenditures are in plan year 1 to repair the backlog of projects that currently exist. With a total 5-year cost of approximately $6,238,000, approximately $5,739,000, or 91%, of the 5-year total budget is being spent in plan year 1. By spending this amount initially, the PCI significantly increases to 87.7 and allows the remainder of the work plan to focus on preventive maintenance and light rehabilitation in the following years. As a result, after year 1 the total expenditures per year for years 2 through 5 is approximately $544,000. The 5-year work plan using the unlimited funds scenario requires a total cost of $6,238,000, or an equivalent annual budget of approximately $1,256,600, and the network will result in an average PCI of 84.48.

It is unrealistic for the City of Oak Hill to spend over $6,000,000 over the next 5 years, nor is it necessary to maintain a network PCI at 80+. As demonstrated by the budget-driven analysis, the cost-effective approach is to find a median spending level that both meets a realistic budget plan while maintaining the network PCI to an acceptable level.

Table 7: Summary of Unlimited Funding Budget Scenario

Year	Target PCI	Annual Expenditures	Network PCI
Plan Year 1	100	$5,739,000	87.7
Plan Year 2	100	$0	85.56
Plan Year 3	100	$0	83.42
Plan Year 4	100	$544,000	83.93
Plan Year 5	100	$0	81.79
Scenario Type	**Total 5-Year Cost**	**Equivalent Annual Budget**	**Network PCI (average)**
PCI-Driven			
Target PCI 90	$6,283,000	$1,256,000	84.48

Even in the unlimited funding scenario, the network PCI peaks in plan year 1 at 87.7. Then, regardless of the "unlimited" amount of money spent, the PCI falls during each of the remaining years of the plan. Additionally, DRIVE never allows the PCI to rise above 90. This is explained by examining what repairs will be most common for a network with an PCI over 76. Preventive maintenance repairs (e.g., crack sealing) and light-duty rehabilitation (e.g., isolated patching, surface sealing, etc.) consume most of the annual expenditures. While these repairs are critical to extending the life of pavement, they do not improve each segment's individual PCI as drastically as a reconstruction or heavy-duty rehabilitation repair would. Therefore, the increase in the network-level PCI from performing these repairs is not always substantial enough to offset the network-wide deterioration as all pavement segments fall down the deterioration curve. Performing reconstruction or heavy rehabilitation on other pavements that do not require it would greatly boost the PCI values, but does not represent a cost-effective repair strategy.

6. RECOMMENDATIONS

6.1 Annual Pavement Repair Budget

The overall network analysis with the $400,000 annual budget produced an overall network PCI of 68.6 at the end of the 5-year work plan. Typically, it is recommended to aim for an average PCI at or above the critical Point between 57-60. Networks with a PCI in this range typically have a pavement network with a management program showing preventive maintenance, rehabilitation, and reconstruction repairs in each year of the plan. Based on the analyses performed during this project, current optimal budget breakdown is as follows: 10% preventive maintenance; 70% rehabilitation; and 20% reconstruction. The budget breakdown should be evaluated annually to obtain the most efficient program results. For example, some years it may be necessary for the reconstruction budget to exceed 20% to address larger road segments that cost more than the typical reconstruction budget is able to provide. But the reconstruction portion of other years may remain well below 20% as the major projects are completed and most segments are in good condition. The results of the DRIVE analysis indicated that the $400,000 annual budget is sufficient to maintain the current PCI of the network and meet the City's Goals.

6.2 Project Prioritization

A cost-effective pavement maintenance plan requires a system of prioritization. Through conversations with City staff, segments for this pavement management program were prioritized based on the current conditions, with the lowest PCI segments prioritized the most. Additionally, to ensure a well-rounded pavement management program that included preventive maintenance, rehabilitation, and reconstruction, separate budgets were established for each repair strategy and projects were prioritized within these separate budgets.

An overview of the recommended yearly maintenance and repair costs for each of the City of Oak Hill's roadway segments is provided in the Segment Analysis Recommendations found in Appendix A. Although the reported costs reflect a $400,000 annual budget, based on the recommendations described in this report, the same prioritization approach can be applied for a budget of any size.

It is important to note that DRIVE is set up to account only for costs associated with pavement maintenance and repair construction projects, which includes items such as material, equipment, labor, mobilization, and other standard construction costs. However, items such as engineering fees, permitting costs, or repair costs for non-pavement improvements (e.g. building, landscaping, drainage, utilities, curbs, sidewalks, unpaved shoulders, ADA) have not been accounted for in the analysis, and may need to be listed as separate line items to future repair projects when performing the project level analysis.

6.3 Project-Level Analysis

It is recommended that the City of Oak Hill use caution in using this plan for direct funding of repair projects. The purpose of an analysis of this level is to confirm network funding levels and assist in selecting projects. Once projects are selected, a detailed "project-level" analysis should be performed. A project-level analysis should identify the most cost-effective repair techniques, establish the scope of the project, develop a detailed project budget, and prepare a project schedule. The City should enlist the services of a licensed engineer to assist in the development of design plans. Additionally, it is recommended that the City perform inspections during construction for quality control and quality assurance measures. The most current City of Oak Hill and State of Tennessee standards and specifications should be followed for all design and construction services.

As mentioned above, part of the project-level analysis includes the direct selection of the materials, products, and repairs that are warranted for a given project. The City of Oak Hill should continue to rely on DOT research and pavement trainings/webinars from local vendors to incorporate industry-leading types of pavement repairs.

6.4 Program Updates and Maintenance

Significant investment has been made to inventory the network of pavement and in the development of this management program. Continued investment into the program is strongly recommended. Once the data is input into DRIVE, the program runs continuously reflecting the constant deterioration of the network's pavement segments. At a minimum, the maintenance and repair database within DRIVE should be updated annually, or as repair measures are completed. It is also recommended the City assess the work plan annually to account for any changes that may have occurred throughout the network.

6.5 Policy Recommendations

Often it is beneficial to complete other hardscape improvements alongside pavement repair and maintenance projects. Examples include drainage improvements such as regrading areas and/or adding curb and gutters, ADA improvements, utility and lighting repairs or upgrades, and so many more. As the City of Oak Hill reviews and considers annual expenditures, the City should consider other best practices and synergies with complimentary cost-effective improvements. One such example could be developing a coordinated policy between the utility companies on municipal utility cuts within City-maintained roadways.

7. PCI VISUALIZATION IN GIS

To help easily identify areas of concern, a visualization tool was set up in ArcGIS that uses a defined color-coding scheme based on the PASER PCI ratings. First, the centerlines associated with each individual pavement segment were exported to a GIS shapefile and assigned a unique ID. The unique ID was then linked to the data exported from DRIVE to associate each centerline with output from the model. The color scale was then applied to the pavement segment shapefile, automatically shading sections based on the PCI value.

By using GIS, the method seamlessly links DRIVE output with the individual pavement segment centerlines. The process eliminates the need to manually color individual pavement segments, saving time and cost as PCI values change year to year. After exporting the PCI values, the colors associated with each roadway can be updated automatically on the PCI map simply by replacing the PCI values in the linked spreadsheet.

PID	BRANCH_NAME	FROM_LOCATION	TO_LOCATION	SEGMENT_AREA	SEGMENT_LENGTH	LANES	YEAR	PCI_INDEX	TREATMENT_ASSIGN	TREATMEN	TREATMEN	EAC	CBV	COST
Oak_Hill::MORRISWOO::217	MORRISWOOD DR	MID-BLOCK	OMANDALE DR	5519.657118	229.9857132	2	2022	67.86	Preventive Maintenance	AC-7	Selected	12.68633	13.87888	1740.348
Oak_Hill::HARDING PL::163	HARDING PL	PEACH ORCHARD DR	FRANKLIN PIKE	46472.02934	968.1672779	4	2022	77.86	Preventive Maintenance	AC-8	Selected	19.0295	13.75931	7326.315
Oak_Hill::HARDING PL::164	HARDING PL	HARDING PL RAMP	I65 RAMP	10482.55273	218.3865152	4	2022	77.86	Preventive Maintenance	AC-8	Selected	19.0295	13.75931	1652.574
Oak_Hill::HARDING PL::166	HARDING PL	I65 RAMP	PEACH ORCHARD DR	55557.48706	1157.447647	4	2022	77.86	Preventive Maintenance	AC-8	Selected	19.0295	13.75931	8758.638
Oak_Hill::BALMORAL ::2	BALMORAL DR	LAKEVIEW DR	CUL-DE-SAC	41558.9404	1731.622517	2	2022	67.86	Preventive Maintenance	AC-7	Selected	12.68633	10.55781	13103.53
Oak_Hill::CADILLAC ::16	CADILLAC AVE	PASADENA DR	MID-BLOCK	15049.75704	627.0732099	2	2022	67.86	Preventive Maintenance	AC-7	Selected	12.68633	10.55781	4745.188
Oak_Hill::CRESTRIDG::39	CRESTRIDGE DR	CALDWELL LN	EVANS RD	8990.646146	374.6102561	2	2022	67.86	Preventive Maintenance	AC-7	Selected	12.68633	10.55781	2834.751
Oak_Hill::GENERAL B::131	GENERAL BATE DR	MID-BLOCK	TOWER PL	4368.413924	182.0172468	2	2022	67.86	Preventive Maintenance	AC-7	Selected	12.68633	10.55781	1377.361
Oak_Hill::GLENDALE ::145	GLENDALE LN	CORAL WAY	SOPER AVE	762.734772	31.7806155	2	2022	67.86	Preventive Maintenance	AC-7	Selected	12.68633	10.55781	240.4903
Oak_Hill::CALDWELL ::25	CALDWELL LN	MID-BLOCK	MID-BLOCK	1066.461134	44.4358806	2	2022	77.86	Preventive Maintenance	AC-8	Selected	19.0295	10.43831	168.1276
Oak_Hill::HILLVIEW ::175	HILLVIEW DR	OAK HILL BOUNDARY	OLD HICKORY BLVD	396.7298181	16.53040909	2	2022	87.86	Preventive Maintenance	AC-8	Selected	19.0295	4.741109	62.54446
Oak_Hill::BROOKHAVE::14	BROOKHAVEN DR	CRESTRIDGE DR	OVERBROOK DR	17648.87466	735.3697775	2	2022	57.86	Minor Rehabilitation	AC-6	Selected	5.189862	8.370772	20403.86
Oak_Hill::CHURCHWOO::28	CHURCHWOOD DR	BATTERY LN	VAN LEER DR	25194.47075	1049.769615	2	2022	57.86	Minor Rehabilitation	AC-6	Selected	5.189862	8.370772	29127.33
Oak_Hill::CRESTRIDG::36	CRESTRIDGE DR	PLEASANT VALLEY RD	CALDWELL LN	10395.14578	433.1310742	2	2022	57.86	Minor Rehabilitation	AC-6	Selected	5.189862	8.370772	12017.83
Oak_Hill::CRESTRIDG::37	CRESTRIDGE DR	WOODMONT BLVD	PLEASANT VALLEY RD	32575.71595	1357.321498	2	2022	57.86	Minor Rehabilitation	AC-6	Selected	5.189862	8.370772	37660.79
Oak_Hill::CRESTRIDG::40	CRESTRIDGE DR	EVANS RD	BROOKHAVEN DR	14580.07527	607.5031363	2	2022	57.86	Minor Rehabilitation	AC-6	Selected	5.189862	8.370772	16856.03
Oak_Hill::CRESTRIDG::41	CRESTRIDGE DR	BROOKHAVEN DR	GREERLAND DR	37983.59256	1582.64969	2	2022	57.86	Minor Rehabilitation	AC-6	Selected	5.189862	8.370772	43912.83
Oak_Hill::CRESTRIDG::42	CRESTRIDGE DR	GREERLAND DR	THOMPSON AVE	11728.21918	488.6757992	2	2022	57.86	Minor Rehabilitation	AC-6	Selected	5.189862	8.370772	13558.99
Oak_Hill::DUSTIN LN::52	DUSTIN LN	BATTERY LN	ALDER DR	16014.31513	667.2631302	2	2022	57.86	Minor Rehabilitation	AC-6	Selected	5.189862	8.370772	18514.15
Oak_Hill::DUSTIN LN::53	DUSTIN LN	ALDER DR	VAN LEER DR	14472.53086	603.0221191	2	2022	57.86	Minor Rehabilitation	AC-6	Selected	5.189862	8.370772	16731.69
Oak_Hill::ELYSIAN F::57	ELYSIAN FIELDS RD	CUL-DE-SAC	OMANDALE DR	62732.84828	2613.868678	2	2022	57.86	Minor Rehabilitation	AC-6	Selected	5.189862	8.370772	72525.45
Oak_Hill::EVANS RD::59	EVANS RD	RUSSELLWOOD DR	GENERAL BATE DR	10261.65448	427.5689366	2	2022	57.86	Minor Rehabilitation	AC-6	Selected	5.189862	8.370772	11863.5
Oak_Hill::GENERAL B::126	GENERAL BATE DR	CALDWELL LN	EVANS RD	730.3229283	30.43012201	2	2022	62.86	Minor Rehabilitation	AC-6	Selected	5.189862	4.521435	844.3263
Oak_Hill::BATTERY LN::4	BATTERY LN	DUSTIN LN	WATERSWOOD DR	40329.12253	840.1900528	2	2023	65.72	Preventive Maintenance	AC-7	Selected	12.07072	11.65173	13364.28
Oak_Hill::BATTERY LN::5	BATTERY LN	WATERSWOOD DR	SOPER AVE	30405.70754	633.4522404	2	2023	65.72	Preventive Maintenance	AC-7	Selected	12.07072	11.65173	10075.85
Oak_Hill::BRINDLEY ::13	BRINDLEY DR	LAMBERT DR	LAMBERT DR	32023.97547	1334.332311	2	2023	65.72	Preventive Maintenance	AC-7	Selected	12.07072	11.65173	10612.11
Oak_Hill::CADILLAC ::17	CADILLAC AVE	MID-BLOCK	SOPER AVE	25795.83693	1074.826539	2	2023	65.72	Preventive Maintenance	AC-7	Selected	12.07072	11.65173	8548.232
Oak_Hill::GLENDALE ::144	GLENDALE LN	PASADENA DR	MID-BLOCK	3253.628939	135.5678724	2	2023	65.72	Preventive Maintenance	AC-7	Selected	12.07072	11.65173	1078.189
Oak_Hill::PARKWOOD ::256	PARKWOOD TER	NORFLEET DR	CUL-DE-SAC	1828.473354	76.18638974	2	2023	75.72	Preventive Maintenance	AC-8	Selected	18.10609	11.53219	302.96
Oak_Hill::FARRELL RD::63	FARRELL RD	FARRELL PKWY	RAGLAND DR	20441.89278	851.7455325	2	2023	55.72	Minor Rehabilitation	AC-6	Selected	4.938023	9.462883	24838.15
Oak_Hill::FOREST HI::79	FOREST HILLS DR	MID-BLOCK	FOREST ACRES DR	31325.49833	1305.229097	2	2023	55.72	Minor Rehabilitation	AC-6	Selected	4.938023	9.462883	38062.39
Oak_Hill::FOREST HI::80	FOREST HILLS DR	FRANKLIN PIKE	MID-BLOCK	3088.793725	128.6997385	2	2023	55.72	Minor Rehabilitation	AC-6	Selected	4.938023	9.462883	3753.073
Oak_Hill::FRONTAGE ::117	FRONTAGE RD	FRANKLIN PIKE	DEAD END	24108.87545	1004.536477	2	2023	55.72	Minor Rehabilitation	AC-6	Selected	4.938023	9.462883	29293.76
Oak_Hill::GENERAL B::130	GENERAL BATE DR	OUTER DR	CRESTRIDGE DR	11597.2291	483.2178792	2	2023	55.72	Minor Rehabilitation	AC-6	Selected	4.938023	9.462883	14091.34
Oak_Hill::GLENDALE ::143	GLENDALE LN	MID-BLOCK	GENERAL BATE DR	10869.65201	452.9021671	2	2023	55.72	Minor Rehabilitation	AC-6	Selected	4.938023	9.462883	13207.29
Oak_Hill::GRANNY WH::148	GRANNY WHITE PIKE	GATEWAY LN	GOODLOE DR	14222.06567	592.5860698	2	2023	55.72	Minor Rehabilitation	AC-6	Selected	4.938023	9.462883	17280.68
Oak_Hill::GREEN VAL::159	GREEN VALLEY DR	GREEN VALLEY CT	CUL-DE-SAC	7178.680646	299.1116936	2	2023	55.72	Minor Rehabilitation	AC-6	Selected	4.938023	9.462883	8722.536
Oak_Hill::HILLVIEW ::172	HILLVIEW DR	LAKEMONT DR	CHERRYWOOD DR	26505.88846	1104.412019	2	2023	55.72	Minor Rehabilitation	AC-6	Selected	4.938023	9.462883	32206.27
Oak_Hill::LAKEMONT ::189	LAKEMONT DR	OAK HILL BOUNDARY	FOREST ACRES DR	14305.78325	596.0743021	2	2023	55.72	Minor Rehabilitation	AC-6	Selected	4.938023	9.462883	17382.4
Oak_Hill::LEALAND LN::203	LEALAND LN	STONEWALL DR	ROBERTSON ACADEMY RD	13389.38739	557.8911411	2	2023	55.72	Minor Rehabilitation	AC-6	Selected	4.938023	9.462883	16268.92
Oak_Hill::LEALAND LN::204	LEALAND LN	GATEWAY LN	TYNE BLVD	4734.775187	197.2822995	2	2023	55.72	Minor Rehabilitation	AC-6	Selected	4.938023	9.462883	5753.041
Oak_Hill::LEALAND LN::206	LEALAND LN	GATEWAY LN	TYNE BLVD	1526.48529	63.60355375	2	2023	55.72	Minor Rehabilitation	AC-6	Selected	4.938023	9.462883	1854.773
Oak_Hill::LEALAND LN::208	LEALAND LN	GATEWAY LN	TYNE BLVD	14010.48497	583.7702069	2	2023	55.72	Minor Rehabilitation	AC-6	Selected	4.938023	9.462883	17023.6
Oak_Hill::OMANDALE ::232	OMANDALE DR	PRESCOTT RD	COURTLAND DR	14898.31707	620.7632114	2	2023	55.72	Minor Rehabilitation	AC-6	Selected	4.938023	9.462883	18102.37
Oak_Hill::OTTER CRE::237	OTTER CREEK RD	FRANKLIN PIKE	PRIVATE	31166.55324	1298.606385	2	2023	55.72	Minor Rehabilitation	AC-6	Selected	4.938023	9.462883	37869.27
Oak_Hill::OVERTON CT::244	OVERTON CT	TYNE VALLEY BLVD	CUL-DE-SAC	5025.539005	209.3974586	2	2023	55.72	Minor Rehabilitation	AC-6	Selected	4.938023	9.462883	6106.337
Oak_Hill::OVERTON L::251	OVERTON LEA RD	OVERTON LEA RD	TYNE BLVD	4940.511566	205.8546486	2	2023	55.72	Minor Rehabilitation	AC-6	Selected	4.938023	9.462883	6003.023
Oak_Hill::HARDING PL::165	HARDING PL	I65 RAMP	HARDING PL RAMP	12601.10648	262.5230516	4	2024	78.58	Preventive Maintenance	AC-8	Selected	17.22748	11.78438	2194.361
Oak_Hill::HARDING P::167	HARDING PL RAMP	I65 S	HARDING PL	24548.62292	1022.859288	2	2024	68.58	Preventive Maintenance	AC-7	Selected	11.48499	11.19962	8549.811
Oak_Hill::HARDING P::168	HARDING PL RAMP	I65 S	I65 S	45457.50549	1894.062729	2	2024	68.58	Preventive Maintenance	AC-7	Selected	11.48499	11.19962	15831.97
Oak_Hill::BLEVINS DR::9	BLEVINS DR	MORRISWOOD DR	DEAD END	12130.55209	505.4396705	2	2024	78.58	Preventive Maintenance	AC-8	Selected	17.22748	8.466125	2112.419
Oak_Hill::BRENTVIEW::11	BRENTVIEW DR	FRANKLIN PIKE	BRENTVIEW CT	10370.24432	432.0935134	2	2024	78.58	Preventive Maintenance	AC-8	Selected	17.22748	8.466125	1805.878

