Street Maintenance Plan

A Roadmap Forward

Plan adopted by resolution by City Council October 23, 2017

EXECUTIVE SUMMARY

General

This executive summary is a brief and concise summary of the findings, conclusions, and recommendations for City of Lebanon Street Maintenance Plan. This report has been prepared by the staff of Lebanon Public Works to provide adequate information on Lebanon's street network for Lebanon City Council to adopt a multi-year street maintenance plan. Conservative assumptions for increases in revenue and material costs are included, which are best guess assumptions and should be considered for years beyond 2018.

Findings

The City operates and maintains approximately 111 miles of streets with six street classifications used in describing the type and use of the streets. The street network has grown by 30 miles since 1994 through annexation and development, representing 37% growth. In the past ten years, the street network has grown by 2.5 miles representing 2.3% growth.

The current overall condition of the street network is at the middle of Fair Condition scoring a 48 Pavement Condition Index (PCI), utilizing the manual Guidelines for a Roadway Management System (RMS) for Local Governments to score the condition of the streets within the network. This score is an improvement from the overall condition score of 40, which is at the low end of fair condition, in 2012. The increase in PCI score is due to 2 miles of street reconstruction, 8.7 miles of asphalt overlay, 7.1 miles of surface treatment, 20 miles of crack sealing, and other maintenance activities that have been completed over the past five years. Still, many of the streets renovated over the past 30 years are beyond their life cycle requiring minor to moderate maintenance to prevent further deterioration requiring major construction for correction.

Funding to support the street network is from three sources totaling just over two million dollars annually, with additional funding to support the system on various years from external grants or internal contributions. The One-half of One Percent Transportation Sales Tax provides approximately 75% of the annual revenue with contributions from the Missouri Motor Fuel Tax, Missouri Motor Vehicle Sales Tax and Motor Vehicle Fee Increase providing the remaining revenue. Prior to 2017, the City received funding from MODOT annually through the STP-Small Urban Program which equated to $42,000 annually. This program has been eliminated effective 2017. The loss of this program will affect improvements made to the street network going forward.

Material cost for maintaining and constructing streets have stabilized in the past five years compared to the previous decade. In 2012, concrete and asphalt costs increased 42% and 97% respectively from the cost ten years prior. Over the past five years, asphalt cost decreased by four percent and concrete cost has increased by seven percent.

Even with the aggressive renovation program over the past three decades, streets still exist that have short term flooding during excessive rain events. Most of these streets were constructed before storm water detention requirements, or streets acquired through annexations without proper engineering.

The City has expanded and improved its sidewalk network in the past five years. Connectivity to schools and public facilities was improved utilizing a MODOT Enhancement Grant which added 2.4 miles of new sidewalk to the network. Accessibility was improved in the downtown area utilizing another MODOT Enhancement Grant that added 73 new curb ramps in this area. These projects began transforming Lebanon into a more pedestrian friendly community to provide safer pedestrian travel. Improvements on much of the sidewalk network are needed to comply to with Americans with Disabilities Act (ADA) requirements and to extend the network into high density residential areas.

Recommendations

Since implementation of the One-half of One Percent Transportation Sales Tax in 1984, improvements have been made on approximately 78 percent of streets, with most improvements made to Residential/Commercial and Residential Collector Streets. The driving surface on many earlier improved streets has reached the end of life and now requires replacement and/or maintenance to the driving surface. In 2012, the decision was made to shift from the aggressive street construction schedule, to a more proactive maintenance program, performing low to moderate cost, high impact maintenance activities which increase the PCI on streets requiring minimal maintenance to gain service life. While maintenance projects and activities are not as glamorous, these efforts provided an economic means of extending the life to major investments in the street network. As a result of that shift, improvements have been made to the driving surfaces in the overall street network. With that being said, this proactive maintenance program should continue, as the most economical means to maintain and improve the street network with the available funding. The rebuilding of streets should not be suspended, only scaled back to properly fund needed maintenance to protect the community's previous investments in street infrastructure. A balance in funding for complete rebuilds to various levels of maintenance activities will soon be established as further advances in PCI rating in the six classifications of streets are met.

The primary focus with the implementation of the 2012 Street Maintenance Master Plan was improvements to the Major Arterial and Collector streets with lesser activities on other classifications. The Major Arterial and Collector streets are the backbone of the street network, having an Average Daily Traffic count up to 9,000 cars per day. PCI scores for Major Arterials rose from 28 to 53, and Collectors rose from 43 to 44. Network inspections show 44 percent of the 219,651 linear feet (41.60 miles) of Arterial and Collector streets and 62 percent of the 366,330 linear feet (69.38 miles) of local streets scoring a poor, very poor, or failing condition, immediate and future improvements have been identified for these streets which will require

approximately $6.1 million in material cost alone over the next six years. Since the PCI scores have been improved on Major Arterial and Collector streets proposed activities will address identified improvements for all classifications of streets. The investment will employ multiple capital improvement strategies ranging from surface treatments to major reconstructions, with an aggressive maintenance component on all streets, in efforts to extending the useful service life of the transportation network.

This plan attempts to provide a balanced approach and cost effective measures to increase the PCI score and improve our transportation corridors. With implementation all classifications of streets will meet or exceed the previously established PCI goals over the next five years. This plan should provide the framework for future decisions affecting the City's transportation network and inform the general public of projects identified for improvements.

INTRODUCTION

The City Lebanon, Missouri is centered between Springfield and Rolla, on Interstate 44, and is the county seat of Laclede County. In 1853, the General Assembly incorporated Lebanon as a town, named after Lebanon, Tennessee. In 1869 the St. Louis and San Francisco Railroad installed track service. Since the 1800's Lebanon has grown to be a thriving community. The City grew steadily between 1920 and 1960 with a gain in excess of twenty percent each decade. This pace slowed between 1960 and 1970 and increased by ten percent between 1970 and 1980, partly due to an annexation in 1979. Between the 1980's and 1990's, Lebanon increased by sixteen percent. In the most recent decades, Lebanon is back to growing above twenty percent. The incorporated limits of Lebanon are approximately 15 square miles with a vast network of City streets and state and federal highways.

The purpose of this planning document is to provide information and recommendations for maintenance activities and improvements needed to the street network within the City. The Elm Street reconstruction project, which was one of the largest project undertaken by the City, began in 2007, was completed in the spring of 2012. Because of the size and scope of this project street reconstruction throughout the remainder of the City was reduced for the reconstruction of Elm Street. As the City transitioned to other street improvements, the Street Maintenance Master Plan adopted in 2012 was instrumental in providing guidance for the management of the street network system. With discipline this planning document should serve the same purpose through 2023.

In 1984 the City started a street renovation program. Since that time 78 percent of the streets within the City Limits of Lebanon have been improved with curb and gutter, asphalt pavement, and storm water piping. However, many of the streets that were renovated early in the program are reaching the end of expected life for the pavement surface.

In order to extend the life and prevent damage of the streets that were renovated, and allow the City to bring other streets to a level acceptable to our citizens, a proactive maintenance program is needed. A street maintenance plan has been developed to identify needed street maintenance and renovation activities for the next few years utilizing distinct means for determining recommended actions for street improvements.

The Street Program

The City of Lebanon has been very proactive in maintaining a viable transportation infrastructure through a voter passed ½ of one percent sales tax dedicated to improving streets. This ½ cent sales tax issue was first passed by the voters in 1984 and has been extended until December 31, 2018. When the street program was started in 1984 it was thought that all streets were to be reconstructed with new curb and gutter, storm drainage, and pavement. Furthermore, the City also thought it would be the best time to upgrade utilities in conjunction with the street program as well.

Historically, this annual tax revenue was used for street renovation in one ward of the City each year, with a four year rotation covering the entire City. This allowed for a major street improvement program in one ward of the City each year to maximize construction efficiencies and mobilization. An average of twenty City blocks per year of renovation was completed with the annual revenue stream.

The selection process to determine which streets are to be renovated was based on the following factors: (a) storm water concerns (b) condition of the driving surface (c) the need of underground utility improvements (d) traffic accident data. These factors are susceptible to subjectivity.

The maintenance of the street network that was not being renovated was maintained through other funding sources. The funding sources are (a) Motor Vehicle Sales Tax (b) Motor Vehicle Fee and (c) Motor Fuel Tax. This maintenance activity includes; pot-hole patching, crack sealing, curb and storm water repairs and chip sealing. In addition to maintaining the driving surface, the right-of-way need constant upkeep including: traffic signal maintenance, painting and striping, sign replacement, cleaning, mowing, and snow and ice removal. These activities are performed through routine inspections and concerns identified by citizen contacts. All maintenance activities are designed to extend the life and structural integrity of the driving surface, as well as assure a safe driving experience.

Street Maintenance Plan

In early 2011 the Public Works Department adopted a formal street infrastructure inspection program tracking system. This program is necessary to properly assess vital information about the driving surface condition and right-of-way management. It also allows the City to look at the funding strategies for immediate and future improvement priorities. This program is based on the manual ***Guidelines for a Roadway Management System (RMS) for Local Governments.*** This manual creates a standardized and industry recognized procedure for street inspections for local communities. This manual also establishes guidelines for addressing defects identified in the inspection process, based upon the severity and extent of the defects.

The streets are managed under six classifications: *Principal Arterial, Major Arterial, Major Collector, Residential Collector, Commercial/Industrial Local, and Residential Local.* Inspections of all classified street have been performed. The classifications inspected were (a) *Principal Arterial* (b) *Major Arterial* (c) *Collector* (d) *Residential Collector (e) Commercial/Industrial Local and Residential Local.* Utilizing the RMS**,** City staff has created recommendations for repairs, maintenance activities, and improvements for each of the streets inspected. The inspections were completed for each block of street and organized by street classification. The implementation of a database and mapping system to store and access this information was adopted for development during the fiscal year 2013.

EXISTING NETWORK

Street Network Condition

The current City street network has approximately 111 miles of streets to serve the residents, commercial, and industrial segments within the City's incorporated limits. Seventy-eight (78) percent of the City streets have curb and gutter. Streets without curb and gutter total approximately 24 miles. **Map 1** depicts streets that do not have curb and gutter improvements.

The City of Lebanon street network contains 219,651 linear feet of roadway classified under *principal arterial, major arterial, collector, and residential collector*. Current inspection findings show that 46 percent of these classified streets received a rating of (1) poor (2) very poor or (3) failing condition. Inspection findings in 2011 on the same streets showed that 52 percent of these streets received a rating of (1) poor (2) very poor or (3) failing condition.

Twenty-seven (27) percent of these streets have not been renovated to the standards under the street reconstruction program, 66 percent of the ditched streets received a rating of poor, very poor, or fail condition. In 2011, 30 percent of these streets were ditched and 66 percent of the ditched streets received a rating of poor, very poor, or fail condition.

Inspections of the streets classified under *principal arterial, major arterial, collector, and residential collector* are performed every five years.

The City of Lebanon street network contains 369,752 linear feet of roadway classified under *commercial/industrial local and residential local*. Inspection findings show that 61 percent of these classified streets received a rating of (1) poor (2) very poor or (3) failing condition.

Nineteen (19) percent of these streets have not been renovated to the standards under the street reconstruction program, 70 percent of the ditched streets received a rating of poor, very poor, or fail condition.