Oak_Hill::BRENTVIEW::12	BRENTVIEW DR	BRENTVIEW CT	CUL-DE-SAC	54077.69648	2253.237353	2	2024	78.58	Preventive Maintenance	AC-8	Selected	17.22748	8.466125	9417.109
Oak_Hill::CHERRYWOO::26	CHERRYWOOD DR	HILLVIEW DR	CUL-DE-SAC	18940.69695	789.1957061	2	2024	78.58	Preventive Maintenance	AC-8	Selected	17.22748	8.466125	3298.34
Oak_Hill::GLENDALE ::142	GLENDALE LN	MID-BLOCK	PASADENA DR	8633.158564	359.7149402	2	2024	78.58	Preventive Maintenance	AC-8	Selected	17.22748	8.466125	1503.381
Oak_Hill::GRANNY WH::150	GRANNY WHITE PIKE	GOODLOE DR	TYNE BLVD	8799.262062	366.6359193	2	2024	78.58	Preventive Maintenance	AC-8	Selected	17.22748	8.466125	1532.307
Oak_Hill::MORRISWOO::216	MORRISWOOD DR	MID-BLOCK	MID-BLOCK	5872.237736	244.6765723	2	2024	58.58	Minor Rehabilitation	AC-6	Selected	4.698405	9.910998	7499.019
Oak_Hill::ALDER DR::1	ALDER DR	CUL-DE-SAC	DUSTIN LN	27092.74748	1128.864478	2	2024	58.58	Minor Rehabilitation	AC-6	Selected	4.698405	6.602494	34598.23
Oak_Hill::CHURCHWOO::27	CHURCHWOOD DR	ROBERTSON ACADEMY	OAK VALLEY LN	5412.778873	225.5324531	2	2024	58.58	Minor Rehabilitation	AC-6	Selected	4.698405	6.602494	6912.277
Oak_Hill::CHURCHWOO::30	CHURCHWOOD DR	ROBERTSON ACADEMY	OAK VALLEY LN	9590.070241	399.5862601	2	2024	58.58	Minor Rehabilitation	AC-6	Selected	4.698405	6.602494	12246.8
Oak_Hill::CORAL WAY::33	CORAL WAY	CORAL RD	GLENDALE LN	9860.688526	410.8620219	2	2024	58.58	Minor Rehabilitation	AC-6	Selected	4.698405	6.602494	12592.39
Oak_Hill::COURTLAND::35	COURTLAND DR	SOUTHMEADE PKWY	OMANDALE DR	20451.68216	852.1534234	2	2024	58.58	Minor Rehabilitation	AC-6	Selected	4.698405	6.602494	26117.4
Oak_Hill::CRESTRIDG::38	CRESTRIDGE DR	CALDWELL LN	EVANS RD	13264.62382	552.6926593	2	2024	58.58	Minor Rehabilitation	AC-6	Selected	4.698405	6.602494	16939.31
Oak_Hill::CURTISWOO::47	CURTISWOOD LN	GLENDALE LN	CURTISWOOD CIR	21334.10026	888.9208442	2	2024	58.58	Minor Rehabilitation	AC-6	Selected	4.698405	6.602494	27244.27
Oak_Hill::DUSTIN LN::51	DUSTIN LN	VAN LEER DR	ROBERTSON ACADEMY RD	13973.79272	582.2413633	2	2024	58.58	Minor Rehabilitation	AC-6	Selected	4.698405	6.602494	17844.94
Oak_Hill::DUSTIN LN::54	DUSTIN LN	ROBERTSON ACADEMY	OAK VALLEY LN	13309.7695	554.573729	2	2024	58.58	Minor Rehabilitation	AC-6	Selected	4.698405	6.602494	16996.96
Oak_Hill::EVANS RD::58	EVANS RD	OUTER DR	RUSSELLWOOD DR	10600.97397	441.7072486	2	2024	58.58	Minor Rehabilitation	AC-6	Selected	4.698405	6.602494	13537.75
Oak_Hill::EVANS RD::60	EVANS RD	CRESTRIDGE DR	OUTER DR	32237.79012	1343.241255	2	2024	58.58	Minor Rehabilitation	AC-6	Selected	4.698405	6.602494	41168.6
Oak_Hill::FOREST AC::64	FOREST ACRES CT	FOREST ACRES DR	CUL-DE-SAC	10142.90286	422.6209526	2	2024	58.58	Minor Rehabilitation	AC-6	Selected	4.698405	6.602494	12952.78
Oak_Hill::GENERAL B::124	GENERAL BATE DR	CALDWELL LN	EVANS RD	15649.81198	652.0754991	2	2024	58.58	Minor Rehabilitation	AC-6	Selected	4.698405	6.602494	19985.27
Oak_Hill::GENERAL B::125	GENERAL BATE DR	AUDUBON RD	MELVILLE DR	3810.101863	158.7542443	2	2024	58.58	Minor Rehabilitation	AC-6	Selected	4.698405	6.602494	4865.611
Oak_Hill::GENERAL B::127	GENERAL BATE DR	EVANS RD	BUFORD PL	11708.57372	487.8572385	2	2024	58.58	Minor Rehabilitation	AC-6	Selected	4.698405	6.602494	14952.19
Oak_Hill::GENERAL B::129	GENERAL BATE DR	CRESTRIDGE DR	MID-BLOCK	6530.55778	272.1065741	2	2024	58.58	Minor Rehabilitation	AC-6	Selected	4.698405	6.602494	8339.713
Oak_Hill::GENERAL B::132	GENERAL BATE DR	TOWER PL	AUDUBON RD	10841.98415	451.7493396	2	2024	58.58	Minor Rehabilitation	AC-6	Selected	4.698405	6.602494	13845.53
Oak_Hill::GRANNY WH::149	GRANNY WHITE PIKE	GOODLOE DR	TYNE BLVD	3720.872716	155.0363632	2	2024	58.58	Minor Rehabilitation	AC-6	Selected	4.698405	6.602494	4751.663
Oak_Hill::GRASSLAND::156	GRASSLAND LN	LEALAND LN	GATEWAY LN	3263.294038	135.9705849	2	2024	58.58	Minor Rehabilitation	AC-6	Selected	4.698405	6.602494	4167.322
Oak_Hill::STONEWALL::304	STONEWALL DR	LEALAND LN	CLENDENIN RD	4428.815409	184.5339754	2	2024	58.58	Minor Rehabilitation	AC-6	Selected	4.698405	6.602494	5655.727
Oak_Hill::BATTERY LN::3	BATTERY LN	CHURCHWOOD DR	DUSTIN LN	72426.75618	1508.890754	2	2025	66.44	Preventive Maintenance	AC-7	Selected	10.92768	11.00399	26511.31
Oak_Hill::BATTERY LN::7	BATTERY LN	SOPER AVE	LORING CT	26242.90007	546.7270847	2	2025	66.44	Preventive Maintenance	AC-7	Selected	10.92768	11.00399	9606.03
Oak_Hill::CURTISWOO::46	CURTISWOOD LN	CURTISWOOD LN	GLENDALE LN	15570.67108	648.7779616	2	2025	66.44	Preventive Maintenance	AC-7	Selected	10.92768	11.00399	5699.535
Oak_Hill::GLENDALE ::139	GLENDALE LN	CURTISWOOD LN	CRESTWOOD DR	11676.15716	486.5065485	2	2025	66.44	Preventive Maintenance	AC-7	Selected	10.92768	11.00399	4273.976
Oak_Hill::KIRKMAN LN::183	KIRKMAN LN	KIRKMAN LN	SEWANEE RD	8007.11088	333.62962	2	2025	76.44	Preventive Maintenance	AC-8	Selected	16.39152	10.88447	1465.473
Oak_Hill::OVERTON L::250	OVERTON LEA RD	TYNE BLVD	MID-BLOCK	4943.332646	205.9721936	2	2025	76.44	Preventive Maintenance	AC-8	Selected	16.39152	10.88447	904.7362
Oak_Hill::GENERAL B::126	GENERAL BATE DR	CALDWELL LN	EVANS RD	730.3229283	30.43012201	2	2025	93.58	Preventive Maintenance	AC-8	Selected	16.39152	4.061489	133.6648
Oak_Hill::GRASSLAND::155	GRASSLAND LN	LEALAND LN	GATEWAY LN	30722.87744	1280.119893	2	2025	56.44	Minor Rehabilitation	AC-6	Selected	4.470414	8.816044	41234.95
Oak_Hill::HAZELWOOD::169	HAZELWOOD CIR	FRANKLIN PIKE	CUL-DE-SAC	40811.05058	1700.460441	2	2025	56.44	Minor Rehabilitation	AC-6	Selected	4.470414	8.816044	54774.87
Oak_Hill::MORRISWOO::218	MORRISWOOD DR	FRANKLIN PIKE	BLEVINS DR	15891.13006	662.130419	2	2025	56.44	Minor Rehabilitation	AC-6	Selected	4.470414	8.816044	21328.4
Oak_Hill::MORRISWOO::220	MORRISWOOD DR	MORRISWOOD CT	PRESCOTT RD	15640.10672	651.6711131	2	2025	56.44	Minor Rehabilitation	AC-6	Selected	4.470414	8.816044	20991.49
Oak_Hill::NORWOOD DR::228	NORWOOD DR	FRANKLIN PIKE	DEAD END	27217.7868	1134.07445	2	2025	56.44	Minor Rehabilitation	AC-6	Selected	4.470414	8.816044	36530.56
Oak_Hill::OAK VALLE::230	OAK VALLEY LN	DUSTIN LN	KIRKMAN LN	31910.38452	1329.599355	2	2025	56.44	Minor Rehabilitation	AC-6	Selected	4.470414	8.816044	42828.77
Oak_Hill::OMANDALE ::233	OMANDALE DR	COURTLAND DR	ELYSIAN FIELDS RD	10807.5397	450.3141542	2	2025	56.44	Minor Rehabilitation	AC-6	Selected	4.470414	8.816044	14505.42
Oak_Hill::OUTER DR::238	OUTER DR	EVANS RD	GREERLAND DR	35657.6727	1485.736363	2	2025	56.44	Minor Rehabilitation	AC-6	Selected	4.470414	8.816044	47858.22
Oak_Hill::OUTER DR::239	OUTER DR	GREERLAND DR	GENERAL BATE DR	20150.82976	839.6179066	2	2025	56.44	Minor Rehabilitation	AC-6	Selected	4.470414	8.816044	27045.59
Oak_Hill::ROBIN RD::280	ROBIN RD	MID-BLOCK	CALDWELL LN	23907.85756	996.1607318	2	2025	56.44	Minor Rehabilitation	AC-6	Selected	4.470414	8.816044	32088.12
Oak_Hill::FOREST AC::67	FOREST ACRES DR	FRANKLIN PIKE	NANEARLE PL	69205.97303	2883.582209	2	2026	79.3	Preventive Maintenance	AC-8	Selected	15.59611	8.113089	13312.16
Oak_Hill::FOREST AC::68	FOREST ACRES DR	REDWOOD DR	MID-BLOCK	2449.254312	102.052263	2	2026	79.3	Preventive Maintenance	AC-8	Selected	15.59611	8.113089	471.1278
Oak_Hill::FOREST AC::70	FOREST ACRES DR	NANEARLE PL	FOREST ACRES CT	4335.458625	180.6441094	2	2026	79.3	Preventive Maintenance	AC-8	Selected	15.59611	8.113089	833.9498
Oak_Hill::FOREST AC::71	FOREST ACRES DR	FOREST ACRES CT	REDWOOD DR	27770.83045	1157.117936	2	2026	79.3	Preventive Maintenance	AC-8	Selected	15.59611	8.113089	5341.875
Oak_Hill::FOREST AC::72	FOREST ACRES DR	MID-BLOCK	FOREST HILLS DR	19613.23644	817.2181849	2	2026	79.3	Preventive Maintenance	AC-8	Selected	15.59611	8.113089	3772.716
Oak_Hill::FOREST AC::74	FOREST ACRES DR	HILLHAVEB CT	MID-BLOCK	4414.107592	183.9211497	2	2026	79.3	Preventive Maintenance	AC-8	Selected	15.59611	8.113089	849.0783
Oak_Hill::FOREST AC::75	FOREST ACRES DR	GREEN VALLEY DR	HILLHAVEN CT	28148.53041	1172.855434	2	2026	79.3	Preventive Maintenance	AC-8	Selected	15.59611	8.113089	5414.528
Oak_Hill::FOREST AC::76	FOREST ACRES DR	MID-BLOCK	DEERCROSSING	4119.622434	171.6509347	2	2026	79.3	Preventive Maintenance	AC-8	Selected	15.59611	8.113089	792.4325
Oak_Hill::FOREST AC::77	FOREST ACRES DR	DEERCROSSING	LAKEMONT DR	26000.87887	1083.369953	2	2026	79.3	Preventive Maintenance	AC-8	Selected	15.59611	8.113089	5001.415
Oak_Hill::GRANNY WH::152	GRANNY WHITE PIKE	OVERTON LEA RD	SAXON DR	22014.26937	917.2612236	2	2026	79.3	Preventive Maintenance	AC-8	Selected	15.59611	8.113089	4234.568
Oak_Hill::HILLVIEW ::171	HILLVIEW DR	CHERRYWOOD DR	NORTH HILLVIEW CT	22635.32892	943.1387052	2	2026	79.3	Preventive Maintenance	AC-8	Selected	15.59611	8.113089	4354.032