Inspections of the streets classified under *commercial/industrial local and residential local* were not completed when the Street Maintenance Master Plan was adopted in 2012. Inspections for these classifications of streets are performed annually by zone division, allowing for every street to be inspected in a quadrennial basis.

Street Classifications

The street classification system in place has six classifications describing the type and use of streets to better manage the street network. Street classifications are used to apply design, construction and access management standards which provide for sound traffic movement and system management with appropriate infrastructure. **Map 4** shows the City's streets system and the associated classifications of each street. The classifications are defined as follows:

- **Principal Arterial** – A system corridor primarily intended to provide for (a) high volume, moderate speed traffic (b) moderate to extended trip length (c) traffic movement between major activity centers. Access to abutting property to major traffic movement and is subject to Access Management for the necessary control of entrances and exits. Examples: *Elm Street, Missouri Highway 5, Missouri Highway 32, Morgan Road*

- **Major Arterial** – A system corridor which interconnects with, augments, and feeds the primary arterial system and is intended for (a) moderate volume, moderate speed traffic (b) short to moderate trip lengths. Access to abutting property is partially controlled. Examples: *Beck Lane, Tower Road*

- **Collector** – A system corridor which collects and distributes traffic to and from residential collector and arterial street systems and is primarily intended to provide for (a) low to moderate volume, low speed, (b) short length trips while also providing access to abutting property. Examples: *Adams Avenue, Clark Avenue, Madison Avenue*

- **Residential Collector** – A system corridor which collects and distributes residential traffic between residential/commercial streets, collector, and arterial streets and is primarily intended for (a) low to moderate volume, low speed (b) short length trips while also providing access to abutting properties. Examples: *Lake Drive, Deadra Drive, Raef Road, Brook Street*

- **Commercial/Industrial Local** – Streets not included within arterial or collector classifications that serve as direct access to abutting commercial or industrial property and access to collector or arterial streets. Primarily intended for (a) low volume, low speed, and (b) short length trips. Should be limited to neighborhood or local traffic. Examples: *Hospital Drive, Butler Drive, Carmeco Road, Pond Drive*

- **Residential Local** – Streets not included within arterial or collector classifications that serve as direct access to abutting residential property and access to collector or arterial streets. Primarily intended for (a) low volume, low speed, and (b) short length trips. Should be limited to neighborhood or local traffic.

Table 1 Street Type and Length

Street Classifications	*Approximate Total Length In Linear Feet*	*Approximate Total Length In Miles*
Principal Arterial	16,740	3.2
Major Arterial	103,058	19.5
Collector	65,353	12.4
Residential Collector	34,500	6.5
Commercial/Industrial	57,597	10.9
Residential	312,155	59

Storm Water Conveyance System

The drainage basins and watersheds in Lebanon generally drain from a Southeast direction to a Northwest direction. The highest point within the corporate limits of the City of Lebanon is on or near the hospital area (1350 feet above sea level). The lowest point is the Goodwin Hollow Lift Station Area (1150 feet above sea level). Goodwin Hollow is located in the northwest corner of Lebanon's Special Road District #1, just outside City limits, about 1/2 mile down Gateway Road. Approximately 200 feet of relief occurs from the high point to the low point. The watersheds which make up Lebanon's drainage system and a brief description are:

A. Goodwin Hollow (Northwest of Lebanon)
   Goodwin Hollow with its drainage area of approximately 3600 acres connects with drainage ditches and drains via Goodwin Hollow into Lake of the Ozarks. Goodwin Hollow lies in the northwestern portion of Lebanon and parts of the watershed are developed residential, commercial and industrial. Other sections are undeveloped at this time.

B. Dry Auglaize (North of Lebanon)
   Dry Auglaize with its drainage area of approximately 3850 acres connects with drainage ditches and drains via Dry Auglaize into Lake of the Ozarks. Dry Auglaize lies in the North portion of Lebanon and parts of the watershed are developed residential, commercial, and industrial. Other sections are undeveloped at this time.

C. Cobb Creek (Southeast of Lebanon)
   Cobb Creek with its drainage area of approximately 2500 acres connects with drainage ditches and drains via Cobb Creek. Cobb Creek lies in the Southeast portion of Lebanon

and parts of the watershed are developed residential, commercial, and industrial. Other sections are undeveloped at this time.

As there is no major stream or river within the City, there is no ditch or stream crossing that meets the Missouri Department of Transportation (MODOT) description of a bridge. Therefore the City utilizes only culverts or storm water pipe to facilitate any storm water crossings through a transportation corridor.

Storm water culverts are used in various locations in the street network to span small drainage ways. Over the years, the City has replaced many of the culverts with structural deficiencies or created traffic hazards due to high water conditions during wet weather events over the past two decades. The largest culverts in the City conveyance system spans 12 to 14 feet, constructed with concrete, with a height of 6 to 8 feet. **Map 2** indicates City maintained storm water culverts within the City limits.

With the City situated on a plateau, most of the drainage crossings are constructed with pipe. The most common pipe in the system is High Density Polyethylene (HDPE). However, concrete, steel and other materials are used to convey storm water within the City. Design standards for storm water crossings allow multiple pipes to handle large volumes of storm water cost-effectively.

As improvements and maintenance is completed to the network, the City will need to make sure it has the proper detention facilities and easements to allow for a connective drainage system along the City's transportation corridors.

Sidewalks

The City has a network of sidewalks constructed in the downtown business district, along the Elm Street corridor and an existing network spanning from the central business district. The network spanning from the downtown area are in several of the City's major collector corridors but are limited to the central commercial areas within the incorporated limits. Most of this existing network were constructed in the 1940-1960s, and were improved in the 1980-1990s. Excluding the Elm street corridor, this area makes up around one square mile connecting business, residential, and the area schools.

These sidewalks are narrow and are of various conditions. Some of this existing sidewalk network does not meet the Americans with Disabilities Act (ADA) requirements for sidewalk construction. These standards specify minimum sidewalk widths, maximum sidewalk slopes, and require curb ramps standards at all street crossings. Sidewalks that do not comply with these standards will have to be replaced or improved in the future to make them compliant.

The City received grants in 2011 and began making some of these improvements in the immediate downtown area. The first grant improved seventy-three curb ramps, bringing them

into compliance with ADA standards. The second grant funded the construction of approximately 12,815 linear feet of new sidewalks, which linked schools and other institutions via the sidewalk network.

Map 3 shows the current City sidewalk network.

STANDARDS

Design Standards

The City of Lebanon uses *American Association of State Highway and Transportation Officials* (AASHTO) and the *Manual on Uniform Traffic Control Devices* (MUTCD) standards in engineering and designing street infrastructure along with recognized best engineering practices. Roadway sections and widths are determined by classification, traffic count information, and other safety considerations to provide the proper roadway construction providing years of service and adequate street life. Other considerations for designs are based on number of lanes, lane widths, traffic count and type, and need for on-street parking. **Appendix A** contains standard detail drawings.

Street Inspections

The City of Lebanon uses the inspection procedures outlined in the *Guidelines for a Roadway Management System (RMS) for Local Governments*. This manual was developed by the Midwest Transportation Consortium and was sponsored by the United States Department of Transportation. A copy of this manual is included in **Appendix C**. Please refer to the *RMS* manual for a more detailed description of how inspections are conducted and to understand the results of the analysis.

Traffic Counts

Traffic Counts within the City are completed by City crews. In addition to local counts, MODOT provides traffic count data to the City for streets that interface with state highways corridors. The traffic count data is collected for the overall volume of traffic, peak traffic volume, and types of vehicles traveling on a roadway. The traffic count data collected is used for a variety of purposes and is a vital element in street design to ensure that a street is constructed to sufficiently handle the volume and type of traffic using the roadway. **Map 6 shows** traffic count information.

Access Management

The City of Lebanon understands that a safe and efficient transportation network is a critical element in providing quality transportation movements and is essential to meet the need of local businesses and industries. Providing an efficient transportation network is resource-intensive and requires planning to provide a safe network.

Access management involves the proper planning and design of points of access to the public roadway. These points of access include public road intersections and access drives. Sound

access management can have a positive impact on roadway safety and the ability of roadways to carry traffic efficiently and safely. Without proper access management the transportation system can be compromised with safety and operational impacts to adjacent property owners and along the transportation corridor. This could result in the loss of public's trust and willingness to investment in the roadway system. The Lebanon City Council adopted Ordinance Number 4510 in 2007 which regulates street access management. The complete ordinance on Access Management can be found in **Appendix B.**

Service and Reliability Standards

The City also provides service to assure a reliable street system this includes debris removal, snow and ice management and removal, street sweeping, maintenance of striping and signage along the corridor. In order to protect the users and satisfy their transportation needs and expectations, the City utilizes 24 hour dispatching and service crews available to handle calls reporting any hazards that might occur on the street network.

Winter precipitation management is completed by the street department during an event. The City manages this with crews placed on alert or stand-by when winter precipitation is forecasted for the area. Dispatchers in the Police Department notify on-call personnel after normal working hours when driving conditions have deteriorated. Winter precipitation on arterial and collector streets with (a) steep grades and intersections; (b) health care services locations; (c) emergency services location; and (d) school areas are a first priority. Residential/commercial streets are addressed after priority areas are clear and safe for motorists. **Appendix D** contains the City of Lebanon winter precipitation management procedures and mapping.

Sweeping provides two primary benefits to the City. The more obvious benefit is the collection and removal of paper, leaves, and other visible debris that collect in the gutters. In addition to being unsightly, this debris can block the catch basins and other storm water facilities, causing localized flooding during heavy rains. An equally important, but less visible benefit is the removal of metal particles, and other hazardous waste products left by passing vehicles. Street sweeping is an effective method of removing both the large and microscopic pollutants that collect on City streets.

In 2016, a new regenerative air type street sweeper was purchased to replace a mechanical type street sweeper that was over twenty years old. Prior to purchasing the new street sweeper, the entire street network was swept twice a year. In the spring after winter weather, cleaning all aggregate spread during snow and ice removal, and once in late fall after leaves had fallen from the trees. All arterial and collector streets were cleaned quarterly due to the high volume of traffic along these corridors. The City also swept the Downtown Business District on a weekly basis. [After purchasing the new sweeper, City Council approved a new street sweeping policy in which the entire street network is swept quarterly, the Downtown Business District and Elm

Street are swept weekly, and the routes maintained by MODOT within the City Limits are also swept by the City.]

The last area of corridor management for service and reliability is the maintenance of painting and signage that control movement along the corridor. Maintenance of traffic signage, signals, street paint striping, and crosswalk striping are necessary to provide for motorist and pedestrian separation and safety. There are currently six traffic signals along Elm Street managed and maintained by the City. The City inspects and maintains all of these components that control movement along the City street network and addresses any deficiencies accordingly.