Oak_Hill::HILLVIEW ::176	HILLVIEW DR	CHERRYWOOD DR	NORTH HILLVIEW CT	23271.74363	969.6559845	2	2026	79.3	Preventive Maintenance	AC-8	Selected	15.59611	8.113089	4476.45
Oak_Hill::LAKEVIEW ::191	LAKEVIEW DR	BALMORAL DR	BALMORAL DR	3360.342788	140.0142828	2	2026	79.3	Preventive Maintenance	AC-8	Selected	15.59611	8.113089	646.3808
Oak_Hill::LAMBERT DR::200	LAMBERT DR	SILLS CT	FARRELL PKWY	8859.374115	369.1405881	2	2026	79.3	Preventive Maintenance	AC-8	Selected	15.59611	8.113089	1704.15
Oak_Hill::CALDWELL ::18	CALDWELL LN	MCCONNELL ST	CRESTRIDGE DR	15261.46653	635.8944388	2	2026	59.3	Minor Rehabilitation	AC-6	Selected	4.253486	6.252449	21527.94
Oak_Hill::CLENDENIN::31	CLENDENIN RD	STONEWALL DR	GATEWAY LN	24083.09075	1003.462115	2	2026	59.3	Minor Rehabilitation	AC-6	Selected	4.253486	6.252449	33971.79
Oak_Hill::CRESTRIDG::43	CRESTRIDGE DR	THOMPSON AVE	GENERAL BATE DR	17033.33603	709.7223346	2	2026	59.3	Minor Rehabilitation	AC-6	Selected	4.253486	6.252449	24027.36
Oak_Hill::CRESTWOOD::44	CRESTWOOD DR	GLENDALE LN	DEAD END	31619.69839	1317.487433	2	2026	59.3	Minor Rehabilitation	AC-6	Selected	4.253486	6.252449	44602.99
Oak_Hill::ELYSIAN F::56	ELYSIAN FIELDS RD	OMANDALE DR	FRANKLIN PIKE	21265.93496	886.0806234	2	2026	59.3	Minor Rehabilitation	AC-6	Selected	4.253486	6.252449	29997.89
Oak_Hill::FARRELL RD::62	FARRELL RD	RAGLAND DR	FRANKLIN PIKE	22656.37347	944.0155614	2	2026	59.3	Minor Rehabilitation	AC-6	Selected	4.253486	6.252449	31959.26
Oak_Hill::FOREST AC::73	FOREST ACRES DR	FOREST HILLS DR	GREEN VALLEY DR	19466.12236	811.0884316	2	2026	59.3	Minor Rehabilitation	AC-6	Selected	4.253486	6.252449	27459.06
Oak_Hill::FOREST HI::78	FOREST HILLS DR	FOREST ACRES DR	CUL-DE-SAC	48049.06119	2002.044216	2	2026	59.3	Minor Rehabilitation	AC-6	Selected	4.253486	6.252449	67778.38
Oak_Hill::GENERAL H::134	GENERAL HOOD TRL	WOODMONT BLVD	ROBIN RD	11177.77856	465.7407733	2	2026	59.3	Minor Rehabilitation	AC-6	Selected	4.253486	6.252449	15767.46
Oak_Hill::GLEN LEVE::135	GLEN LEVEN DR	MCCONNELL ST	NEWMAN PL	9077.177213	378.2157172	2	2026	59.3	Minor Rehabilitation	AC-6	Selected	4.253486	6.252449	12804.34
Oak_Hill::GLEN LEVE::136	GLEN LEVEN DR	NEWMAN PL	OVERBROOK DR	27978.99089	1165.791287	2	2026	59.3	Minor Rehabilitation	AC-6	Selected	4.253486	6.252449	39467.38
Oak_Hill::HILLVIEW ::173	HILLVIEW DR	N HILLVIEW CT	W HILLVIEW DR	5068.78398	211.1993325	2	2026	59.3	Minor Rehabilitation	AC-6	Selected	4.253486	6.252449	7150.066
Oak_Hill::BATTERY LN::8	BATTERY LN	LORING CT	LEALAND LN	20497.81034	427.0377155	2	2027	67.16	Preventive Maintenance	AC-7	Selected	9.892873	10.48772	8287.91
Oak_Hill::BROOKWOOD::15	BROOKWOOD LN	SEWANEE RD	GATEWAY LN	36172.50054	1507.187523	2	2027	67.16	Preventive Maintenance	AC-7	Selected	9.892873	10.48772	14625.68
Oak_Hill::CALDWELL ::19	CALDWELL LN	FRANKLIN PIKE	MCCONNELL ST	11865.24383	494.3851597	2	2027	67.16	Preventive Maintenance	AC-7	Selected	9.892873	10.48772	4797.492
Oak_Hill::CALDWELL ::20	CALDWELL LN	CRESTRIDGE DR	RAINBOW PL	13126.87538	546.9531409	2	2027	67.16	Preventive Maintenance	AC-7	Selected	9.892873	10.48772	5307.609
Oak_Hill::CALDWELL ::21	CALDWELL LN	RAINBOW PL	ROBIN RD	10227.26005	426.1358355	2	2027	67.16	Preventive Maintenance	AC-7	Selected	9.892873	10.48772	4135.203
Oak_Hill::CALDWELL ::22	CALDWELL LN	CALDWELL CT	GENERAL BATE DR	26974.53841	1123.9391	2	2027	67.16	Preventive Maintenance	AC-7	Selected	9.892873	10.48772	10906.65
Oak_Hill::CALDWELL ::23	CALDWELL LN	MID-BLOCK	CALDWELL CT	4477.416091	186.5590038	2	2027	67.16	Preventive Maintenance	AC-7	Selected	9.892873	10.48772	1810.36
Oak_Hill::CALDWELL ::24	CALDWELL LN	ROBIN RD	MID-BLOCK	4585.92815	191.0803396	2	2027	67.16	Preventive Maintenance	AC-7	Selected	9.892873	10.48772	1854.235
Oak_Hill::HOGAN RD::180	HOGAN RD	OAK HILL BOUNDARY	RAGLAND DR	4473.006853	186.3752855	2	2027	67.16	Preventive Maintenance	AC-7	Selected	9.892873	10.48772	1808.577
Oak_Hill::LEALAND LN::206	LEALAND LN	GATEWAY LN	TYNE BLVD	1526.48529	63.60355375	2	2027	91.44	Preventive Maintenance	AC-8	Selected	14.83931	4.08355	308.603
Oak_Hill::GLEN LEVE::137	GLEN LEVEN DR	FRANKLIN PIKE	MCCONNELL ST	15528.26306	647.010961	2	2027	57.16	Minor Rehabilitation	AC-6	Selected	4.047084	8.300853	23021.41
Oak_Hill::GLENDALE ::140	GLENDALE LN	CRESTWOOD DR	MELVILLE DR	17285.76355	720.2401478	2	2027	57.16	Minor Rehabilitation	AC-6	Selected	4.047084	8.300853	25626.99
Oak_Hill::GREEN VAL::157	GREEN VALLEY CT	GREEN VALLEY DR	CUL-DE-SAC	18522.68366	771.778486	2	2027	57.16	Minor Rehabilitation	AC-6	Selected	4.047084	8.300853	27460.78
Oak_Hill::GREERLAND::160	GREERLAND DR	RUSSELLWOOD DR	GENERAL BATE DR	9789.273963	407.8864151	2	2027	57.16	Minor Rehabilitation	AC-6	Selected	4.047084	8.300853	14513.08
Oak_Hill::GREERLAND::161	GREERLAND DR	OUTER DR	RUSSELLWOOD DR	9092.096515	378.8373548	2	2027	57.16	Minor Rehabilitation	AC-6	Selected	4.047084	8.300853	13479.48
Oak_Hill::HILLVIEW ::174	HILLVIEW DR	S HILLVIEW DR	MID-BLOCK	30970.50379	1290.437658	2	2027	57.16	Minor Rehabilitation	AC-6	Selected	4.047084	8.300853	45915.28
Oak_Hill::LAKEMONT ::185	LAKEMONT DR	LAKEMONT CT	HILLVIEW DR	4080.775971	170.0323321	2	2027	57.16	Minor Rehabilitation	AC-6	Selected	4.047084	8.300853	6049.949
Oak_Hill::LAKEMONT ::186	LAKEMONT DR	LAKEMONT CT	HILLVIEW DR	12403.6268	516.8177833	2	2027	57.16	Minor Rehabilitation	AC-6	Selected	4.047084	8.300853	18388.98
Oak_Hill::LAKEMONT ::190	LAKEMONT DR	FRANKLIN PIKE	OAK HILL BOUNDARY	3379.525676	140.8135699	2	2027	57.16	Minor Rehabilitation	AC-6	Selected	4.047084	8.300853	5010.312
Oak_Hill::LAMBERT DR::196	LAMBERT DR	MID-BLOCK	BRINDLEY DR	14020.8419	584.2017456	2	2027	57.16	Minor Rehabilitation	AC-6	Selected	4.047084	8.300853	20786.58
Oak_Hill::LEALAND LN::201	LEALAND LN	ROBERTSON ACADEMY	GATEWAY LN	15998.13157	666.5888154	2	2027	57.16	Minor Rehabilitation	AC-6	Selected	4.047084	8.300853	23718.01
Oak_Hill::LEALAND LN::202	LEALAND LN	KIRKMAN LN	STONEWALL DR	6393.838699	266.4099458	2	2027	57.16	Minor Rehabilitation	AC-6	Selected	4.047084	8.300853	9479.178
Oak_Hill::MAXWELL CT::209	MAXWELL CT	TYNE VALLEY BLVD	CUL-DE-SAC	13519.47418	563.3114241	2	2027	57.16	Minor Rehabilitation	AC-6	Selected	4.047084	8.300853	20043.28
Oak_Hill::MELVILLE ::213	MELVILLE DR	GLENDALE LN	THOMPSON AVE	20915.52103	871.4800431	2	2027	57.16	Minor Rehabilitation	AC-6	Selected	4.047084	8.300853	31008.28
Oak_Hill::MORRISWOO::214	MORRISWOOD CT	MORRISWOOD DR	OVERTON ST	8587.976845	357.8323685	2	2027	57.16	Minor Rehabilitation	AC-6	Selected	4.047084	8.300853	12732.09
Oak_Hill::MORRISWOO::215	MORRISWOOD CT	OVERTON ST	DEAD END	2447.356279	101.9731783	2	2027	57.16	Minor Rehabilitation	AC-6	Selected	4.047084	8.300853	3628.325
Oak_Hill::MORRISWOO::219	MORRISWOOD DR	BLEVINS DR	MORRISWOOD CT	12806.97779	533.6240747	2	2027	57.16	Minor Rehabilitation	AC-6	Selected	4.047084	8.300853	18986.97
Oak_Hill::NEWMAN PL::224	NEWMAN PL	GLEN LEVEN DR	DEAD END	33076.70131	1378.195888	2	2027	57.16	Minor Rehabilitation	AC-6	Selected	4.047084	8.300853	49037.82
Oak_Hill::OVERTON L::249	OVERTON LEA RD	CLONMEL RD	LEALAND LN	3536.109885	147.3379119	2	2027	57.16	Minor Rehabilitation	AC-6	Selected	4.047084	8.300853	5242.455
Oak_Hill::ROBIN RD::281	ROBIN RD	WINSTON PL	OAK HILL BOUNDARY	2163.388199	90.14117494	2	2027	57.16	Minor Rehabilitation	AC-6	Selected	4.047084	8.300853	3207.328
Oak_Hill::GATEWAY LN::118	GATEWAY LN	BROOKWOOD LN	GRANNY WHITE PIKE	16605.00611	691.8752547	2	2028	65.02	Preventive Maintenance	AC-7	Selected	9.412819	12.04665	7056.337
Oak_Hill::GLEN LEVE::138	GLEN LEVEN DR	OVERBROOK DR	CURTISWOOD LN	37433.51791	1559.729913	2	2028	65.02	Preventive Maintenance	AC-7	Selected	9.412819	12.04665	15907.46
Oak_Hill::GLENDALE ::141	GLENDALE LN	MELVILLE DR	MID-BLOCK	13229.53436	551.2305983	2	2028	65.02	Preventive Maintenance	AC-7	Selected	9.412819	12.04665	5621.922
Oak_Hill::GRANNY WH::151	GRANNY WHITE PIKE	TYNE BLVD	OVERTON LEA RD	18195.37182	758.1404924	2	2028	65.02	Preventive Maintenance	AC-7	Selected	9.412819	12.04665	7732.167
Oak_Hill::GRANNY WH::153	GRANNY WHITE PIKE	SAXON DR	OAK HILL BOUNDARY	16452.80561	685.533567	2	2028	65.02	Preventive Maintenance	AC-7	Selected	9.412819	12.04665	6991.659
Oak_Hill::GRANNY WH::154	GRANNY WHITE TRCE	MID-BLOCK	GRANNY WHITE PIKE	23781.47465	990.8947771	2	2028	65.02	Preventive Maintenance	AC-7	Selected	9.412819	12.04665	10105.99
Oak_Hill::LAKEVIEW ::194	LAKEVIEW DR	NORFLEET DR	DEAD END	4679.610414	194.9837673	2	2028	65.02	Preventive Maintenance	AC-7	Selected	9.412819	12.04665	1988.612
Oak_Hill::FOREST AC::69	FOREST ACRES DR	FRANKLIN PIKE	NANEARLE PL	1910.342017	79.59758404	2	2028	80.02	Preventive Maintenance	AC-8	Selected	14.11923	7.787119	405.9022

Oak_Hill::TYNE BLVD::316	TYNE BLVD	MID-BLOCK	MID-BLOCK	2697.409973	112.3920822	2	2028	80.02	Preventive Maintenance	AC-8	Selected	14.11923	7.787119	573.1354
Oak_Hill::HILLVIEW ::175	HILLVIEW DR	OAK HILL BOUNDARY	OLD HICKORY BLVD	396.7298181	16.53040909	2	2028	81.44	Preventive Maintenance	AC-8	Selected	14.11923	6.173237	84.29564
Oak_Hill::MORRISWOO::221	MORRISWOOD DR	PRESCOTT RD	MID-BLOCK	39181.65059	1632.568775	2	2028	55.02	Minor Rehabilitation	AC-6	Selected	3.850699	9.857419	61051.23
Oak_Hill::OMANDALE ::234	OMANDALE DR	MORRISWOOD DR	PRESCOTT RD	17745.45638	739.3940158	2	2028	55.02	Minor Rehabilitation	AC-6	Selected	3.850699	9.857419	27650.24
Oak_Hill::OTTER CRE::236	OTTER CREEK RD	FRANKLIN PIKE	PRIVATE	5848.547575	243.6894823	2	2028	55.02	Minor Rehabilitation	AC-6	Selected	3.850699	9.857419	9112.965
Oak_Hill::OVERBROOK::241	OVERBROOK DR	GLEN LEVEN DR	BROOKHAVEN DR	17827.64371	742.8184877	2	2028	55.02	Minor Rehabilitation	AC-6	Selected	3.850699	9.857419	27778.3
Oak_Hill::OVERBROOK::243	OVERBROOK DR	OVERBROOK CT	THOMPSON AVE	13318.94454	554.9560225	2	2028	55.02	Minor Rehabilitation	AC-6	Selected	3.850699	9.857419	20753.03
Oak_Hill::OVERTON L::253	OVERTON LEA RD	CLONMEL RD	LEALAND LN	46850.40534	1952.100222	2	2028	55.02	Minor Rehabilitation	AC-6	Selected	3.850699	9.857419	73000.37
Oak_Hill::OVERTON LN::254	OVERTON LN	FRANKLIN PIKE	CUL-DE-SAC	28607.52898	1191.980374	2	2028	55.02	Minor Rehabilitation	AC-6	Selected	3.850699	9.857419	44575.07
Oak_Hill::PRESCOTT ::261	PRESCOTT CT	DEAD END	PRESCOTT RD	14978.73841	624.1141003	2	2028	55.02	Minor Rehabilitation	AC-6	Selected	3.850699	9.857419	23339.25
Oak_Hill::PRESCOTT ::265	PRESCOTT RD	ELYSIAN FIELDS RD	DEAD END	23658.73314	985.7805474	2	2028	55.02	Minor Rehabilitation	AC-6	Selected	3.850699	9.857419	36864.06
Oak_Hill::REDWOOD DR::270	REDWOOD DR	FRANKLIN PIKE	MID-BLOCK	3485.157214	145.2148839	2	2028	55.02	Minor Rehabilitation	AC-6	Selected	3.850699	9.857419	5430.428
Oak_Hill::RIDGEVIEW::271	RIDGEVIEW DR	LAKEVIEW DR	S RIDGEVIEW DR	40369.38081	1682.057534	2	2028	55.02	Minor Rehabilitation	AC-6	Selected	3.850699	9.857419	62901.9
Oak_Hill::GLENDALE ::145	GLENDALE LN	CORAL WAY	SOPER AVE	762.734772	31.7806155	2	2028	63.58	Minor Rehabilitation	AC-6	Selected	3.850699	4.006585	1188.462
Oak_Hill::HARDING PL::163	HARDING PL	PEACH ORCHARD DR	FRANKLIN PIKE	46472.02934	968.1672779	4	2029	69.3	Preventive Maintenance	AC-7	Selected	8.95606	10.63046	20755.57
Oak_Hill::HARDING PL::164	HARDING PL	HARDING PL RAMP	I65 RAMP	10482.55273	218.3865152	4	2029	69.3	Preventive Maintenance	AC-7	Selected	8.95606	10.63046	4681.77
Oak_Hill::HARDING PL::166	HARDING PL	I65 RAMP	PEACH ORCHARD DR	55557.48706	1157.447647	4	2029	69.3	Preventive Maintenance	AC-7	Selected	8.95606	10.63046	24813.36
Oak_Hill::LAKEMONT ::184	LAKEMONT CT	CUL-DE-SAC	LAKEMONT DR	10847.96788	451.9986615	2	2029	67.88	Preventive Maintenance	AC-7	Selected	8.95606	10.04842	4844.973
Oak_Hill::PARKWOOD ::255	PARKWOOD TER	NORFLEET DR	CUL-DE-SAC	9920.650718	413.3604466	2	2029	67.88	Preventive Maintenance	AC-7	Selected	8.95606	10.04842	4430.81
Oak_Hill::BATTERY LN::6	BATTERY LN	HARDING PL	CHURCHWOOD DR	84031.3271	1750.652648	2	2029	57.88	Minor Rehabilitation	AC-6	Selected	3.663843	7.862824	137611.8
Oak_Hill::CURTISWOO::45	CURTISWOOD CIR	CURTISWOOD LN	DEAD END	39871.94489	1661.331037	2	2029	57.88	Minor Rehabilitation	AC-6	Selected	3.663843	7.862824	65295.29
Oak_Hill::EVANSDALE::61	EVANSDALE DR	FRANKLIN PIKE	KINGSVIEW CT	48088.59391	2003.691413	2	2029	57.88	Minor Rehabilitation	AC-6	Selected	3.663843	7.862824	78751.08
Oak_Hill::GOODLOE DR::146	GOODLOE DR	GRANNY WHITE PIKE	OAK HILL BOUNDARY	12604.35488	525.1814535	2	2029	57.88	Minor Rehabilitation	AC-6	Selected	3.663843	7.862824	20641.2
Oak_Hill::GREEN VAL::158	GREEN VALLEY DR	FOREST ACRES DR	GREEN VALLEY CT	16563.41833	690.1424304	2	2029	57.88	Minor Rehabilitation	AC-6	Selected	3.663843	7.862824	27124.67
Oak_Hill::HILLHAVEN::170	HILLHAVEN CT	FOREST ACRES DR	CUL-DE-SAC	21631.5168	901.3132001	2	2029	57.88	Minor Rehabilitation	AC-6	Selected	3.663843	7.862824	35424.31
Oak_Hill::LEALAND LN::207	LEALAND LN	TYNE BLVD	OVERTON LEA RD	23773.25012	990.5520882	2	2029	57.88	Minor Rehabilitation	AC-6	Selected	3.663843	7.862824	38931.66
Oak_Hill::OVERBROOK::240	OVERBROOK CT	OVERBROOK DR	CUL-DE-SAC	7980.407979	332.5169991	2	2029	57.88	Minor Rehabilitation	AC-6	Selected	3.663843	7.862824	13068.91
Oak_Hill::PEACH ORC::259	PEACH ORCHARD DR	PEACH ORCHARD DR	HARDING PL	3809.774512	158.7406047	2	2029	22.88	Major Reconstruction	AC-2	Selected	1.767643	6.744546	32329.27
Oak_Hill::CURTISWOO::48	CURTISWOOD LN	FRANKLIN PIKE	GLEN LEVEN DR	67397.66377	2808.235991	2	2030	65.74	Preventive Maintenance	AC-7	Selected	8.521466	11.13291	31636.65
Oak_Hill::CURTISWOO::49	CURTISWOOD LN	CURTISWOOD CIR	FRANKLIN PIKE	59153.32284	2464.721785	2	2030	65.74	Preventive Maintenance	AC-7	Selected	8.521466	11.13291	27766.74
Oak_Hill::CALDWELL ::25	CALDWELL LN	MID-BLOCK	MID-BLOCK	1066.461134	44.4358806	2	2030	67.16	Preventive Maintenance	AC-7	Selected	8.521466	10.2726	500.5999
Oak_Hill::PARKWOOD ::256	PARKWOOD TER	NORFLEET DR	CUL-DE-SAC	1828.473354	76.18638974	2	2030	67.16	Preventive Maintenance	AC-7	Selected	8.521466	10.2726	858.2906
Oak_Hill::MORRISWOO::216	MORRISWOOD DR	MID-BLOCK	MID-BLOCK	5872.237736	244.6765723	2	2030	87.16	Preventive Maintenance	AC-8	Selected	12.7822	7.516623	1378.222
Oak_Hill::MORRISWOO::217	MORRISWOOD DR	MID-BLOCK	OMANDALE DR	5519.657118	229.9857132	2	2030	59.3	Minor Rehabilitation	AC-6	Selected	3.486054	9.270615	9500.123
Oak_Hill::REDWOOD DR::268	REDWOOD DR	FOREST ACRES DR	CUL-DE-SAC	17980.24115	749.1767145	2	2030	55.74	Minor Rehabilitation	AC-6	Selected	3.486054	8.94475	30946.58
Oak_Hill::REDWOOD DR::269	REDWOOD DR	MID-BLOCK	FOREST ACRES DR	22345.06282	931.044284	2	2030	55.74	Minor Rehabilitation	AC-6	Selected	3.486054	8.94475	38459.06
Oak_Hill::ROBIN RD::279	ROBIN RD	GENERAL HOOD TRL	WINSTON PL	10280.4896	428.3537333	2	2030	55.74	Minor Rehabilitation	AC-6	Selected	3.486054	8.94475	17694.2
Oak_Hill::STONEWALL::306	STONEWALL JACKSON CT	STONEWALL JACKSON C	CUL-DE-SAC	32336.89233	1347.370514	2	2030	55.74	Minor Rehabilitation	AC-6	Selected	3.486054	8.94475	55656.44
Oak_Hill::WILLOWDAL::336	WILLOWDALE CT	FRANKLIN PIKE	CUL-DE-SAC	19885.22324	828.5509685	2	2030	55.74	Minor Rehabilitation	AC-6	Selected	3.486054	8.94475	34225.33
Oak_Hill::RUSSELLWO::282	RUSSELLWOOD DR	EVANS RD	GREERLAND DR	33136.70891	1380.696205	2	2030	45.74	Minor Rehabilitation	AC-5	Selected	2.662958	8.466454	99548.57
Oak_Hill::SOUTHMEAD::301	SOUTHMEADE PKWY	PRESCOTT RD	COURTLAND DR	13098.20544	545.7585601	2	2030	45.74	Minor Rehabilitation	AC-5	Selected	2.662958	8.466454	39349.34
Oak_Hill::THOMPSON ::307	THOMPSON AVE	NOEL AVE	OVERBROOK DR	8849.505058	368.7293774	2	2030	45.74	Minor Rehabilitation	AC-5	Selected	2.662958	8.466454	26585.49
Oak_Hill::THOMPSON ::308	THOMPSON AVE	OVERBROOK DR	CRESTRIDGE DR	7827.763302	326.1568042	2	2030	45.74	Minor Rehabilitation	AC-5	Selected	2.662958	8.466454	23515.99
Oak_Hill::W HILLVIE::333	W HILLVIEW DR	HILLVIEW DR	CUL-DE-SAC	3825.061458	159.3775607	2	2030	45.74	Minor Rehabilitation	AC-5	Selected	2.662958	8.466454	11491.17
Oak_Hill::CORAL WAY::34	CORAL WAY	DEAD END	CORAL RD	3166.776006	131.9490002	2	2030	35.74	Minor Rehabilitation	AC-4	Selected	2.166474	8.034273	14617.19
Oak_Hill::OAK VALLE::229	OAK VALLEY LN	CHURCHWOOD DR	DUSTIN LN	2073.931362	86.41380676	2	2030	35.74	Minor Rehabilitation	AC-4	Selected	2.166474	8.034273	9572.841
Oak_Hill::CADILLAC ::16	CADILLAC AVE	PASADENA DR	MID-BLOCK	15049.75704	627.0732099	2	2030	59.3	Minor Rehabilitation	AC-6	Selected	3.486054	5.969558	25902.79
Oak_Hill::HARDING PL::165	HARDING PL	I65 RAMP	HARDING PL RAMP	12601.10648	262.5230516	4	2031	70.02	Preventive Maintenance	AC-7	Selected	8.10796	10.30339	6216.66
Oak_Hill::BROOKHAVE::14	BROOKHAVEN DR	CRESTRIDGE DR	OVERBROOK DR	17648.87466	735.3697775	2	2031	80.74	Preventive Maintenance	AC-8	Selected	12.16194	7.410803	4353.469
Oak_Hill::CHURCHWOO::28	CHURCHWOOD DR	BATTERY LN	VAN LEER DR	25194.47075	1049.769615	2	2031	80.74	Preventive Maintenance	AC-8	Selected	12.16194	7.410803	6214.75
Oak_Hill::CRESTRIDG::36	CRESTRIDGE DR	PLEASANT VALLEY RD	CALDWELL LN	10395.14578	433.1310742	2	2031	80.74	Preventive Maintenance	AC-8	Selected	12.16194	7.410803	2564.183
Oak_Hill::CRESTRIDG::37	CRESTRIDGE DR	WOODMONT BLVD	PLEASANT VALLEY RD	32575.71595	1357.321498	2	2031	80.74	Preventive Maintenance	AC-8	Selected	12.16194	7.410803	8035.49
Oak_Hill::CRESTRIDG::40	CRESTRIDGE DR	EVANS RD	BROOKHAVEN DR	14580.07527	607.5031363	2	2031	80.74	Preventive Maintenance	AC-8	Selected	12.16194	7.410803	3596.484

Oak_Hill::CRESTRIDG::41	CRESTRIDGE DR	BROOKHAVEN DR	GREERLAND DR	37983.59256	1582.64969	2	2031	80.74	Preventive Maintenance	AC-8	Selected	12.16194	7.410803	9369.458
Oak_Hill::CRESTRIDG::42	CRESTRIDGE DR	GREERLAND DR	THOMPSON AVE	11728.21918	488.6757991	2	2031	80.74	Preventive Maintenance	AC-8	Selected	12.16194	7.410803	2893.014
Oak_Hill::DUSTIN LN::52	DUSTIN LN	BATTERY LN	ALDER DR	16014.31513	667.2631302	2	2031	80.74	Preventive Maintenance	AC-8	Selected	12.16194	7.410803	3950.27
Oak_Hill::DUSTIN LN::53	DUSTIN LN	ALDER DR	VAN LEER DR	14472.53086	603.0221191	2	2031	80.74	Preventive Maintenance	AC-8	Selected	12.16194	7.410803	3569.956
Oak_Hill::EVANS RD::59	EVANS RD	RUSSELLWOOD DR	GENERAL BATE DR	10261.65448	427.5689366	2	2031	80.74	Preventive Maintenance	AC-8	Selected	12.16194	7.410803	2531.254
Oak_Hill::LAKEMONT ::187	LAKEMONT DR	MID-BLOCK	LAKEMONT CT	17203.85703	716.8273761	2	2031	68.6	Preventive Maintenance	AC-7	Selected	8.10796	7.377156	8487.392
Oak_Hill::N HILLVIE::222	N HILLVIEW CT	HILLVIEW DR	CUL-DE-SAC	7667.77633	319.4906804	2	2031	68.6	Preventive Maintenance	AC-7	Selected	8.10796	7.377156	3782.839
Oak_Hill::GENERAL B::126	GENERAL BATE DR	CALDWELL LN	EVANS RD	730.3229283	30.43012201	2	2031	87.16	Preventive Maintenance	AC-8	Selected	12.16194	4.195977	180.1496
Oak_Hill::BALMORAL ::2	BALMORAL DR	LAKEVIEW DR	CUL-DE-SAC	41558.9404	1731.622517	2	2031	57.16	Minor Rehabilitation	AC-6	Selected	3.316893	8.014809	75176.88
Oak_Hill::BATTERY LN::4	BATTERY LN	DUSTIN LN	WATERSWOOD DR	40329.12253	840.1900528	2	2031	57.16	Minor Rehabilitation	AC-6	Selected	3.316893	8.014809	72952.24
Oak_Hill::BATTERY LN::5	BATTERY LN	WATERSWOOD DR	SOPER AVE	30405.70754	633.4522404	2	2031	57.16	Minor Rehabilitation	AC-6	Selected	3.316893	8.014809	55001.55
Oak_Hill::BRINDLEY ::13	BRINDLEY DR	LAMBERT DR	LAMBERT DR	32023.97547	1334.332311	2	2031	57.16	Minor Rehabilitation	AC-6	Selected	3.316893	8.014809	57928.87
Oak_Hill::CADILLAC ::17	CADILLAC AVE	MID-BLOCK	SOPER AVE	25795.83693	1074.826539	2	2031	57.16	Minor Rehabilitation	AC-6	Selected	3.316893	8.014809	46662.66
Oak_Hill::CRESTRIDG::39	CRESTRIDGE DR	CALDWELL LN	EVANS RD	8990.646146	374.6102561	2	2031	57.16	Minor Rehabilitation	AC-6	Selected	3.316893	8.014809	16263.38
Oak_Hill::GENERAL B::131	GENERAL BATE DR	MID-BLOCK	TOWER PL	4368.413924	182.0172468	2	2031	57.16	Minor Rehabilitation	AC-6	Selected	3.316893	8.014809	7902.12
Oak_Hill::GLENDALE ::144	GLENDALE LN	PASADENA DR	MID-BLOCK	3253.628939	135.5678724	2	2031	57.16	Minor Rehabilitation	AC-6	Selected	3.316893	8.014809	5885.561
Oak_Hill::HARDING P::167	HARDING PL RAMP	I65 S	HARDING PL	24548.62292	1022.859288	2	2031	62.16	Minor Rehabilitation	AC-6	Selected	3.316893	7.261444	44406.54
Oak_Hill::GREERLAND::162	GREERLAND DR	CRESTRIDGE DR	OUTER DR	10806.6573	450.2773875	2	2031	58.6	Minor Rehabilitation	AC-6	Selected	3.316893	6.100131	19548.4
Oak_Hill::HOGAN RD::179	HOGAN RD	RAGLAND DR	FRANKLIN PIKE	15505.69143	646.0704764	2	2031	58.6	Minor Rehabilitation	AC-6	Selected	3.316893	6.100131	28048.59
Oak_Hill::KINGSVIEW::181	KINGSVIEW CT	CUL-DE-SAC	EVANSDALE DR	7675.183928	319.7993303	2	2031	58.6	Minor Rehabilitation	AC-6	Selected	3.316893	6.100131	13883.81
Oak_Hill::NORFLEET ::227	NORFLEET DR	PARKWOOD TER	CUL-DE-SAC	4103.800481	170.9916867	2	2031	58.6	Minor Rehabilitation	AC-6	Selected	3.316893	6.100131	7423.455
Oak_Hill::SAXON DR::286	SAXON DR	MID-BLOCK	DRESDEN CIR	4917.071351	204.877973	2	2031	58.6	Minor Rehabilitation	AC-6	Selected	3.316893	6.100131	8894.599
Oak_Hill::HILLVIEW ::177	HILLVIEW DR	N HILLVIEW CT	W HILLVIEW DR	9846.73515	410.2806313	2	2031	23.6	Major Reconstruction	AC-2	Selected	1.600255	6.977508	92298.42