FUNDING

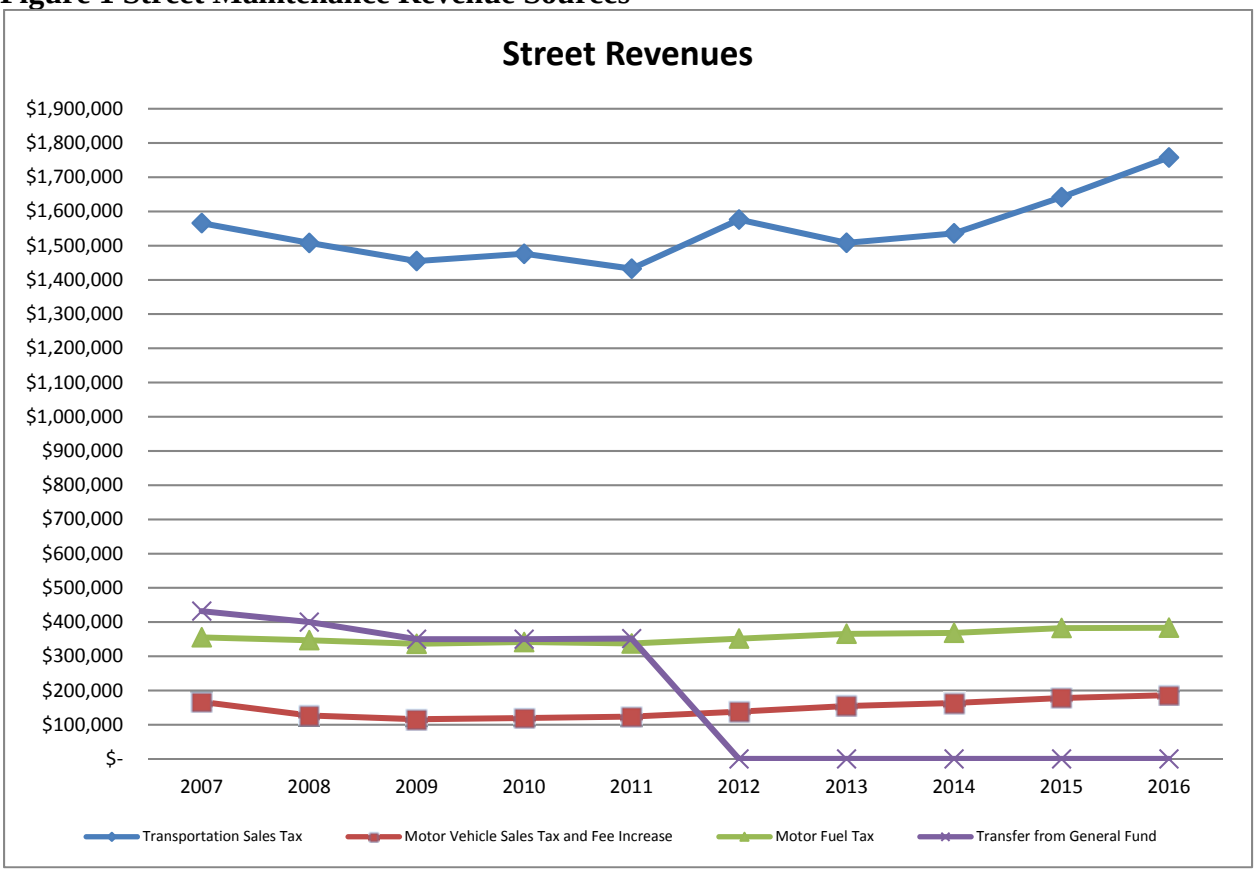
One-half of One Percent Transportation Sales Tax

The voters of the City passed a One-Half of One Percent Transportation Sales Tax in 1984 dedicated to improving transportation within the City through renovation, reconstruction, management and maintenance of the existing transportations corridors. The Transportation Sales Tax has been extended several times by the voters with a most recent extension in 2007 that extended the sales tax through December 31, 2018. Annual revenues generated by the one-half of one percent sales tax have averaged 1.6 million dollars per year over the past five years. Figure 1 shows annual revenues for the past ten years.

Sales tax revenues are subject to economic conditions and are less predictable than property taxes or other excise tax mechanisms. Transportation Sales Tax revenue funding street activities was 11 percent higher in fiscal year 2016 than it was in 2012, a reflection of the positive economic conditions within the City and surrounding area. No primary information is available to understand the impact internet sales have on the sales tax revenue of Lebanon, secondary and anecdotal data would suggest that the community's experience is in line with national trends. Even as the economic conditions changes, buying habits are here to stay and this funding is built on the idea that citizens buy from brick and mortar buildings within their local community, or sales tax will someday be applied to internet purchases.

Lebanon does serve as a primary business center of the county and region having a regional commercial draw to Lebanon from the surrounding area with a retail pull-factor of 1.55 to 1.70. Interstate 44 offers opportunities to increase sales tax revenues through greater capture of the trade potential represented by the 35,000 plus cars in each direction that travel by Lebanon's three exits each day. The community should continue to ensure that it is taking full advantage of this transportation asset and needs to explore ways to more effectively capture leakage from this market.

Figure 1 Street Maintenance Revenue Sources



Motor Fuel Tax

The City receives funds through the Motor Fuel Tax to fund street maintenance activities. Over the past five years, these revenues have averaged $370,000 annually. This revenue is the most stable source of funding for maintenance funding as this tax is collected at a per gallon rate. Motor Fuel Tax is distributed monthly by the Missouri Department of Revenue. Each City and County receives a distribution of the state fuel tax. Net proceeds of the tax are apportioned between counties, cities, and the state as follows: 10% to counties, 15% to cities, and 75% to the state road fund. Cities receive their distribution of the state fuel tax based on the population from the previous federal decennial census. As vehicles continue to achieve higher gallons per mile, or if due to economic conditions the general public is traveling less, revenue from this tax will not keep pace with the City's growth. Figure 1 reflects the revenue over the past ten years.

Motor Vehicle Sales Tax and Motor Vehicle Fee Increase

The City receives funds through a Motor Vehicle Sales Tax and uses it to fund street maintenance activities. These funds are distributed to the City by the Missouri Department of Revenue. Fifty percent of the proceeds from the 3 percent State Motor Vehicle Sales Tax revenues is dedicated to highway and transportation use and is apportioned between cities, counties, and state as follows: 10 percent to counties, 15 percent to cities with allocation based

on population from the last federal decennial census, 2 percent to the state transportation fund, and 73 percent to the state road fund.

In addition to Motor Vehicle Sales Tax the City and County receives a distribution from increases in the state motor vehicle fees. The Motor Vehicle Fee Increase is state license fees and taxes on motor vehicles that have been increased by law since 1979. The amount distributed is similar to the Motor Vehicle Sales Tax. These revenue sources are somewhat volatile with new and used car sales activity. Revenues from the Motor Vehicle Sales Tax and Motor Vehicle Fee Increase are shown in Figure 1. This table underscores the volatility of this revenue and can have an impact on the total funds available for street maintenance activities. Over the past five years, these revenues have averaged $164,000 annually.

Surface Transportation Program (STP)-Small Urban Program

Prior to 2017, the City received funding from MODOT annually through the STP-Small Urban Program authorized by legislation for urban cities with a population greater than 5,000. Appropriations typically equated to $42,000 annually which could be banked for a maximum of six years. Funding from the STP-Small Urban Program could be utilized for eligible street and bridge projects on routes classified as Collectors or Arterials. Projects were required to be programmed through MODOT and would be funded up to 80% of the total project cost. In 2017, the STP-Small Urban Program was eliminated. The City has until September 30, 2019 to obligate its existing balance of $105,780.51 or the funds will be forfeited. The fiscal year 2018 Street Division budget proposes using this balance to fund a portion of a mill and fill overlay on Springfield Road. In 2016, the City used STP-Small Urban funds for mill and fill overlays on Beck Lane and South Washington Avenue. The annual funds for street improvements lost due to the elimination of the STP-Small Urban Program are equivalent to the cost of a 3 inch asphalt overlay on 1,000 linear feet of an average street. The loss of this program will affect funding for improvements made to the street network going forward.

Other Internal Funds

The City historically contributed other internal funds toward street maintenance activities and improvements. Governing bodies will determine if any other internal funds will be used for future capital improvements or management and maintenance of the street network going forward. **Figure 1** shows General Fund contributions over the past ten years.

PAST MAINTENANCE ACTIVITIES

Street Renovation Program

Street renovation projects have in the past been funded through the Transportation Sales Tax described above and grants. Prior to the Elm Street project, *the City Street Program* consisted of projects that were rotated yearly between the four wards to allow one large renovation project, typically averaging 20 blocks in a single ward each year to maximize construction efficiency. Corridors with significant storm-water concerns and utility infrastructure issues received priority

when determining the project within each ward. Additional criteria used to consider a project were condition of the street, street classification, and traffic safety. Since adoption of the Street Maintenance Master Plan in 2012, renovation projects have been prioritized based upon pavement condition index score and street classification as well as storm-water concerns and utility infrastructure issues.

City construction crews perform all street improvements, allowing the City to control project cost and schedule. This provides for greater interaction with citizens affected by improvement efforts. Many of the renovation projects affect daily neighborhood travel. City employees coordinate project activity with residents and other property owners to minimize their inconvenience. Utility and storm water improvements are made in conjunction with the renovation projects. This program is successful in having control of the construction process from engineering, through public meetings, to construction. The street, water, sewer, storm water, and in some cases sidewalks and electric are all renovated giving comprehensive improvements in the project area.

Street Maintenance

Corridor maintenance and management activities have traditionally been funded through the Motor Fuel Tax, Motor Vehicle Sales Tax, Motor Vehicle Fee Increase, and other miscellaneous revenue sources. This activity consists of maintaining all City streets, sidewalks, and associated right-of-way. The level of maintenance activities for a particular street are determined through a inspection program, as well as responding to work orders generated through citizens or other effected motorists. Maintenance to the driving surface can consist of: patching, crack sealing, chip sealing, minor overlays, painting, and thermo-plastic installation. Maintenance in the corridor consists of traffic signal maintenance, sign installation and repair, traffic counting, sidewalk and curb repair, weed and debris management, including street sweeping and mowing, storm-water infrastructure maintenance and repairs.

Street Infrastructure Inspections

Inspections are performed on street infrastructure. Inspections on local streets are completed in one zone each year, using a four year rotation. This allows all streets to be properly inspected every four years. Arterial and collector streets are inspected every four years, to assure critical streets are properly maintained. Inspection data is used to determine (1) the maintenance activities for the following year and (2) future street renovation projects. **Appendix E** shows the form used by the City to complete inspections.

PAVEMENT CONDITION INDEX GOAL BY CLASSIFICATION

To better manage the street network, minimum standards were adopted for all classifications of streets. These standards can be utilized in determining strategies and alternatives for maintenance, rehabilitation, and reconstruction activities to meet the established PCI goal.

Given the PCI score, the following table characterizes the general state of the driving surface.

Table 2 PCI Score and Condition Description

PCI Level	PCI Score	General Description of the driving surface
Level A	85-95	Pavement is in relatively excellent condition, may require routine maintenance to arrest early signs of deterioration and to extend the pavement life
Level B	70-85	Pavement is in very good condition, needs preventative maintenance to arrest early signs of deterioration and to prevent the development of pavement problems.
Level C	55-70	Pavement is in somewhat good condition, needs routine and preventative maintenance to maintain relatively good performance level. Pavement is starting to deteriorate and is approaching a critical PCI
Level D	40-55	Pavement in fair condition, continuing to deteriorate and starting to suffer a reduction in performance. Beyond this point the rate of deterioration and cost to repair increases significantly. This level is a critical pavement condition.