Pavement Surface Evaluation and Rating

PASER Manual
Asphalt Roads

RATING 10

RATING 7

RATING 4

RATING 1

Transportation Information Center
University of Wisconsin–Madison

Contents

This manual is intended to assist local officials in understanding and rating the surface condition of asphalt pavement. It describes types of defects and provides a simple system to visually rate pavement condition. The rating procedure can be used as condition data for the Wisconsin DOT local road inventory and as part of a computerized pavement management system like PASERWARE.

The PASER system described here and in other T.I.C. publications is based in part on a roadway management system originally developed by Phil Scherer, transportation planner, Northwest Wisconsin Regional Planning Commission.

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Pavement Surface Evaluation and Rating

PASER Manual
Asphalt Roads

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Transportation Information Center
University of Wisconsin–Madison

Pavement Surface Evaluation and Rating

Asphalt PASER Manual

A local highway agency's major goal is to use public funds to provide a comfortable, safe and economical road surface—no simple task. It requires balancing priorities and making difficult decisions in order to manage pavements. Local rural and small city pavements are often managed informally, based on the staff's judgment and experience. While this process is both important and functional, using a slightly more formalized technique can make it easier to manage pavements effectively.

Experience has shown that there are three especially useful steps in managing local roads:

1. Inventory all local roads and streets.
2. Periodically evaluate the condition of all pavements.
3. Use the condition evaluations to set priorities for projects and select alternative treatments.

A comprehensive pavement management system involves collecting data and assessing several road characteristics: roughness (ride), surface distress (condition), surface skid characteristics, and structure (pavement strength and deflection). Planners can combine this condition data with economic analysis to develop short-range and long-range plans for a variety of budget levels. However, many local agencies lack the resources for such a full-scale system.

Since surface condition is the most vital element in any pavement management system, local agencies can use the simplified rating system presented in this ***Asphalt PASER Manual*** to evaluate their roads. The PASER ratings combined with other inventory data (width, length, shoulder, pavement type, etc.) from the WisDOT local roads inventory (WISLR) can be very helpful in planning future budgets and priorities.

WISLR inventory information and PASER ratings can be used in a computerized pavement management system, PASERWARE, developed by the T.I.C and WisDOT. Local officials can use PASERWARE to evaluate whether their annual road budgets are adequate to maintain or improve current road conditions and to select the most cost-effective strategies and priorities for annual projects.

PASER Manuals for gravel, concrete, and other road surfaces, with compatible rating systems are also available (page 29). Together they make a comprehensive condition rating method for all road types. PASER ratings are accepted for WISLR condition data.

Asphalt pavement distress

PASER uses visual inspection to evaluate pavement surface conditions. The key to a useful evaluation is identifying different types of pavement distress and linking them to a cause. Understanding the cause for current conditions is extremely important in selecting an appropriate maintenance or rehabilitation technique.

There are four major categories of common asphalt pavement surface distress:

Surface defects
Raveling, flushing, polishing.

Surface deformation
Rutting, distortion—rippling and shoving, settling, frost heave.

Cracks
Transverse, reflection, slippage, longitudinal, block, and alligator cracks.

Patches and potholes

Deterioration has two general causes: environmental due to weathering and aging, and structural caused by repeated traffic loadings.

Obviously, most pavement deterioration results from both environmental and structural causes. However, it is important to try to distinguish between the two in order to select the most effective rehabilitation techniques.

The rate at which pavement deteriorates depends on its environment, traffic loading conditions, original construction quality, and interim maintenance procedures. Poor quality materials or poor construction procedures can significantly reduce the life of a pavement. As a result, two pavements constructed at the same time may have significantly different lives, or certain portions of a pavement may deteriorate more rapidly than others. On the other hand, timely and effective maintenance can extend a pavement's life. Crack sealing and seal coating can reduce the effect of moisture in aging of asphalt pavement.

With all of these variables, it is easy to see why pavements deteriorate at various rates and why we find them in various stages of disrepair. Recognizing defects and understanding their causes helps us rate pavement condition and select cost-effective repairs. The pavement defects shown on the following pages provide a background for this process.

Periodic inspection is necessary to provide current and useful evaluation data. It is recommended that PASER ratings be updated every two years, and an annual update is even better.

SURFACE DEFECTS

Raveling

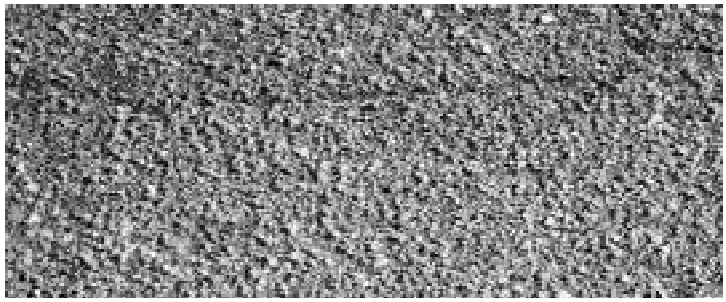
Raveling is progressive loss of pavement material from the surface downward, caused by: stripping of the bituminous film from the aggregate, asphalt hardening due to aging, poor compaction especially in cold weather construction, or insufficient asphalt content. Slight to moderate raveling has loss of fines. Severe raveling has loss of coarse aggregate. Raveling in the wheelpaths can be accelerated by traffic. Protect pavement surfaces from the environment with a sealcoat or a thin overlay if additional strength is required.

Flushing

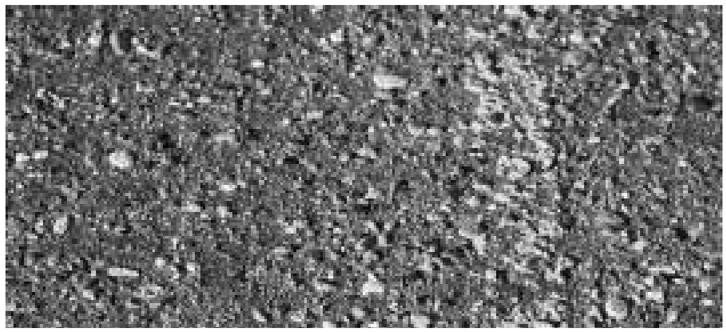
Flushing is excess asphalt on the surface caused by a poor initial asphalt mix design or by paving or sealcoating over a flushed surface. Repair by blotting with sand or by overlaying with properly designed asphalt mix.

Polishing

Polishing is a smooth slippery surface caused by traffic wearing off sharp edges of aggregates. Repair with sealcoat or thin bituminous overlay using skid-resistant aggregate.



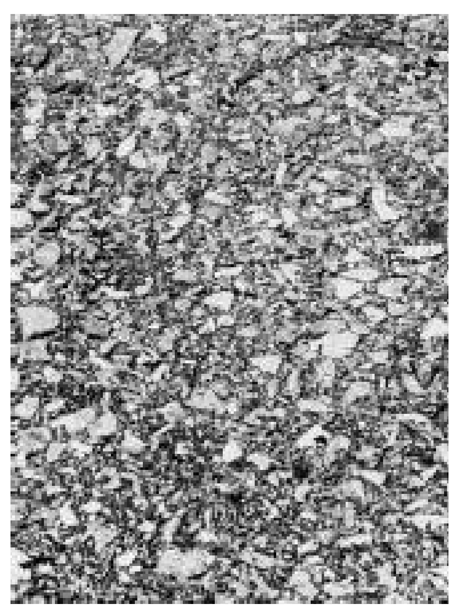
◄ **Slight raveling. Small aggregate particles have worn away exposing tops of large aggregate.**



◄ **Moderate to severe raveling. Erosion further exposes large aggregate.**

◄ **Severe raveling and loss of surface material.**

Polished, worn aggregate needs repair. ▼



► **Flushing. Dark patches show where asphalt has worked to surface.**

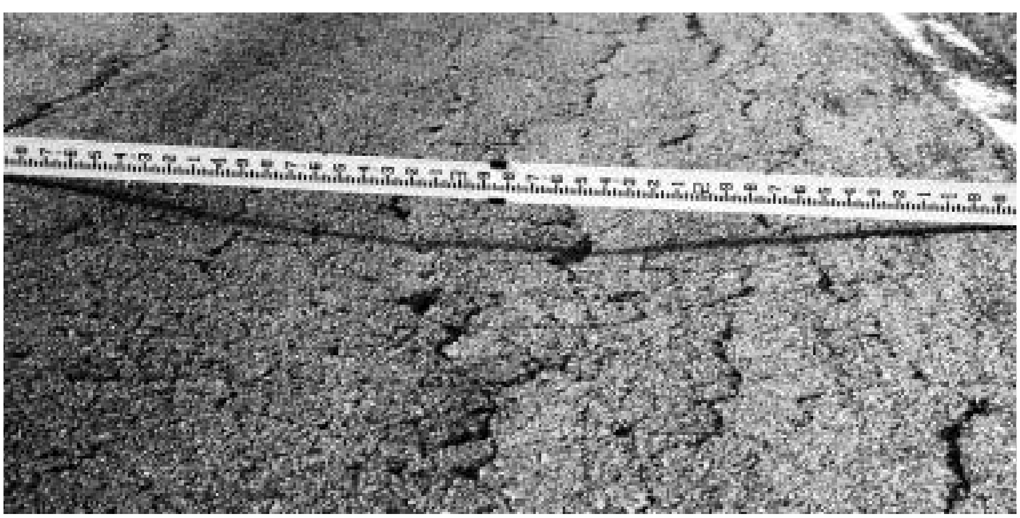
SURFACE DEFORMATION

Rutting

Rutting is displacement of material, creating channels in wheelpaths. It is caused by traffic compaction or displacement of unstable material. Severe rutting (over 2″) may be caused by base or subgrade consolidation. Repair minor rutting with overlays. Severe rutting requires milling the old surface or reconstructing the roadbed before resurfacing.

◄ **Even slight rutting is evident after a rain.**

◄ **Severe rutting over 2" caused by poor mix design.**



◄ **Severe rutting caused by poor base or subgrade.**

Distortion

Shoving or rippling is surfacing material displaced crossways to the direction of traffic. It can develop into washboarding when the asphalt mixture is unstable because of poor quality aggregate or improper mix design. Repair by milling smooth and overlaying with stable asphalt mix.

Other pavement distortions may be caused by settling, frost heave, etc. Patching may provide temporary repair. Permanent correction usually involves removal of unsuitable subgrade material and reconstruction.

▼ **Heavy traffic has shoved pavement into washboard ripples and bumps.**

► **Severe settling from utility trench.**

► **Frost heave damage from spring break-up.**

▼ **Widely spaced, well-sealed cracks.**

◄ **Sealed cracks, a few feet apart.**

CRACKS

Transverse cracks

A crack at approximately right angles to the center line is a transverse crack. They are often regularly spaced. The cause is movement due to temperature changes and hardening of the asphalt with aging.

Transverse cracks will initially be widely spaced (over 50′). Additional cracking will occur with aging until they are closely spaced (within several feet). These usually begin as hairline or very narrow cracks; with aging they widen. If not properly sealed and maintained, secondary or multiple cracks develop parallel to the initial crack. The crack edges can further deteriorate by raveling and eroding the adjacent pavement.

Prevent water intrusion and damage by sealing cracks which are more than ¼″ wide.

▲ **Tight cracks less than ¼″ in width.**

▲ **Open crack – ½″ or more in width.**

▲ **Water enters unsealed cracks softening pavement and causing secondary cracks.**

▲ **Pavement ravels and erodes along open cracks causing deterioration.**

Reflection cracks

Cracks in overlays reflect the crack pattern in the pavement underneath. They are difficult to prevent and correct. Thick overlays or reconstruction is usually required.

► **Concrete joints reflected through bituminous overlay.**

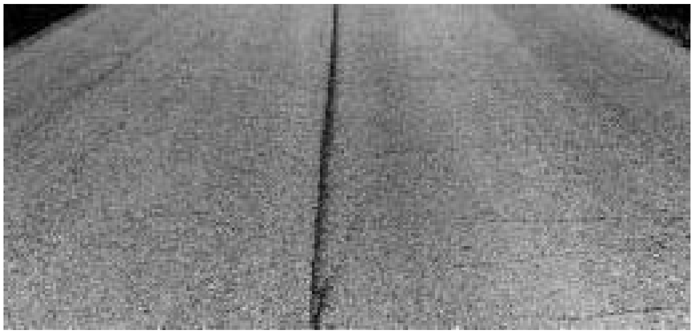
Slippage cracks

Crescent or rounded cracks in the direction of traffic, caused by slippage between an overlay and an underlying pavement. Slippage is most likely to occur at intersections where traffic is stopping and starting. Repair by removing the top surface and resurfacing using a tack coat.

► **Crescent-shaped cracks characteristic of slippage.**

► **Loss of bond between pavement layers allows traffic to break loose pieces of surface.**

Centerline crack (still tight). ►



Edge cracking from weakened subbase and traffic loads. ▼

Longitudinal cracks

Cracks running in the direction of traffic are longitudinal cracks. Center line or lane cracks are caused by inadequate bonding during construction or reflect cracks in underlying pavement. Longitudinal cracks in the wheel path indicate fatigue failure from heavy vehicle loads. Cracks within one foot of the edge are caused by insufficient shoulder support, poor drainage, or frost action. Cracks usually start as hairline or vary narrow and widen and erode with age. Without crack filling, they can ravel, develop multiple cracks, and become wide enough to require patching.

Filling and sealing cracks will reduce moisture penetration and prevent further subgrade weakening. Multiple longitudinal cracks in the wheel path or pavement edge indicate a need for strengthening with an overlay or reconstruction.

► **First stage of wheelpath cracking caused by heavy traffic loads.**

Load-related cracks in wheel path plus centerline cracking. ▼

Multiple open cracks at center line, wheelpaths and lane center. ▼

Block cracks

Block cracking is interconnected cracks forming large blocks. Cracks usually intersect at nearly right angles. Blocks may range from one foot to approximately 10’ or more across. The closer spacing indicates more advanced aging caused by shrinking and hardening of the asphalt over time. Repair with sealcoating during early stages to reduce weathering of the asphalt. Overlay or reconstruction required in the advanced stages.

► **Large blocks, approximately 10’ across.**

► **Intermediate-size block cracking, 1’-5’ across with open cracks.**

▲ **Extensive block cracking in an irregular pattern.**

► **Severe block cracking – 1’ or smaller blocks. Tight cracks with no raveling.**

Alligator cracks

Interconnected cracks forming small pieces ranging in size from about 1″ to 6″. This is caused by failure of the surfacing due to traffic loading (fatigue) and very often also due to inadequate base or subgrade support. Repair by excavating localized areas and replacing base and surface. Large areas require reconstruction. Improvements in drainage may often be required.

◄
Alligator crack pattern. Tight cracks and one patch.

◄
Characteristic “chicken wire” crack pattern shows smaller pavement pieces and patching.

◄
Open raveled alligator cracking with settlement along lane edge most likely due to very soft subgrade.

PATCHES AND POTHOLES

Patches

Original surface repaired with new asphalt patch material. This indicates a pavement defect or utility excavation which has been repaired. Patches with cracking, settlement or distortions indicate underlying causes still remain. Recycling or reconstruction are required when extensive patching shows distress.

►
Typical repair of utility excavation. Patch in fair to good condition.

►
Edge wedging. Pavement edges strengthened with wedges of asphalt. Patch is in very good condition.

►
Extensive patching in very poor condition.

Potholes

Holes and loss of pavement material caused by traffic loading, fatigue and inadequate strength. Often combined with poor drainage. Repair by excavating or rebuilding localized potholes. Reconstruction required for extensive defects.

◄
Small pothole where top course has broken away.

◄
Multiple potholes show pavement failure, probably due to poor subgrade soils, frost heave, and bad drainage.

◄
Large, isolated pothole, extends through base. Note adjacent alligator cracks which commonly deteriorate into potholes.

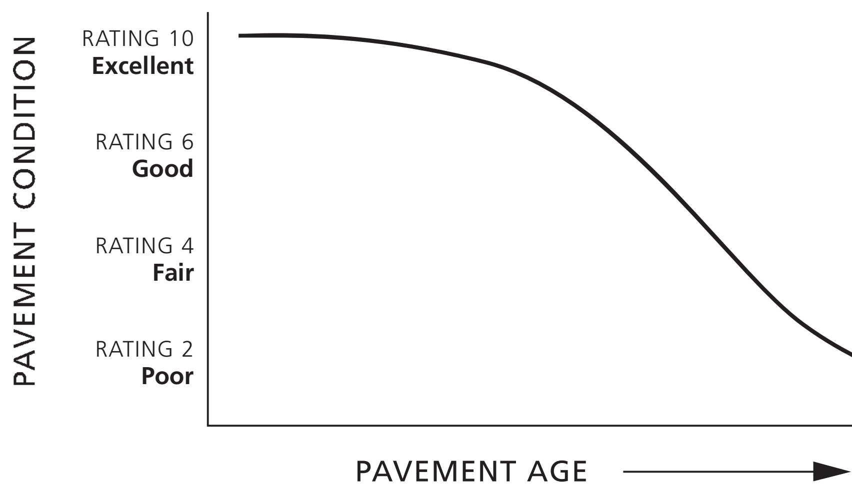
Rating pavement surface condition

With an understanding of surface distress, you can evaluate and rate asphalt pavement surfaces. The rating scale ranges from **10–excellent** condition to **1–failed**. Most pavements will deteriorate through the phases listed in the rating scale. The time it takes to go from excellent condition (10) to complete failure (1) depends largely on the quality of the original construction and the amount of heavy traffic loading.

Once significant deterioration begins, it is common to see pavement decline rapidly. This is usually due to a combination of loading and the effects of additional moisture. As a pavement ages and additional cracking develops, more moisture can enter the pavement and accelerate the rate of deterioration.

Look at the photographs in this section to become familiar with the descriptions of the individual rating categories. To evaluate an individual pavement segment, first determine its general condition. Is it relatively new, toward the top end of the scale? In very poor condition and at the bottom of the scale? Or somewhere in between? Next, think generally about the appropriate maintenance method. Use the rating categories outlined below.

Finally, review the individual pavement distress and select the appropriate surface rating. Individual pavements will ***not*** have all of the types of distress listed for any particular rating. They may have only one or two types.



In addition to indicating the surface condition of a road, a given rating also includes a recommendation for needed maintenance or repair. This feature of the rating system facilitates its use and enhances its value as a tool in ongoing road maintenance.

RATINGS ARE RELATED TO NEEDED MAINTENANCE OR REPAIR

Rating 9 & 10	No maintenance required
Rating 8	Little or no maintenance
Rating 7	Routine maintenance, cracksealing and minor patching
Rating 5 & 6	Preservative treatments (sealcoating)
Rating 3 & 4	Structural improvement and leveling (overlay or recycling)
Rating 1 & 2	Reconstruction

Rating system

Surface rating	*Visible distress**	*General condition/ treatment measures*
10 Excellent	None.	New construction.
9 Excellent	None.	Recent overlay. Like new.
8 Very Good	No longitudinal cracks except reflection of paving joints. Occasional transverse cracks, widely spaced (40′ or greater). All cracks sealed or tight (open less than 1⁄4″).	Recent sealcoat or new cold mix. Little or no maintenance required.
7 Good	Very slight or no raveling, surface shows some traffic wear. Longitudinal cracks (open 1⁄4″) due to reflection or paving joints. Transverse cracks (open 1⁄4″) spaced 10′ or more apart, little or slight crack raveling. No patching or very few patches in excellent condition.	First signs of aging. Maintain with routine crack filling.
6 Good	Slight raveling (loss of fines) and traffic wear. Longitudinal cracks (open 1⁄4″–1⁄2″), some spaced less than 10′. First sign of block cracking. Sight to moderate flushing or polishing. Occasional patching in good condition.	Shows signs of aging. Sound structural condition. Could extend life with sealcoat.
5 Fair	Moderate to severe raveling (loss of fine and coarse aggregate). Longitudinal and transverse cracks (open 1⁄2″) show first signs of slight raveling and secondary cracks. First signs of longitudinal cracks near pavement edge. Block cracking up to 50% of surface. Extensive to severe flushing or polishing. Some patching or edge wedging in good condition.	Surface aging. Sound structural condition. Needs sealcoat or thin non-structural overlay (less than 2″)
4 Fair	Severe surface raveling. Multiple longitudinal and transverse cracking with slight raveling. Longitudinal cracking in wheel path. Block cracking (over 50% of surface). Patching in fair condition. Slight rutting or distortions (1⁄2″ deep or less).	Significant aging and first signs of need for strengthening. Would benefit from a structural overlay (2″ or more).
3 Poor	Closely spaced longitudinal and transverse cracks often showing raveling and crack erosion. Severe block cracking. Some alligator cracking (less than 25% of surface). Patches in fair to poor condition. Moderate rutting or distortion (1″ or 2″ deep). Occasional potholes.	Needs patching and repair prior to major overlay. Milling and removal of deterioration extends the life of overlay.
2 Very Poor	Alligator cracking (over 25% of surface). Severe distortions (over 2″ deep) Extensive patching in poor condition. Potholes.	Severe deterioration. Needs reconstruction with extensive base repair. Pulverization of old pavement is effective.
1 Failed	Severe distress with extensive loss of surface integrity.	Failed. Needs total reconstruction.

** Individual pavements will not have all of the types of distress listed for any particular rating. They may have only one or two types.*

RATING 10 & 9

EXCELLENT — No maintenance required

Newly constructed or recently overlaid roads are in excellent condition and require no maintenance.

► **RATING 10** **New construction.**

► **RATING 9** **Recent overlay, rural.**

► **RATING 9** **Recent overlay, urban.**

RATING 8

VERY GOOD —
Little or no maintenance required

This category includes roads which have been recently sealcoated or overlaid with new cold mix. It also includes recently constructed or overlaid roads which may show longitudinal or transverse cracks. All cracks are tight or sealed.

◄ **Recent chip seal.**

◄ **Recent slurry seal.**

▼ **Widely spaced, sealed cracks.**

▲ **New cold mix surface.**

RATING 7

GOOD —
Routine sealing recommended

Roads show first signs of aging, and they may have very slight raveling. Any longitudinal cracks are along paving joint. Transverse cracks may be approximately 10’ or more apart. All cracks are ¼” or less, with little or no crack erosion. Few if any patches, all in very good condition. Maintain a crack sealing program.

▶ **Tight and sealed transverse and longitudinal cracks. Maintain crack sealing program.**

▶ **Tight and sealed transverse and longitudinal cracks.**

▶ **Transverse cracks about 10’ or more apart. Maintain crack sealing program.**

RATING 6

GOOD —
Consider preservative treatment

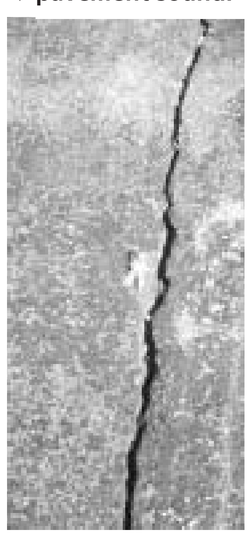
Roads are in sound structural condition but show definite signs of aging. Seal-coating could extend their useful life. There may be slight surface raveling. Transverse cracks can be frequent, less than 10′ apart. Cracks may be $1/4$–$1/2$″ and sealed or open. Pavement is generally sound adjacent to cracks. First signs of block cracking may be evident. May have slight or moderate bleeding or polishing. Patches are in good condition.

◄ **Slight surface raveling with tight cracks, less than 10′ apart.**

◄ **Transverse cracking less than 10′ apart; cracks well-sealed.**

▼ **Large blocks, early signs of raveling and block cracking.**

▼ **Open crack, $1/2$″ wide; adjoining pavement sound.**



▼ **Moderate flushing.**

RATING 5

FAIR — Preservative maintenance treatment required

Roads are still in good structural condition but clearly need sealcoating or overlay. They may have moderate to severe surface raveling with significant loss of aggregate. First signs of longitudinal cracks near the edge. First signs of raveling along cracks. Block cracking up to 50% of surface. Extensive to severe flushing or polishing. Any patches or edge wedges are in good condition.

▼ **Block cracking with open cracks.**

▶ **Moderate to severe raveling in wheel paths.**

▼ **Severe flushing.**

▲ **Wedges and patches extensive but in good condition.**

RATING 4

FAIR —
Structural improvement required

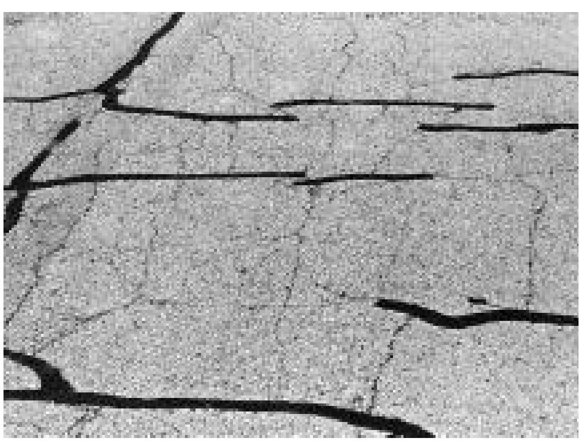
Roads show first signs of needing strengthening by overlay. They have very severe surface raveling which should no longer be sealed. First longitudinal cracking in wheel path. Many transverse cracks and some may be raveling slightly. Over 50% of the surface may have block cracking. Patches are in fair condition. They may have rutting less than ½″ deep or slight distortion.

Severe raveling with ▼ extreme loss of aggregate.

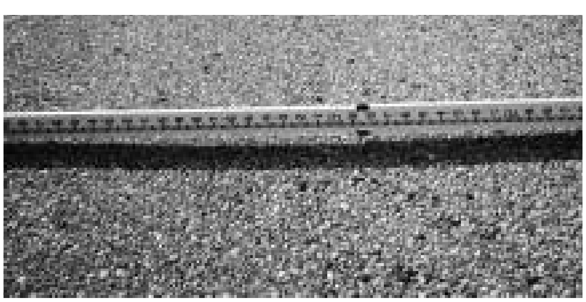
Load cracking and slight ▼ rutting in wheel path.

◄ Longitudinal cracking; early load-related distress in wheel path. Strengthening needed.

▼ Slight rutting; patch in good condition.



▼ Extensive block cracking. Blocks tight and sound.



◄ Slight rutting in wheel path.

RATING 3

POOR— Structural improvement required

Roads must be strengthened with a structural overlay (2″ or more). Will benefit from milling and very likely will require pavement patching and repair beforehand. Cracking will likely be extensive. Raveling and erosion in cracks may be common. Surface may have severe block cracking and show first signs of alligator cracking. Patches are in fair to poor condition. There is moderate distortion or rutting (1-2″) and occasional potholes.

► **Many wide and raveled cracks indicate need for milling and overlay.**

► **2″ ruts need mill and overlay.**

► **Open and raveled block cracks.**

RATING 3

POOR — (continued)
Structural improvement required

◄ **Alligator cracking. Edge needs repair and drainage needs improvement prior to rehabilitation.**

▼ **Distortion with patches in poor condition. Repair and overlay.**

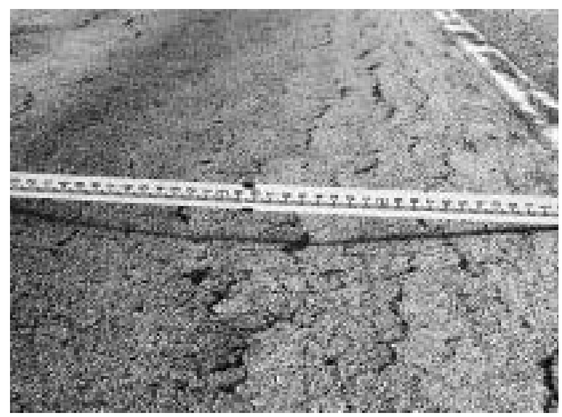
RATING 2

VERY POOR—
Reconstruction required

Roads are severely deteriorated and need reconstruction. Surface pulverization and additional base may be cost-effective. These roads have more than 25% alligator cracking, severe distortion or rutting, as well as potholes or extensive patches in poor condition.

► **Extensive alligator cracking. Pulverize and rebuild.**

▲ **Patches in poor condition, wheelpath rutting. Pulverize, strengthen and reconstruct.**



▲ **Severe rutting. Strengthen base and reconstruct.**

► **Severe frost damage. Reconstruct.**

RATING 1

FAILED —
Reconstruction required

Roads have failed, showing severe distress and extensive loss of surface integrity.

◄
Potholes from frost damage. Reconstruct.

◄
Potholes and severe alligator cracking. Failed pavement. Reconstruct.

◄
Extensive loss of surface. Rebuild.

Practical advice on rating roads

Inventory and field inspection

Most agencies routinely observe roadway conditions as a part of their normal work and travel. However, an actual inspection means looking at the entire roadway system as a whole and preparing a written summary of conditions. This inspection has many benefits over casual observations. It can be helpful to compare segments, and ratings decisions are likely to be more consistent because the roadway system is considered as a whole within a relatively short time.

An inspection also encourages a review of specific conditions important in roadway maintenance, such as drainage, adequate strength, and safety.

A simple written inventory is useful in making decisions where other people are involved. You do not have to trust your memory, and you can usually answer questions in more detail. Having a written record and objective information also improves your credibility with the public.

Finally, a written inventory is very useful in documenting changing roadway conditions. Without records over several years it is impossible to know if road conditions are improving, holding their own, or declining.

Annual budgets and long range planning are best done when based on actual needs as documented with a written inventory.

The Wisconsin DOT local road inventory (WISLR) is a valuable resource for managing your local roads. Adding PASER surface condition ratings is an important improvement.