Having a PCI score of 95 or greater for the entire street network is laudable to the City; this could only be accomplished with unlimited resources dedicated to street management. However this is not the case and the goal established below, is a balance between (1) importance of the classification in the network and (2) the resources available to maintain this score.

Principal Arterial Street – currently the only streets City maintained in this classification are Elm Street and Historic Route 66 between Elm Street and Wrinkle Avenue. Elm Street has been reconstructed from a two lane to a five lane street to support the current 10,000 plus cars per day and to promote development increasing traffic count in the future. This project was a major investment for the City and should be maintained to a PCI score of 70 to provide adequate service life. Several principal arterial streets such as Lynn, Jefferson, Seminole, Highway MM, Highway W, Highway YY, Highway 64, and Highway 32 within the City are maintained by MODOT and subject to their priorities and funding.

Major Arterial Street – typically provides connection to Lebanon Special Road District #1 and MODOT roads providing a transition from higher speeds to a moderate speed and serves as an efficient means of moving mostly local traffic. Inspections in 2012 indicated nearly 65 percent of these streets are Poor, Very Poor, or Failing with a PCI score of 40 or less compared to 40 percent shown in current inspections. Streets with a current PCI score of 45 or greater should be maintained to a minimum PCI score of 60.

Collector Street- serves as a connection for residential collector streets and arterial streets, sometimes connecting to Lebanon Special Road District #1 and MODOT roads. Many of these streets serve commercial areas of town, schools, and institutional buildings. These streets should be maintained to a minimum PCI score of 50.

Residential Collector Street – used to distribute residential traffic to collector, and arterial streets at low speeds and moderate volumes at short length trip. Currently 38 percent of residential collector streets PCI score of 40 or above and should be maintained a minimum PCI score of 45.

Commercial/Industrial Local Streets –serves as direct access to abutting commercial or industrial property and access to collector or arterial streets. Commercial/Local streets should maintain a minimum PCI of 40. Routine maintenance can be completed on these streets with little disruption to traffic flow.

Residential Local Streets – serve as direct access to residential property primarily connecting to residential collector, but does connect to all other classifications. Residential/commercial streets should maintain a minimum PCI of 40. Routine maintenance can be completed on these streets with little disruption to traffic flow.

The established PCI scores for a classification are minimums. This does not mean every street within the classification will meet the minimum score for the classification.

CURRENT STATUS OF THE NETWORK

Street Inspections

In the fall of 2011, street department personnel began performing inspections on streets. These inspection followed procedures as outlined in the manual *Guidelines for a Roadway Management System (RMS) for Local Governments*. A Pavement Condition Index number or PCI was established for each street or street section. A PCI is an index reflecting the composite effects of varying distress types, severity level, and extent upon the overall condition of pavement.

The PCI number ranges from zero to 100 points, a score of zero to nine equals a **failed condition**, a score of 10 to 24 equals a **very poor condition**, a score of 25 to 39 equals a **poor condition**, a score of 40 to 54 equals a **fair condition**, a score of 55 to 69 equals a **good condition**, a score of 70 to 84 equals a **very good condition**, and a score of 85 to 100 equals a **excellent condition**.

Current inspections on arterial and collector streets showed 24 percent scoring between 85 to 100 or excellent condition, 10 percent scoring between 70 to 84 or very good condition, 9 percent scoring between 55 to 69 or good condition, 13 percent scoring between 40 to 54 or fair condition, 11 percent scoring between 25 to 39 or a poor condition, 13 percent scoring between 10 to 24 or very poor condition, and 20 percent scoring between zero to nine or a failed condition. The average PCI for the arterial and collector streets inspected was 48. This is a mid-range score in the fair condition.

Inspections had not been performed on local streets when the Street Maintenance Master Plan was adopted in 2012. Current inspections on local streets showed 5 percent scoring between 85

to 100 or excellent condition, 7 percent scoring between 70 to 84 or very good condition, 10 percent scoring between 55 to 69 or good condition, 16 percent scoring between 40 to 54 or fair condition, 21 percent scoring between 25 to 39 or a poor condition, 24 percent scoring between 10 to 24 or very poor condition, and 17 percent scoring between zero to nine or a failed condition. The average PCI for the arterial and collector streets inspected was 36. This is a higher range score in the poor condition. **Table 3** depicts a summary of pavement condition index scores for all street classifications.

Table 3 Average Street Condition by Classification

Average Street Condition by Classification			
	Minimum PCI Score Goal	2011 PCI Score	Current PCI Score
Principal Arterial	70	82	61
Major Arterial	60	28	53
Collector	50	43	44
Residential Collector	45	49	36
Overall Avg. Arterial and Collector Streets		***40***	***48***
Commercial/Industrial Local	40	N/A	30
Residential Local	40	N/A	37
Overall Avg. Local Streets		***N/A***	***36***
Overall Avg. All Street Classifications		***N/A***	***41***

The evaluation methodology in this manual is considered a good standard by which to measure overall pavement condition, however, it has been observed that it has a bias toward certain defects in the pavement. Some defects, such as potholes, can cause the overall street PCI number to be lower even if the area of the pothole is a small percentage of the total street square footage. Inspections and pavement condition index reports were reviewed by City staff and follow up inspections were conducted on some of the streets that scored low to evaluate alternative actions for correcting the pavement defects identified in the inspections. A summary of findings by classification is listed below. Inspection information is included in **Appendix F.**

<u>Principal Arterial Streets</u>

Elm Street and Historic Route 66 between Elm Street and Wrinkle Avenue are the only City maintained streets that falls under principal arterial street classification and are approximately 16,740 feet in total length. Reconstruction of Elm Street was a five year project which was completed in the spring of 2012. Elm Street is in good condition and was designed and built to meet the requirements for the types and volume of traffic to be expected on a street of this classification. Current traffic counts on Elm Street average 11,000 vehicles per day. In 2012, the average PCI for principal arterial streets was 82. The current average PCI for principal arterial

streets is 61. Table 4 and Figure 2 depict a summary of street inspection pavement surface information for principal arterial streets.

Table 4 Principal Arterial Street Condition

Principal Arterial Condition								
	Excellent	Very Good	Good	Fair	Poor	Very Poor	Fail	Total (LF)
Ditched (LF)				50				50
Curb and Gutter (LF)	0	5,693	5,669	3,265	2,063	0	0	16,690
Condition by (LF)	0	5,693	5,669	3,315	2,063	0	0	16,740
Condition as a Percentage	0%	34%	34%	20%	12%	0%	0%	

Figure 2 Principal Arterial Streets

Since 2012, crack sealing and other routine maintenance activities have been performed on principal arterial streets. Streets in this classification continue to need routine maintenance to improve the condition of the pavement. Planned maintenance activities in fiscal year 2018 should improve the average PCI score on these streets to 72.

Major Arterial Streets

There are approximately 103,058 linear feet of major arterial streets within the City. Forty-two percent of these streets have ditches as a primary way to convey storm water. Major arterial streets include Beck, Cowan, East Bland, Fourth, Fremont, Goldenwood, Jacket Junction, Millcreek, Mountrose, New Buffalo, Ostrich, Rolling Hills, Springfield, Tower, Washington, and Wyota, and sections of Brice, Commercial, Ivey, and Utah. In 2012, the average PCI for major arterial streets was 28. The current average PCI for major arterial streets is 53. Table 5 and Figure 3 depict a summary of street inspection pavement surface information for major arterial streets.

Table 5 Major Arterial Street Condition

Major Arterial Condition								
	Excellent	Very Good	Good	Fair	Poor	Very Poor	Fail	Total (LF)
Ditched (LF)	7,459	443	3,022	3,211	5,810	5,613	17,742	43,300
Curb and Gutter (LF)	32,685	2,404	1,489	11,447	1,461	7,086	3,186	59,758
Condition by (LF)	40,144	2,847	4,511	14,658	7,271	12,699	20,928	103,058
Condition as a Percentage	39%	3%	4%	14%	7%	12%	20%	

Figure 3 Major Arterial Streets

Since 2012, 8,545 linear feet (1.6 miles) of street re-construction, 28,495 linear feet (5.4 miles) of asphalt overlay, 11,675 linear feet (2.2 miles) of surface treatment, and routine maintenance activities have been performed on major arterial streets. Many streets in this classification continue to need routine maintenance or asphalt overlay of the existing pavement to improve the condition of the pavement. Some streets need major renovation to address the existing traffic loading and poor driving surface. Major arterial streets not built to current design standards for existing traffic volume and loading are a priority concern that should be addressed. These streets average several thousand vehicles per day and are the backbone of the City's street network. Many of the major arterial streets have been added to the street network through annexation of Lebanon Special Road District Number 1 roadways or through improvement negotiations with MODOT. As a result of this action, some of these streets were not designed for their current use for safe flow of traffic, storm water conveyance, and lack adequate pavement section thickness for the existing vehicle type, volume and weight. Planned maintenance and street improvement activities in fiscal year 2018 should improve the average PCI score on these streets to 58.

Collector Streets

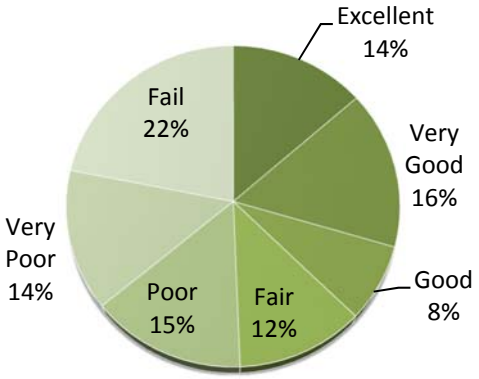
There are approximately 65,353 linear feet of Collector Streets within the City. Twenty percent of these streets have ditches as a primary way to convey storm water. Examples of Collector

Streets include Adams, Bethel, West Bland, Cherry, Copeland, Harris, Harwood, Herndon, Kansas, Kent, Laclede, Lawson, Madison, Main, Maple Lane, Northview, Second, Seventh, Tuscumbia, Van Buren, Vance, and sections of Bennett, Clark, Commercial, and Dilworth. In 2012, the average PCI for collector streets was 43.The current average PCI for collector streets is 44. Table 6 and Figure 4 depict a summary of street inspection pavement surface information for Collector Streets.

Table 6 Collector Street Condition

Collector Condition								
	Excellent	Very Good	Good	Fair	Poor	Very Poor	Fail	Total (LF)
Ditched (LF)	4,307	0	1,396	0	1,352	484	5,332	12,871
Curb and Gutter (LF)	4,568	10,430	3,685	7,878	8,198	8,753	8,970	52,482
Condition by (LF)	8,875	10,430	5,081	7,878	9,550	9,237	14,302	65,353
Condition as a Percentage	14%	16%	8%	12%	15%	14%	22%	

Figure 4 Collector Streets



Since 2012, 7,284 linear feet (1.4 miles) of asphalt overlay, 14,173 linear feet (2.7 miles) of surface treatment, and routine maintenance activities have been performed on collector streets. Many streets in this classification continue to need routine maintenance or asphalt overlay of the existing pavement to improve the condition of the pavement. Planned maintenance and street improvement activities in fiscal year 2018 should improve the average PCI score on these streets to 51.

Residential Collector Streets

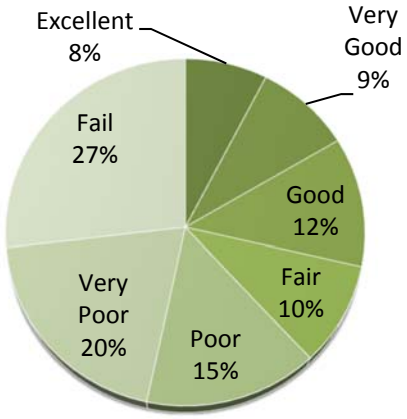
There are approximately 34,500 linear feet of residential collector streets within the City. Almost 93 percent of these streets have curb and gutter. Some examples of a residential collector are Bonnie, Brice, Brook, Catherine, Deadra, Drury, Hoover, Howard, Indian Creek, Ivey, Jackson, Lake, Lincoln, Monroe, Morton, North Bend, Polk, Raef, Rye, Sherman, Smith, and Waterman. Table 7 and Figure 5 depict a summary of street inspection pavement surface information for this

classification. Since 2012, 1,348 linear feet (0.3 miles) of asphalt overlay, 6,902 linear feet (1.3 miles) of surface treatment, and routine maintenance activities have been performed on residential collector streets. Many streets in this classification continue to need routine maintenance or asphalt overlay of the existing pavement to improve the condition of the pavement. Planned maintenance and street improvement activities in fiscal year 2018 should improve the average PCI score on these streets to 50.

Table 7 Residential Collector Street Condition

Residential Collector Condition								
	Excellent	Very Good	Good	Fair	Poor	Very Poor	Fail	Total (LF)
Ditched (LF)	0	0	0	0	0	1,439	1,138	2,577
Curb and Gutter (LF)	2,631	3,083	4,153	3,288	5,251	5,387	8,130	31,923
Condition by (LF)	2,631	3,083	4,153	3,288	5,251	6,826	9,268	34,500
Condition as a Percentage	8%	9%	12%	10%	15%	20%	27%	

Figure 5 Residential Collector Streets



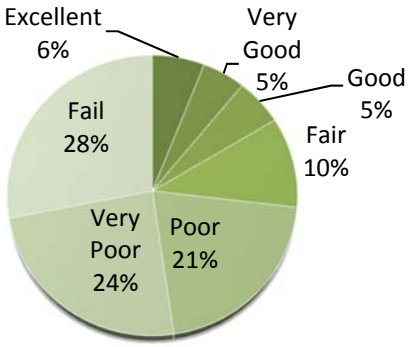
Commercial/Industrial Local Streets

There are approximately 57,597 linear feet of commercial/industrial local streets within the City. Twenty percent of these streets have an open ditch design to convey water. Eighty percent use curb and gutter and inlet boxes to mange storm water. Table 8 and Figure 6 depict a summary of street inspection pavement surface information for this classification. Since 2012, 2,355 linear feet (0.4 miles) of new street construction, 670 linear feet (0.1 miles) of asphalt overlay, and routine maintenance activities have been performed on commercial/industrial local streets. Many streets in this classification continue to need routine maintenance or asphalt overlay of the existing pavement to improve the condition of the pavement. Planned maintenance and street improvement activities in fiscal year 2018 should improve the average PCI score on these streets to 40.

Table 8 Commercial/Industrial Local Street Condition

Commercial/Industrial Local Condition									
	Excellent	Very Good	Good	Fair	Poor	Very Poor	Fail	Gravel	Total (LF)
Ditched (LF)	0	558	0	340	0	3,354	6,971	343	11,566
Curb and Gutter (LF)	3,440	2,271	3,125	5,647	11,931	10,507	9,110	0	46,031
Condition by (LF)	3,440	2,829	3,125	5,987	11,931	13,861	16,081	343	57,597
Condition as a Percentage	6%	5%	5%	10%	21%	24%	28%		

Figure 6 Commercial/Industrial Local Streets



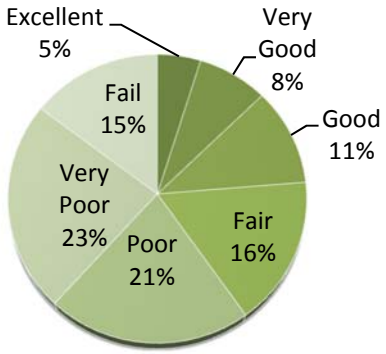
Residential Local Streets

There are approximately 312,155 linear feet of residential local streets within the City. Nineteen percent of these streets have an open ditch design to convey water. Eighty-one percent use curb and gutter and inlet boxes to mange storm water. Table 9 and Figure 7 depict a summary of street inspection pavement surface information for this classification. Since 2012, 1,414 linear feet (0.3 miles) of street re-construction, 8,150 linear feet (1.5 miles) of asphalt overlay, 4,698 linear feet (0.9 miles) of surface treatment, and routine maintenance activities have been performed on residential local streets. Many streets in this classification continue to need routine maintenance or asphalt overlay of the existing pavement to improve the condition of the pavement. Planned maintenance and street improvement activities in fiscal year 2018 should improve the average PCI score on these streets to 41.

Table 9 Residential Local Street Condition

Residential Local Condition									
	Excellent	Very Good	Good	Fair	Poor	Very Poor	Fail	Gravel	Total (LF)
Ditched (LF)	4,866	1,556	2,882	7,841	9,315	12,113	17,404	3,079	59,056
Curb and Gutter (LF)	10,078	22,770	31,094	43,270	57,039	60,878	27,970	0	253,099
Condition by (LF)	14,944	24,326	33,976	51,111	66,354	72,991	45,374	3,079	312,155
Condition as a Percentage	5%	8%	11%	16%	21%	23%	15%		

Figure 7 Residential Local Streets



Flooding Streets

Streets with significant flooding issues have always taken priority during renovation efforts within the City. There are areas within the City that were developed or annexed without any requirements for management of on-site storm water. The lack of storm water design that would address detention or proper pipe sizing is the cause of the majority of the flooding issues within the City. Many of these issues can be improved with on-site detention or pipe sizing, after a hydraulic storm water study for the micro water shed is completed. Elevation of the roadway can also cause concerns during intense wet weather events. Some City streets experience short term road closures during these events due to the low street elevations. **Map 2** indicates streets that have experienced short term closure during intense rain events.

Sidewalk Network

As stated earlier, many of the current sidewalks within the City are not compliant with ADA standards and will require modifications. Sidewalks that interface with curbs at street crossings will need replaced with ramps to accommodate wheelchairs and truncated dome panel indicators for the visually impaired. Other sidewalks within the system need to be reconstructed to comply with maximum slope and minimum sidewalk width standards. These design criteria and associated cost will need to be considered with a renovation or re-construction project.

The City received a grant that began making some of these improvements in the immediate downtown area. The first grant improved 73 curb ramps, bringing them into compliance with ADA standards. The second grant constructed approximately 12,815 linear feet of new sidewalks, which linked schools and other institutions via the sidewalk network.

Fiscal year 2017 projects include the construction of 2,375 linear feet of sidewalk on East Bland Road between Jefferson Avenue and Dara Drive. This area has several multifamily developments with significant pedestrian traffic along a high traffic volume major arterial street.

In 2015, the City partnered with the Missouri Department of Transportation to replace the sidewalks along Jefferson Avenue with new ADA compliant sidewalks. The first phase of this project, 1,300 linear feet of sidewalk, which is between Bennett Street and Sixth Street, was completed in 2015. The second phase of this project, 7,800 linear feet of sidewalk, which is between Sixth Street and Elm Street, was started in the fall of 2016 and is scheduled for completion in November 2017.

Signage

The Federal Highway Administration issued a ruling that became effective in June 2012 requiring that signs be retro-reflective or illuminated to show the same shape and similar color by both day and night. This ruling requires public agencies to have a plan in place and begin executing the plan on complying with the retro-reflectivity requirements for signs. A plan was developed that called for the replacement of existing stop signs in the City of Lebanon. The stop signs would be replaced over a period of four years, replacing stop signs in one ward of the city per year. After the stop signs were replaced then other regulatory signs would be replaced over the next four years, again in one ward of the city per year. Replacement of stop signs began in 2013 and was completed in 2017. In 2018 work will begin on replacement of other regulatory signs, with a preliminary schedule for completion in 2021.

Signal Lights

With the renovation of Elm Street, the City installed six signal lights to break traffic and enhance the flow of traffic accessing Elm Street by streets and adjoining properties. Three members of the City of Lebanon Street Division have received training and are certified in the maintenance and operation of traffic signals by the International Municipal Signal Association (IMSA), and maintain all city owned traffic signal lights

The need for signalized intersections within the City will continue to grow with increased traffic. Many of the future signal lights required, will be where City right of way intersects with state highway corridors. Locations have been identified in the Capital Improvements Plan. These locations are the intersection of South Jefferson and Fremont Road, Missouri Highway 32 and Tower Road, and the intersection of Cowan Drive and Missouri Highway MM. The City will continue working with MODOT to identify and plan for the construction of future signalized

intersections. The cost of operation and maintenance of traffic signal signals will need to be considered in future budgets.

Limited Access

Development within the City has occurred without proper circular flow. While this design works well to control ingress and egress to limited developed area, this does present challenges for circular movement and could cause delay in times of emergency. Many of these areas are multiple phase developments and will build out to provide multiple access points to streets allowing for alternate street access. As build out occurs in these areas considerations for traffic movement and circulation should be a factor in approved final plats of subdivisions. The need for residential/commercial streets to tie into residential collectors and for collectors to be designed to extend into future sub-divided land improving traffic flow is identified in the current comprehensive plan.

Overall System Concerns

The City of Lebanon has an evolved street network in place, but, as the community continues to grow in both non-developed areas along with developed areas there are still concerns to be addressed assuring an efficient and effective street network for the future.

The first concern is the number miles of major arterial, major collector, and residential collector streets not built to design standards that effectively utilize the classified corridor as it relates to existing and future traffic volume, changes in the type of traffic, newly incorporated streets, pedestrian movement or proper storm water conveyance. An example of this is Washington Avenue. It was reconstructed in the late 1980's and early 1990's. Over the past several years Washington Avenue has been used as an alternate route to Jefferson Avenue and has an average daily traffic count of over 9,000 cars per day. There are numerous driveway interfaces on each block and on-street parallel parking is permitted on the majority of the route. On a Major Arterial route, like Washington Avenue, driveway interfaces are limited and on-street parking is not allowed, especially when considering the traffic volume and the type of traffic that utilizes Washington Avenue on a daily basis.

The second concern is the unimproved streets within the street network system. Even with the aggressive renovation of the City streets over the past three decades that improved the streets and storm water conveyance systems, the City still has not improved every street in the network. Street design widths that allow for safe flow of traffic, pavement thicknesses adequate for traffic volume and vehicle weight are all areas of concern when evaluating street improvements. As the City continues to connect the conveyance system for storm water, design for the conveyance system should parallel the street when improvements to an unimproved street are being considered. An example, responsibility for a 3,500 linear foot section of Morgan Road was assumed by the City after an annexation. Morgan Road had been previously maintained by Lebanon Special Road District #1. Morgan Road consists of less than 5 inches of asphalt 20 feet

wide and a traffic count of over 3,000 vehicles per day. This street is classified as a major arterial street, but as presently constructed would not meet current design standards for this corridor.

The third concern is that many of the streets that were improved in the beginning of the street renovation program are reaching the end of their expected life and need extensive maintenance improvements. An example of this is East Bland. It was reconstructed in the early 1990's. East Bland Road is a Major Arterial Street and has an average daily traffic count of over 2,700 cars per day. East Bland Road has reached the typical maximum life expectancy for an asphalt street of 20 years. Considering the traffic volume and the type of traffic that utilize East Bland Road on a daily basis, its general condition needs to be held to a PCI Level C standard, or better.

The fourth concern is cost effectiveness and available labor pool for maintenance activities. A leading cause of damage to the existing street pavement surfaces is moisture penetrating the pavement. A proactive surface preservation program will extend the life of many streets renovated during the beginning years of the program. This plan proposes a more aggressive maintenance program across the street network to hit the targeted PCI goals for each street classification, requiring seasonal labor to assist full time staff in maintenance activities. With the limited labor pool for the area, finding the available seasonal work force with the ability to be trained will be challenging.

The fifth concern is the ability to keep pace with the network. Tax revenues have only increased an average of 1% per year over the past 10 years while costs for materials such as asphalt and concrete have increased 3% and 2% respectively. Material costs growing at a greater rate than revenues is a concern in providing a quality street network and attempting to maintain aging equipment.

The sixth concern is the ability of the Missouri Department of Transportation to manage and maintain their routes within the City in the future. MODOT reports that they are underfunded to meet the current transportation needs in the state. MODOT estimates that an additional $170 million per year of funding is required to improve the condition of their roadways and bridges. Further stating that with current available resources, MODOT must focus its attention on keeping the existing road system in the condition it is in today leaving a number of unfunded transportation needs.

ABILITY TO BUILD AND MAINTAIN THE NETWORK

Personnel and Equipment

The Street Division currently has 17 FTE's. This staff performs all street maintenance and construction activities except for large asphalting projects. As stated previously, three members of the Street Division staff are certified through the International Municipal Signal Association (IMSA) for the operation and maintenance of traffic signals. Fourteen members of the Staff are currently enrolled in the Missouri Local Technical Assistance Program (MOLTAP) Road

Scholars Program. MOLTAP is located at the Missouri University of Science and Technology in Rolla, Missouri and is funded by MODOT and the Federal Highway Administration. The purpose of this program is to train personnel within local transportation agencies by increasing knowledge of road systems and improving administrative, supervisory, technical, and worker skills. Street Division staff is scheduled to complete their Road Scholar Certification training within the next three years. With the limited labor pool for the area, finding individuals with applicable skills to fill open positions has been challenging, especially for seasonal positions.

The department has a wide variety of equipment and tools for maintaining and constructing street infrastructure. The average age of the equipment is 11 years and the average life for this equipment is 14 years. In the past five years, over $870,000 has been spent on equipment replacement. A comprehensive equipment replacement for street maintenance should be considered in the capital equipment program. Funding deprecation has not been considered for several years. Equipment purchases have been placed in the budget for consideration on an annual basis and subject to annual priority. The current replacement cost of the equipment in the department is approximately $3,500,000, with several pieces of equipment which should be considered for replacement in the near future that cost in excess of 10 percent of the annual department budget. **Appendix G** contains a current Street Department equipment list and depreciation schedule.

Material Cost

Material costs have stabilized in the past five years compared to the previous decade. In 2012, asphalt cost for the City had increased by 97 percent and concrete cost by 42 percent compared to a decade before, while revenues have increased slightly or remain flat. In the past five years, asphalt cost has decreased by 4 percent and concrete costs have increased 7 percent, while average tax revenues for the past five years are 9 percent higher than the previous five year period.

Fuel Cost

Nationwide average fuel prices increased by over 50 percent from 2006 to 2012. Since 2012, nationwide average fuel prices have decreased by 29 percent. Higher fuel prices have a multiplying affect on the cost for operating equipment and cost of raw materials. Heavy equipment used for street maintenance uses on the average of 3 gallons of fuel per hour. Current fuel prices decreases the average cost per hour to operate this equipment by $3 per hour compared to 5 years ago. Also materials such as asphalt and storm water pipe cost less when the cost of the petroleum used to make them is less.

Funding

Funding for street corridor management is tied to sales tax revenues and the local economy. Sales tax revenue is a stable tax, but is a consumption tax and subject to economic activity. As a result, planning of new projects can be difficult. Transportation Sales Tax revenue funding street

activities was 11 percent higher in fiscal year 2016 than it was in 2012, a reflection of economic conditions within the City and surrounding area.

In the past, other internal funds have been used to promote an aggressive street maintenance and construction program. Until 2012, the street fund received funding from the General Fund. The General Fund has other demands on its resources and has not been used to fund street related work. At the time of the adoption of the Street Maintenance Master Plan in 2012, the Street Fund was indebted at the level of $373,755 per year for the financing required to expedite the Elm Street Project. That debt payment ended in 2014, freeing up those funds to be used for maintenance and construction projects.

The Transportation Sales Tax has been extended several times by the voters with the most recent extension in 2007 that extended the sales tax through December 31, 2018. Transportation Sales Tax revenue makes up 75 percent of the funds used for the maintenance and renovation of City streets. These funds are critical in enabling the City to provide sound management of its street network that citizens have come to expect.

Surface Transportation Program (STP)-Small Urban Program

As stated previously, prior to 2017, the City received funding from MODOT annually through the STP-Small Urban Program that equated to $42,000 annually. These funds could be banked for a maximum of six years and utilized for eligible street and bridge projects on Collector and Arterial routes. The elimination of this program in 2017 will affect funding for improvements made to the street network going forward. The loss of this funding is the equivalent to the cost of an asphalt overlay of over 1 mile of an average street every six years.

MODOT Projects

MODOT completed renovations to North Highway 5, transforming the existing four lane street into five lanes. This project completed their plan to link Lebanon with Jefferson City providing an improved four and five lane highway to adequately handle traffic. Conservatively, MODOT projects 10 to 15 percent future traffic growth over the next decade through Lebanon. The current traffic volume of around 13,500 vehicles per day would increase to 15,000 placing further strains on the existing Jefferson Avenue.

Jefferson Avenue with the most recent traffic study conducted by MODOT has in excess of 22,500 vehicles per day traveling through Lebanon. This traffic experiences congestion issues at peak times. The additional traffic from the improvements to North Highway 5 will necessitate MODOT consideration of alternate measures to reduce traffic volume on Jefferson Avenue over the next decade. The City will need to be heavily involved with any Jefferson Avenue traffic volume reduction discussions.

Additional growth south and east of the City will require upgrades to South Highway 5, transforming the existing two lane road into a three-lane road. Three lanes will allow motorists

exiting South Highway 5 onto Mountrose and Fremont to complete left turns safely without causing traffic back-up. The South Highway 5 area along with other projects such as a (a) traffic signal at the intersection of East Hwy. 32 and Tower Road, and (b) a signal or roundabout at the Highway MM, Cowan Drive and Millcreek intersection will alleviate traffic backups during periods of peak traffic flow in this area.

Funding for the future projects that interface with state highways will require some form of cost sharing by the City and MODOT to move needed projects forward. Since the STP Small Urban Funds program was eliminated in 2017, funding for future cost share projects between the City and MODOT will be required to come from other sources.

Since MODOT realigned their district boundaries in 2011, City staff has been successful in building a working relationship with the MODOT Central Office officials to adequately address transportation needs in the Lebanon area.

RECOMMENDATIONS

Create spending guidelines for maintaining the network system

Based on the current PCI scores, the City should establish a fiscal policy to invest at least 40 percent of the total annual street fund revenue to maintaining the transportation network system. This should be invested in direct spending, or for the driving surface, and indirect spending, corridor management not related to the driving surface.

Direct spending

After completing inspections of the street network, City staff utilized guidelines to plan repairs, maintenance activities, and improvement needs for each of the streets inspected. This process was completed for each block of street inspected and is organized by classification of street. Many identified defects can be corrected through pothole patching, dig out and repair of sub grade, crack filling, and driving surface treatment. These activities are the most quick and cost effective means of improving the street and increasing the PCI score. Generally, these maintenance efforts are more labor and equipment intensive but have a lower material cost.

Pothole Patching-Patching of small potholes on the street driving surface is an immediate means of improving the street. Most potholes occur from moisture entering the subsurface of the street and throughout the freeze and thaw cycle the asphalt is damaged. After the pothole is formed the problem accelerates by water holding in the potholes and further damage caused by traffic movements and freezing and thawing.

Dig out and Replace-Is the replacement of the driving surface and sub grade to a small area of the street with severely compromised asphalt and sub grade. These areas must be dugout and stabilized before improvements to the driving surface are made.

Crack Filling-Is a proactive activity to delay further damage to the driving surface. Streets form cracks in the driving surface with age that allow moisture to enter the subsurface which accelerate deterioration. To prevent further damage caused by moisture, cracks with one eight inch separation must be filled with a bitumastic sealant

Surface Treatment-Is a preventative maintenance activity to prevent damage to the driving surface that have been identified through the inspection process having small cracks or polished aggregate. An asphalt oil based compound is spread on the entire width of the driving surface penetrating the cracks and sealing off from moisture intrusion. Streets that have polished aggregate, this application will improve the driving surface and will add service life.

Indirect spending

Equipment Replacement-An evaluation and study has been completed on street department equipment. **Appendix G** shows a plan for these equipment adjustments with a proposed depreciation schedule. Funds will need to be assigned in the budget for replacement of aging equipment. The equipment depreciation schedule shows the need to budget approximately $200,000 per year for equipment replacement.

Sidewalk Improvements-All transportation circulation assets, including sidewalks require maintenance to mitigate the accumulated damage from weathering, abuse and general usage. Proper maintenance is essential to ensure the ease of access and user safety that makes sidewalks a viable alternative to motor vehicle travel. Further, the implementation of Title II of the Americans with Disabilities Act require all features, equipment, and programming, including sidewalks, to be accessible and in operable condition for all individuals with disabilities. Creating a connected and walk-able community for the citizens should be integrated when possible to street maintenance and expansion activities undertaken by the City.

Storm Water Conveyance System and Short Term Flooding-The entire conveyance system will require effort and funding to properly manage, connect, and maintain important missing links within the system. This is critical infrastructure that must be engineered and studies completed within watersheds to identify capital improvement projects which address (a) capacity, (b) detention, and (c) an adequate conveyance system. In addition to management of the entire conveyance system, funding should be provided for smaller maintenance projects to the storm water conveyance system where known bottlenecks occur during intense wet weather events.

Example of these projects would be; installing larger pipe capacity, building small area detention, and earthwork that effect elevation and flow. Some smaller projects within a sub watershed should be combined and engineered using the hydraulic storm water study and corrected with City crews when plans are complete. These types of improvement are considered to be maintenance activity. Large capital improvement projects should be a part of the CIP and funded as such.

Right of Way Management
Proper management of the street right of way requires significant labor and equipment resources, but material costs are considerably low. Also these activities have peak times throughout the year. Because these activities have different peak times a small labor pool is required to perform these activities. These activities include: inspections, maintaining vegetative growth, removal of debris, and street signage and markings.

Inspecting the right of way and driving surfaces- Crews will continue to provide inspection services to the street network identifying defects and safety issues that may require immediate repair or planning for future improvements to both the driving surface and transportation corridor.

Maintaining vegetative growth- It is necessary to maintain vegetative growth by mowing and spraying grass and weeds during the growing season, trimming brush and trees identified by inspections encroaching in the right of way that interfere with safe traffic movement. This service provides both a safety and aesthetic value to the community. A mowing policy has been submitted for review that identifies areas and different methods for maintaining vegetative growth within City rights of way. **Appendix H** contains the proposed mowing policy and maps.

Removal of debris on the street driving surface, or street sweeping, is the removal of debris such as rock, sand, leaves, and small trash with a mechanical street sweeper. These materials accumulate and do not give the right of way a clean look and are harmful to the driving surface. This service helps to keep debris from clogging the storm sewer and causing short term flooding or property damage and gives the community a clean look.

Street markings and signage- Maintaining street markings in the form of signage and painted striping is a key component in traffic safety. Costs associated with the management of signage and marking infrastructure is driven by changes in signage and safety regulation requirements, damaged or aging street markings and signage. These requirements necessitate the replacement, repair and general management of these safety features. A pavement marking policy has submitted for review that establishes guidelines for street markings based upon standards outlined in the Manual on Uniform Traffic Control Devices (MUTCD). **Appendix I** contains this proposed pavement marking policy.

The activities described above will not add significant value or years of service life to the system but are necessary tools in any street maintenance program. Capital improvement strategies should be considered for a robust comprehensive street program.

Identified Investments in Capital Improvements
Surface Treatment
Treatments designed to extend the life of the existing driving surface by a slurry seal, or the combination of asphalt oil and aggregate (chip and seal). Treatments seal cracks and other

defects on the existing driving surface from the intrusion of moisture that hasten the deterioration of driving surfaces. Cost for slurry seal treatments are typically around 50% of the cost of a minor asphalt overlay. Chip and seal treatments are typically around 20% of the cost of a minor asphalt overlay. This is the most cost effective means of maintaining a street to add life. Over the past five years, Street Division personnel have met with several vendors, contractors, and neighboring communities discussing the different types of surface treatments, proper surface treatment application, and materials. Personnel have also been on site to observe different types of surface treatments being applied. Return visits were made to some of these areas to observe the condition of the surface treatment after it had been applied for a year or longer. This done in an effort to be more informed on surface treatment materials and application techniques so sound recommendations could be made for surface treatment of paved surfaces in the street network.

Asphalt Overlays

Is the placement of asphalt concrete on the road surface providing both structural value and enhanced driving surface conditions. Asphalt overlays can be utilized for wide range of applications from milling and filling of an existing paved street replacing the driving surface to transforming gravel or base rock surfaces to paved asphalt. This activity has short term disruption of traffic flow and a low install time.

Mill and Fill

Mill and Fill is the process of grinding and removing the existing 2 to 4 inches of driving surface and replacing with new asphalt concrete. The cost for this type of improvement is 45 percent of a total replacement. The expected lifecycle for a mill and fill is 8 to 12 years dependent upon street conditions, traffic type and volume.

Moderate Overlay

Asphalt installed to a depth of 2 to 4 inches can be used on any street classification that has a good sub grade; the depth of asphalt is usually dependent on traffic volume and type. The cost for this type of improvement is 40 percent of the cost of the materials for total replacement. This application is generally used when curb and gutter is not present in the corridor.

Major Overlay

Asphalt installed to a depth of 3 to 5 inches used for arterial streets as well as less traveled streets with marginal sub grade. This is excellent option for streets within our network that have a low PCI score that warrant rehabilitation or a rebuild. Many failing streets can be improved using this method to extend life of the driving surface, until such time circumstances warrant total replacement. Cost for a 3 to 5 inch overlay is approximately 50 percent of the cost for the materials for total replacement.

Total Replacement

A total replacement project includes the complete removal and reconstruction of the existing street system, sub grade, base, and driving surface. This is the most capital intensive option but is used when the existing street needs multiple modifications to properly address major structural issues, storm water collection and conveyance, geometrics, and the need to add capacity. Cost for total replacement is variable based on the complexities of the site and street function. A total replacement in 2017 can cost as low as $70 per linear foot for materials on simple residential/commercial streets to over $200 per linear foot on arterial and collector streets with heavy class traffic, high traffic volumes or complex storm water improvement needs.

System Enhancements

Taking many forms, system enhancements are items constructed or added to the streetscape for the purpose of adding safety, functionality, or aesthetic value to street network system. As streets become more heavily traveled it is important to consider safety of diverse usages as there will be an increase in the use of street right of ways by pedestrians, bicycle and non vehicular modes of transportation. Other enhancements to be considered are those which add aesthetic values, encouraging development or enhancing the surrounding area.

Curb and Gutter-Concrete curb and gutter on a street can serve as a means of handling and conveying storm water as well as adding aesthesis to street providing a defined clean edge to the street. Constructing a City standard street on right of way that was once that of the County or the Special Road district can pose engineering challenges. Due to the narrow characteristics of the right of way associated with these roads, either through original design or manmade conditions, providing a curbed and guttered street with the proper width, crown, and drainage presents concern during the design process. When appropriate and allowable by the terrain provision of this enhancement will be considered, though there may arise occasion in which a ditched design will better serve the conditions.

Sidewalks-Providing a safe and walk-able sidewalk network for the community should be considered as capital street projects are defined in the Capital Improvement Program. Design standards and capacity concerns relative to Federal and State accessibility edicts will shape the design and improvements of the existing and future sidewalk network. The City has been fortunate in securing MODOT enhancement grant funds to expand and improve the sidewalk network. The City will need to continue to search grant opportunities to meet future needs. This enhancement will be necessary to address the need for adequate infrastructure to support both pedestrian and bicycle transportation in the City.

Lighting-Lighting within a street right of way is used several ways, (a) to provide safety for vehicular and pedestrian traffic, (b) traffic calming, (c) adding aesthetic value to the streetscape. City streets have adequate lighting to provide a safe environment for traffic around intersections and lighting properly spaced paralleling most streets. The existing street light network generally

consists of high pressure sodium bulbs and fixtures that provide adequate lighting with a good life cycle. As more energy efficient lighting becomes economical the City should invest in order to realize energy and cost savings.

Green Space-Green space within a street right of way is used to provide, (a) separation and safety for pedestrian traffic, (b) traffic calming, (c) aesthetics to the streetscape. Green Space within a traffic corridor or adjacent to the right of way provides pervious surface to manage storm water flows. Regional detention facilities also provide a key function to managing water flow in the City transportation network. These facilities are used to manage the storm water flow and capacity during rain events, but also act as green space when conditions are dry. Detention facilities can require capital investment, and should be included in any improvement plans that address storm water flow within a watershed.

Intersection Improvements-Intersections serve as a designed place within the street to enter and exit the street which can create safety and traffic flow conflicts. Most serious traffic accidents typically occur at intersections during a left turn traffic movement. Intersections also serve as an area for pedestrian crossing mixing pedestrian and vehicular traffic. As traffic volumes change over time, intersections must be studied to assure safety and minimize traffic flow conflicts. Other concerns with an intersection can be geometrics, causing line of site issues, and conflicts with other area connection points. Although much of the street network has been improved, intersections within the network still exist that have geometric problems that will become more prevalent as traffic volumes increase. Different intersection designs should be employed based on traffic impact studies throughout the development process.

Capital Improvement Priority Projects by Classification

Near Term Plans 2018 - 2023

The near term projects are those efforts which will quickly be undertaken, five years or less, following adoption of Street Maintenance Plan. These 96 projects represent significant capital improvements to the network, employing a number of the preservation and rehabilitation techniques listed in previous sections. The completion of these proposed projects and planned maintenance activities should raise the average PCI scores to 91 for principal arterial, 83 for major arterial, 69 for collector, 60 for residential collector, 60 for commercial/industrial local, and 50 for residential local streets by the end of fiscal year 2023.

Table 10 Near Term Capital Projects

Near Term Projects 2018 - 2023				
Street Name	**Section**	**Street Classification**	**Work to be Performed**	**Year**
Springfield	Elm to Commercial	Major Arterial	Mill and Fill Overlay	2018
Van Buren	Commercial to Fourth	Collector	Mill and Fill Overlay	2018
East Fowler	Elm to Rader	Comm. /Ind. Local	Mill and Fill Overlay	2018
Tower	Hwy. 32 to Gresham	Major Arterial	Mill and Fill Overlay	2018
Bonnie	Jefferson to Planeview	Residential Collector	Mill and Fill Overlay	2018

Owens	Springfield to Elm	Comm. /Ind. Local	Complete Rebuild with Curb and Gutter	2018
Lake	Phillips to Beck	Residential Collector	Mill and Fill Overlay	2018
Fourth	Jefferson to Washington	Comm. /Ind. Local	Mill and Fill Overlay	2018
Copeland	Cowan to Tower	Collector	Mill and Fill Overlay	2018
Lake	Phillips to Elm	Residential Collector	Surface Treatment - Chip Seal	2018
Glenridge	Elm to Lake	Residential Local	Surface Treatment - Chip Seal	2018
Orchard	Phillips to Beck	Residential Local	Surface Treatment - Chip Seal	2018
Tyler	Phillips to Beck	Residential Local	Surface Treatment - Chip Seal	2018
Evergreen	Morgan to Jefferson	Major Arterial	Moderate Overlay	2019
Millcreek	RR Crossing to Sherman	Major Arterial	Complete Rebuild with Curb and Gutter	2019
Hoover	Dilworth to Kennedy	Residential Collector	Mill and Fill Overlay	2019
West Bland	Kent to Elm	Collector	Mill and Fill Overlay	2019
Woodhill	Raef to Hwy. YY	Residential Local	Mill and Fill Overlay	2019
Hogan	Elm to Prosser	Comm. /Ind. Local	Mill and Fill Overlay	2019
Hogan	Prosser to Rader	Residential Local	Mill and Fill Overlay	2019
Clara	Millcreek to End of Street	Residential Local	Moderate Overlay	2019
Lenz	Millcreek to Bland	Residential Local	Moderate Overlay	2019
Minkler	Millcreek to Bland	Residential Local	Surface Treatment - Chip Seal	2019
Booten	Fairfax to Elm	Residential Local	Surface Treatment - Chip Seal	2019
Hilsdale	Prairie Ridge to Planeview	Residential Local	Surface Treatment - Chip Seal	2019
Lafayette	Lasalle to Fremont	Residential Local	Surface Treatment - Chip Seal	2019
Carpentry Circle	Morton to End of Street	Residential Local	Surface Treatment - Chip Seal	2019
Harrison	Fourth to Fifth	Residential Local	Surface Treatment - Chip Seal	2019
Madison	Bennett to Commercial	Collector	Mill and Fill Overlay	2020
Madison	Railroad Crossing to Elm	Collector	Mill and Fill Overlay	2020
Morgan	Evergreen to Oasis	Major Arterial	Major Overlay	2020
Utah	Beck to Sunrise	Major Arterial	Moderate Overlay	2020
Kansas	Bethel to Beck	Collector	Major Overlay	2020
Ohio	Kansas to Utah	Comm. /Ind. Local	Moderate Overlay	2020
Texas	Kansas to Crisp	Comm. /Ind. Local	Moderate Overlay	2020
Texas	Crisp to Utah	Residential Local	Moderate Overlay	2020
Iowa	Texas to Ohio	Residential Local	Moderate Overlay	2020
Crisp	Texas to Ohio	Residential Local	Moderate Overlay	2020
Second	Van Buren to Washington	Collector	Surface Treatment - Chip Seal	2020
Pearl	Clark to Harwood	Residential Local	Surface Treatment - Chip Seal	2020
South	Catherine to Center	Residential Local	Surface Treatment - Chip Seal	2020
Bonnie	Prairie Ridge to Planeview	Residential Local	Surface Treatment - Chip Seal	2020
Jessie	Jefferson to King James	Residential Local	Surface Treatment - Chip Seal	2020
Stanwood	Maple to Drury	Residential Local	Surface Treatment - Chip Seal	2020
Mountrose	Jefferson to Tower	Major Arterial	Major Overlay	2021
East Fremont	Jefferson to Tower	Major Arterial	Complete Rebuild with Curb and Gutter	2021
Adams	Fourth to Railroad Crossing	Collector	Mill and Fill Overlay	2021
Adams	Elm to Gadd	Comm. /Ind. Local	Mill and Fill Overlay	2021
Windbrook	Fremont to Copperwood	Residential Local	Mill and Fill Overlay	2021
McGinnis	South King to Allen	Residential Local	Moderate Overlay	2021
Allen	McGinnis to Bennett	Residential Local	Moderate Overlay	2021
Adams	Brice to Fourth	Collector	Surface Treatment - Chip Seal	2021
Adams	Railroad Crossing to Elm	Collector	Surface Treatment - Chip Seal	2021
Tower	Copeland to Hospital	Major Arterial	Surface Treatment - Chip Seal	2021
Raef	Lynn to Hwy. YY	Residential Collector	Surface Treatment - Chip Seal	2021
Herndon	Rolling Hills to Northview	Collector	Surface Treatment - Chip Seal	2021
Jackson	Commercial to Fourth	Residential Collector	Surface Treatment - Chip Seal	2021
Millcreek	Green Hills to Hwy. MM	Major Arterial	Complete Rebuild with Curb and Gutter	2022
West Hayes	Jefferson to Madison	Comm. /Ind. Local	Mill and Fill Overlay	2022
Bethel	Springfield to Ohio	Collector	Mill and Fill Overlay	2022
Madison	Vance to Monroe	Comm. /Ind. Local	Mill and Fill Overlay	2022
Glenridge	Phillips to Beck	Residential Local	Mill and Fill Overlay	2022
Beckett	Perry to Jackson	Comm. /Ind. Local	Mill and Fill Overlay	2022
Perry	Jackson to Beckett	Residential Local	Mill and Fill Overlay	2022
Elm	Ivey to Jefferson	Principal Arterial	Surface Treatment - Slurry Seal	2022
Harwood	Pearl to St. Louis	Collector	Surface Treatment - Chip Seal	2022

Harwood	Washington to Locust	Collector	Surface Treatment - Chip Seal	2022
Harris	Lynn to Northview	Collector	Surface Treatment - Chip Seal	2022
Rolling Hills	Jefferson to Rosewood	Major Arterial	Surface Treatment - Chip Seal	2022
Howard	Elm to Beck	Residential Collector	Surface Treatment - Chip Seal	2022
East Bland	Amy to Tower	Major Arterial	Surface Treatment - Chip Seal	2022
Quail Valley	Hwy. YY to End of Street	Residential Local	Surface Treatment - Chip Seal	2022
Belwood	Maple to Drury	Residential Local	Surface Treatment - Chip Seal	2022
Timberwood Ct	Ivey to End of Street	Residential Local	Surface Treatment - Chip Seal	2022
Crestline	Walser to Krudwig	Residential Local	Surface Treatment - Chip Seal	2022
Dickinson	New Buffalo to Barlow	Residential Local	Surface Treatment - Chip Seal	2022
Harrison	Sixth to Hoover	Residential Local	Surface Treatment - Chip Seal	2022
Farmers	Jefferson to King James	Residential Local	Mill and Fill Overlay	2023
Cherokee	Deere Lane to End of Street	Comm. /Ind. Local	Moderate Overlay	2023
Pierce	Jackson to Jefferson	Comm. /Ind. Local	Mill and Fill Overlay	2023
Pierce	Springfield to Jefferson	Residential Local	Mill and Fill Overlay	2023
West Bland	Jefferson to Evergreen	Comm. /Ind. Local	Major Overlay	2023
Hospital Drive	All	Comm. /Ind. Local	Mill and Fill Overlay	2023
Elm	Jefferson to Historic Rte 66	Principal Arterial	Surface Treatment - Slurry Seal	2023
Historic Rte 66	Elm to Wrinkle	Principal Arterial	Surface Treatment - Slurry Seal	2023
Beckett	Jackson to Monroe	Comm. /Ind. Local	Surface Treatment - Chip Seal	2023
Darina	Rolling Hills to End of Street	Residential Local	Surface Treatment - Chip Seal	2023
Brandon Circle	Lily to End of Street	Residential Local	Surface Treatment - Chip Seal	2023
Elizabeth	Dixie to Ozark	Residential Local	Surface Treatment - Chip Seal	2023
Lily	J Robert to Carrie	Residential Local	Surface Treatment - Chip Seal	2023
Lily	Stella to Mountrose	Residential Local	Surface Treatment - Chip Seal	2023
Jaden Court	Jaden to End of Street	Residential Local	Surface Treatment - Chip Seal	2023
Phillips	Fowler to Howard	Residential Local	Surface Treatment - Chip Seal	2023
Polk	Second to Third	Residential Local	Surface Treatment - Chip Seal	2023
Sixth	Taylor to Pole	Residential Local	Surface Treatment - Chip Seal	2023
Taylor	Fifth to Sixth	Residential Local	Surface Treatment - Chip Seal	2023

Longer Term Plans 2024-2029

The longer-term projects are those which stretch from 2024 to the next plan update or beyond. These are projects on the horizon staff has included to help maintain visibility of the project for the governing body and community as the implementation of the plan moves forward. The timing and work performed on these projects will have some fluidity due to the potential for development along these corridors.

Table 11 Longer Term Capital Projects

Longer Term Projects				
Street Name	Section	Street Classification	Work to be Performed	Year
Beck	Utah to West Commercial	Major Arterial	Mill and Fill Overlay	2024
Utah	Elm to Beck	Major Arterial	Mill and Fill Overlay	2019-2020
New Buffalo	Existing Improved to City Limit	Major Arterial	Complete Rebuild	2020-2021
Mountrose	Hwy. 32 to Tower Road	Major Arterial	Complete Rebuild with Curb and Gutter	2020-2021
East Fremont Rd.	Hwy. 32 to Tower Road	Major Arterial	Complete Rebuild with Curb and Gutter	2021-2022
West Elm	Jefferson to Ivey Lane	Principal Arterial	Surface Treatment or Overlay	2021-2022
East Elm	Jefferson to Seminole	Principal Arterial	Surface Treatment or Overlay	2022-2023
Main Street	Cherry to City Limits	Major Collector	Complete Rebuild	2022-2023
Lake Drive	Beck to Elm	Residential Collector	Mill and Fill Overlay	2023-2024
West Bland Rd.	Jefferson to Evergreen	Commercial	Mill and Fill Overlay	2023-2024

Sherman	Elm to Millcreek	Residential Collector	Mill and Fill Overlay	2023-2024
Adams	Hwy. 5 to Elm	Major Collector	Mill and Fill Overlay	2024-2025
Raef Road	Hwy. 5 to Hwy. YY	Residential Collector	Mill and Fill Overlay	2024-2025
Herndon	Rolling Hills Road to Northview	Major Collector	Mill and Fill Overlay	2025-2026
Northview	Herndon to Harris	Major Collector	Mill and Fill Overlay	2025-2026
Harris Lane	Northview to Hwy. 5	Major Collector	Mill and Fill Overlay	2025-26
Lincoln	Commercial to Catherine	Residential Collector	Mill and Fill Overlay	2026-2027
Vance Road	Maple to Jefferson	Major Collector	Mill and Fill Overlay	2026-2027
Kent	West Bland to Elm	Major Collector	Mill and Fill Overlay	2026-2027
Deadra	Hwy. 32 to East Bland	Residential Collector	Mill and Fill Overlay	2027-2028
Rolling Hills Road	Hwy. 64 to City Limits	Major Collector	Mill and Fill Overlay	2027-2028

Storm water areas that require road closures in times of intensity rain events will need capital investments to improve the travel way, these projects will require significant funding and be identified in the CIP and funded during the annual budgeting process. These identified projects affect road closures, but are not reflective of a comprehensive storm water improvement program.

Table 12 Storm Water Projects

Storm Water Projects				
Street Name	Section	Street Classification	Work to be Performed	Year
Quail Valley Circle	South of Highway YY	Local	Increased capacity of existing storm water drainage facilities studies should be completed to identify improvements.	2018
Tuscumbia Road and Cherry	South of Highway YY	Collector	Increased capacity of existing storm water crossings studies should be completed to identify improvements.	2018
Main Street	South of Highway YY	Collector	Increased capacity of existing storm water crossings studies should be completed to identify improvements	2018
Beck and Kansas	Major Storm Water conveyance crossing Beck Lane running toward Kansas	Major Arterial	Increased capacity of existing storm water drainage facilities studies should be completed to identify improvements.	2018
Highway 64 and South King	Highway 64 south to South King	Principal Arterial, Local	Increased capacity of existing storm water drainage facilities studies should be completed to identify improvements.	2019
West Bland Road	West of I-44 and Elm Street	Major Collector	Engineering should be completed on improvements identified in study within drainage basin that identified improvements needed to address street flooding issues	2019
Kansas	South of Highway 32	Major Collector	Increased capacity of existing storm water drainage facilities studies should be completed to identify improvements.	2020
Waterman and Windsor	North of Highway 64	Local	Increased capacity of existing storm water crossings studies should be completed to identify improvements.	2021
Mountrose	East of Tower Road	Major Arterial	Study should be completed within drainage basin to identify detention facilities and locations to decrease peak flows	2021-2022
Springfield and Jackson	South of Commercial and North of Pierce	Major Arterial	Increased capacity of existing storm water drainage facilities studies should be completed to identify improvements.	2022
Washington and Park Manor	East of Jefferson and South of Cowan Civic Center	Major Arterial	Increased capacity of existing storm water drainage facilities studies should be completed to identify improvements.	2022

Institute Policies and Guideline for Corridor Management

Inspection program for the transportation corridor - A complete street infrastructure inspection program which tracks street assets and conditions is now in place for the street network. This program will allow the City to properly maintain and plan improvements. This program is necessary to properly evaluate vital information and program funding for immediate and future street improvement needs.

Standards - As the City develops within the existing City limits, arterial and collector streets should be identified and properly designed from the beginning to adequately handle future traffic needs. Most of these street upgrades will be Major Collectors or Residential Collectors to help residential traffic flow efficiently.

Access Management – Access management involves the proper planning and design of point of access to the public roadway. The City Council adopted an ordinance regulating street access management in 2007. The access management ordinance was largely modeled after the access management policy of the Missouri Department of Transportation at the time it was adopted. A study should be conducted to ensure that the current access management policy properly addresses roadway safety and efficient traffic movement on the different classifications of streets in the City.