Averaging and comparing sections

For evaluation, divide the local road system into individual segments which are similar in construction and condition. Rural segments may vary from ½ mile to a mile long, while sections in urban areas will likely be 1-4 blocks long or more. If you are starting with the WISLR Inventory, the segments have already been established. You may want to review them for consistent road conditions.

Obviously, no roadway segment is entirely consistent. Also, surfaces in one section will not have all of the types of distress listed for any particular rating. They may have only one or two types. Therefore, some averaging is necessary.

The objective is to rate the condition that represents the majority of the roadway. Small or isolated conditions should not influence the rating. It is useful to note these special conditions on the inventory form so this information can be used in planning specific improvement projects. For example, some spot repairs may be required.

Occasionally surface conditions vary significantly within a segment. For example, short sections of good condition may be followed by sections of poor surface conditions. In these cases, it is best to rate the segment according to the worst conditions and note the variation on the form.

The overall purpose of condition rating is to be able to compare each segment relative to all the other segments in your roadway system. On completion you should be able to look at any two pavement segments and find that the better surface has a higher rating.

Within a given rating, say 6, not all pavements will be exactly the same. However, they should all be considered to be in better condition than those with lower ratings, say 5. Sometimes it is helpful in rating a difficult segment to compare it to other previously rated segments. For example, if it is better than one you rated 5 and worse than a typical 7, then a rating of 6 is appropriate. Having all pavement segments rated in the proper relative order is most important and useful.

Assessing drainage conditions

Moisture and poor pavement drainage are significant factors in pavement deterioration. Some assessment of drainage conditions during pavement rating is highly recommended. While you should review drainage in detail at the project level, at this stage simply include an overview drainage evaluation at the same time as you evaluate surface condition.

Urban drainage.

RATING: Excellent

Good rural ditch and driveway culvert. Culvert end needs cleaning.

RATING: Good

High shoulder and no ditch lead to pavement damage. Needs major ditch improvement for a short distance.

RATING: Fair

No drainage leads to failed pavement.

RATING: Poor

Consider both pavement surface drainage and lateral drainage (ditches or storm sewers). Pavement should be able to quickly shed water off the surface into the lateral ditches. Ditches should be large and deep enough to drain the pavement and remove the surface water efficiently into adjacent waterways.

Look at the roadway crown and check for low surface areas that permit ponding. Paved surfaces should have approximately a 2% cross slope or crown across the roadway. This will provide approximately 3" of fall on a 12′ traffic lane. Shoulders should have a greater slope to improve surface drainage.

A pavement's ability to carry heavy traffic loads depends on both the pavement materials (asphalt surfacing and granular base) and the strength of the underlying soils. Most soils lose strength when they are very wet. Therefore, it is important to provide drainage to the top layer of the subgrade supporting the pavement structure.

In rural areas, drainage is provided most economically by open ditches that allow soil moisture to drain laterally. As a rule of thumb, the bottom of the ditch ought to be at least one foot below the base course of the pavement in order to drain the soils. This means that minimum ditch depth should be about 2′ below the center of the pavement. Deeper ditches, of course, are required to accommodate roadway culverts and maintain the flow line to adjacent drainage channels or streams.

You should also check culverts and storm drain systems. Storm drainage systems that are silted in, have a large accumulation of debris, or are in poor structural condition will also degrade pavement performance.

The T.I.C. publication, ***Drainage Manual: Local Road Assessment and Improvement,*** describes the elements of drainage systems, depicts them in detailed photographs, and explains how to rate their condition. Copies are available from the Transportation Information Center.

Planning annual maintenance and repair budgets

We have found that relating a normal maintenance or rehabilitation procedure to the surface rating scheme helps local officials use the rating system. However, an individual surface rating should not automatically dictate the final maintenance or rehabilitation technique.

You should consider future traffic projections, original construction, and pavement strength since these may dictate a more comprehensive rehabilitation than the rating suggests. On the other hand, it may be appropriate under special conditions to do nothing and let the pavement fully deteriorate, then rebuild when funds are available.

Summary

Using local road funds most efficiently requires good planning and accurate identification of appropriate rehabilitation projects. Assessing roadway conditions is an essential first step in this process. This asphalt pavement surface condition rating procedure has proved effective in improving decision making and using highway funds more efficiently. It can be used directly by local officials and staff. It may be combined with additional testing and data collection in a more comprehensive pavement management system.

Transportation Information Center Publications

Pavement Surface Evaluation and Rating (PASER) Manuals

Asphalt PASER Manual, 2002, 28 pp.

Brick and Block PASER Manual, 2001, 8 pp.

Concrete PASER Manual, 2002, 28 pp.

Gravel PASER Manual, 2002, 20 pp.

Sealcoat PASER Manual, 2000, 16 pp.

Unimproved Roads PASER Manual, 2001, 12 pp.

Drainage Manual
Local Road Assessment and Improvement, 2000, 16 pp.

SAFER Manual
Safety Evaluation for Roadways, 1996, 40 pp.

Flagger's Handbook (pocket-sized guide), 1998, 22 pp.

Work Zone Safety, Guidelines for Construction, Maintenance, and Utility Operations, (pocket-sized guide), 1999, 55 pp.

Wisconsin Transportation Bulletins

#1 Understanding and Using Asphalt
#2 How Vehicle Loads Affect Pavement Performance
#3 LCC—Life Cycle Cost Analysis
#4 Road Drainage
#5 Gravel Roads
#6 Using Salt and Sand for Winter Road Maintenance
#7 Signing for Local Roads
#8 Using Weight Limits to Protect Local Roads
#9 Pavement Markings
#10 Seal Coating and Other Asphalt Surface Treatments
#11 Compaction Improves Pavement Performance
#12 Roadway Safety and Guardrail
#13 Dust Control on Unpaved Roads
#14 Mailbox Safety
#15 Culverts-Proper Use and Installation
#16 Geotextiles in Road Construction/Maintenance and Erosion Control
#17 Managing Utility Cuts
#18 Roadway Management and Tort Liability in Wisconsin
#19 The Basics of a Good Road
#20 Using Recovered Materials in Highway Construction
#21 Setting Speed Limits on Local Roads

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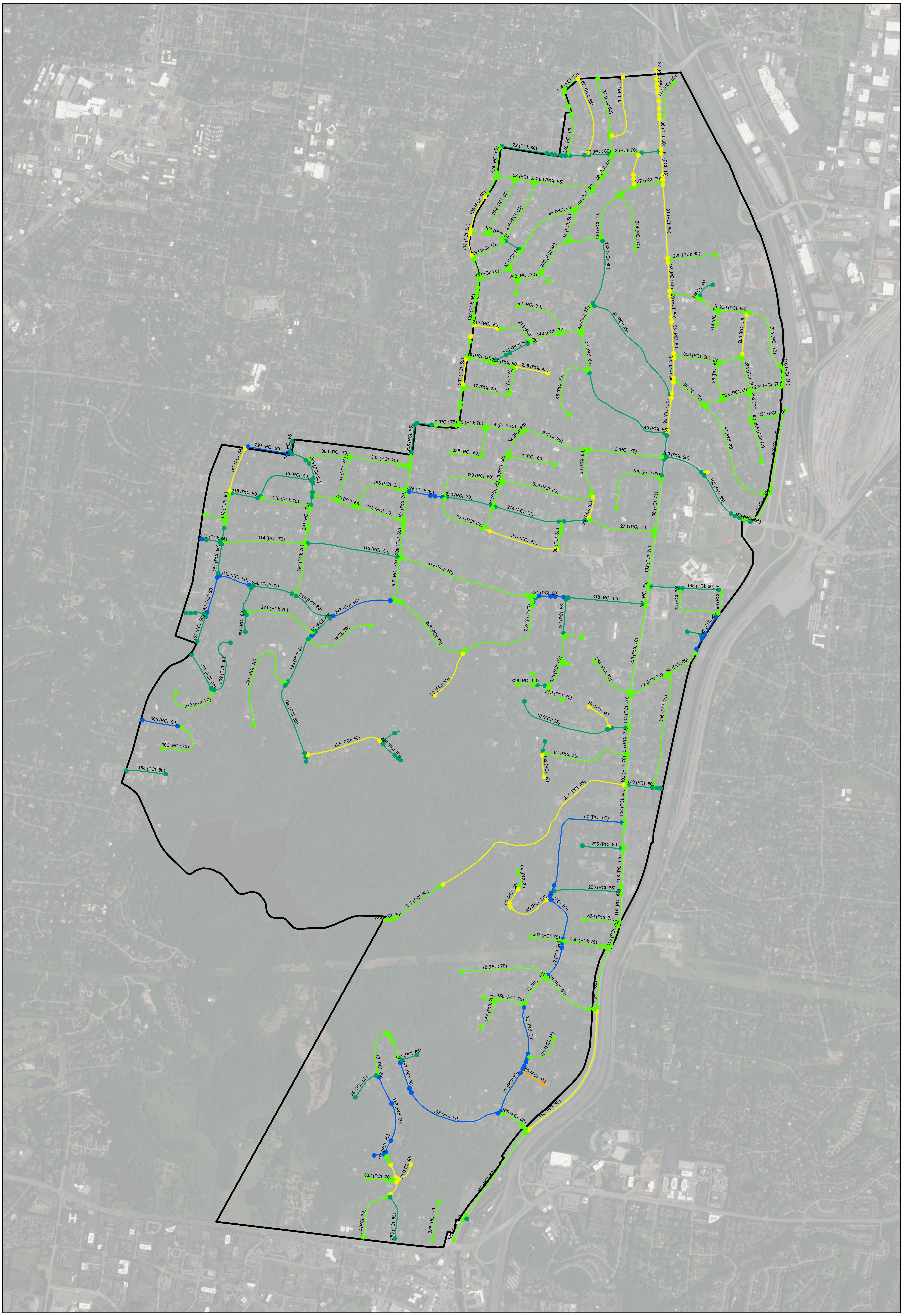
URL http://tic.engr.wisc.edu

PASER

Asphalt Roads

Transportation Information Center
University of Wisconsin–Madison



City of Oak Hill

Pavement Management System

Pavement Condition Plan

0 462.5 925 1,850 Feet

KHA Project	170214001
Date	10/28/2021
Scale As Shown	
Designed By: EAK	
Drawn By: MDH	
Checked By: PRK	

Kimley»Horn

4201 Warrenville Road, Suite 600,
Warrenville, IL 60555
Phone: 630-487-5550
www.kimley-horn.com

Pavement Condition Index
- -99.00 - 19.00
- 19.01 - 39.00
- 39.01 - 59.00
- 59.01 - 79.00
- 79.01 - 89.00
- 89.01 - 100.0

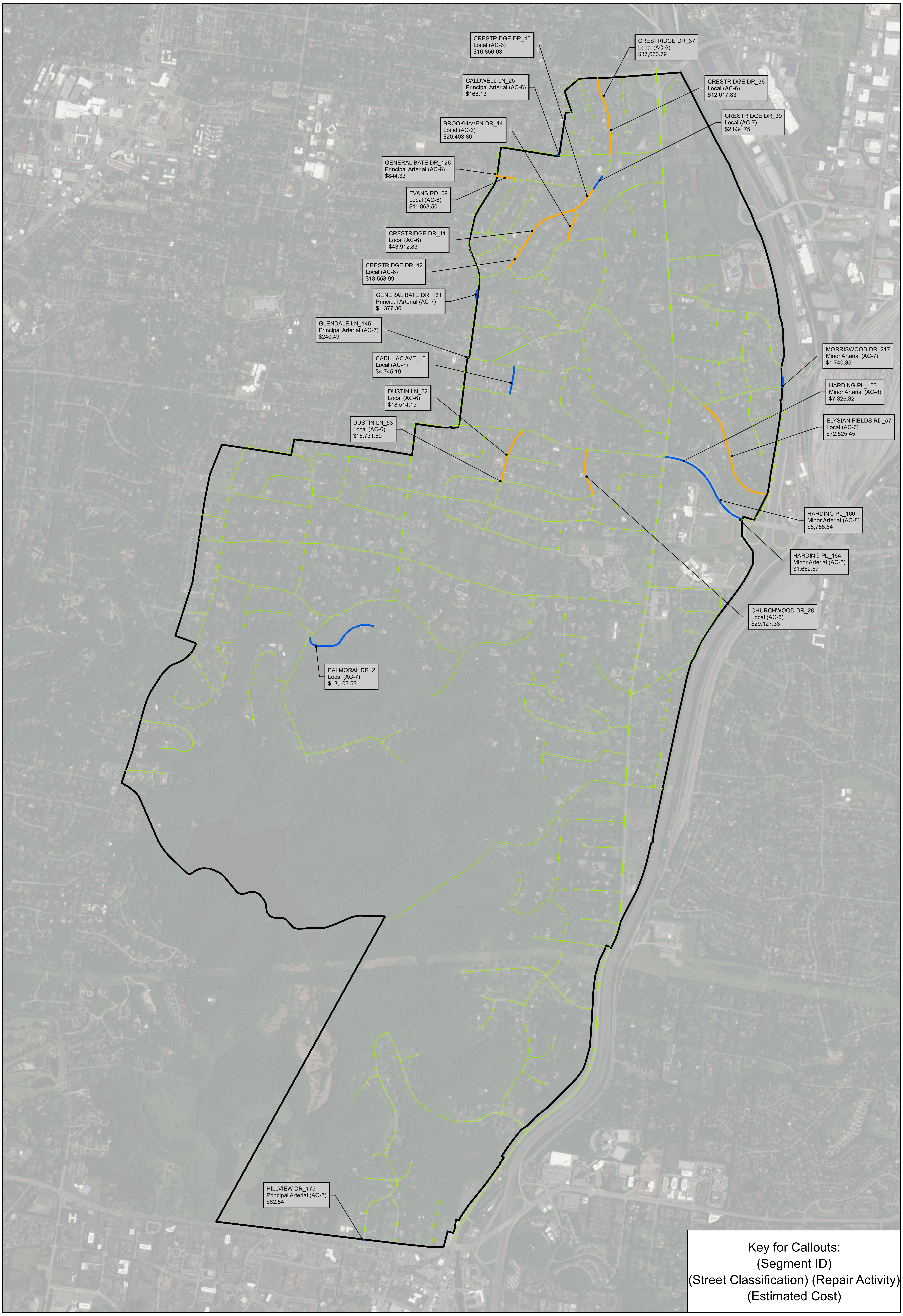
City Limits (Approximate)

N E S W

Legend

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet



Plan Activity 1

City of Oak Hill

Pavement Management System

Pavement Maintenance Activity Plan

0 462.5 925 1,850 Feet

KHA Project 268022000
Date 10/6/2021
Scale As Shown
Designed By: EAK
Drawn By: MDH
Checked By: PRK

Kimley»Horn

4201 Warrenville Road, Suite 600,
Warrenville, IL 60555
Phone: 630-487-5550
www.kimley-horn.com

Legend

City Limits (Approximate)

No repair this year

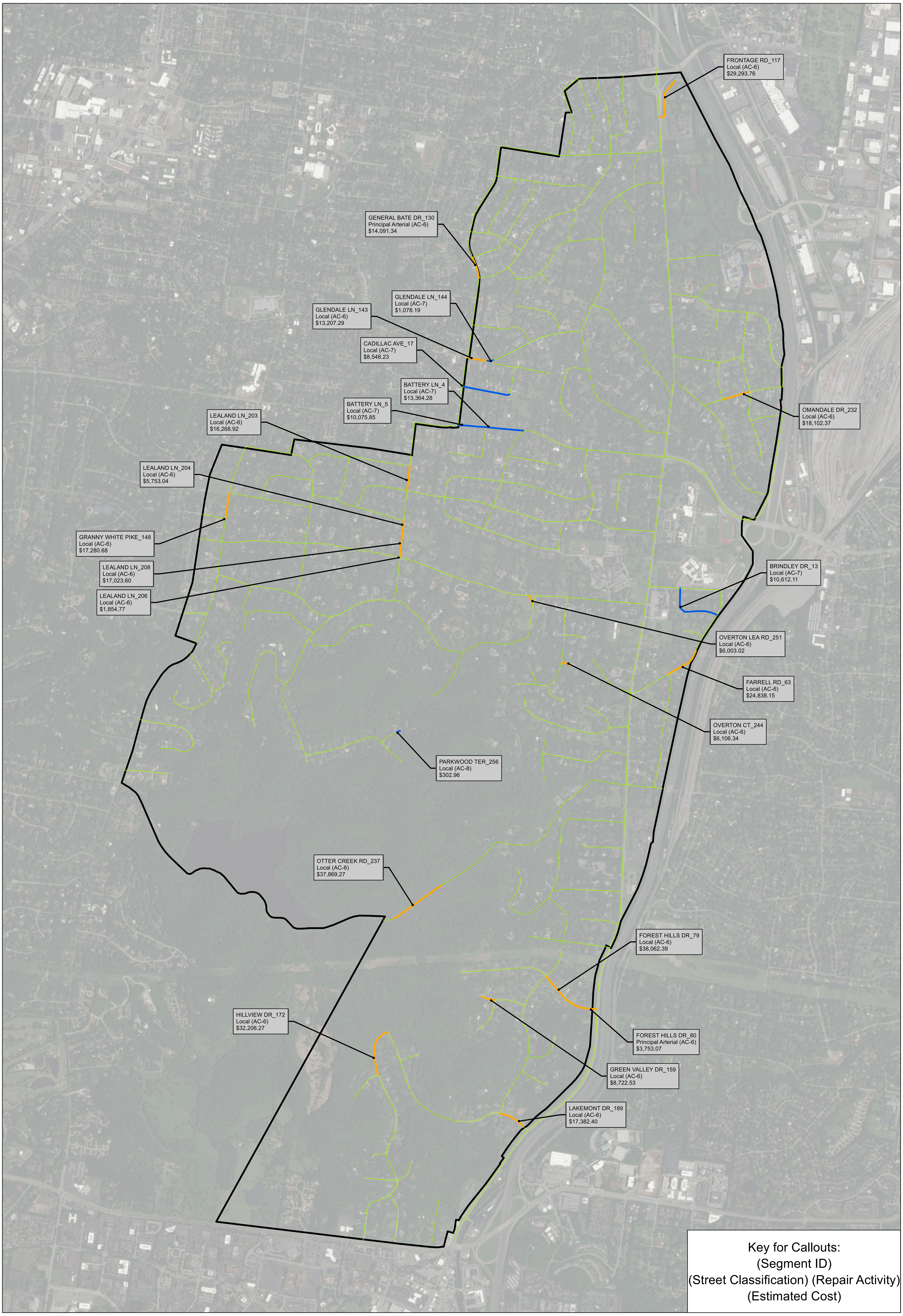
Rehabilitation

Preventative Maintenance

N E S W

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet



Plan Activity 2

City of Oak Hill

Pavement Management System

Pavement Maintenance Activity Plan

0 462.5 925 1,850 Feet

KHA Project	268022000
Date	10/6/2021
Scale As Shown	
Designed By: EAK	
Drawn By: MDH	
Checked By: PRK	

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Phone: 630-487-5550
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Legend

City Limits (Approximate)

No repair this year

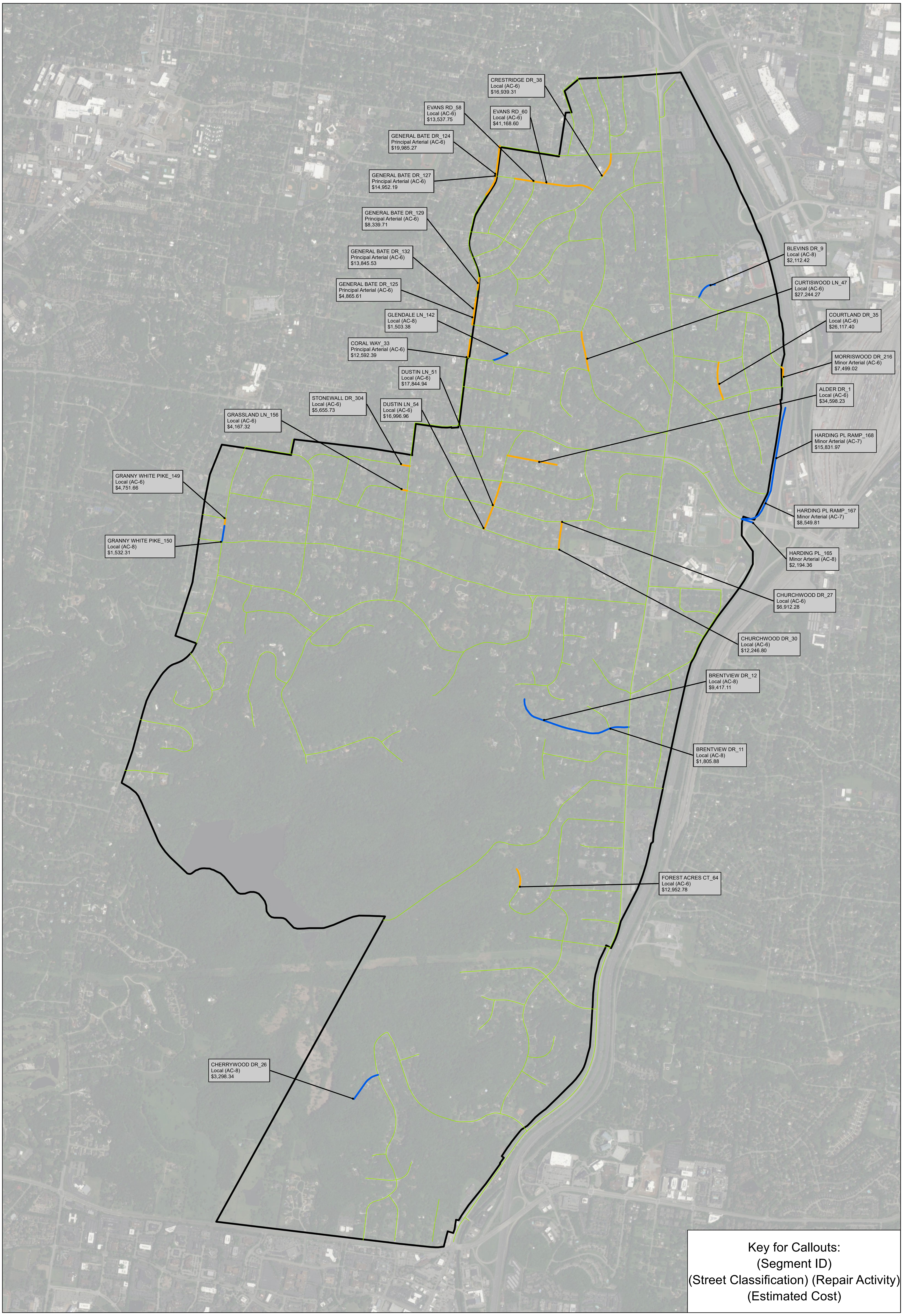
Rehabilitation

Preventative Maintenance

N W E S

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet



Plan Activity 3

City of Oak Hill

Pavement Management System

Pavement Maintenance Activity Plan

0 462.5 925 1,850 Feet

KHA Project 268022000
Date 10/6/2021
Scale As Shown
Designed By: EAK
Drawn By: MDH
Checked By: PRK

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Phone: 630-487-5550
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Legend

City Limits (Approximate)

No repair this year

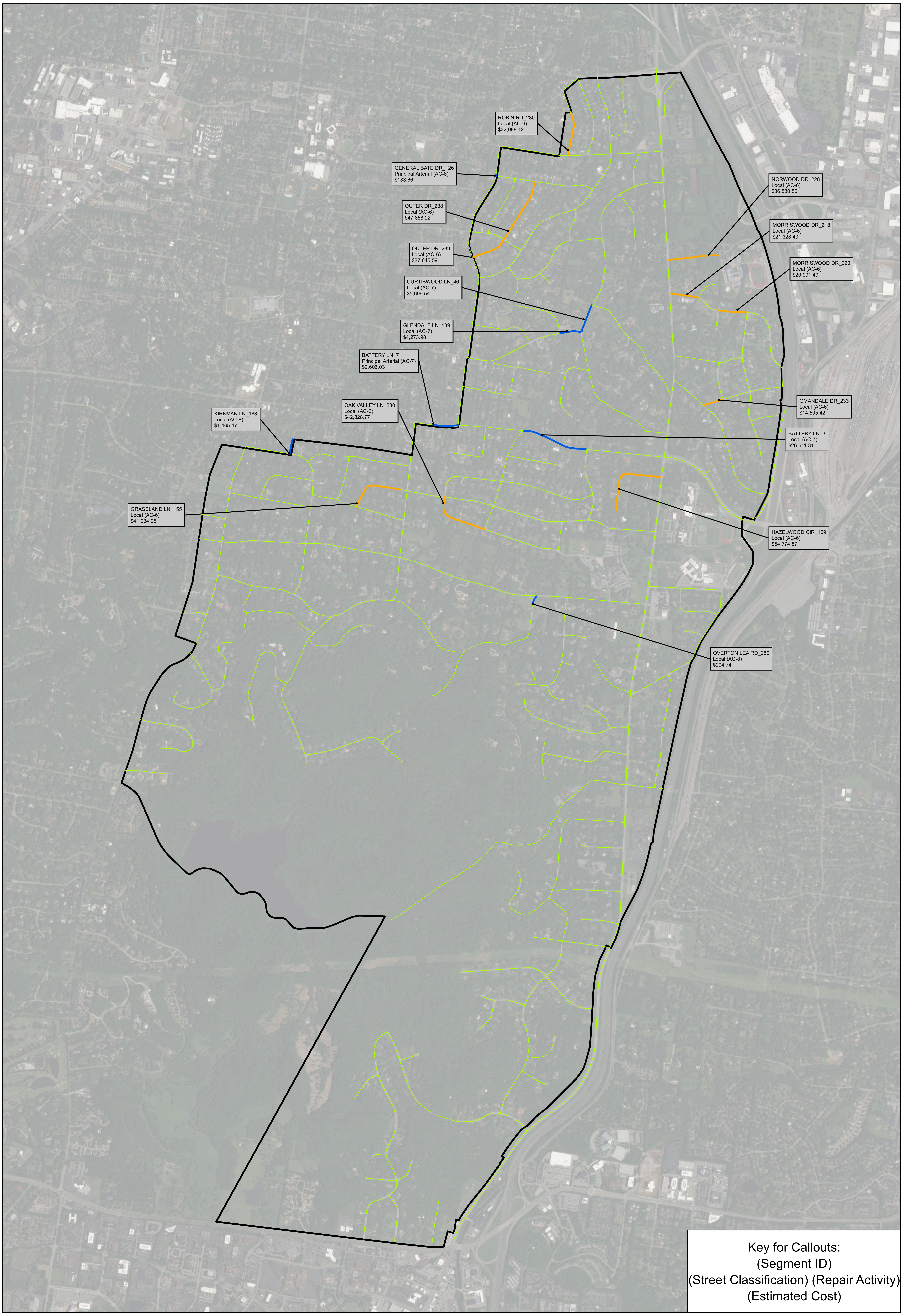
Rehabilitation

Preventative Maintenance

N W E S

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet



Plan Activity 4

City of Oak Hill

Pavement Management System

Pavement Maintenance Activity Plan

0 462.5 925 1,850 Feet

KHA Project 268022000	
Date 10/6/2021	
Scale As Shown	
Designed By: EAK	
Drawn By: MDH	
Checked By: PRK	

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Warrenville, IL 60555
Phone: 630-487-5550
www.kimley-horn.com

Legend

City Limits (Approximate)

No repair this year

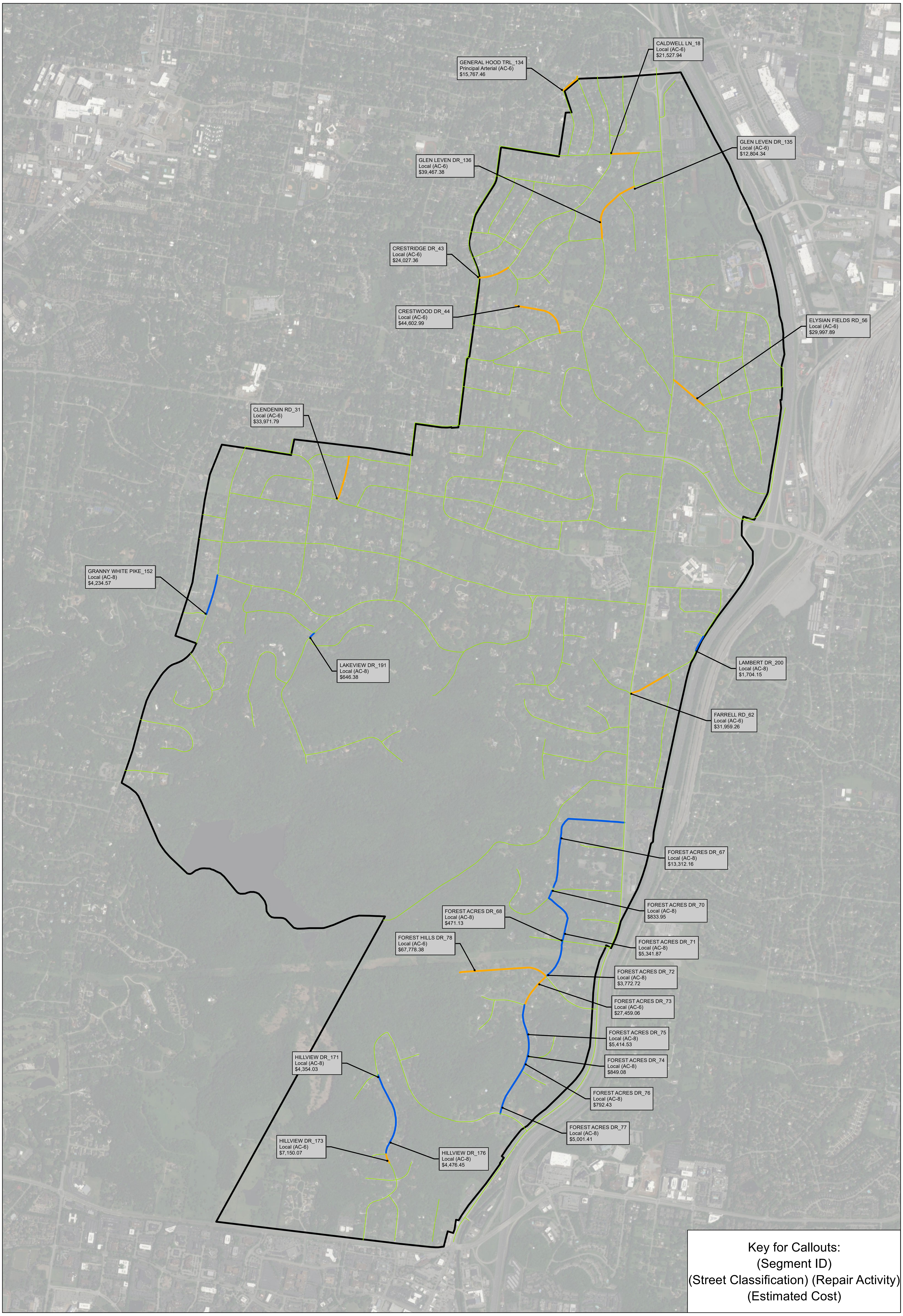
Rehabilitation

Preventative Maintenance

N W E S

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet



Key for Callouts:
(Segment ID)
(Street Classification) (Repair Activity)
(Estimated Cost)

Plan Activity 5

City of Oak Hill

Pavement Management System

Pavement Maintenance Activity Plan

0 462.5 925 1,850 Feet

KHA Project	268022000
Date	10/6/2021
Scale As Shown	
Designed By: EAK	
Drawn By: MDH	
Checked By: PRK	

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Warrenville, IL 60555
Phone: 630-487-5550
www.kimley-horn.com

Legend

City Limits (Approximate)

No repair this year

Rehabilitation

Preventative Maintenance

N W E S

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet