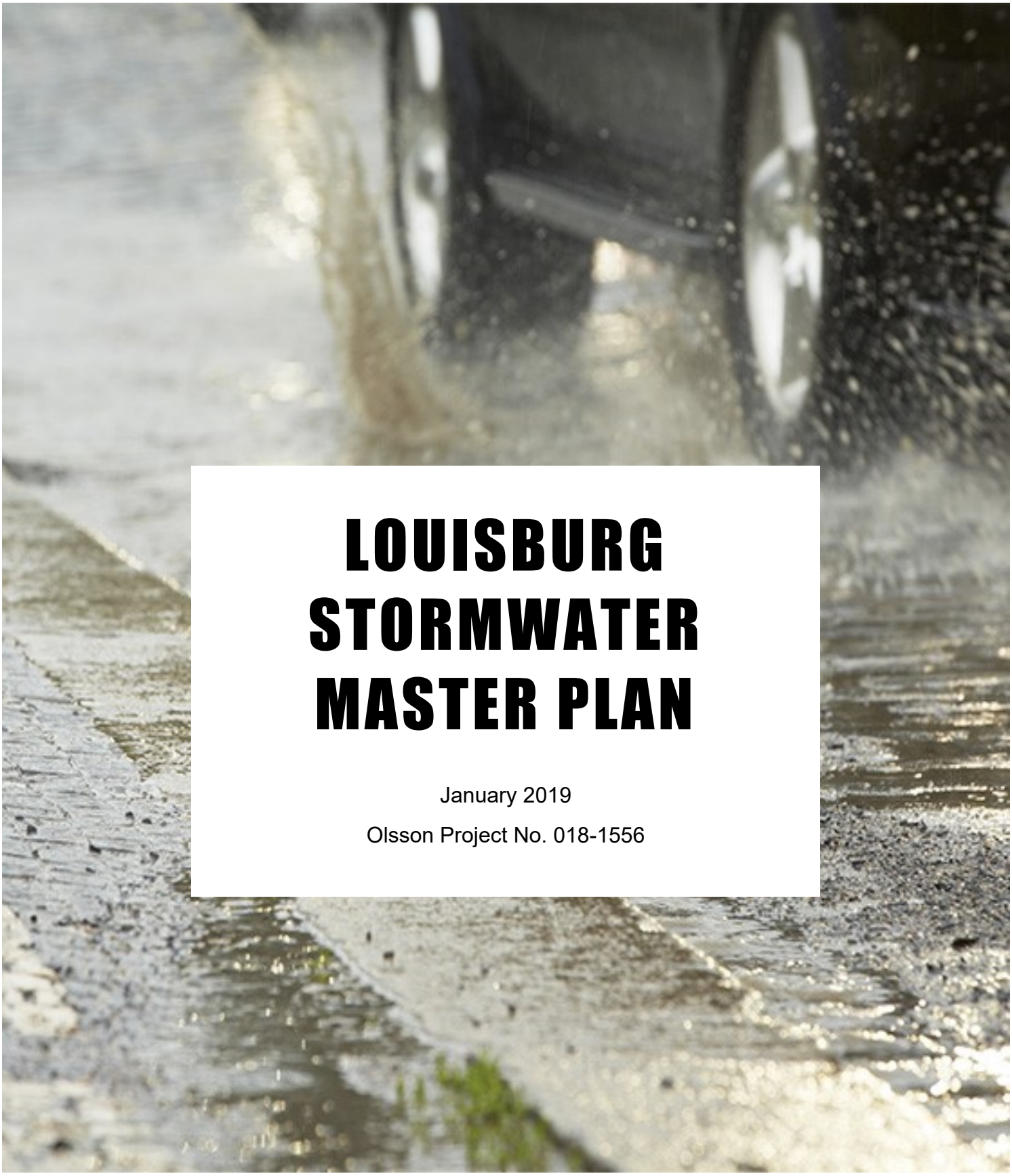


# LOUISBURG STORMWATER MASTER PLAN

January 2019

Olsson Project No. 018-1556

olsson

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# 1. INTRODUCTION

The City of Louisburg has a long history, beginning in the late 1800s when new settlers started building homes in the area and the railroad established a station. The city has grown gradually over the past 50 years and still maintains its small-town feel. The city is well positioned for continued growth with direct access to state and federal highways, an excellent school system, and overall commitment to maintaining a high quality of life for its residents. Maintaining that high quality of life has been founded on the city's desire to establish clear goals and a vision for the future. The 5x5 Vision Plan (City of Louisburg 2013) for 2013-2018 established five initiatives for the community. These three initiatives in the 5x5 plan directly correspond to the establishment of a stormwater master plan (SMP):

- Update infrastructure and improve utility services
- Increase city government accountability
- Create a long-term vision for the community

## 1.1. Comprehensive Plans

The city has been collecting a stormwater utility fee since 2007, primarily building a reserve for future planning and construction, while occasionally using those funds to help complete infrastructure projects that include stormwater components within the city. With the formulation of the 5x5 Vision Plan (City of Louisburg 2013) and the Bright Future Comprehensive Plan (City of Louisburg 2017), momentum has been increasing over the past several years to establish a proactive stormwater program that will address long-standing drainage problems and identify existing storm systems that are in poor condition and in need of replacement. The past two comprehensive plans have documented the need for stormwater management, mentioning that many parts of the city do not have curb and gutter streets. These streets occasionally flood, creating short-term acute drainage problems and increased long-term maintenance needs.

## 1.2. Goals & Objectives

The primary goals and objectives for the SMP are:

- Deliver a comprehensive yet concise action-orientated plan that accurately quantifies the stormwater improvement needs for the community and prioritizes those needs using a proven cost-benefit approach that is tailored for Louisburg. The plan will provide a clear road map to address the city's current and future stormwater needs for flood control, erosion control, water quality, and resource protection.
- Develop a prioritization system that is applicable to Louisburg and can be easily explained to government officials and citizens.

- Identify solutions that tackle multiple objectives wherever possible and that work in harmony with other city infrastructure systems and plans (transportation, sidewalks, trails and parks, water, and sewer).
- Achieve financial savings through comprehensive watershed-based planning and coordination with other infrastructure master planning.
- Plan for growth as it affects the city's stormwater systems.

# 2. BACKGROUND OBJECTIVES

The City of Louisburg encompasses approximately 6.1 square miles, with a total population estimate of 4,527 in 2016 per the Bright Future Comprehensive Plan (City of Louisburg 2017). Louisburg is located in Miami County, Kansas, just south of the Kansas City metropolitan area. U.S. Highway 69 and Kansas Highway 68 run through the city, allowing easy access and potential for continued growth. The city limits referred to in this report include the contiguous city boundary for the majority of Louisburg (see Figure 1); there are several smaller annexed areas located within the city's legal limits that were not included as part of this SMP.

## 2.1. Major Watersheds

The majority of Louisburg is located within the South Wea Creek watershed, with small portions of the city located in the Poney Creek and North Wea Creek watersheds. Water generally drains to the south to South Wea Creek through a number of unnamed tributaries and Louisburg Lake. A map containing the city boundary and watershed boundaries can be seen in Figure 2.

## 2.2. FEMA Designated Flood Areas

The Federal Emergency Management Agency (FEMA) identifies a special flood hazard area (SFHA) as an area that would be inundated during a 100-year flood (a flood event having a 1 percent chance of occurring or being exceeded in any given year). These areas are identified on Flood Insurance Rate Maps (FIRMs) and have a number of different designations depending on the type of area or flooding. The city is split up on four separate FIRM panels (20121C0090D, 20121C0095D, 20121C0205D, 20121C0210D), which were last updated in January 2014 and identify the only SFHA within the city limits as Zone A. Areas within Zone A are determined to be subject to inundation from the 100-year flood through approximate methodologies, as detailed hydraulic analyses have not been performed. A map of the SFHA located within the city limits is also included in Figure 2.

# Figure 1. SMP Limits
# Louisburg, Kansas
# Stormwater Master Plan

## Legend

- Stormwater Master Plan Limits
- City Limits

0 2,250 4,500 Feet

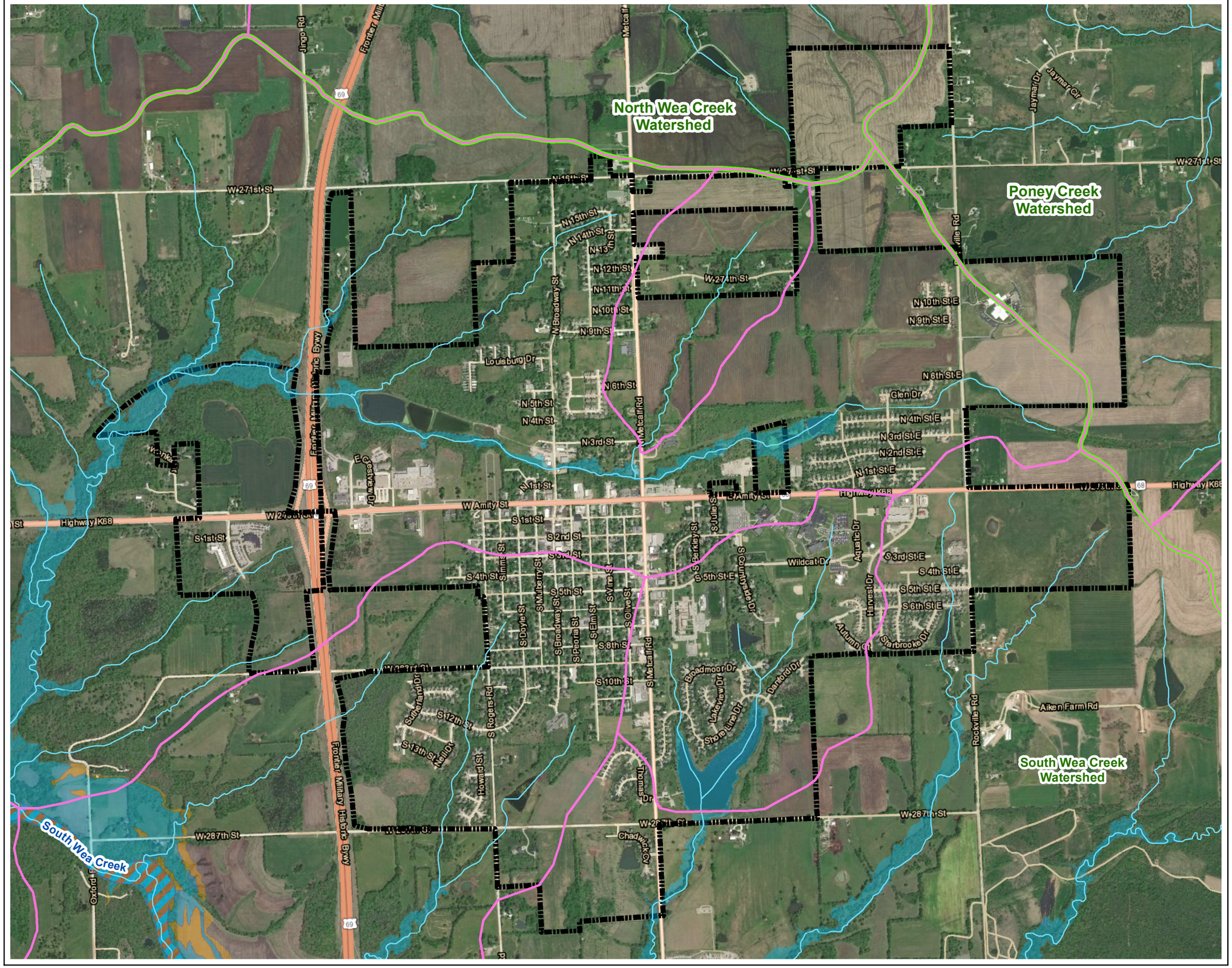
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1 inch = 2,250 feet

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# Figure 2. Watershed Map
# Louisburg, Kansas
# Stormwater Master Plan




## Legend

- NHD Stream Centerline
- Current Effective Floodway
- Current Effective Zone A/AE
- Current Effective Zone X
- Subshed Boundaries
- HUC 12 Watershed Boundary
- City Limits

NHD = National Hydrography Dataset
HUC = Hydrologic Unit Code

0 1,500 3,000 Feet

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1 inch = 1,500 feet

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## 2.3. Soil Types

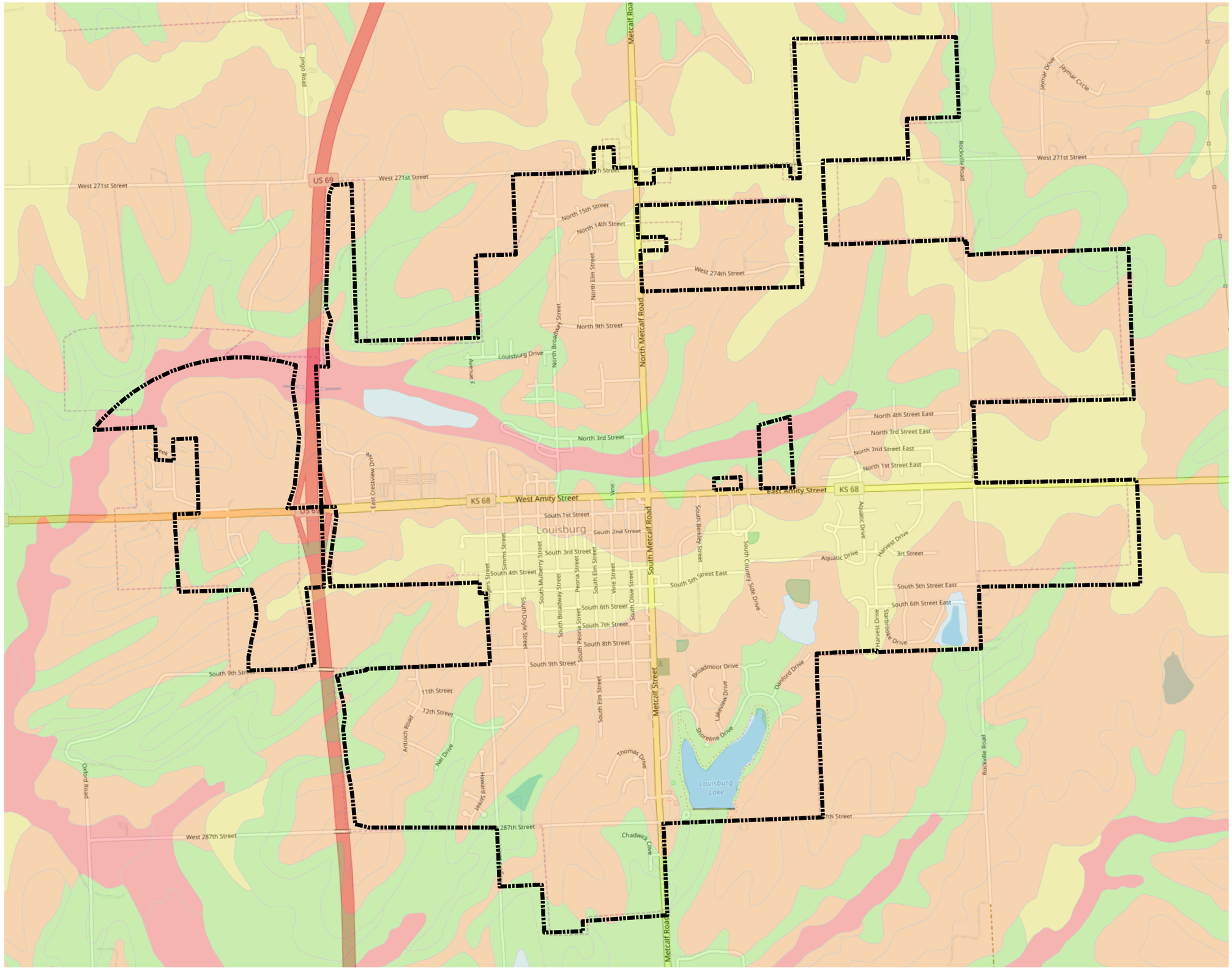
The Natural Resources Conservation Service's (NRCS) Web Soil Survey was used to determine the soil types located within the city limits. The NRCS assigns a unique unit symbol to each soil depending on its type and slopes. Each soil is also assigned to a hydrologic soil group (HSG), which is based on runoff potential and infiltration rates. The four hydrologic soil groups are A, B, C, and D; group A soils generally have the lowest potential for runoff while group D soils generally have the highest. Most of the soils in Louisburg are either C or D soils, with a very small portion of B soils. A summary of soils located within the city is included in Table 1. A map of the hydrologic soil groups located in the city is displayed in Figure 3.

**Table 1. Soil Types.**

| Map Unit Symbol | Map Unit Name | HSG | Area (acres) | Area (percent of total) |
|---|---|---|---|---|
| 7251 | Grundy silt loam, 1 to 3 percent slopes | C/D | 586.0 | 22 |
| 8301 | Verdigris silt loam, 0 to 1 percent slopes, frequently flooded | B | 101.5 | 4 |
| 8631 | Bucyrus silty clay loam, 1 to 3 percent slopes | C | 943.1 | 36 |
| 8632 | Bucyrus silty clay loam, 3 to 8 percent slopes | C | 454.8 | 17 |
| 8663 | Clareson-Rock outcrop complex, 3 to 15 percent slopes | D | 255.8 | 10 |
| 8735 | Eram silty clay loam, 3 to 7 percent slopes | D | 32.8 | 1 |
| 8789 | Lebo channery silty clay loam, 15 to 30 percent slopes | D | 67.1 | 2 |
| 8911 | Summit silty clay loam, 1 to 3 percent slopes | D | 87.7 | 3 |
| 8912 | Summit silty clay loam, 3 to 7 percent slopes | C | 14.1 | 1 |
| 8951 | Wagstaff silty clay loam, 1 to 3 percent slopes | D | 42.6 | 2 |
| 9986 / 9989 | Miscellaneous Water | - | 52.9 | 2 |
| **Total** | **-** | **-** | **2,638.4** | **100** |

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# Figure 3. Soils Map
# Louisburg, Kansas
# Stormwater Master Plan




## Legend

- Louisburg City Boundary

### Hydrologic Soil Group

- B
- C
- C/D
- D
- Water

0 1,500 3,000 Feet

N

1 inch = 1,500 feet

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## 2.4. Land Use

The existing land use for the city was determined in the Bright Future Comprehensive Plan (City of Louisburg 2017). Most of the land within municipal boundaries is vacant and agricultural land, with residential being the second highest land use. Existing land use, which has been determined from the comprehensive plan, is summarized in Table 2 and a visual representation is included in Figure 4.

**Table 2. Existing Land Use.**

| Land Use | Area (acres) | Area (percent of total) |
|---|---|---|
| Vacant / Agricultural | 1,296 | 45.2 |
| Residential | 606 | 21.2 |
| Public / Semi-Public | 258 | 9.0 |
| Parks / Open Space | 494 | 17.2 |
| Commercial | 154 | 5.4 |
| Industrial | 58 | 2.0 |
| **Total** | **2,866** | **100.0** |

The Bright Future Comprehensive Plan (City of Louisburg 2017) also outlines the city's planned future land uses. Future land use includes a majority of single-family residential land, with little vacant and agricultural land. A visual representation of the future land use, which has been determined from the comprehensive plan, is included in Figure 5.

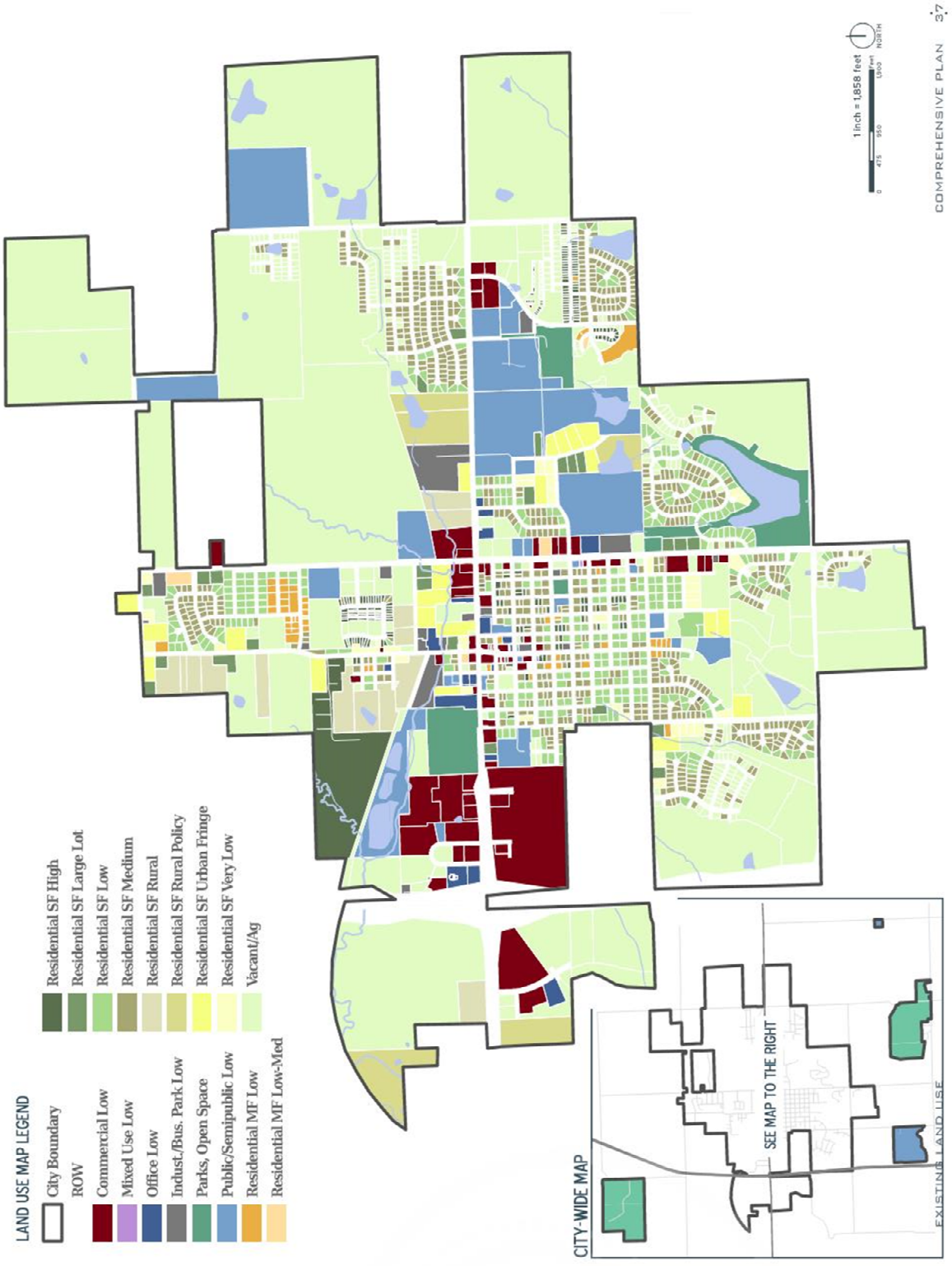



**Figure 4. Existing Land Use Map.**

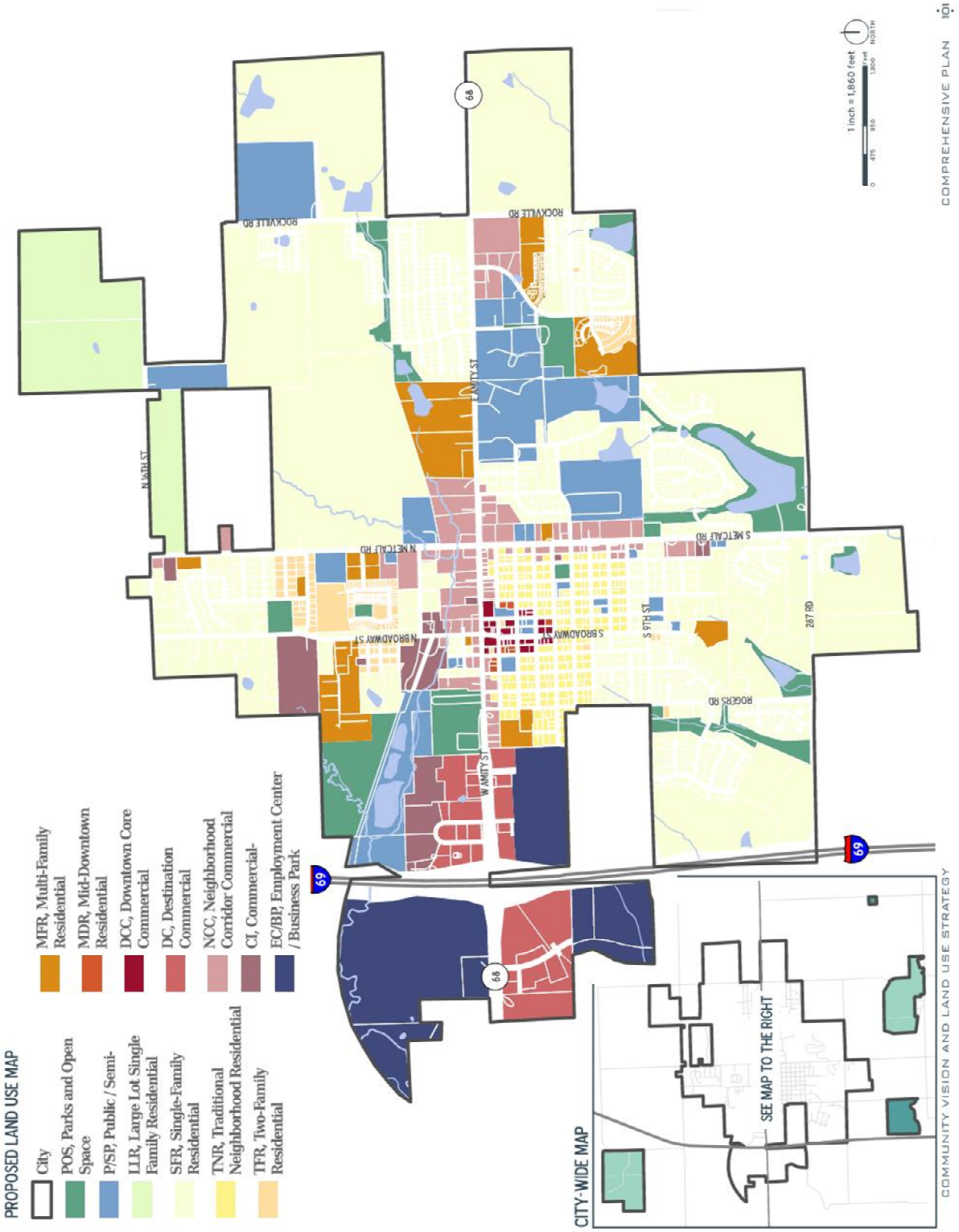



**Figure 5. Future Land Use Map.**

## 2.5. Precipitation Data

The climate in the Kansas City area is characterized by wide precipitation and temperature fluctuations throughout the year. Short duration thunderstorms with high intensity rains generally occur from spring to early fall, which can produce floods with high peak runoff rates. Annual average precipitation in the metropolitan area is approximately 39 inches. Table 3 lists the monthly and seasonal distributions from the National Weather Service.

**Table 3. Monthly Precipitation Distribution.**

| Month | Average Monthly Precipitation (inches) | Seasonal Precipitation |
|---|---|---|
| December | 1.53 | Winter (10 percent) |
| January | 1.07 | - |
| February | 1.46 | - |
| March | 2.37 | Spring (29 percent) |
| April | 3.70 | - |
| May | 5.23 | - |
| June | 5.23 | Summer (35 percent) |
| July | 4.45 | - |
| August | 3.89 | - |
| September | 4.62 | Fall (26 percent) |
| October | 3.16 | - |
| November | 2.15 | - |
| **Average Yearly** | **38.86** | **-** |

# 3. DIGITAL DATA COLLECTION

Data was collected from city records and in the field to aid in the creation of the storm sewer system inventory. This inventory was analyzed to aid in the design of several potential capital improvements projects throughout the city. Existing storm sewer data for pipes and structures was collected as part of this process. Storm sewer as-built plans were also obtained in both paper and electronic form from the city.

## 3.1. Electronic Data Collection

The storm sewer geodatabase was developed using ArcMap, then published to ArcGIS Online for use within the Environmental Systems Research Institute's (ESRI) "Collector" application in the field.

## 3.2. As-Built Data

Copies of as-built records were obtained from the city. The as-built records or final plans for most of the new developments and subdivisions within the city were available. These records were used to determine the locations of newer existing stormwater infrastructure in preparation for field work.

## 3.3. GIS Data

Geographic information system (GIS) data was obtained by Miami County via the Beacon database and developed by Schneider Geospatial. Beacon is an online GIS database that is used by some local governments to house their GIS data. Available data, such as the city limits, parcel information, and contours was obtained via data request from Miami County, Kansas.

# 4. PUBLIC OUTREACH

The citizens of Louisburg were engaged in multiple ways during the SMP process. In order to gather more information about flooding within the city, stormwater questionnaires were sent out to residents and a public meeting was held to discuss the stormwater master plan itself. Also, while collecting field data for the inventory and condition assessment, multiple residents provided firsthand information to our team. Feedback from the questionnaires and the public meeting was used to formulate the capital projects for the master plan.

## 4.1. Questionnaires

One of the first steps in communicating with residents was sending out stormwater questionnaires to residents with the city's assistance. The questionnaires were sent to all Louisburg properties in June 2018 with the monthly water bill. Questionnaires were also posted online through the city's webpage and social media outlets. On the questionnaires, residents

were requested to report problems such as home flooding, street flooding, sanitary sewer backups, and erosion caused by stormwater. Out of approximately 1,552 addresses, 99 responses were received, yielding a return rate of roughly 6 percent; 41 of these responses indicated building and/or street flooding. A copy of the stormwater questionnaire and a summary table of responses are included in Appendix A. A digital copy of all returned questionnaire responses is included.

## 4.2. Public Meeting

One public meeting was held to inform residents about the SMP process and to gather public comment and opinion. The meeting took place at Louisburg City Hall on July 26, 2018, in the form of an open house-style meeting. Residents were presented with maps of the city depicting existing stormwater infrastructure. Residents were able to locate their homes on the maps and discuss stormwater problems with Olsson and city staff. Stormwater questionnaires were available at the meeting and residents were encouraged to fill them out. A copy of the public meeting notice is displayed in Figure 6. A digital copy of the sign-in sheet from the meeting is included.




**Figure 6. Public Meeting Flyer.**

## 4.3. City Council Meeting

Olsson staff attended the city council meeting on December 17, 2018, which residents were able to attend. Olsson presented a summary of findings from the SMP and was available for questions. An outline of the presentation is included in Appendix B.

# 5. FIELD DATA COLLECTION & CONDITION ASSESSMENT

A storm sewer system inventory and condition assessment were completed for the City of Louisburg storm sewer system. The inventory was completed by field locating and visually inspecting existing stormwater infrastructure located within city limits. The inventory and condition assessment are valuable evaluations of both the magnitude and condition of city-owned assets and provide up-to-date planning tools for future development within the city. A detailed property record search was not conducted to determine public versus privately owned infrastructure. Any stormwater infrastructure singularly serving a commercial property was not considered to be a part of the public system and was not inventoried and assessed.

Infrastructure inspected included:

Structures

- Area inlets
- Curb inlets
- Grate inlets
- Manholes
- Junction boxes
- Underground connections
- Pipe end section entrances and exits

Pipes / Conveyance

- Driveway culverts
- Enclosed pipe systems
- Crossroad culverts
- Swales
- Streams
- Concrete channels

## 5.1. Field Data Collection

Field crews walked within the city limits collecting data on an electronic tablet using ESRI's "Collector" application. Existing stormwater infrastructure was located in the field, manhole lids were removed, and both the structure and pipe were visually inspected. The field-located infrastructure was drawn and edited using ESRI's "Collector" application to create a GIS shapefile. Global positioning system (GPS) coordinates of the structure were collected at the relative location of the structure and adjusted to match available aerial photography after the data was downloaded in the office. The results of the inspection were downloaded and entered into a master geodatabase for further analysis. Each structure and pipe have been given a unique asset identification number within the database. Example data collected for structures included structure type, size, material and condition. Example data collected for pipes included pipe type, size, shape and defects. A condition assessment was not completed for structures that were inaccessible by manhole, that posed a safety risk because of the condition of the structure, or were located within a heavily travelled roadway. No condition assessment was completed for pipes that were obstructed due to sediment or debris. No closed-circuit television inspections of the pipe systems were completed.

## 5.2. Rating System

A condition assessment was completed for each inventoried structure. Structure assessment included a visual inspection of the invert, walls, sides, top of inlet and inlet opening. Each structure was assigned a condition based on the criteria listed in Table 4. Examples of minor and major structure deterioration can be seen in figures 7 and 8, respectively.

**Table 4. Structure Condition Rating System.**

| Structure Condition | Description |
|---|---|
| No Deterioration | No cracking, defects, or deterioration |
| Minor Deterioration | Minor defects, cracks, deterioration |
| Repair Needed | Major cracks, deterioration; Sink holes adjacent to structure |
| Could Not Inspect | Unable to inspect structure |



**Figure 7.**

**Structure Condition – Minor Deterioration.**

Minor cracking, some material missing below inlet throat, and other minor defects present



**Figure 8.**

**Structure Condition – Repair Needed.**

Cracking, large amount of material missing below inlet throat and other deterioration present

A condition assessment was also completed for each inventoried pipe. Pipe assessment included a visual inspection of the pipe invert, structural condition, blockage and presence of deterioration such as corrosion, cracking, and holes. Each pipe was assigned a condition based on the criteria listed in Table 5 and a defect based on the criteria listed in Table 6. Examples of pipe deterioration can be seen in figures 9 - 11.

**Table 5. Pipe Condition Rating System.**

| Pipe Condition | Description |
|---|---|
| Excellent | No cracking, defects or deterioration |
| Fair | Minor defects, cracks, joint damage, deterioration |
| Poor | Pipe patching or lining needed soon, minor holes and corrosion |
| Replace | Major cracks, joint separation, corrosion, pipe deformation, holes |
| Could Not Inspect | Unable to inspect pipe |

**Table 6. Pipe Defect Rating System.**

| Pipe Condition | Description |
|---|---|
| All Clear | No visible defects or blockage |
| Corrosion – Erosion | Pipe is corroding, surrounding area is eroded |
| Deformed – Collapsed | Pipe has visible deformities or is collapsing |
| Holes – Major | Major holes present in pipe |
| Holes – Minor | Minor holes present in pipe |
| Obstructed | Presence of sediment, debris, or other blockage in pipe |



**Figure 9. Pipe Condition – Fair.**

Minor corrosion along invert of pipe



**Figure 10. Pipe Condition – Poor.**

Corrosion and minor holes along invert



**Figure 11.**

**Pipe Condition – Replace.**

Major holes, corrosion, deformation, and joint separation

## 5.3. Results

A total of 2,085 structures and 89,567 linear feet of pipe were inspected as part of this SMP. A majority of the structures (79 percent) were rated as having no deterioration or minor deterioration, and a majority of the pipe length (93 percent) were rated as being in excellent or fair condition. The majority of the total pipe length (65 percent) was also rated as all clear. However, a large amount of pipe was determined to be obstructed (14 percent) or corroded (19 percent). Summaries of structure conditions and pipe conditions are included in tables 7 and 8, respectively. A summary of pipe defects is included in Table 9.

**Table 7. Structure Conditions Summary.**

| Structure Condition | Number of Structures | Percent of Total |
|---|---|---|
| No Deterioration | 1,020 | 48.1 |
| Minor Deterioration | 656 | 31.0 |
| Repair Needed | 194 | 9.2 |
| Could Not Inspect | 249 | 11.7 |
| **Total** | **2,119** | **100.0** |

**Table 8. Pipe Conditions Summary.**

| Pipe Condition | Linear Feet of Pipe | Percent of Total |
|---|---|---|
| Excellent | 54,354 | 60.7 |
| Fair | 28,800 | 32.1 |
| Poor | 1,500 | 1.7 |
| Replace | 548 | 0.6 |
| Could Not Inspect | 4,365 | 4.9 |
| **Total** | **89,567** | **100.0** |

**Table 9. Pipe Defects Summary.**

| Pipe Defect | Linear Feet of Pipe | Percent of Total |
|---|---|---|
| All Clear | 58,375 | 65.2 |
| Corrosion – Erosion | 16,903 | 18.9 |
| Deformed – Collapsed | 124 | 0.1 |
| Holes – Minor | 605 | 0.7 |
| Holes – Major | 494 | 0.5 |
| Obstructed | 12,814 | 14.3 |
| Unable to Determine | 252 | 0.3 |
| **Total** | **89,567** | **100.0** |

## 5.4. Stormwater Infrastructure Value & Repairs

The existing stormwater system has an estimated total value of $24.0 million. The existing structures have an estimated total value of $10.6 million, with an estimated $970,000 needed for repairs (excluding the cost of surface restoration). The existing pipes have an estimated total value of $13.4 million, with an estimated $307,400 needed for repairs (excluding the cost of surface restoration); of the pipes that are rated poor and replace, 90 percent are corrugated metal pipes. Summaries of structure repairs and pipe repairs are included in Table 10 and a summary of types of pipe needing repair is included in Table 11.

**Table 10. Repair Summary.**

| Structure Condition | Amount | Estimated Value* |
|---|---|---|
| Structure Repair (number of) | 194 | $970,000 |
| Pipe Repair (linear feet) | 2,048 | $307,400 |

** Estimated $5,000 per structure, $150 per linear foot of pipe*

**Table 11. Pipe Types in Need of Repair.**

| Pipe Type | Linear Feet of Pipe | Percent of Total |
|---|---|---|
| Cast Iron | 74 | 3.6 |
| Ceramic | 2 | 0.1 |
| Corrugated Metal | 1,861 | 90.9 |
| Reinforced Concrete | 111 | 5.4 |
| **Total** | **2,048** | **100.0** |

# 6. CAPITAL IMPROVEMENT PROJECTS

Feedback provided through the public outreach effort and through city staff internal records of historical flooding and drainage problems within the city was used to develop capital improvement project locations. Known flooding locations were pinned on aerial and topographic maps within GIS and then grouped together within the watershed to form project locations. A total of 16 projects were identified throughout the city to address current flooding, erosion, and deteriorating stormwater infrastructure problems. Projects were assigned names according to the road intersection that was closest to the cluster of pinned flooding locations. No hydrologic or hydraulic modeling was completed to confirm the magnitude and extent of the flooding problems or to design improvements recommended within the capital projects. Conceptual solutions developed for the capital improvement projects are based on experience working on similar projects and must be refined as the projects move forward to design phases.

## 6.1. Prioritization Methodology

A prioritized list of stormwater projects was developed ranking projects based on benefit scores. Ultimately, this full list of 16 projects will include a full cost-to-benefit (C/B) ratio to provide the city with a complete ranking that prioritizes projects that prove the most beneficial to the city for the least amount of dollars expended. For the stormwater master plan, conceptual solutions and estimates of probable construction costs were prepared for six of the 16 projects as identified within the scope of work for the master plan. The remaining 10 projects do not have a cost associated with them and can be completed as the city progresses through the initial six projects.

A problem severity scoring system was established as a basis for assessing and quantifying a project benefit. The system developed for the city follows methodology that has been used in other communities where project needs have been based upon flooding, erosion, water quality and replacement of the existing system. Higher benefit scores are assigned to flooding that has caused causalities, flooded buildings and streets, and caused erosion, in that specific order. Flooding locations that frequently flood versus rarely flood are also scored higher on the benefit scale. Existing pipes and structures that have been identified in fair or poor condition through the condition assessment were also assigned benefit points on the basis that the capital project would remove and replace infrastructure that should be rehabilitated.

The proposed methodology is a prioritization tool, which is used to plan future projects efficiently. However, it can never fully account for all situations that ultimately determine the city's stormwater prioritization needs. Justification to move projects higher or lower on the priority list should always be considered. Examples of situations that have already been discussed with city staff include:

- Capital projects within the same sub-watershed should be completed from the downstream to upstream direction. For example, the project identified as South Ninth and South Rogers must be constructed prior to constructing the South Fifth and South Broadway project.
- Capital projects where future development is anticipated cannot occur until downstream flooding problems have been corrected.
- Coordination with other city capital improvement projects (street, sidewalk, sanitary sewer, etc.) would provide an economy of scale by completing both projects at the same time, saving the project area from being disrupted multiple times.
- Easement and property acquisition may delay project schedules and start dates. Projects that require easement from multiple properties can be delayed depending on residents' willingness to cooperate.

## 6.2. Project Ratings

Each project was scored using a rating form to position projects in order of importance. Projects were assigned point values based on factors such as home flooding, street flooding, erosion, and the condition of nearby stormwater infrastructure; a project with a high score indicates more problems that must be fixed. The scoring for one of the identified project areas, South Fifth and South Broadway, is explained below as an example:

- The South Fifth and South Broadway project was identified as having three homes that reported flooding and was assigned 180 points.
- South Elm, South Mulberry, and South Fifth streets were reported as flooding and were assigned 270 points.
- The project area has 136 linear feet of storm sewer system that was rated poor, and was assigned 13.6 points.
- The project area has 2,877 linear feet of storm sewer system that was rated fair or obstructed, and was assigned 143.9 points.

Olsson met with city staff on November 13, 2018, to discuss the identified project areas and ratings. Out of the 16 project areas, six projects were chosen as priority capital improvement projects; priority projects were selected based on the benefit rating and investment required for each project. To further prioritize these projects, a C/B analysis was completed for each priority capital improvement project. This was determined by dividing the estimated total project costs by the benefit score received on the project rating form; a lower C/B ratio indicates a higher prioritization. A summary of project ratings for all 16 projects and C/B ratios for the six prioritized projects are included in tables 12 and 13. Exhibits for each of the identified project areas are included in Appendix C and rating forms are included in Appendix D.

**Table 12. Prioritized Projects Summary.**

| Project Name | Estimated Project Cost | Benefit Rating | C/B Ratio |
|---|---|---|---|
| North Third & North Broadway | $93,096 | 90 | 1,034 |
| Shoreline & Broadmoor | $280,930 | 231 | 1,216 |
| North Ninth & North Metcalf | $354,629 | 237 | 1,496 |
| South First & South Vine | $677,290 | 387 | 1,750 |
| South Fifth & South Broadway | $1,351,181 | 608 | 2,222 |
| South Ninth & South Rogers | $1,112,242 | 341 | 3,262 |
| **Total** | **$3,869,368** | **-** | **-** |

**Table 13. Project Ratings Summary.**

| Project Name | Benefit Rating |
|---|---|
| South Ninth & South Doyle | 336 |
| South Second & South Berkley | 297 |
| South Seventh & South Peoria | 159 |
| Shoreline & South Metcalf | 127 |
| South 16th & South Metcalf | 122 |
| South Fourth & South Rogers | 120 |
| North 14th & North Metcalf | 107 |
| West 287th & South Metcalf | 61 |
| West Amity & Crestview | 33 |
| North Fifth & North Broadway | 24 |

## 6.3. Priority Projects

Conceptual solutions and cost estimates were prepared for each of the six projects. Conceptual solutions for each project are included in Appendix E and cost estimates are included in Appendix F. Summaries of each of the prioritized projects are included below.

### 6.3.1. North Third & North Broadway

The North Third and North Broadway project is located in the northwest quadrant of the city near the Southtrails subdivision. Stormwater exits from the detention basin at the southern side of the subdivision and has caused erosion on the property at 300 North Third Street and reported street flooding. The conceptual solution for this project includes:

- Grading a riprap overflow swale from the detention basin outlet to the 30-inch reinforced concrete pipe (RCP) that crosses underneath North Third Street
- Constructing an area inlet and connecting it to the existing 30-inch RCP

The proposed overflow swale would prevent further erosion of the property at 300 N. Third Street. The proposed area inlet would capture flow from the proposed swale and surface runoff from the north and south.

### 6.3.2. Shoreline & Broadmoor

The Shoreline and Broadmoor project is located in the northeast portion of the Lake subdivision, just southeast of the Louisburg High School practice soccer field. Stormwater exits from the natural low point of the pond at 606 Countryside Drive into a small channel that runs through the backyard of the home at 212 Broadmoor Drive. Water overtops the channel during heavy rain

events and floods the yard at 212 Broadmoor Drive; this residence also reported home flooding. The conceptual solution for this project includes:

- Placing fill at the southern corner of the pond at 606 Countryside Drive to raise the natural low point
- Constructing a concrete riser structure and concrete overflow spillway at the eastern corner of the pond
- Grading a riprap overflow channel from the proposed concrete riser structure to the 72-inch corrugated metal pipe (CMP) that crosses underneath Broadmoor Cove
- Construction of proposed storm sewer that connects to the proposed concrete riser structure and outlets just north of the existing 72-inch CMP.

The proposed concrete riser structure would collect base flow and runoff from low-intensity rain events into the proposed storm sewer. The overflow spillway and channel would collect runoff during high-intensity rain events and direct it toward the existing storm sewer.

### 6.3.3. North Ninth & North Metcalf

The North Ninth and North Metcalf project is located in the northwest quadrant of the city near the Haefele Addition subdivision and Louisburg mobile home park. An existing 30-inch CMP that is located in the mobile home park crosses underneath Louisburg Drive. It is in poor condition and is likely undersized; home flooding was reported from one of the mobile homes. Many of the pipes are in fair condition or better; however, a large number of these pipes have become obstructed. Two 15-inch CMPs, located near the intersection of North Ninth Street and North Metcalf Terrace are undersized and one is in poor condition, causing water to back up. The conceptual solution for this project includes:

- Removing the 30-inch CMP underneath Louisburg Drive and replacing it with larger proposed storm sewer
- Removing the 15-inch CMPs near the intersection of North Ninth Street and North Metcalf Terrace and replacing them with larger proposed storm sewer
- Cleaning out obstructed pipes including driveway culverts
- Regrading ditches and swales to provide positive drainage and match flowlines of existing storm sewer as needed

The proposed storm sewer would replace existing storm sewer that is in poor condition and help alleviate home flooding of the mobile homes. The proposed pipe cleanouts and ditch grading would clear a large number of obstructed pipes and help prevent future flooding problems.

### 6.3.4. South First & South Vine

The South First and South Vine project is located in the southwest quadrant of the city, just southwest of the intersection of North Metcalf Road and West Amity Street. The existing storm sewer is aging and not built to current construction standards. Two cases of home flooding and two cases of street flooding were reported within the project limits. There are also a fair number of obstructed pipes. The conceptual solution for this project includes:

- Removal of existing storm sewer
- Construction of proposed storm sewer, including area inlets, junction boxes, grate inlets, flared end sections, and RCP ranging from 18-inch to 36-inch

The proposed storm sewer system would replace existing storm sewer that is undersized, and help alleviate reported home and street flooding.

### 6.3.5. South Fifth & South Broadway

The South Fifth and South Broadway project is located in the southwest quadrant of the city, just southwest of the South First and South Vine project. The existing storm sewer is aging and not built to current construction standards. Three cases of home flooding, five cases of street flooding, and one case of sanitary backup were reported within the project limits. There are also a fair number of obstructed pipes. The conceptual solution for this project includes:

- Removal of existing storm sewer
- Construction of proposed storm sewer, including area inlets, flared end sections, and RCP ranging from 18-inch to 42-inch

The proposed storm sewer system would replace existing storm sewer that is undersized and help alleviate reported home and street flooding. This project would connect to the South Ninth and South Rogers project, located downstream.

### 6.3.6. South Ninth & South Rogers

The South Ninth and South Rogers project is located in the southwest quadrant of the city, downstream from the South Fifth and South Broadway project. The existing storm sewer is aging and not built to current construction standards. One case of home flooding, one case of street flooding, and one case of sanitary backup were reported within the project limits. There are also a fair number of obstructed pipes and pipes that are in poor condition. The conceptual solution for this project includes:

- Removal of existing storm sewer
- Construction of proposed storm sewer, including area inlets, flared end sections, and RCP ranging from 18-inch to 54-inch

The proposed storm sewer system would replace existing storm sewer that is undersized and in poor condition and help alleviate reported home and street flooding. This project would connect to the South Fifth and South Broadway project, located upstream.

# 7. STORMWATER RATE & STAFFING ANALYSIS

In 2007, the city moved forward with a flat stormwater fee to fund existing drainage problems within the city and to maintain existing infrastructure. The city currently collects a flat rate of $4 per month per property within the city limits, regardless of size, and generates roughly $88,000 per year. The stormwater funds have accrued since the origination of the fund and the city has accumulated $697,260 to date.

The flat stormwater fee is the same for each parcel of land regardless of land use, acreage, imperviousness, stormwater improvements, etc. This methodology is simple to administer and bill since everyone pays the same amount. However, it can be difficult to justify and may not be considered equitable among rate payers since it does not consider differences in land use (imperviousness) and the amount of stormwater runoff generated. Additional revenue may be realized if the city were to consider adjusting the fee to account for impervious area and require larger commercial and industrial properties to increase contributions.

A 10-year plan is recommended to address the priority capital improvement projects and maintenance of the city. Table 14 projects the stormwater fund balance, assuming consistent revenues collected and without expenditures through 2029.

**Table 14. Stormwater Fund Balance.**

| Year | Revenue | Stormwater Fund Dollars |
|---|---|---|
| 2019 | $88,000 | $697,260 |
| 2020 | $88,000 | $785,260 |
| 2021 | $88,000 | $873,260 |
| 2022 | $88,000 | $961,260 |
| 2023 | $88,000 | $1,049,260 |
| 2024 | $88,000 | $1,137,260 |
| 2025 | $88,000 | $1,225,260 |
| 2026 | $88,000 | $1,313,260 |
| 2027 | $88,000 | $1,401,260 |
| 2028 | $88,000 | $1,489,260 |
| 2029 | $88,000 | $1,577,260 |

The City of Louisburg is organized similarly to many cities serving populations with less than 10,000 residents. A mayor and five council members govern the city. Departments within the city include Administration, City Clerk, Finance, Police and Fire, Planning and Zoning, Public Works and Utilities. A city of Louisburg's size typically employs a public works director or city engineer to be responsible for administering capital projects and maintenance programs within the city through a public works department. Neither of these positions exist within the organization. Public Works and Utilities supervisors and support staff are responsible for performing routine maintenance activities associated with streets and utilities. Current city staffing does not have the capacity to undertake the level of maintenance, design, and construction of the recommendations provided in Section 8. It is recommended that the city select a qualified consulting engineering firm to design and prepare construction plans, specifications, and bidding documents for the capital improvements and maintenance projects. Agreements with the consulting firm could be contracted on a project by project basis or as an on-call arrangement to complete the work on an annual basis. Construction of the capital improvements and maintenance projects should be publicly advertised and bid through a public procurement process that allows the work to be completed with the lowest, qualified bid.

# 8. RECOMMENDATIONS

The recommendations listed in this section are formulated to provide the city with a clear and concise plan to achieve the stormwater management goals listed in Section 1.

Investment in the city's stormwater infrastructure up to this point has been minimal and a considerable financial investment is needed over the next decade to address flooding and stormwater infrastructure problems within the city. By preparing the stormwater master plan, Olsson has explored and documented the needs within the city and prepared a prioritized plan for the city to implement. The recommended plan spans a 10-year period and attempts to balance the need to maintain existing infrastructure and upgrade or construct new systems to alleviate flooding problems with the need to use a reasonable amount of resources. Additional funding is needed to implement the plan and is described in detail in Section 8.3.

## 8.1. Capital Improvements Projects

Through public outreach, investigations, and analyses efforts, a recommended prioritized capital improvement plan was developed. A capital project enlarges or enhances existing infrastructure or constructs systems where none currently exist. This plan considered all 16 identified project areas and recommends the six priority projects (Table 13) be completed from highest to lowest priority, except for the South Fifth and Broadway project which is upstream from the South Ninth and Rogers project. The established prioritization methodology does not take the location of the project within the watershed into consideration. Generally, projects located downstream in the

watershed should be completed first to avoid aggravating drainage problems downstream. The total estimated cost for these six priority projects is approximately $3.9 million. The implementation plan, listed in Table 15, is recommended.

**Table 15. Capital Improvement Project Implementation Plan.**

| Year Constructed | Capital Improvement Project |
|---|---|
| 2019 | North Third & North Broadway |
| 2020 | Shoreline & Broadmoor |
| 2021 | North Ninth & North Metcalf |
| 2022 | South First & South Vine |
| 2023 | South Ninth & South Rogers |
| 2024 | South Fifth & South Broadway |

Design and construction cost savings can be realized by combining projects with projected costs of less than $300,000 into a larger, single project. The city also gains an economy of scale with material and labor and the attention of a wider group of contractors who may be interested in bidding a midsize project versus a project less than $100,000. For this reason, we recommend combining the North Third and North Broadway project with the Shoreline and Broadmoor project into a single design and construction package or combining the North Third and North Broadway project with proposed maintenance work described in Section 8.2.

## 8.2. Maintenance Projects

The stormwater inventory and condition analysis identified roughly $1 million in existing stormwater infrastructure that is in poor condition and in need of immediate repair or replacement. This infrastructure contributes to current flooding and drainage problems throughout the city and poses a safety concern should the pipes or structures collapse. A reactive approach to replacing failed stormwater infrastructure can have many undesirable consequences associated with it, including increasing replacement costs by 30 to 50 percent because it requires expedited work and lacks a competitive bid environment to solicit the best prices.

A proactive 10-year financial investment is recommended to replace the existing stormwater infrastructure that is identified in poor condition in the condition assessment. Following the 10-year investment, the city's infrastructure should be reassessed, and ongoing maintenance should be performed as an investment in the future. Current infrastructure that is identified in good or fair condition will continue to deteriorate over time and eventually move into the poor category. The goal of the city's stormwater maintenance program is to extend the life of the assets with the least amount of investment needed to complete this objective. This is best

accomplished by addressing infrastructure when it reaches the fair condition category, when repairs are less intensive and before complete replacement is needed.

The city's maintenance program priorities should focus on:

1. Clearing obstructions – The system inventory identified numerous pipes that have become obstructed with sediment or debris. When conveyance structures become obstructed, the capacity of the system is compromised and can no longer function as originally designed. Vacuum trucks and jet cleaning of existing pipes and excavation of excess sediment can significantly improve the capacity of the existing systems.
2. Pipe lining – As CMP ages it oxidizes and corrodes, and holes form along the invert or bottom of the pipe. If left unchecked these holes continue to grow, allowing bedding and soil surrounding the pipe to migrate through the pipe, which ultimately causes the pipe to collapse. There are several trenchless methods to mitigate this process and renew the pipe to ensure its service life is extended for several years, including cured-in-place pipe lining.
3. Pipe replacement – Sections of pipe that have structurally deformed or already collapsed must be replaced. Replacement of the pipe requires open excavation of the surrounding ground and restoration of the surface features (roadways, driveways, sidewalks) upon completion. Surface restoration costs for pipe and structure replacement were estimated for the prioritized projects outlined in Section 6.3, but have not been accounted for within other master plan estimates.
4. Structure replacement – Inlet and junction structures that are in poor condition must be reconstructed. As with pipe replacement, surrounding surface features must be restored.

## 8.3. Combined Plan

A total investment of over $5 million is needed over a 10-year period to implement the proposed plan of capital and maintenance projects, which exceeds the city's current stormwater utility reserves and anticipated revenue (see Section 7). An overall annual budget of $425,000 was established to set the level of maintenance funding in the initial years of the program when the capital project investment is lower. Over the next five years, investment in the capital projects increases on an annual basis and peaks in 2023 and 2024 when the two largest projects are planned. Conversely, a large investment in maintenance work is recommended immediately in 2019 and 2020, tapering to zero investment in maintenance between 2021 and 2024 when the large capital projects are planned. The maintenance work continues on an annual basis from 2025 until 2029 when the program comes to completion. Capital improvement projects take longer to design, require the acquisition of easements, and the relocation of utilities, which maintenance and replacement projects do not require. Starting the implementation plan with a heavy load of maintenance projects will allow the lead time necessary for the larger capital

improvement projects and also allow the city time to solidify funding for the heavy investment years. Table 16 illustrates the investments needed and a proposed timeline for construction.

**Table 16. Proposed Construction Timeline.**

| Year | Revenue | Capital Improvement Project Costs | Maintenance Project Costs | Stormwater Fund Balance* |
|---|---|---|---|---|
| 2019 | $88,000 | $93,096 | $331,904 | $697,260 |
| 2020 | $88,000 | $280,930 | $144,070 | $360,260 |
| 2021 | $88,000 | $354,629 | - | $23,260 |
| 2022 | $88,000 | $677,290 | - | $(243,369) |
| 2023 | $88,000 | $1,112,242 | - | $(832,659) |
| 2024 | $88,000 | $1,351,181 | - | $(1,856,901) |
| 2025 | $88,000 | - | $160,000 | $(3,120,082) |
| 2026 | $88,000 | - | $160,000 | $(3,192,082) |
| 2027 | $88,000 | - | $160,000 | $(3,264,082) |
| 2028 | $88,000 | - | $160,000 | $(3,336,082) |
| 2029 | $88,000 | - | $161,426 | $(3,408,082) |
| **Total** | | **$3,869,368** | **$1,277,400** | |

*Stormwater fund balance = Prior year stormwater fund balance plus Revenue minus Capital Improvement and Maintenance Project Costs (prior year). For example, Year 2020 = $697,260 + $88,000 - $93,096 - $331,904.

It is recommended that the city supplement the stormwater fund revenue with other funding mechanisms to improve the level of stormwater service to citizens. Additional funding could be obtained from:

- Sales Tax
- General Obligation (GO) Bonds
- Increased Stormwater Utility Fees
- Kansas Department of Health and Environment (KDHE) - Kansas Water Pollution Control Revolving Fund
- United Stated Department of Agriculture (USDA), Rural Development - Water & Waste Disposal Loan & Grant Program

Each mechanism has been used by numerous municipalities both locally and across the country in order to fund stormwater improvements and maintenance. There is no one-size-fits-all approach because each option carries its share of advantages and disadvantages, and proper application ultimately depends on the community's goals, needs, and financial position. As a

minimum measure, the stormwater utility revenue needs to increase twofold to address current and long-term stormwater infrastructure maintenance (Table16). This can be accomplished by raising rates uniformly across the city or adjusting to a variable fee based on impervious area as described in Section 7.

Table 17 briefly summarizes additional funding sources the city could consider.

**Table 17. Summary of Potential Stormwater Program Funding Mechanisms.**

| Funding Option | Basic Structure | Recommended Application | Advantages | Disadvantages or Limitations |
|---|---|---|---|---|
| Sales Tax | A dedicated amount of local sales tax is authorized for public improvements and maintenance. | Contribute to funding the priority capital improvement projects. | Part of the revenue is generated by out-of-town visitors. | Revenue can fluctuate greatly from year to year.<br><br>Takes time to build funds; not ideal for completing priority capital projects. |
| GO Bonds | Low-interest debt instrument typically used by cities to fund public infrastructure. | Bond capital improvement projects | Large amount of funds available up front to address most severe problems quickly<br><br>Low interest | City pays interest<br><br>Not practical for multiple small cost repairs |
| Stormwater Fees | Property owners are charged a monthly fee to fund the stormwater program. | Fund annual maintenance of the existing system at $160k per year; requires a rate increase across the city. | Steady, predictable annual funding stream<br><br>Fee can be structured to be equitable, based on runoff generation. | Takes time to build funds; not ideal for completing priority capital projects. |
| KDHE Revolving Fund | State provides financial assistance in the form of loans for water quality projects | Contribute to funding the priority capital improvement projects. | State funds available up front to address most severe problems quickly. | Priority given to projects that achieve major water quality objectives and eliminate health hazards<br><br>City Pays interest<br><br>State and federal regulations may increase project costs |
| USDA Loan / Grant | Program that provides funding for stormwater drainage and other projects in rural areas. | Contribute to funding the priority capital improvement projects. | Long-term, low-interest, fixed interest<br><br>Grants may be combined with loans to keep costs reasonable if funds are available | City pays interest<br><br>State and federal regulations may increase project costs |

## 8.4. Planning & Prevention Measures

Louisburg is developing and growing on the periphery of the greater Kansas City metropolitan area. Data from the comprehensive plan estimates the growth rate over the last decade to have been 3.6 percent. Future growth is anticipated in the undeveloped portions of the city as further described in the city's comprehensive plan. Planning and prevention measures undertaken now can put the city in the best situation to avoid costly capital improvement projects in the future and to minimize the need for maintenance dollars for the upkeep of its infrastructure.

### 8.4.1. Ordinance Review

City ordinances and codes typically dictate the design and standards established for each community. Currently, the city has adopted building codes, zoning regulations and subdivision regulations, which have requirements for public infrastructure design in new developments. The inventory analysis identified recent residential development that constructed the pipe conveyance system with CMP. As shown in the city's condition assessment, CMP has a much shorter design life and a history of requiring lining or replacement sooner than other pipe materials. The city's ordinances should be reviewed (and revised as necessary) by an engineering consultant to ensure the best practices of design and construction are required within the city.

### 8.4.2. Stream Buffer / Erosion Hazard Zones

The current stormwater master plan focused primarily on the city's enclosed storm sewer system. Many communities within the Kansas City metropolitan area have experienced development problems in the past when residential, commercial, and industrial projects have encroached upon stream corridors. Urbanization changes the volume and timing of stormwater runoff within a watershed. Streams respond to urbanization and increased runoff by deepening, widening, and changing their alignment until they reach a state of equilibrium within the watershed. Stream erosion and instability can threaten both private and public property, infrastructure, and utilities. Cities are faced with the challenges of intervening to stop these changes and to protect development that was built within the stream corridor. Mitigating the impact of changes within streams is an expensive endeavor.

Designating land adjacent to a stream to be preserved or left undeveloped is a best practice to prevent future challenges and help to preserve water quality. Stream buffers or erosion hazard zones are established methods accepted by cities across the country to preserve land adjacent to streams. The City of Louisburg should consider using these methods.

### 8.4.3. Identify Flood Risks

The only SFHA located within the city limits is Zone A, as mentioned in Section 2.2. Areas within Zone A are determined to be subject to inundation from the 100-year flood through approximate

methodologies, as detailed hydrologic and hydraulic analyses have not been performed. FEMA has established these areas to be at risk of flooding by estimating limits. Detailed hydrologic and hydraulic modeling should be completed for watersheds greater than one square mile and could be completed by the state through FEMA. It is also recommended that the city consider extending the hydrologic and hydraulic modeling further upstream within the watershed to better define areas at risk of flooding.

### 8.4.4. Stormwater Best Management Practices

A post-construction stormwater best management practice (BMP) is designed to infiltrate and slowly release stormwater runoff during a rainfall event. BMPs can be designed to collect pollutants and sediment from impervious surfaces and improve water quality downstream within the watershed. Water bodies such as the Louisburg Lake would benefit from the collection of pollutants such as nitrogen and sediment upstream within the watershed, thus reducing algae blooms and improving the clarity of the water. A city ordinance is recommended to address volume and quality control for stormwater discharges from developed sites. Guidance on BMPs for the Kansas City metropolitan area are outlined in the Mid-America Regional Council's Manual of Best Management Practices for Stormwater Quality (MARC 2012).

# 9. REFERENCES

Federal Emergency Management Agency (FEMA). <https://www.fema.gov> (Jan. 14, 2019)

City of Louisburg, Kansas. 2013. 5x5 Vision Plan

City of Louisburg, Kansas. 2017. The Bright Future Comprehensive Plan

Natural Resource Conservation Service (NRCS). <https://websoilsurvey.nrcs.usda.gov> (Jan. 14, 2019)

Natural Weather Service. Kansas City Monthly Precipitation <https://www.weather.gov/eax/monthlypcpn> (Jan. 14, 2019)

Mid-America Regional Council (MARC). 2012. Manual of Best Management Practices for Stormwater Quality

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# APPENDIX A

## Stormwater Questionnaire

A1 – A2 Stormwater Questionnaire

A3 Questionnaire Summary Table

Received Questionnaires Included as Digital Copy

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# IMPORTANT – PLEASE READ

## Flood Assessment Questionnaire

City of Louisburg, KS

The City of Louisburg is conducting a city-wide Stormwater Management Master Plan and needs your input to evaluate potential widespread or localized stormwater flooding and erosion problems in the city. Such problems include flooding of homes/businesses due to inadequate public drainage systems, flooding of public roadways, and stream erosion impacting improved property, but not nuisance yard flooding or problems due to poor yard grading.

We appreciate your assistance in this effort. A response is helpful even if you have not experienced or witnessed problems in the past. Please complete this form (both sides) to the best of your knowledge and return to either City Hall or the city's engineering consultant via mail, fax or email. The form can also be completed online at www.louisburgkansas.gov.

Olsson Associates
Attn: Brent Johnson, PE
7301 W. 133rd Street, Ste. 200
Overland Park, KS 66213
Fax: (913) 381-1174
bmjohnson@olssonassociates.com

---

Date: _____

Name (optional): _____

Address: _____

Phone: _____

1. How long have you owned/lived at this location? _____

2. How many times has your building experienced stormwater flooding (surface water entering your building or attached garage) in that time? _____

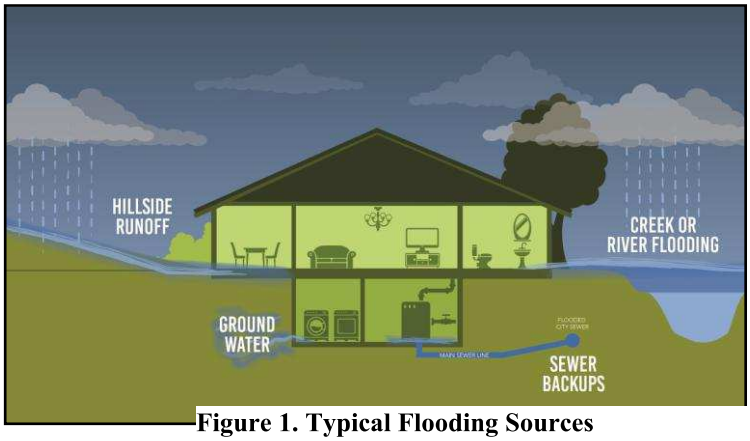



**Figure 1. Typical Flooding Sources**

Approximate dates of flooding and amounts of rainfall (if known): _____

_____

_____

3. Flooding during heavy rains can occur for many different reasons (Figure 1). Please indicate which of the following has caused the flooding you listed above. (check all that apply)

_____ ***Sanitary sewers*** backing up.

_____ Rainfall soaking into the ground and running as ***groundwater*** into the basement due to cracks in the wall or floor or through the foundation drains.

_____ Rainfall from streets, gutters, neighboring yards, ditches, creeks, etc., which runs on top of the ground ***(Hillside or Creek Sources)*** into a surface level opening of the building, such as a door or basement window.

_____ Other reasons (please explain). _____

4. For the flooding listed, where specifically is water entering the building? (check all that apply)

_____Doors _____Windows _____Window Wells _____Attached Garage Door

_____Walls _____Floor Cracks _____Floor Drains _____Sump Pump

_____(Other) _____

_____

_____

5. If you've experienced stormwater flooding or erosion, what appears to be the source or cause? (check all that apply)

_____ Garbage/debris/overgrowth clogging storm sewer drains or pipes

_____ Flooding from creek: floodwater jumps out of stream banks and enters building

_____ Not enough drain inlets upstream to capture runoff

_____ Undersized drainage pipes cause flood waters to back up and flood building(s)

_____ Stormwater carried in street overtops curbs and floods building

_____ Improper yard drainage

_____ Other _____

6. Have nearby streets where you live/own been flooded to a depth of 7 inches or more? (7 inches is roughly the distance between the ground and the body of a normal car) and if so, where and how often?

_____

7. Does the surface drainage cause erosion which threatens your property, or the street where you live/own? Yes _____ No _____ Please explain _____

8. Additional comments: Please share any other concerns you may have regarding flooding and stormwater in your neighborhood that are not addressed in the sections above

_____

_____

_____

_____

_____

_____

_____

**THANK YOU!**

| Owner Name | Property Address | Years at Residence | Building Flood Frequency | Flood Reason | Flood Entry Point | Flood Cause | Street Flooding | Drainage/Erosion |
|---|---|---|---|---|---|---|---|---|
| SHIPPY, LILLIAN F | 402 S ROGERS RD, Louisburg, KS 66053 | 20 | No Answer Given | No Answer Given | No Answer Given | No Answer Given | Yes | Yes |
| JOHNSEN, LEONARD JR & PHYLLISS | 101 S 16TH TER, Louisburg, KS 66053 | 10 | No Answer Given | No Answer Given | No Answer Given | No Answer Given | Yes | Yes |
| GOLLADAY, CHARLES & SUELLEN TRUST | 909 S 10TH ST, Louisburg, KS 66053 | 44 | No Answer Given | No Answer Given | No Answer Given | Garbage/debris/overgrowth clogging storm sewer drains or pipes | Yes | Yes |
| J C CONTRACTING LLC | 507 S 5TH ST, Louisburg, KS 66053 | 1 | No Answer Given | Other | No Answer Given | Flooding from creek: floodwater jumps out of stream banks and enters building | Yes | Yes |
| CUTSHAW, JOSHUA & CINDY | 708 S 5TH ST, Louisburg, KS 66053 | 13 | No Answer Given | Rainfall soaking into the ground and running as groundwater into the basement | Sump Pump | Undersized drainage pipes cause flood waters to back up and flood building | Yes | Yes |
| TRINKLE, CHRISTOPHER D | 507 S 6TH ST, Louisburg, KS 66053 | 2 | No Answer Given | Rainfall surface runoff flows into surface level opening of building | No Answer Given | Not enough drain inlets upstream to capture runoff | Yes | Yes |
| LANCASTER, JAMES M & NANCY J | 601 S DOYLE ST, Louisburg, KS 66053 | 45 | No Answer Given | Rainfall surface runoff flows into surface level opening of building | Attached Garage Door | Undersized drainage pipes cause flood waters to back up and flood building | Yes | No Answer Given |
| BRECKENRIDGE, JAMES E & VICTORIA A | 202 S DOYLE ST, Louisburg, KS 66053 | 43 | 43 | Rainfall soaking into the ground and running as groundwater into the basement | Walls | Stormwater carried in street overtops curbs and floods building | Yes | Yes |
| KETTLER, JAMES A & COOK, JENNIE L | 114 SHORELINE DR, Louisburg, KS 66053 | 14 | 14 | Rainfall soaking into the ground and running as groundwater into the basement | Floor Drains | Other | No | Yes |
| AYE, DONALD E & STEFFANY A | 1502 N BROADWAY ST, Louisburg, KS 66053 | 20 | 10 | Other | Floor Drains | Garbage/debris/overgrowth clogging storm sewer drains or pipes | No | No |
| BARTLETT, DANA M | 202 S VINE ST, Louisburg, KS 66053 | 5 | 10 | Rainfall soaking into the ground and running as groundwater into the basement | Floor Drains | Other | Yes | Yes |
| CARDER, DOUGLAS W & L JEAN TRUST | 202 S BROADMOOR ST, Louisburg, KS 66053 | 22 | 10 | Rainfall surface runoff flows into surface level opening of building | Attached Garage Door | No Answer Given | No | No |
| LIGHTNER FAMILY TRUST | 408 S ELM ST, Louisburg, KS 66053 | 6 | 10 | Rainfall surface runoff flows into surface level opening of building | Window Wells | Undersized drainage pipes cause flood waters to back up and flood building | Yes | No |
| ARPIN, JAMES C | 302 ROGERS RD, Louisburg, KS 66053 | 17 | 10 | Sanitary sewers backing up | Floor Drains | Garbage/debris/overgrowth clogging storm sewer drains or pipes | No | No |
| KEEFHAVER, JOSEPH G & GLENNA S TRUSTEES | 207 S 2ND ST E, Louisburg, KS 66053 | 29 | 7 | Rainfall soaking into the ground and running as groundwater into the basement | Window Wells | Improper yard drainage | No | No |
| BLUE SKY DEVELOPERS INC | 700 N BROADWAY ST, Louisburg, KS 66053 | 17 | 7 | Rainfall surface runoff flows into surface level opening of building | Other | Flooding from creek: floodwater jumps out of stream banks and enters building | No | Yes |
| CKC ENTERPRISES LLC | 607 S 2ND ST, Louisburg, KS 66053 | 3 | 6 | Rainfall soaking into the ground and running as groundwater into the basement | Floor Cracks | Improper yard drainage | No | No |
| MOSSINGHOFF, CASSIE & JONATHAN | 801 S MULBERRY ST, Louisburg, KS 66053 | 3 | 6 | Rainfall surface runoff flows into surface level opening of building | Windows | Garbage/debris/overgrowth clogging storm sewer drains or pipes | No | Yes |
| MAIER, DARCY R | 805 S 8TH ST, Louisburg, KS 66053 | 7 | 6 | Sanitary sewers backing up | Attached Garage Door | Other | No | Yes |
| CASEY, JONATHAN & RENEE | 1400 GLEN DR, Louisburg, KS 66053 | 7 | 5 | Rainfall surface runoff flows into surface level opening of building | Other | Improper yard drainage | No | No |
| LOUISBERG KS PROPERTY HOLDINGS, LLC | 1200 S BROADWAY ST, Louisburg, KS 66053 | 50 | 5 | Rainfall surface runoff flows into surface level opening of building | Walls | Not enough drain inlets upstream to capture runoff | Yes | No |
| SALERNO, LINDA L | 407 S DOYLE ST, Louisburg, KS 66053 | 8 | 4 | Rainfall soaking into the ground and running as groundwater into the basement | Attached Garage Door | Stormwater carried in street overtops curbs and floods building | No | No |
| RATHMAN, JAMES J & JESSICA M | 1012 ROCKVILLE TER, Louisburg, KS 66053 | 7 | 4 | Rainfall soaking into the ground and running as groundwater into the basement | Sump Pump | Improper yard drainage | No | No |
| ZAMMIT, CHRISTOPHER T & LINDSAY M | 1407 SYCAMORE DR, Louisburg, KS 66053 | 4 | 4 | Rainfall surface runoff flows into surface level opening of building | No Answer Given | Garbage/debris/overgrowth clogging storm sewer drains or pipes | No | Yes |
| ROUSH, NADA J | 204 E 2ND ST, Louisburg, KS 66053 | 27 | 4 | Sanitary sewers backing up | Floor Drains | Undersized drainage pipes cause flood waters to back up and flood building | Yes | No |
| WINE, KURT & MONICA | 408 S 9TH ST, Louisburg, KS 66053 | 3 | 4 | Sanitary sewers backing up | Walls | Garbage/debris/overgrowth clogging storm sewer drains or pipes | No | Yes |
| GANGEL, J T & JOANN | 102 S VINE ST, Louisburg, KS 66053 | 4 | 3 | Other | Doors | Other | Yes | No |
| MENDEZ, JESSE R & PATRICIA MATILDE | 506 S MULBERRY ST, Louisburg, KS 66053 | 1 | 3 | Rainfall surface runoff flows into surface level opening of building | Doors | Other | Yes | Yes |
| PENDLETON, TABITHA R & HUNTSMAN, ANNA MARIA | 307 S 7TH ST, Louisburg, KS 66053 | 1 | 3 | Rainfall surface runoff flows into surface level opening of building | Walls | Garbage/debris/overgrowth clogging storm sewer drains or pipes | Yes | Yes |
| SIFERS, JANICE M | 802 S BROADWAY ST, Louisburg, KS 66053 | 16 | 2 | Rainfall soaking into the ground and running as groundwater into the basement | Walls | Improper yard drainage | No | Yes |
| BLAIR, J T & CATHERINE J TR | 1406 N BROADWAY ST, Louisburg, KS 66053 | 39 | 2 | Rainfall soaking into the ground and running as groundwater into the basement | Walls | Improper yard drainage | No | No |
| HESSLER, KENT A & DEBORAH K | 102 SHORELINE DR, Louisburg, KS 66053 | 12 | 2 | Rainfall soaking into the ground and running as groundwater into the basement | Window Wells | Improper yard drainage | No | No Answer Given |
| MCINTIRE, MICHAEL J & SARA L | 508 BROADMOOR CV, Louisburg, KS 66053 | 9 | 2 | Rainfall surface runoff flows into surface level opening of building | Doors | Flooding from creek: floodwater jumps out of stream banks and enters building | No | Yes |
| MOORE, DOUGLAS R & LYNNE M | 104 SHORELINE DR, Louisburg, KS 66053 | 11 | 2 | Rainfall surface runoff flows into surface level opening of building | Window Wells | Garbage/debris/overgrowth clogging storm sewer drains or pipes | No | No |
| GHANNAM, MOHAMMAD & HASIAN, AMANI | 8625 W 271ST ST, Louisburg, KS 66053 | 1 | 2 | Sanitary sewers backing up | Walls | Garbage/debris/overgrowth clogging storm sewer drains or pipes | No Answer Given | No Answer Given |
| DEAN PHILIP S & KELSEY M | 302 N 3RD ST, Louisburg, KS 66053 | 4 | 1 | Rainfall soaking into the ground and running as groundwater into the basement | Sump Pump | Other | Yes | Yes |
| SHERARD, THOMAS J & MARJORIE D | 308 S 6TH ST, Louisburg, KS 66053 | 3 | 1 | Rainfall soaking into the ground and running as groundwater into the basement | Walls | Other | No | No Answer Given |
| WOODS, ROBERT W & WANDA D | 104 S 2ND ST, Louisburg, KS 66053 | 9 | 1 | Rainfall surface runoff flows into surface level opening of building | Other | Garbage/debris/overgrowth clogging storm sewer drains or pipes | No | Yes |
| SMOTHERMAN, JEANETTE L TRUST | 1000 S BROADWAY ST, Louisburg, KS 66053 | 25 | 1 | Sanitary sewers backing up | Floor Cracks | Not enough drain inlets upstream to capture runoff | Yes | Yes |
| HARRIS, WARREN S JR ETAL | 211 SHORELINE DR, Louisburg, KS 66053 | 13 | 1 | Sanitary sewers backing up | Other | No Answer Given | No Answer Given | Yes |
| FLANDER, SHAREN L & PETER K TRUST | 308 S 4TH ST, Louisburg, KS 66053 | 13 | 1 | Sanitary sewers backing up | Walls | Other | No | No |

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# APPENDIX B

City Council Presentation

B1 – B4 City Council Presentation

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**Stormwater Masterplan Presentation**
**December 17, 2018**

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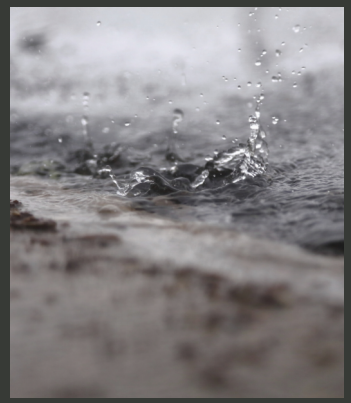
1

## PURPOSE

- Identify and prioritize areas of concern, capital improvements and operational costs
- Address future needs of surface water collection and operations

Inventory & assess → Seek city & public input → Group problem areas

Score & prioritize → Conceptual solutions → Capital plan



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2



## SYSTEM SURVEY & CONDITION ASSESSMENT

- Field inventory (GPS)
- GIS database



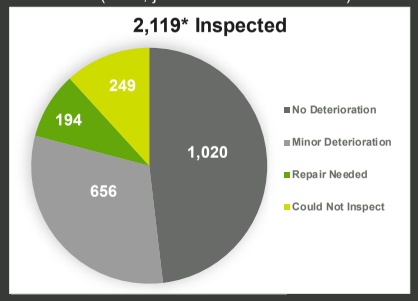
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3

## SYSTEM SURVEY & CONDITION ASSESSMENT CONTINUED…

•Structures (inlets, junction boxes & manholes)






- System value $10.6M*
- Estimated $970k structure replacements needed

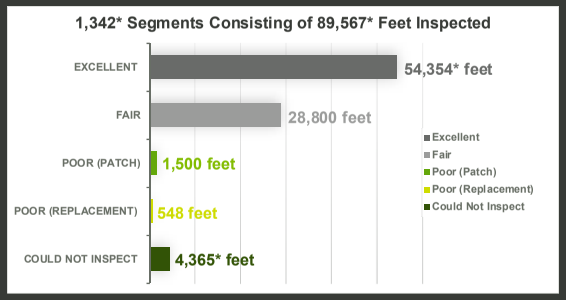
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** Value was changed after presentation*

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## SYSTEM SURVEY & CONDITION ASSESSMENT CONTINUED…






- Pipes
  - System value $13.4M*
  - Estimated $307k* in pipe repairs needed (excludes surface restoration)

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** Value was changed after presentation*

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## PUBLIC OUTREACH

- Questionnaires
  - Delivered through the water bill, posted on the city's webpage and social media sites
- Responses
  - 94 in total
  - 50 of those responses indicated building and street flooding
- Open House Meeting (July 26*)
  - Attendance (18 property owners)

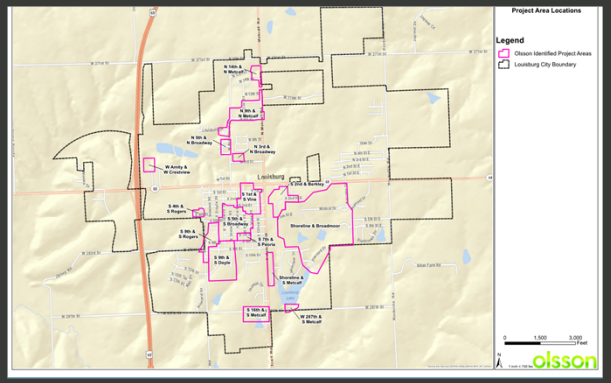



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** Date was corrected after presentation*

6

## CAPITAL PROJECTS




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## PROJECT SCORING AND PRIORITIZATION

Prioritization and points assigned to:
- Loss of life
- Flooding of buildings
- Flooding of arterial, collector and residential streets
- Erosion threatening buildings or other infrastructure
- System condition ratings for "fair" or "poor" condition

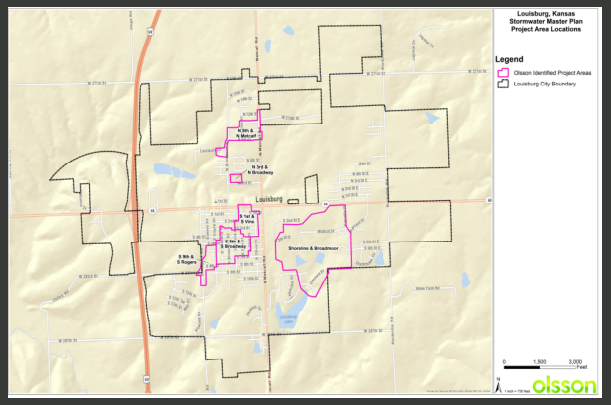
Categories are weighted to consider frequency and severity

Cost to Benefit
- Conceptual solutions and estimated project costs were prepared for 6 of the 16 Capital Projects

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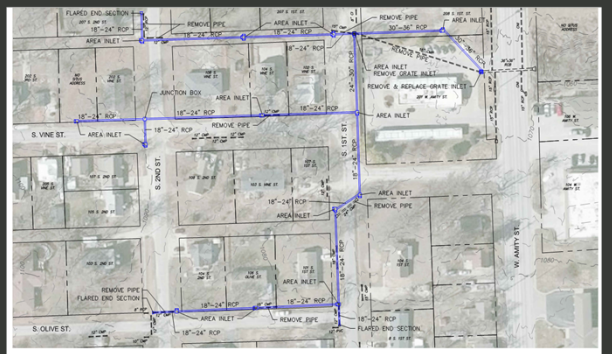
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S. First and S. Vine St

SCALE 1"=60'
S. 1ST & S. VINE

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# PRIORITIZATION

| Location | Est. Project Cost | Benefit Score | Ratio (C/B) |
|---|---|---|---|
| N. 3RD & N. BROADWAY | $93,096 | 90 | 1,034 |
| SHORELINE & BROADMOOR | $280,930 | 231 | 1,216 |
| N. 9TH & N. METCALF | $354,629 | 237 | 1,496 |
| S. 1ST & S. VINE | $677,290 | 387 | 1,750 |
| S. 5TH & S. BROADWAY | $1,351,181 | 608 | 2,222 |
| S. 9TH & S. ROGERS | $1,112,242 | 341 | 3,262 |

**Other factors to consider:**

- Downstream projects need to be constructed first (S. 9th and S. Rogers)
- Street and sidewalk capital improvement or maintenance plan
- Property acquisition

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# NEXT STEPS…

- Staffing and utility rate analysis
- Draft plan to City by end of January 2019

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## SUMMARY

- Asset inventory and condition assessment completed
  - Identified $1.3M* in system repairs needed
- 16 Capital Improvement Projects to address flooding identified
  - $3.9M needed to address six prioritized locations
- Draft masterplan document submitted by end of January

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* Value was changed after presentation

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# APPENDIX C

## Project Location Maps

| | |
|---|---|
| C1 | Overall Project Locations |
| C2 | North Third & North Broadway |
| C3 | Shoreline & Broadmoor |
| C4 | North Ninth & North Metcalf |
| C5 | South First & South Vine |
| C6 | South Fifth & South Broadway |
| C7 | South Ninth & South Rogers |
| C8 | South Ninth & South Doyle |
| C9 | South Second & South Berkley |
| C10 | South Seventh & South Peoria |
| C11 | Shoreline & South Metcalf |
| C12 | South 16th & South Metcalf |
| C13 | South Fourth & South Rogers |
| C14 | North 14th & North Metcalf |
| C15 | West Amity & West Crestview |
| C16 | North Fifth & North Broadway |
| C17 | West 287th & South Metcalf |

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# Louisburg, Kansas
# Stormwater Master Plan
# Project Area Locations

## Legend

- Olsson Identified Project Areas
- Louisburg City Boundary

1 inch = 1,500 feet

0 1,500 3,000 Feet

N

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C1

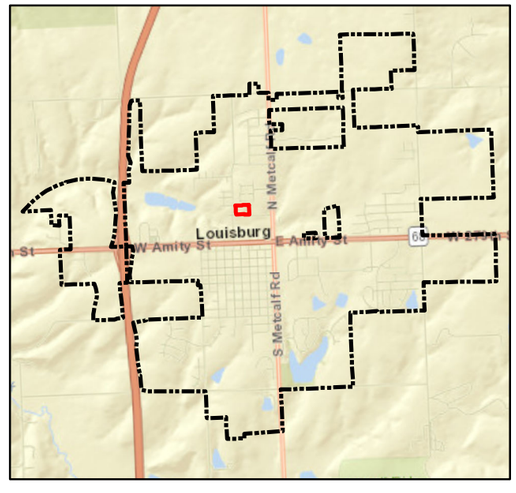
# Louisburg, Kansas Stormwater Master Plan

## Legend

- N. 3rd & N. Broadway Limits
- Other Project Limits
- City Limits
- Reported Street Flooding
- Reported Groundwater Flooding
- Reported Sanitary Backup
- Reported Building Flooding

**Stormwater Pipes**

- Excellent & Obstructed
- Excellent
- Fair & Obstructed
- Fair
- Poor
- Could Not Inspect




1 inch = 100 feet

0 50 100 200 Feet

N

olsson

N 5th & N Broadway

N 3rd & N Broadway

N 5TH ST
N 5TH TER
N 5TH TER
JACKSON ST
MCKENNA ST
N 4TH TER
N 4TH ST
N BROADWAY ST
N 3RD ST

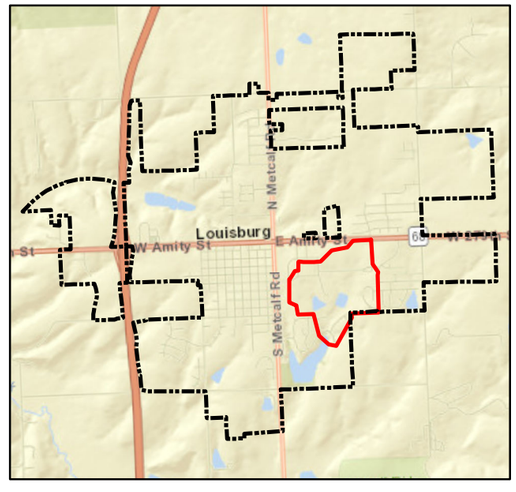
# Louisburg, Kansas
# Stormwater Master Plan

## Legend

- Shoreline & Broadmoor Limits
- Other Project Limits
- City Limits
- Reported Street Flooding
- Reported Groundwater Flooding
- Reported Sanitary Backup
- Reported Building Flooding

**Stormwater Pipes**

- Excellent & Obstructed
- Excellent
- Fair & Obstructed
- Fair
- Poor
- Could Not Inspect




1 inch = 400 feet

0 200 400 800 Feet

N

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S 1st & S Vine

S 2nd & Berkley

S 5th & S Broadway

Shoreline & Broadmoor

S 7th & S Peoria

Shoreline & S Metcalf

Note: Danford Drive project completed after aerial imagery was taken

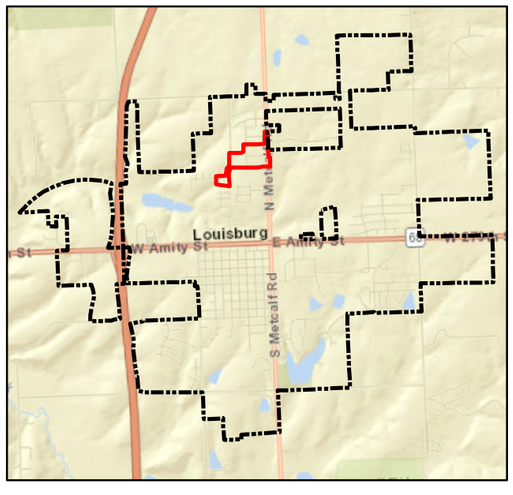
# Louisburg, Kansas
# Stormwater Master Plan

## Legend

- N. 9th & N. Metcalf Limits
- Other Project Limits
- City Limits
- Reported Street Flooding
- Reported Groundwater Flooding
- Reported Sanitary Backup
- Reported Building Flooding

**Stormwater Pipes**

- Excellent & Obstructed
- Excellent
- Fair & Obstructed
- Fair
- Poor
- Could Not Inspect




1 inch = 200 feet

0 100 200 400 Feet

N

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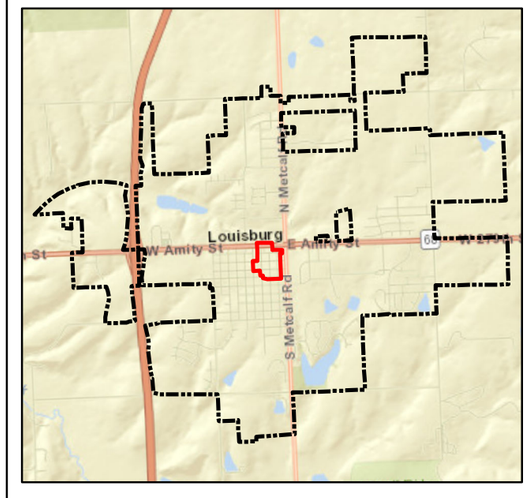
# Louisburg, Kansas
# Stormwater Master Plan

## Legend

- S. 1st & S. Vine Limits
- Other Project Limits
- City Limits
- Reported Street Flooding
- Reported Groundwater Flooding
- Reported Sanitary Backup
- Reported Building Flooding

**Stormwater Pipes**

- Excellent & Obstructed
- Excellent
- Fair & Obstructed
- Fair
- Poor
- Could Not Inspect




1 inch = 150 feet

0 75 150 300 Feet

N

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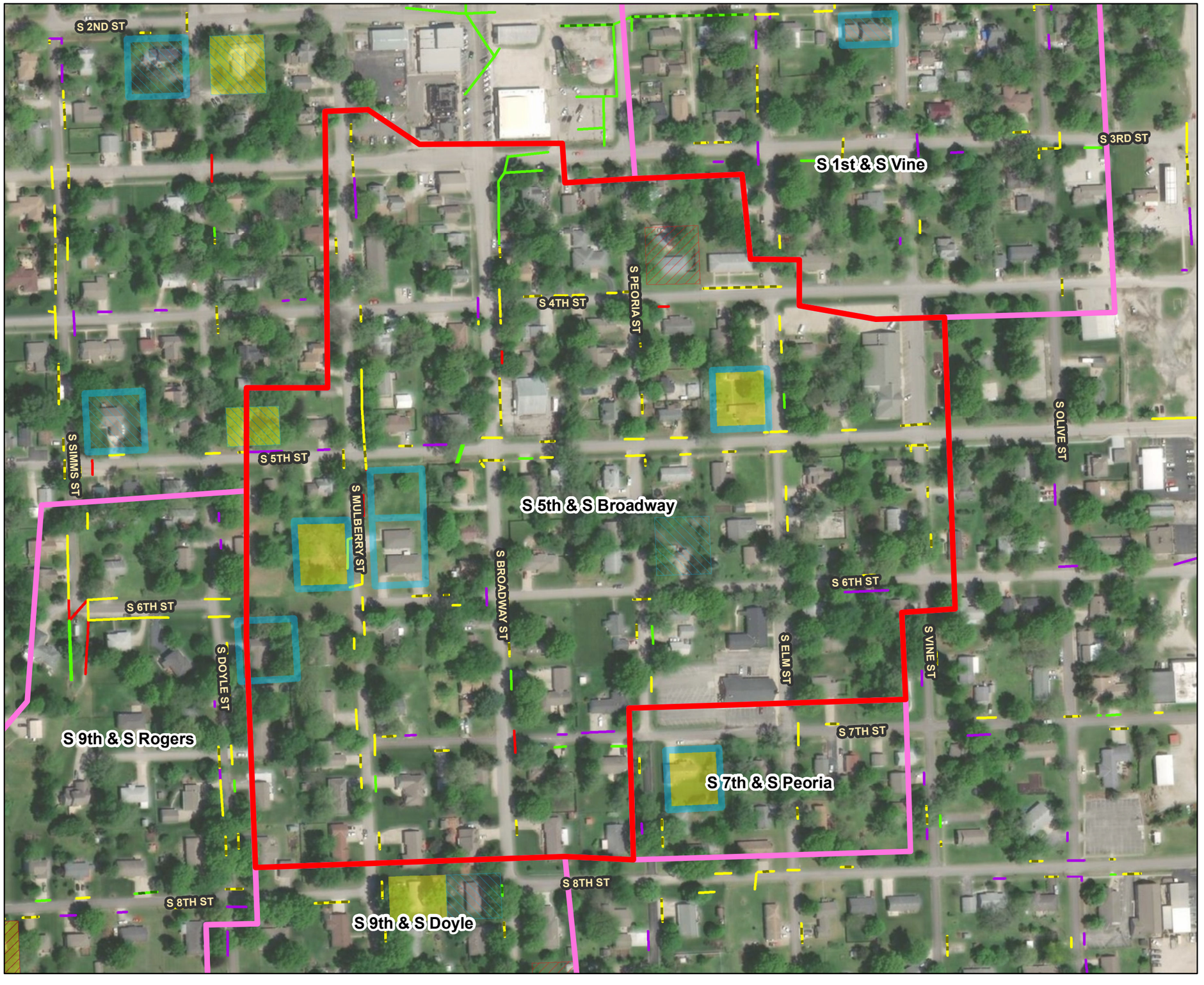
# Louisburg, Kansas
# Stormwater Master Plan

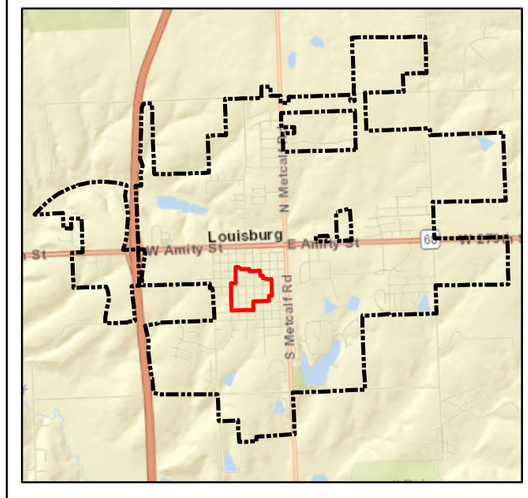
## Legend

- S 5th & S. Broadway Limits
- Other Project Limits
- City Limits
- Reported Street Flooding
- Reported Groundwater Flooding
- Reported Sanitary Backup
- Reported Building Flooding

**Stormwater Pipes**

- Excellent & Obstructed
- Excellent
- Fair & Obstructed
- Fair
- Poor
- Could Not Inspect




1 inch = 200 feet

0 100 200 400 Feet

N

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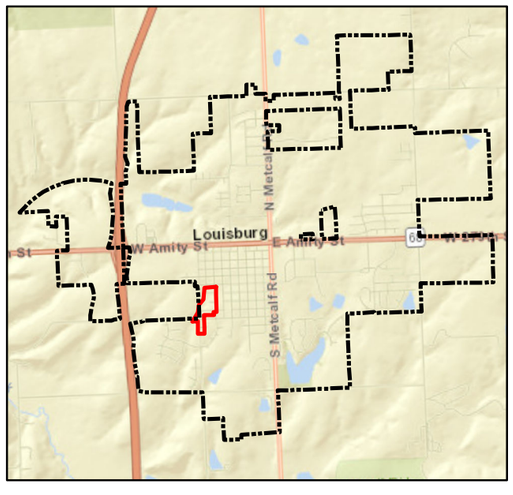
# Louisburg, Kansas
# Stormwater Master Plan

## Legend

- S. 9th & S. Rogers Limits
- Other Project Limits
- City Limits
- Reported Street Flooding
- Reported Groundwater Flooding
- Reported Sanitary Backup
- Reported Building Flooding

**Stormwater Pipes**

- Excellent & Obstructed
- Excellent
- Fair & Obstructed
- Fair
- Poor
- Could Not Inspect




1 inch = 200 feet

0 100 200 400 Feet

N

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# Louisburg, Kansas
# Stormwater Master Plan

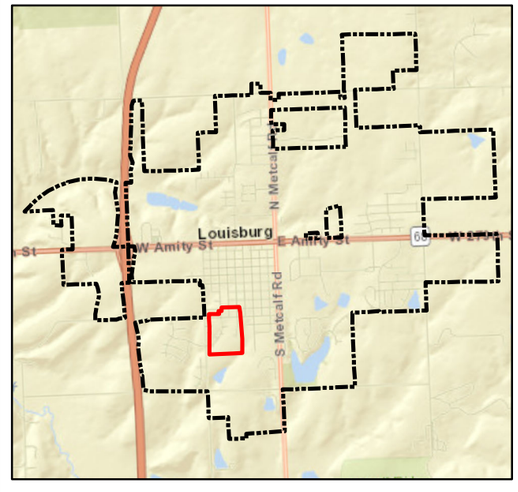
S 7TH ST
S 5th & S Broadway
S 7th & S Peoria
S 9th & S Rogers
S 8TH ST
S MULBERRY ST
S BROADWAY ST
S PEORIA ST
S 9TH ST
S DOYLE ST
S 10TH ST
S 9th & S Doyle
S 11TH ST
S ROGERS RD
S 12TH ST
S ELM ST

## Legend

- S. 9th & S. Doyle Limits
- Other Project Limits
- City Limits
- Reported Street Flooding
- Reported Groundwater Flooding
- Reported Sanitary Backup
- Reported Building Flooding

**Stormwater Pipes**

- Excellent & Obstructed
- Excellent
- Fair & Obstructed
- Fair
- Poor
- Could Not Inspect



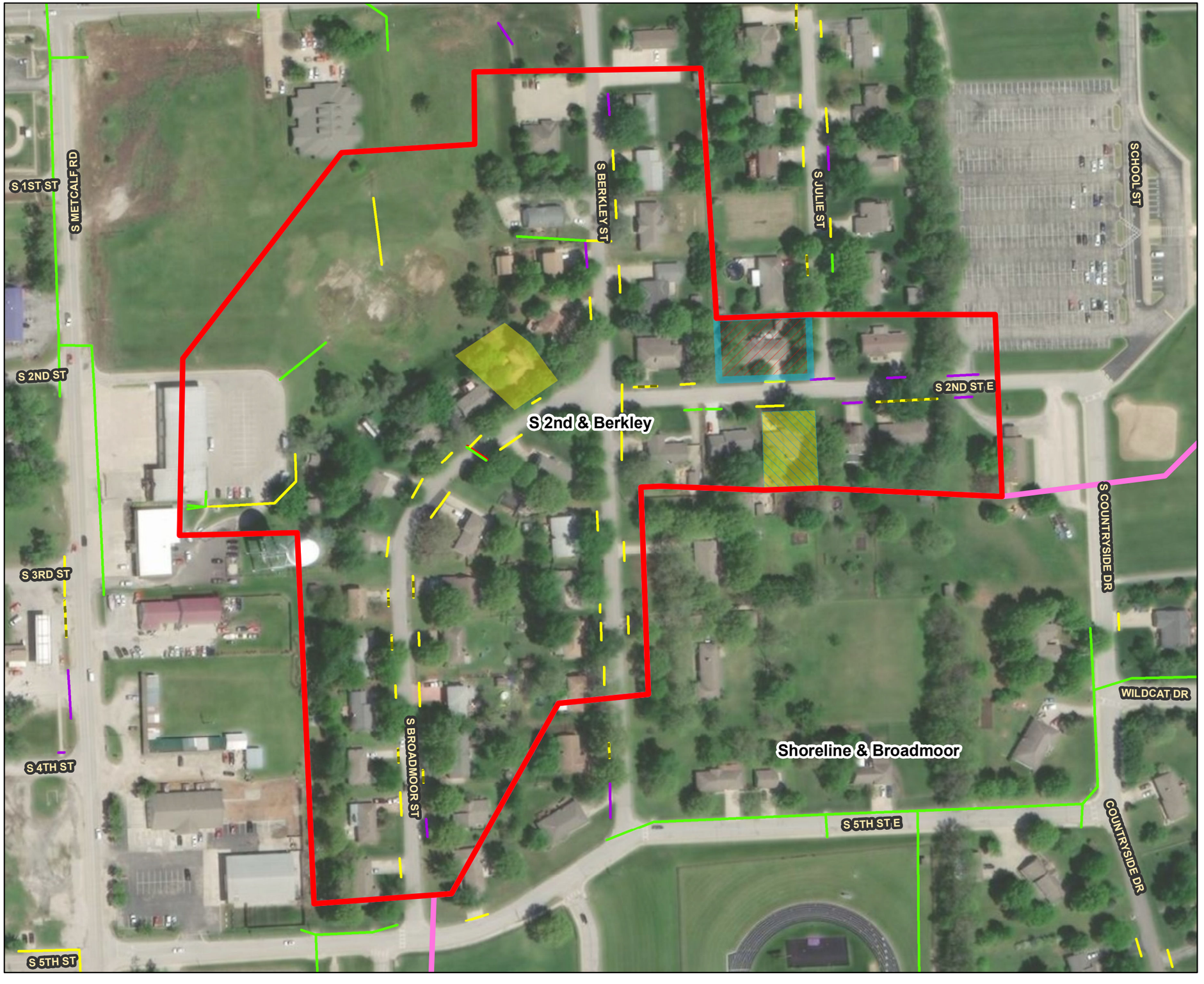

1 inch = 200 feet

0 100 200 400 Feet

N

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# Louisburg, Kansas
# Stormwater Master Plan

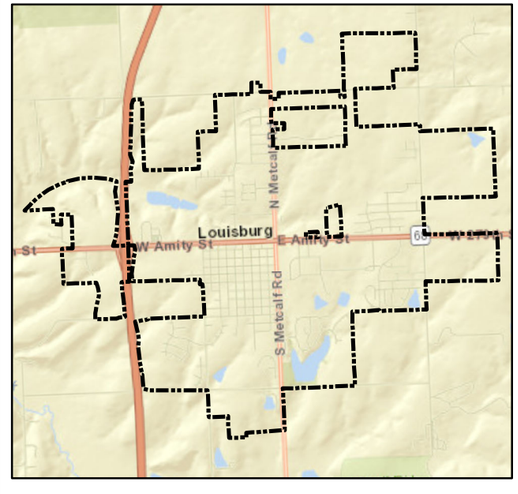



## Legend

- S. 2nd & S. Berkley Limits
- Other Project Limits
- City Limits
- Reported Street Flooding
- Reported Groundwater Flooding
- Reported Sanitary Backup
- Reported Building Flooding

**Stormwater Pipes**

- Excellent & Obstructed
- Excellent
- Fair & Obstructed
- Fair
- Poor
- Could Not Inspect




1 inch = 150 feet

0 75 150 300 Feet

N

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# Louisburg, Kansas
# Stormwater Master Plan

S 5th & S Broadway

S 7th & S Peoria

S 9th & S Doyle

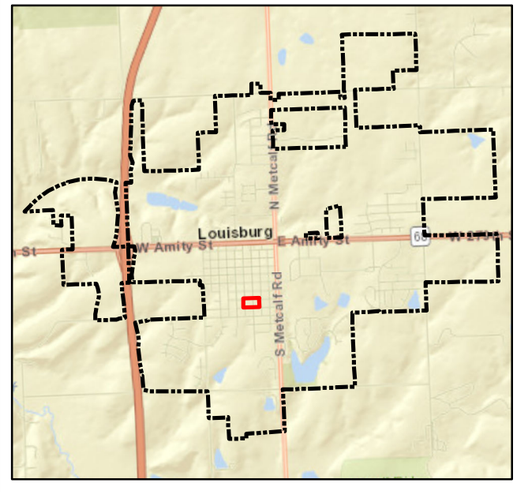
S 6TH ST
S ELM ST
S VINE ST
S 7TH ST
S PEORIA ST
S BROADWAY ST
S 8TH ST
S 9TH ST

## Legend

- S. 7th & S. Peoria Limits
- Other Project Limits
- City Limits
- Reported Street Flooding
- Reported Groundwater Flooding
- Reported Sanitary Backup
- Reported Building Flooding

**Stormwater Pipes**

- Excellent & Obstructed
- Excellent
- Fair & Obstructed
- Fair
- Poor
- Could Not Inspect




1 inch = 100 feet

0 50 100 200 Feet

N

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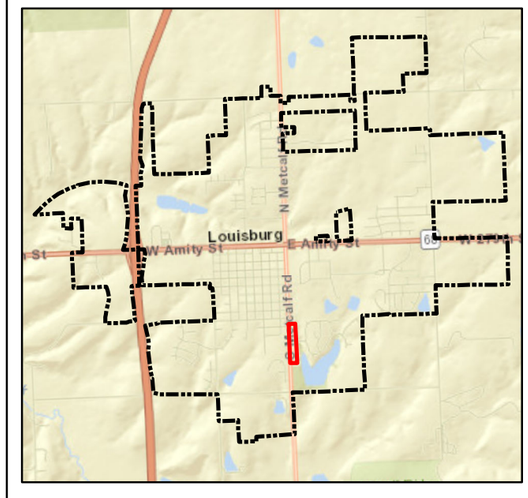
# Louisburg, Kansas
# Stormwater Master Plan

## Legend

- Shoreline & S. Metcalf Limits
- Other Project Limits
- City Limits
- Reported Street Flooding
- Reported Groundwater Flooding
- Reported Sanitary Backup
- Reported Building Flooding

**Stormwater Pipes**

- Excellent & Obstructed
- Excellent
- Fair & Obstructed
- Fair
- Poor
- Could Not Inspect




1 inch = 200 feet

0 100 200 400 Feet

N

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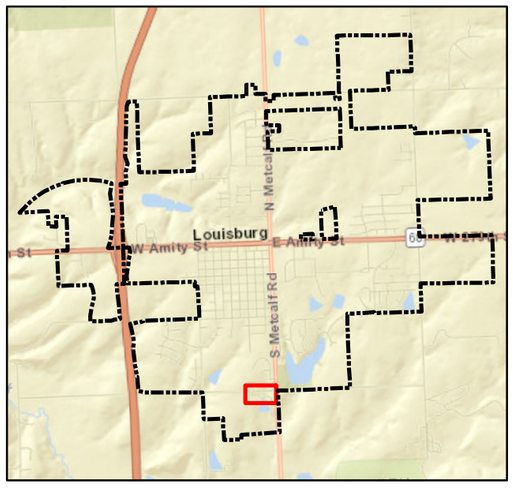
# Louisburg, Kansas
# Stormwater Master Plan

## Legend

- S. 16th & S. Metcalf Limits
- Other Project Limits
- City Limits
- Reported Street Flooding
- Reported Groundwater Flooding
- Reported Sanitary Backup
- Reported Building Flooding

**Stormwater Pipes**

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- Fair & Obstructed
- Fair
- Poor
- Could Not Inspect




1 inch = 100 feet

0 50 100 200 Feet

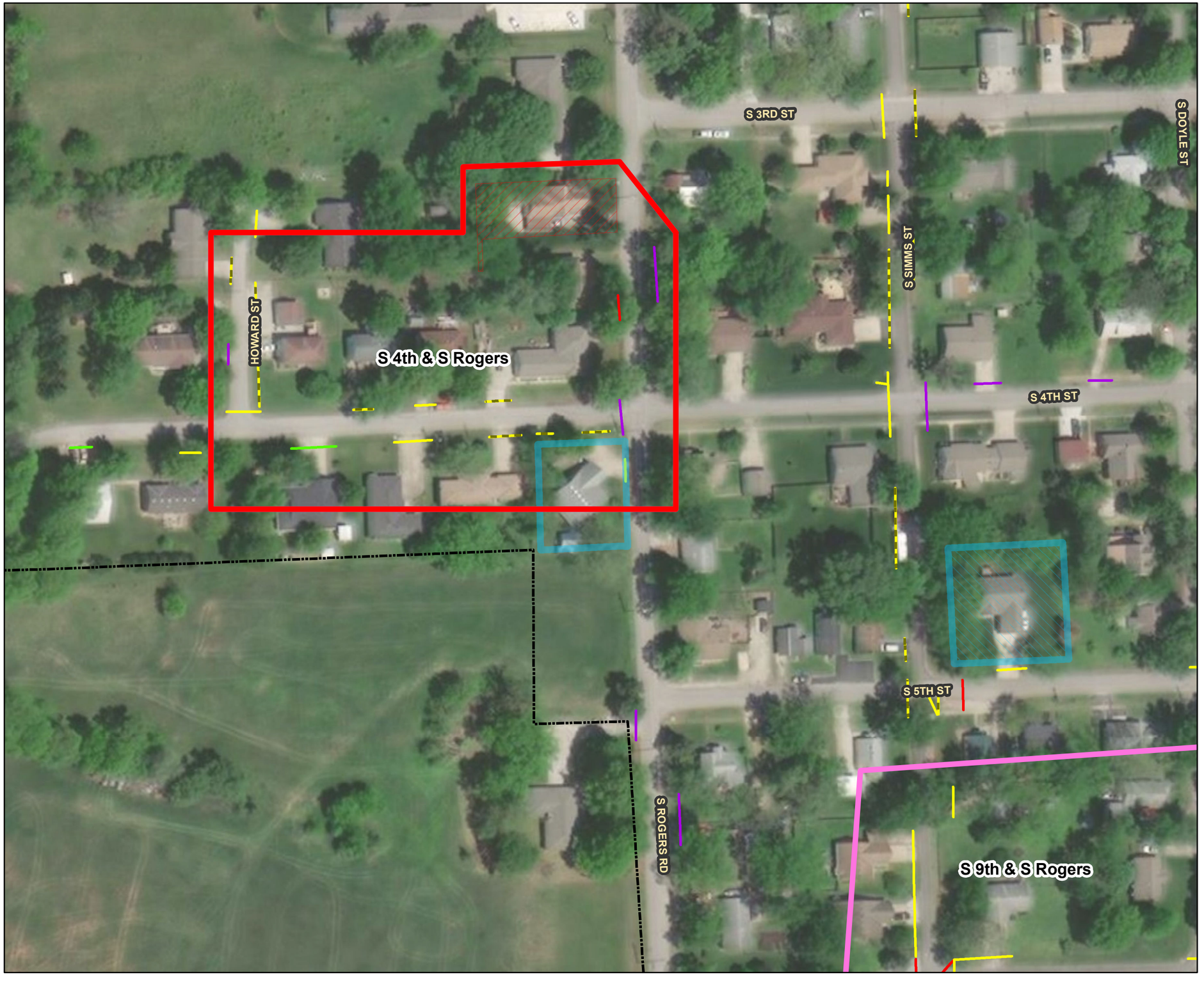
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S 16th & S Metcalf

S METCALF RD
S 16TH ST
S 16TH TER
PRAIRIE CROSSING AVE
CHADWICK COVE ST
S 17TH TER
ELM ST

# Louisburg, Kansas
# Stormwater Master Plan

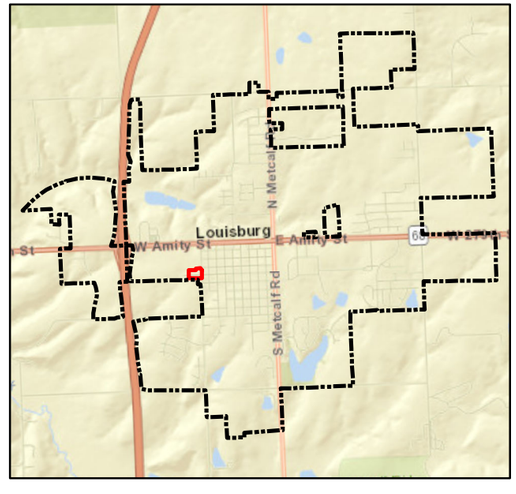



## Legend

- S 4th & S. Rogers Limits
- Other Project Limits
- City Limits
- Reported Street Flooding
- Reported Groundwater Flooding
- Reported Sanitary Backup
- Reported Building Flooding

**Stormwater Pipes**

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0 50 100 200 Feet

N

olsson

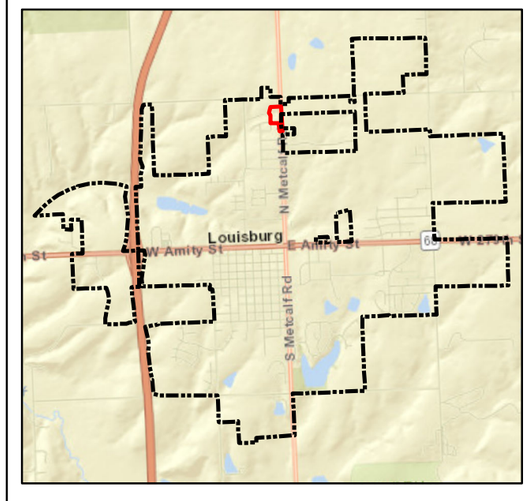
# Louisburg, Kansas
# Stormwater Master Plan

## Legend

- N. 14th & N. Metcalf Limits
- Other Project Limits
- City Limits
- Reported Street Flooding
- Reported Groundwater Flooding
- Reported Sanitary Backup
- Reported Building Flooding

**Stormwater Pipes**

- Excellent & Obstructed
- Excellent
- Fair & Obstructed
- Fair
- Poor
- Could Not Inspect




1 inch = 100 feet

0 50 100 200 Feet

N

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# Louisburg, Kansas
# Stormwater Master Plan

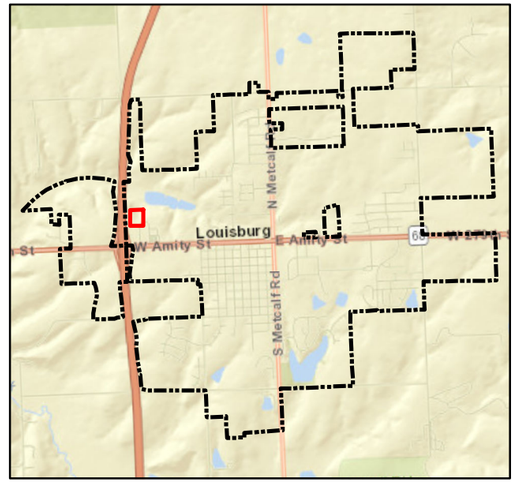



## Legend

- W. Amity & W. Crestview Limits
- Other Project Limits
- City Limits
- Reported Street Flooding
- Reported Groundwater Flooding
- Reported Sanitary Backup
- Reported Building Flooding

**Stormwater Pipes**

- Excellent & Obstructed
- Excellent
- Fair & Obstructed
- Fair
- Poor
- Could Not Inspect




1 inch = 100 feet

0 50 100 200 Feet

N

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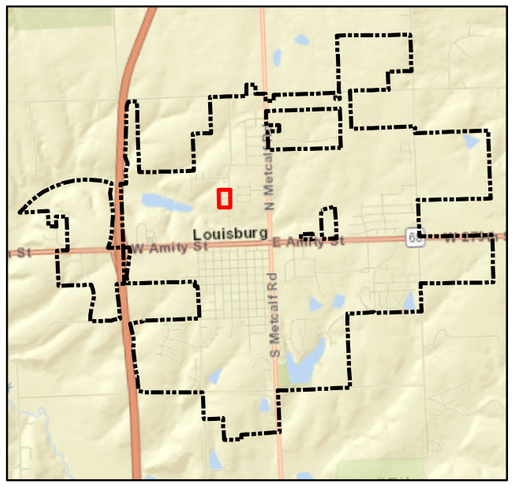
# Louisburg, Kansas
# Stormwater Master Plan

## Legend

- N. 5th & N. Broadway Limits
- Other Project Limits
- City Limits
- Reported Street Flooding
- Reported Groundwater Flooding
- Reported Sanitary Backup
- Reported Building Flooding

**Stormwater Pipes**

- Excellent & Obstructed
- Excellent
- Fair & Obstructed
- Fair
- Poor
- Could Not Inspect




1 inch = 100 feet

0 50 100 200 Feet

N

olsson



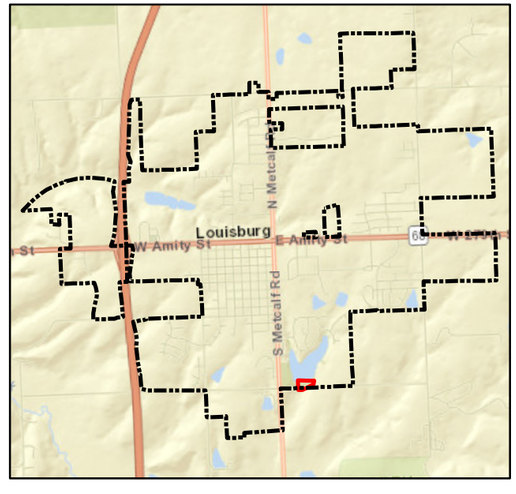

# Louisburg, Kansas Stormwater Master Plan

## Legend

- W. 287th & S. Metcalf Limits
- Other Project Limits
- City Limits
- Reported Street Flooding
- Reported Groundwater Flooding
- Reported Sanitary Backup
- Reported Building Flooding

**Stormwater Pipes**

- Excellent & Obstructed
- Excellent
- Fair & Obstructed
- Fair
- Poor
- Could Not Inspect




1 inch = 100 feet

0 50 100 200 Feet

N

olsson

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# APPENDIX D

## Project Rating Forms

| | |
|---|---|
| D1 | North Third & North Broadway |
| D2 | Shoreline & Broadmoor |
| D3 | North Ninth & North Metcalf |
| D4 | South First & South Vine |
| D5 | South Fifth & South Broadway |
| D6 | South Ninth & South Rogers |
| D7 | South Ninth & South Doyle |
| D8 | South Second & South Berkley |
| D9 | South Seventh & South Peoria |
| D10 | Shoreline & South Metcalf |
| D11 | South 16th & South Metcalf |
| D12 | South Fourth & South Rogers |
| D13 | North 14th & North Metcalf |
| D14 | West Amity & West Crestview |
| D15 | North Fifth & North Broadway |
| D16 | West 287th & South Metcalf |

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# Stormwater Masterplan
# Project Rating Table

City of Louisburg, KS  Project Area: N. 3rd & N. Broadway

City of Louisburg - Stormwater Masterplan

Description of Problem: Reported home and street flooding at 302 N. 3rd St. The stormwater system and detention basin in the neighborhood directly north of this location flow to this area into a shallow channel too small for flow. Home directly to the east of this location experiences flooding as well, but not reported.

Special Comments: Everything from the neighborhood flows into this location.

## Project Benefit Rating

| Factor # | Description of Problems Addressed by Project | Eliminates Factor | Rating Points | Frequency Multiplier | Severity Multiplier | % Resolved by Project* | Total Points |
|---|---|---|---|---|---|---|---|
| 1 | Loss of Life | | 40 | | | | |
| 2 | Flooding of habitable building | 3 | 40 | | | | |
| 3 | Flooding of arterial street of more than 7 inches | 5,6,7 | 30 | | | | |
| 4 | Flooding of collector street of more than 7 inches | 4,6,7 | 25 | | | | |
| 5 | Flooding of residential street of more than 7 inches | 4,5,7 | 20 | 3 | 1.5 | 100% | 90 |
| 6 | Widespread or long-term ponding in streets | 4,5,6 | 20 | | | | |
| 7 | Erosion threatens habitable buildings, utilities, streets, bridges | 9 | 30 | | | | |
| 8 | Erosion significant in unmaintained areas | 8 | 10 | | | | |
| 9 | Erosion causes imminent drainage structure collapse | 11,12 | 30 | | | | |
| 10 | Erosion causes marginal drainage structural collapse | 10,12 | 15 | | | | |
| 11 | Erosion causes failure of drainage structure | 10,11 | 10 | | | | |
| 12 | System condition rated "Poor" | 14 | 10 | | | | |
| 13 | System condition rated "Fair" or "Obstructed" | 13 | 5 | | | | |
| | | | | | | | |
| | Project Total Benefit Points | | | | | | **90** |

** % flood or erosion reduction achieved based on # structures removed or % of necessary base flood level*

| Applies to # | Frequency Multiplier | Multiplier Value |
|---|---|---|
| 2-7 | One time in ten years or by 10- to 100-year design storm | 1 |
| 2-7 | Two times in ten years or by 5- to 10-year design storm | 2 |
| 2-7 | Three or more times in 10 years or less than under 5-year design | 3 |
| 13,14 | One multiplier point per 100' of system replaced | 1 |

| Other Factors | Y or N? |
|---|---|
| Benefits other infr. | Y |
| Outside cost support | N |
| Regional benefits | N |
| Aesthetics | N |

| Applies to # | Severity Description | Multiplier Value |
|---|---|---|
| 1 | Number of known deaths *=1 for each death | 8 |
| 2,3 | No. of buildings flooded historically or by 100-year design storm | 0.5/bldg |
| 4,5,6 | Restricts emergency vehicles | 1.5 |
| 8 | Nuisance erosion creates maintenance problems | 1 |
| 8 | Moderate erosion, failure of structure or facility within next 5 years possible | 2 |
| 8 | Severe erosion, failure of structure or facility imminent | 3 |
| 10-11 | Collapse causes flooding of land by 100-year design storm | 1 |
| 10-11 | Collapse causes flooding of garages/outbuildings by 100-year design storm | 1.5 |
| 10-11 | Collapse causes 1-3 habitable buildings to be flooded | 2 |
| 10-11 | Collapse causes 4-6 habitable buildings to be flooded | 3 |
| 10-11 | Collapse causes more than 6 habitable buildings to be flooded | 4 |

# Stormwater Masterplan
# Project Rating Table

City of Louisburg, KS  Project Area: Shoreline & Broadmoor

City of Louisburg - Stormwater Masterplan

Description of Problem: Flooding of homes on Broadmoor Cv. Runoff from school and surrounding neighboorhoods accumulates behind homes along Danford Dr. The stormwater system northeast of this area is in overall good condition, causing heavy stormwater flow to the southwest. Home flooding reported at 508 Broadmoor Cv. and 211 Shoreline Dr. Sanitary backup reported at 211 Shoreline Dr. Stormwater also flows from Wildcat Dr. and Countryside Dr. toward this area. The private lake at 606 Countryside Dr. drains at the southwest corner and flows southeast toward the backyards of 500 and 508 Broadmore Cv., both of which are experience heavy flooding during significant rain events. School property and soccer fields drain toward lake as well. Culverts along Countryside Dr. flow south and also flow into the lake.

Special Comments: Homeowner at 508 Broadmoor Cv. has reported flooding and voiced concern to city.

## Project Benefit Rating

| Factor # | Description of Problems Addressed by Project | Eliminates | Rating | Frequency | Severity | % Resolved | Total Points |
|---|---|---|---|---|---|---|---|
| 1 | Loss of Life | | 40 | | | | |
| 2 | Flooding of habitable building | 3 | 40 | 2 | 1 | 100% | 80 |
| 3 | Flooding of arterial street of more than 7 inches | 5,6,7 | 30 | | | | |
| 4 | Flooding of collector street of more than 7 inches | 4,6,7 | 25 | | | | |
| 5 | Flooding of residential street of more than 7 inches | 4,5,7 | 20 | | | | |
| 6 | Widespread or long-term ponding in streets | 4,5,6 | 20 | | | | |
| 7 | Erosion threatens habitable buildings, utilities, streets, bridges | 9 | 30 | | | | |
| 8 | Erosion significant in unmaintained areas | 8 | 10 | | | | |
| 9 | Erosion causes imminent drainage structure collapse | 11,12 | 30 | | | | |
| 10 | Erosion causes marginal drainage structural collapse | 10,12 | 15 | | | | |
| 11 | Erosion causes failure of drainage structure | 10,11 | 10 | | | | |
| 12 | System condition rated "Poor" | 14 | 10 | | | | |
| 13 | System condition rated "Fair" or "Obstructed" | 13 | 5 | 30.26 | | 100% | 151.3 |
| | | | | | | | |
| | Project Total Benefit Points | | | | | | **231.3** |

** % flood or erosion reduction achieved based on # structures removed or % of necessary base flood level*

| Applies to # | Frequency Multiplier | Multiplier Value |
|---|---|---|
| 2-7 | One time in ten years or by 10- to 100-year design storm | 1 |
| 2-7 | Two times in ten years or by 5- to 10-year design storm | 2 |
| 2-7 | Three or more times in 10 years or less than under 5-year design | 3 |
| 13,14 | One multiplier point per 100' of system replaced | 1 |

| Other Factors | Y or N? |
|---|---|
| Benefits other infr. | Y |
| Outside cost support | Y |
| Regional benefits | Y |
| Aesthetics | Y |

| Applies to # | Severity Description | Multiplier Value |
|---|---|---|
| 1 | Number of known deaths *=1 for each death | 8 |
| 2,3 | No. of buildings flooded historically or by 100-year design storm | 0.5/bldg |
| 4,5,6 | Restricts emergency vehicles | 1.5 |
| 8 | Nuisance erosion creates maintenance problems | 1 |
| 8 | Moderate erosion, failure of structure or facility within next 5 years possible | 2 |
| 8 | Severe erosion, failure of structure or facility imminent | 3 |
| 10-11 | Collapse causes flooding of land by 100-year design storm | 1 |
| 10-11 | Collapse causes flooding of garages/outbuildings by 100-year design storm | 1.5 |
| 10-11 | Collapse causes 1-3 habitable buildings to be flooded | 2 |
| 10-11 | Collapse causes 4-6 habitable buildings to be flooded | 3 |
| 10-11 | Collapse causes more than 6 habitable buildings to be flooded | 4 |

**Stormwater Masterplan**
**Project Rating Table**

City of Louisburg, KS  Project Area: N. 9th & N. Metcalf

City of Louisburg - Stormwater Masterplan

Description of Problem: Very heavy corrosion of pipes on Louisburg Dr. between Ave. A and Ave. B. Majority of pipes in this area are obstructed. Homeowner at 1 N. 9th St. reports street flooding. 902 N. Broadway St. reports driveway flooding

Special Comments: There is a very large number of obstructed pipes and silted in swales.

## Project Benefit Rating

| Factor # | Description of Problems Addressed by Project | Eliminates Factor | Rating Points | Frequency Multiplier | Severity Multiplier | % Resolved by Project* | Total Points |
|---|---|---|---|---|---|---|---|
| 1 | Loss of Life | | 40 | | | | |
| 2 | Flooding of habitable building | 3 | 40 | 3 | 0.5 | 100% | 60 |
| 3 | Flooding of arterial street of more than 7 inches | 5,6,7 | 30 | 1 | 1.5 | 100% | 45 |
| 4 | Flooding of collector street of more than 7 inches | 4,6,7 | 25 | | | | |
| 5 | Flooding of residential street of more than 7 inches | 4,5,7 | 20 | | | | |
| 6 | Widespread or long-term ponding in streets | 4,5,6 | 20 | | | | |
| 7 | Erosion threatens habitable buildings, utilities, streets, bridges | 9 | 30 | | | | |
| 8 | Erosion significant in unmaintained areas | 8 | 10 | | | | |
| 9 | Erosion causes imminent drainage structure collapse | 11,12 | 30 | | | | |
| 10 | Erosion causes marginal drainage structural collapse | 10,12 | 15 | | | | |
| 11 | Erosion causes failure of drainage structure | 10,11 | 10 | | | | |
| 12 | System condition rated "Poor" | 14 | 10 | 3.2 | | 100% | 32 |
| 13 | System condition rated "Fair" or "Obstructed" | 13 | 5 | 19.91 | | 100% | 99.55 |
| | | | | | | | |
| | Project Total Benefit Points | | | | | | **236.55** |

** % flood or erosion reduction achieved based on # structures removed or % of necessary base flood level reduction*

| Applies to # | Frequency Multiplier | Multiplier Value |
|---|---|---|
| 2-7 | One time in ten years or by 10- to 100-year design storm | 1 |
| 2-7 | Two times in ten years or by 5- to 10-year design storm | 2 |
| 2-7 | Three or more times in 10 years or less than under 5-year design | 3 |
| 13,14 | One multiplier point per 100' of system replaced | 1 |

| Other Factors | Y or N? |
|---|---|
| Benefits other infr. | N |
| Outside cost support | N |
| Regional benefits | N |
| Aesthetics | N |

| Applies to # | Severity Description | Multiplier Value |
|---|---|---|
| 1 | Number of known deaths *=1 for each death | 8 |
| 2,3 | No. of buildings flooded historically or by 100-year design storm | 0.5/bldg |
| 4,5,6 | Restricts emergency vehicles | 1.5 |
| 8 | Nuisance erosion creates maintenance problems | 1 |
| 8 | Moderate erosion, failure of structure or facility within next 5 years possible | 2 |
| 8 | Severe erosion, failure of structure or facility imminent | 3 |
| 10-12 | Collapse causes flooding of land by 100-year design storm | 1 |
| 10-12 | Collapse causes flooding of garages/outbuildings by 100-year design storm | 1.5 |
| 10-12 | Collapse causes 1-3 habitable buildings to be flooded | 2 |
| 10-12 | Collapse causes 4-6 habitable buildings to be flooded | 3 |
| 10-12 | Collapse causes more than 6 habitable buildings to be flooded | 4 |

# Stormwater Masterplan
# Project Rating Table

City of Louisburg, KS  Project Area: S. 1st & S. Vine

City of Louisburg - Stormwater Masterplan

Description of Problem: 3 reported home flooding, 2 reported street flooding. Water accumulating and pooling in the side yard of 101 S. 1st St. Homeowner complains of runoff flowing through front and back yards as well. Once water crosses S. 1st St, it flows over S. Vine St. and winds up in the curb inlet on Amity.

Special Comments: Heavy water accumulation in the side yard of 101 S. 1st St.

## Project Benefit Rating

| Factor # | Description of Problems Addressed by Project | Eliminates Factor | Rating Points | Frequency Multiplier | Severity Multiplier | % Resolved by Project* | Total Points |
|---|---|---|---|---|---|---|---|
| 1 | Loss of Life | | 40 | | | | |
| 2 | Flooding of habitable building | 3 | 40 | 3 | 1 | 100% | 120 |
| 3 | Flooding of arterial street of more than 7 inches | 5,6,7 | 30 | | | | |
| 4 | Flooding of collector street of more than 7 inches | 4,6,7 | 25 | | | | |
| 5 | Flooding of residential street of more than 7 inches | 4,5,7 | 20 | 3 | 3 | 100% | 180 |
| 6 | Widespread or long-term ponding in streets | 4,5,6 | 20 | | | | |
| 7 | Erosion threatens habitable buildings, utilities, streets, bridges | 9 | 30 | | | | |
| 8 | Erosion significant in unmaintained areas | 8 | 10 | | | | |
| 9 | Erosion causes imminent drainage structure collapse | 11,12 | 30 | | | | |
| 10 | Erosion causes marginal drainage structural collapse | 10,12 | 15 | | | | |
| 11 | Erosion causes failure of drainage structure | 10,11 | 10 | | | | |
| 12 | System condition rated "Poor" | 14 | 10 | | | | |
| 13 | System condition rated "Fair" or "Obstructed" | 13 | 5 | 17.36 | | 100% | 86.8 |
| | | | | | | | |
| | Project Total Benefit Points | | | | | | **386.8** |

** % flood or erosion reduction achieved based on # structures removed or % of necessary base flood level*

| Applies to # | Frequency Multiplier | Multiplier Value |
|---|---|---|
| 2-7 | One time in ten years or by 10- to 100-year design storm | 1 |
| 2-7 | Two times in ten years or by 5- to 10-year design storm | 2 |
| 2-7 | Three or more times in 10 years or less than under 5-year design | 3 |
| 13,14 | One multiplier point per 100' of system replaced | 1 |

| Other Factors | Y or N? |
|---|---|
| Benefits other infr. | N |
| Outside cost support | N |
| Regional benefits | N |
| Aesthetics | N |

| Applies to # | Severity Description | Multiplier Value |
|---|---|---|
| 1 | Number of known deaths *=1 for each death | 8 |
| 2,3 | No. of buildings flooded historically or by 100-year design storm | 0.5/bldg |
| 4,5,6 | Restricts emergency vehicles | 1.5 |
| 8 | Nuisance erosion creates maintenance problems | 1 |
| 8 | Moderate erosion, failure of structure or facility within next 5 years possible | 2 |
| 8 | Severe erosion, failure of structure or facility imminent | 3 |
| 10-12 | Collapse causes flooding of land by 100-year design storm | 1 |
| 10-12 | Collapse causes flooding of garages/outbuildings by 100-year design storm | 1.5 |
| 10-12 | Collapse causes 1-3 habitable buildings to be flooded | 2 |
| 10-12 | Collapse causes 4-6 habitable buildings to be flooded | 3 |
| 10-12 | Collapse causes more than 6 habitable buildings to be flooded | 4 |

# Stormwater Masterplan
## Project Rating Table

City of Louisburg, KS  Project Area: S. 5th & S. Broadway

City of Louisburg - Stormwater Masterplan

Description of Problem: Reported home flooding at 407 S. Doyle St, 408 S. Elm St, 308 S. 6th St, and 506 S. Mulberry St. Reported street flooding at 601 S. Doyle St, 408 S. Elm St, 507 S 6th St, 507 S. 5th St, and 506 S. Mulberry St. Many obstructed pipes and silted-in swales, too much runoff for ditch at S. 5th and S. Broadway

Special Comments: This project area is directly upstream from the S. 9th & S. Rogers project area, and needs to be completed after S. 9th & S. Rogers.

### Project Benefit Rating

| Factor # | Description of Problems Addressed by Project | Eliminates Factor | Rating Points | Frequency Multiplier | Severity Multiplier | % Resolved by Project* | Total Points |
|---|---|---|---|---|---|---|---|
| 1 | Loss of Life | | 40 | | | | |
| 2 | Flooding of habitable building | 3 | 40 | 3 | 1.5 | 100% | 180 |
| 3 | Flooding of arterial street of more than 7 inches | 5,6,7 | 30 | | | | |
| 4 | Flooding of collector street of more than 7 inches | 4,6,7 | 25 | | | | |
| 5 | Flooding of residential street of more than 7 inches | 4,5,7 | 20 | 3 | 4.5 | 100% | 270 |
| 6 | Widespread or long-term ponding in streets | 4,5,6 | 20 | | | | |
| 7 | Erosion threatens habitable buildings, utilities, streets, bridges | 9 | 30 | | | | |
| 8 | Erosion significant in unmaintained areas | 8 | 10 | | | | |
| 9 | Erosion causes imminent drainage structure collapse | 11,12 | 30 | | | | |
| 10 | Erosion causes marginal drainage structural collapse | 10,12 | 15 | | | | |
| 11 | Erosion causes failure of drainage structure | 10,11 | 10 | | | | |
| 12 | System condition rated "Poor" | 14 | 10 | 1.36 | | 100% | 13.6 |
| 13 | System condition rated "Fair" or "Obstructed" | 13 | 5 | 28.77 | | 100% | 143.85 |
| | | | | | | | |
| | Project Total Benefit Points | | | | | | **607.45** |

** % flood or erosion reduction achieved based on # structures removed or % of necessary base flood level*

| Applies to # | Frequency Multiplier | Multiplier Value |
|---|---|---|
| 2-7 | One time in ten years or by 10- to 100-year design storm | 1 |
| 2-7 | Two times in ten years or by 5- to 10-year design storm | 2 |
| 2-7 | Three or more times in 10 years or less than under 5-year design | 3 |
| 13,14 | One multiplier point per 100' of system replaced | 1 |

| Other Factors | Y or N? |
|---|---|
| Benefits other infr. | Y |
| Outside cost support | N |
| Regional benefits | N |
| Aesthetics | N |

| Applies to # | Severity Description | Multiplier Value |
|---|---|---|
| 1 | Number of known deaths *=1 for each death | 8 |
| 2,3 | No. of buildings flooded historically or by 100-year design storm | 0.5/bldg |
| 4,5,6 | Restricts emergency vehicles | 1.5 |
| 8 | Nuisance erosion creates maintenance problems | 1 |
| 8 | Moderate erosion, failure of structure or facility within next 5 years possible | 2 |
| 8 | Severe erosion, failure of structure or facility imminent | 3 |
| 10-11 | Collapse causes flooding of land by 100-year design storm | 1 |
| 10-11 | Collapse causes flooding of garages/outbuildings by 100-year design storm | 1.5 |
| 10-11 | Collapse causes 1-3 habitable buildings to be flooded | 2 |
| 10-11 | Collapse causes 4-6 habitable buildings to be flooded | 3 |
| 10-11 | Collapse causes more than 6 habitable buildings to be flooded | 4 |

# Stormwater Masterplan
## Project Rating Table

City of Louisburg, KS  Project Area: S. 9th & S. Rogers

City of Louisburg - Stormwater Masterplan

Description of Problem: Reported home flooding and sanitary backup at 805 S. 8th St. Reported street flooding at 601 S. Doyle St., and 909 S 10th St. Several obstructed pipes. Very heavy flow for channel / stormwater system.

Special Comments: This project area is directly downstream from the S. 5th & S. Broadway project area, and must be completed before it.

### Project Benefit Rating

| Factor # | Description of Problems Addressed by Project | Eliminates Factor | Rating Points | Frequency Multiplier | Severity Multiplier | % Resolved by Project* | Total Points |
|---|---|---|---|---|---|---|---|
| 1 | Loss of Life | | 40 | | | | |
| 2 | Flooding of habitable building | 3 | 40 | 3 | 0.5 | 100% | 60 |
| 3 | Flooding of arterial street of more than 7 inches | 5,6,7 | 30 | | | | |
| 4 | Flooding of collector street of more than 7 inches | 4,6,7 | 25 | | | | |
| 5 | Flooding of residential street of more than 7 inches | 4,5,7 | 20 | 3 | 3 | 100% | 180 |
| 6 | Widespread or long-term ponding in streets | 4,5,6 | 20 | | | | |
| 7 | Erosion threatens habitable buildings, utilities, streets, bridges | 9 | 30 | | | | |
| 8 | Erosion significant in unmaintained areas | 8 | 10 | | | | |
| 9 | Erosion causes imminent drainage structure collapse | 11,12 | 30 | | | | |
| 10 | Erosion causes marginal drainage structural collapse | 10,12 | 15 | | | | |
| 11 | Erosion causes failure of drainage structure | 10,11 | 10 | | | | |
| 12 | System condition rated "Poor" | 14 | 10 | 2.57 | | 100% | 25.7 |
| 13 | System condition rated "Fair" or "Obstructed" | 13 | 5 | 15.05 | | 100% | 75.25 |
| | | | | | | | |
| | Project Total Benefit Points | | | | | | **340.95** |

** % flood or erosion reduction achieved based on # structures removed or % of necessary base flood level*

| Applies to # | Frequency Multiplier | Multiplier Value |
|---|---|---|
| 2-7 | One time in ten years or by 10- to 100-year design storm | 1 |
| 2-7 | Two times in ten years or by 5- to 10-year design storm | 2 |
| 2-7 | Three or more times in 10 years or less than under 5-year design | 3 |
| 13,14 | One multiplier point per 100' of system replaced | 1 |

| Other Factors | Y or N? |
|---|---|
| Benefits other infr. | Y |
| Outside cost support | N |
| Regional benefits | N |
| Aesthetics | N |

| Applies to # | Severity Description | Multiplier Value |
|---|---|---|
| 1 | Number of known deaths *=1 for each death | 8 |
| 2,3 | No. of buildings flooded historically or by 100-year design storm | 0.5/bldg |
| 4,5,6 | Restricts emergency vehicles | 1.5 |
| 8 | Nuisance erosion creates maintenance problems | 1 |
| 8 | Moderate erosion, failure of structure or facility within next 5 years possible | 2 |
| 8 | Severe erosion, failure of structure or facility imminent | 3 |
| 10-11 | Collapse causes flooding of land by 100-year design storm | 1 |
| 10-11 | Collapse causes flooding of garages/outbuildings by 100-year design storm | 1.5 |
| 10-11 | Collapse causes 1-3 habitable buildings to be flooded | 2 |
| 10-11 | Collapse causes 4-6 habitable buildings to be flooded | 3 |
| 10-11 | Collapse causes more than 6 habitable buildings to be flooded | 4 |

# Stormwater Masterplan
# Project Rating Table

City of Louisburg, KS  Project Area: S. 9th & S. Doyle

City of Louisburg - Stormwater Masterplan

Description of Problem: Building flooding reported at 408 S. 9th St., 1000 S. Broadway St., 1200 S. Broadway St., 801 S. Mulberry St., and 802 S. Broadway St. Sanitary backup reported at 408 S. 9th St. and 1000 S. Broadway St. Street flooding reported at 100 S. Broadway and 1200 S. Broadway. Almost no stormwater system in the entire area. Everything drains to two curb inlets at the corner of S. 11th St. and S. Doyle St. Too much flow for 18" and 24" CMPs attached to the curb inlets. Both pipes corroded.

Special Comments: Minimal stormwater system in this area.

## Project Benefit Rating

| Factor # | Description of Problems Addressed by Project | Eliminates Factor | Rating Points | Frequency Multiplier | Severity Multiplier | % Resolved by Project* | Total Points |
|---|---|---|---|---|---|---|---|
| 1 | Loss of Life | | 40 | | | | |
| 2 | Flooding of habitable building | 3 | 40 | 3 | 1 | 100% | 120 |
| 3 | Flooding of arterial street of more than 7 inches | 5,6,7 | 30 | | | | |
| 4 | Flooding of collector street of more than 7 inches | 4,6,7 | 25 | | | | |
| 5 | Flooding of residential street of more than 7 inches | 4,5,7 | 20 | 3 | 3 | 100% | 180 |
| 6 | Widespread or long-term ponding in streets | 4,5,6 | 20 | | | | |
| 7 | Erosion threatens habitable buildings, utilities, streets, bridges | 9 | 30 | | | | |
| 8 | Erosion significant in unmaintained areas | 8 | 10 | | | | |
| 9 | Erosion causes imminent drainage structure collapse | 11,12 | 30 | | | | |
| 10 | Erosion causes marginal drainage structural collapse | 10,12 | 15 | | | | |
| 11 | Erosion causes failure of drainage structure | 10,11 | 10 | | | | |
| 12 | System condition rated "Poor" | 14 | 10 | | | 100% | |
| 13 | System condition rated "Fair" or "Obstructed" | 13 | 5 | 7.16 | | 100% | 35.8 |
| | | | | | | | |
| | Project Total Benefit Points | | | | | | **335.8** |

** % flood or erosion reduction achieved based on # structures removed or % of necessary base flood level*

| Applies to # | Frequency Multiplier | Multiplier Value |
|---|---|---|
| 2-7 | One time in ten years or by 10- to 100-year design storm | 1 |
| 2-7 | Two times in ten years or by 5- to 10-year design storm | 2 |
| 2-7 | Three or more times in 10 years or less than under 5-year design | 3 |
| 13,14 | One multiplier point per 100' of system replaced | 1 |

| Other Factors | Y or N? |
|---|---|
| Benefits other infr. | N |
| Outside cost support | N |
| Regional benefits | N |
| Aesthetics | N |

| Applies to # | Severity Description | Multiplier Value |
|---|---|---|
| 1 | Number of known deaths *=1 for each death | 8 |
| 2,3 | No. of buildings flooded historically or by 100-year design storm | 0.5/bldg |
| 4,5,6 | Restricts emergency vehicles | 1.5 |
| 8 | Nuisance erosion creates maintenance problems | 1 |
| 8 | Moderate erosion, failure of structure or facility within next 5 years possible | 2 |
| 8 | Severe erosion, failure of structure or facility imminent | 3 |
| 10-11 | Collapse causes flooding of land by 100-year design storm | 1 |
| 10-11 | Collapse causes flooding of garages/outbuildings by 100-year design storm | 1.5 |
| 10-11 | Collapse causes 1-3 habitable buildings to be flooded | 2 |
| 10-11 | Collapse causes 4-6 habitable buildings to be flooded | 3 |
| 10-11 | Collapse causes more than 6 habitable buildings to be flooded | 4 |

# Stormwater Masterplan
## Project Rating Table

City of Louisburg, KS  Project Area: S. 2nd & S. Berkley

City of Louisburg - Stormwater Masterplan

Description of Problem: Many pipes in this area are obstructed/corroded. Reported house flooding at 202 Broadmoor St., 204 S. 2nd St. E. and 207 S. 2nd St. E. Street flooding and sanitary backup also reported at 204 E. 2nd St. Project area encompasses everything flowing toward detention basin. The only pipe flowing out of the detention basin is a 12" cast iron pipe.

Special Comments: Many pipes are obstructed and undersized. Everything flows to the detention basin northwest of the S. 2nd St. E. and S. Berkley intersection

### Project Benefit Rating

| Factor # | Description of Problems Addressed by Project | Eliminates Factor | Rating Points | Frequency Multiplier | Severity Multiplier | % Resolved by Project* | Total Points |
|---|---|---|---|---|---|---|---|
| 1 | Loss of Life | | 40 | | | | |
| 2 | Flooding of habitable building | 3 | 40 | 3 | 1 | 100% | 120 |
| 3 | Flooding of arterial street of more than 7 inches | 5,6,7 | 30 | | | | |
| 4 | Flooding of collector street of more than 7 inches | 4,6,7 | 25 | | | | |
| 5 | Flooding of residential street of more than 7 inches | 4,5,7 | 20 | 3 | 1.5 | 100% | 90 |
| 6 | Widespread or long-term ponding in streets | 4,5,6 | 20 | | | | |
| 7 | Erosion threatens habitable buildings, utilities, streets, bridges | 9 | 30 | | | | |
| 8 | Erosion significant in unmaintained areas | 8 | 10 | | | | |
| 9 | Erosion causes imminent drainage structure collapse | 11,12 | 30 | | | | |
| 10 | Erosion causes marginal drainage structural collapse | 10,12 | 15 | | | | |
| 11 | Erosion causes failure of drainage structure | 10,11 | 10 | | | | |
| 12 | System condition rated "Poor" | 14 | 10 | 0.37 | | 100% | 3.7 |
| 13 | System condition rated "Fair" or "Obstructed" | 13 | 5 | 16.66 | | 100% | 83.3 |
| | | | | | | | |
| | Project Total Benefit Points | | | | | | **297** |

** % flood or erosion reduction achieved based on # structures removed or % of necessary base flood level reduction*

| Applies to # | Frequency Multiplier | Multiplier Value |
|---|---|---|
| 2-7 | One time in ten years or by 10- to 100-year design storm | 1 |
| 2-7 | Two times in ten years or by 5- to 10-year design storm | 2 |
| 2-7 | Three or more times in 10 years or less than under 5-year design | 3 |
| 13,14 | One multiplier point per 100' of system replaced | 1 |

| Other Factors | Y or N? |
|---|---|
| Benefits other infr. | N |
| Outside cost support | N |
| Regional benefits | N |
| Aesthetics | N |

| Applies to # | Severity Description | Multiplier Value |
|---|---|---|
| 1 | Number of known deaths *=1 for each death | 8 |
| 2,3 | No. of buildings flooded historically or by 100-year design storm | 0.5/bldg |
| 4,5,6 | Restricts emergency vehicles | 1.5 |
| 8 | Nuisance erosion creates maintenance problems | 1 |
| 8 | Moderate erosion, failure of structure or facility within next 5 years possible | 2 |
| 8 | Severe erosion, failure of structure or facility imminent | 3 |
| 10-12 | Collapse causes flooding of land by 100-year design storm | 1 |
| 10-12 | Collapse causes flooding of garages/outbuildings by 100-year design storm | 1.5 |
| 10-12 | Collapse causes 1-3 habitable buildings to be flooded | 2 |
| 10-12 | Collapse causes 4-6 habitable buildings to be flooded | 3 |
| 10-12 | Collapse causes more than 6 habitable buildings to be flooded | 4 |

# Stormwater Masterplan
# Project Rating Table

City of Louisburg, KS  Basin & Watershed: S. 7th & S. Peoria

City of Louisburg - Stormwater Masterplan

Description of Problem: Reported home flooding and street flooding at 307 S. 7th St. Pipes in this area are obstructed/corroded.

Special Comments: Many obstructed pipes in this area.

## Project Benefit Rating

| Factor # | Description of Problems Addressed by Project | Eliminates Factor | Rating Points | Frequency Multiplier | Severity Multiplier | % Resolved by Project* | Total Points |
|---|---|---|---|---|---|---|---|
| 1 | Loss of Life | | 40 | | | | |
| 2 | Flooding of habitable building | 3 | 40 | 3 | 0.5 | 100% | 60 |
| 3 | Flooding of arterial street of more than 7 inches | 5,6,7 | 30 | | | | |
| 4 | Flooding of collector street of more than 7 inches | 4,6,7 | 25 | | | | |
| 5 | Flooding of residential street of more than 7 inches | 4,5,7 | 20 | 3 | 1.5 | 100% | 90 |
| 6 | Widespread or long-term ponding in streets | 4,5,6 | 20 | | | | |
| 7 | Erosion threatens habitable buildings, utilities, streets, bridges | 9 | 30 | | | | |
| 8 | Erosion significant in unmaintained areas | 8 | 10 | | | | |
| 9 | Erosion causes imminent drainage structure collapse | 11,12 | 30 | | | | |
| 10 | Erosion causes marginal drainage structural collapse | 10,12 | 15 | | | | |
| 11 | Erosion causes failure of drainage structure | 10,11 | 10 | | | | |
| 12 | System condition rated "Poor" | 14 | 10 | | | | |
| 13 | System condition rated "Fair" or "Obstructed" | 13 | 5 | 1.87 | | 100% | 9.35 |
| | | | | | | | |
| | Project Total Benefit Points | | | | | | **159.35** |

** % flood or erosion reduction achieved based on # structures removed or % of necessary base flood level*

| Applies to # | Frequency Multiplier | Multiplier Value |
|---|---|---|
| 2-7 | One time in ten years or by 10- to 100-year design storm | 1 |
| 2-7 | Two times in ten years or by 5- to 10-year design storm | 2 |
| 2-7 | Three or more times in 10 years or less than under 5-year design | 3 |
| 13,14 | One multiplier point per 100' of system replaced | 1 |

| Other Factors | Y or N? |
|---|---|
| Benefits other infr. | N |
| Outside cost support | N |
| Regional benefits | N |
| Aesthetics | N |

| Applies to # | Severity Description | Multiplier Value |
|---|---|---|
| 1 | Number of known deaths *=1 for each death | 8 |
| 2,3 | No. of buildings flooded historically or by 100-year design storm | 0.5/bldg |
| 4,5,6 | Restricts emergency vehicles | 1.5 |
| 8 | Nuisance erosion creates maintenance problems | 1 |
| 8 | Moderate erosion, failure of structure or facility within next 5 years possible | 2 |
| 8 | Severe erosion, failure of structure or facility imminent | 3 |
| 10-11 | Collapse causes flooding of land by 100-year design storm | 1 |
| 10-11 | Collapse causes flooding of garages/outbuildings by 100-year design storm | 1.5 |
| 10-11 | Collapse causes 1-3 habitable buildings to be flooded | 2 |
| 10-11 | Collapse causes 4-6 habitable buildings to be flooded | 3 |
| 10-11 | Collapse causes more than 6 habitable buildings to be flooded | 4 |

# Stormwater Masterplan
# Project Rating Table

City of Louisburg, KS  Project Area: Shoreline & S. Metcalf

City of Louisburg - Stormwater Masterplan

Description of Problem: Building flooding reported at 102, 104, and 114 Shoreline Dr. Water flows south along Metcalf, and the swale on the east side of Metcalf is inefficient, causing stormwater to flow into the residential yards east of Metcalf.

Special Comments: Runoff from the east side of Metcalf runs into the backyards of the homes on Shoreline

## Project Benefit Rating

| Factor # | Description of Problems Addressed by Project | Eliminates Factor | Rating Points | Frequency Multiplier | Severity Multiplier | % Resolved by Project* | Total Points |
|---|---|---|---|---|---|---|---|
| 1 | Loss of Life | | 40 | | | | |
| 2 | Flooding of habitable building | 3 | 40 | 3 | 1 | 100% | 120 |
| 3 | Flooding of arterial street of more than 7 inches | 5,6,7 | 30 | | | | |
| 4 | Flooding of collector street of more than 7 inches | 4,6,7 | 25 | | | | |
| 5 | Flooding of residential street of more than 7 inches | 4,5,7 | 20 | | | | |
| 6 | Widespread or long-term ponding in streets | 4,5,6 | 20 | | | | |
| 7 | Erosion threatens habitable buildings, utilities, streets, bridges | 9 | 30 | | | | |
| 8 | Erosion significant in unmaintained areas | 8 | 10 | | | | |
| 9 | Erosion causes imminent drainage structure collapse | 11,12 | 30 | | | | |
| 10 | Erosion causes marginal drainage structural collapse | 10,12 | 15 | | | | |
| 11 | Erosion causes failure of drainage structure | 10,11 | 10 | | | | |
| 12 | System condition rated "Poor" | 14 | 10 | | | | |
| 13 | System condition rated "Fair" or "Obstructed" | 13 | 5 | 1.32 | | 100% | 6.6 |
| | | | | | | | |
| | Project Total Benefit Points | | | | | | **126.6** |

** % flood or erosion reduction achieved based on # structures removed or % of necessary base flood level*

| Applies to # | Frequency Multiplier | Multiplier Value |
|---|---|---|
| 2-7 | One time in ten years or by 10- to 100-year design storm | 1 |
| 2-7 | Two times in ten years or by 5- to 10-year design storm | 2 |
| 2-7 | Three or more times in 10 years or less than under 5-year design | 3 |
| 13,14 | One multiplier point per 100' of system replaced | 1 |

| Other Factors | Y or N? |
|---|---|
| Benefits other infr. | N |
| Outside cost support | N |
| Regional benefits | N |
| Aesthetics | N |

| Applies to # | Severity Description | Multiplier Value |
|---|---|---|
| 1 | Number of known deaths *=1 for each death | 8 |
| 2,3 | No. of buildings flooded historically or by 100-year design storm | 0.5/bldg |
| 4,5,6 | Restricts emergency vehicles | 1.5 |
| 8 | Nuisance erosion creates maintenance problems | 1 |
| 8 | Moderate erosion, failure of structure or facility within next 5 years possible | 2 |
| 8 | Severe erosion, failure of structure or facility imminent | 3 |
| 10-11 | Collapse causes flooding of land by 100-year design storm | 1 |
| 10-11 | Collapse causes flooding of garages/outbuildings by 100-year design storm | 1.5 |
| 10-11 | Collapse causes 1-3 habitable buildings to be flooded | 2 |
| 10-11 | Collapse causes 4-6 habitable buildings to be flooded | 3 |
| 10-11 | Collapse causes more than 6 habitable buildings to be flooded | 4 |

# Stormwater Masterplan
# Project Rating Table

City of Louisburg, KS  Project Area: S. 16th & S. Metcalf

City of Louisburg - Stormwater Masterplan

Description of Problem: No road culvert to collect flow at Prairie Crossing Ave. and S. 16th St. Water flows south off S. 16th St. through residential yards. Street flooding reported at 101 S. 16th Ter.

Special Comments: Most pipes are in decent shape. Problems come from the runoff from S. 16th into the backyards on S. 16th Ter.

## Project Benefit Rating

| Factor # | Description of Problems Addressed by Project | Eliminates Factor | Rating Points | Frequency Multiplier | Severity Multiplier | % Resolved by Project* | Total Points |
|---|---|---|---|---|---|---|---|
| 1 | Loss of Life | | 40 | | | | |
| 2 | Flooding of habitable building | 3 | 40 | | | | |
| 3 | Flooding of arterial street of more than 7 inches | 5,6,7 | 30 | | | | |
| 4 | Flooding of collector street of more than 7 inches | 4,6,7 | 25 | | | | |
| 5 | Flooding of residential street of more than 7 inches | 4,5,7 | 20 | 2 | 3 | 100% | 120 |
| 6 | Widespread or long-term ponding in streets | 4,5,6 | 20 | | | | |
| 7 | Erosion threatens habitable buildings, utilities, streets, bridges | 9 | 30 | | | | |
| 8 | Erosion significant in unmaintained areas | 8 | 10 | | | | |
| 9 | Erosion causes imminent drainage structure collapse | 11,12 | 30 | | | | |
| 10 | Erosion causes marginal drainage structural collapse | 10,12 | 15 | | | | |
| 11 | Erosion causes failure of drainage structure | 10,11 | 10 | | | | |
| 12 | System condition rated "Poor" | 14 | 10 | | | | |
| 13 | System condition rated "Fair" or "Obstructed" | 13 | 5 | 0.31 | | 100% | 1.55 |
| | | | | | | | |
| | Project Total Benefit Points | | | | | | **121.55** |

** % flood or erosion reduction achieved based on # structures removed or % of necessary base flood level*

| Applies to # | Frequency Multiplier | Multiplier Value |
|---|---|---|
| 2-7 | One time in ten years or by 10- to 100-year design storm | 1 |
| 2-7 | Two times in ten years or by 5- to 10-year design storm | 2 |
| 2-7 | Three or more times in 10 years or less than under 5-year design | 3 |
| 13,14 | One multiplier point per 100' of system replaced | 1 |

| Other Factors | Y or N? |
|---|---|
| Benefits other infr. | N |
| Outside cost support | N |
| Regional benefits | N |
| Aesthetics | N |

| Applies to # | Severity Description | Multiplier Value |
|---|---|---|
| 1 | Number of known deaths *=1 for each death | 8 |
| 2,3 | No. of buildings flooded historically or by 100-year design storm | 0.5/bldg |
| 4,5,6 | Restricts emergency vehicles | 1.5 |
| 8 | Nuisance erosion creates maintenance problems | 1 |
| 8 | Moderate erosion, failure of structure or facility within next 5 years possible | 2 |
| 8 | Severe erosion, failure of structure or facility imminent | 3 |
| 10-11 | Collapse causes flooding of land by 100-year design storm | 1 |
| 10-11 | Collapse causes flooding of garages/outbuildings by 100-year design storm | 1.5 |
| 10-11 | Collapse causes 1-3 habitable buildings to be flooded | 2 |
| 10-11 | Collapse causes 4-6 habitable buildings to be flooded | 3 |
| 10-11 | Collapse causes more than 6 habitable buildings to be flooded | 4 |

# Stormwater Masterplan
# Project Rating Table

City of Louisburg, KS  Project Area: S. 4th & S. Rogers

City of Louisburg - Stormwater Masterplan

Description of Problem: Pipes in this area are corroded/obstructed. Home flooding and sanitary backup reported at 302 S. Rogers Rd. Homeowner at 402 S. Rogers Rd. complains of street flooding at the intersection of S. Rogers Rd. and S. 4th St.

Special Comments: Street flooding at the intersection of S. Rogers Rd. and S. 4th St.

## Project Benefit Rating

| Factor # | Description of Problems Addressed by Project | Eliminates Factor | Rating Points | Frequency Multiplier | Severity Multiplier | % Resolved by Project* | Total Points |
|---|---|---|---|---|---|---|---|
| 1 | Loss of Life | | 40 | | | | |
| 2 | Flooding of habitable building | 3 | 40 | | | | |
| 3 | Flooding of arterial street of more than 7 inches | 5,6,7 | 30 | | | | |
| 4 | Flooding of collector street of more than 7 inches | 4,6,7 | 25 | | | | |
| 5 | Flooding of residential street of more than 7 inches | 4,5,7 | 20 | 3 | 1.5 | 100% | 90 |
| 6 | Widespread or long-term ponding in streets | 4,5,6 | 20 | | | | |
| 7 | Erosion threatens habitable buildings, utilities, streets, bridges | 9 | 30 | | | | |
| 8 | Erosion significant in unmaintained areas | 8 | 10 | | | | |
| 9 | Erosion causes imminent drainage structure collapse | 11,12 | 30 | | | | |
| 10 | Erosion causes marginal drainage structural collapse | 10,12 | 15 | | | | |
| 11 | Erosion causes failure of drainage structure | 10,11 | 10 | | | | |
| 12 | System condition rated "Poor" | 14 | 10 | 0.26 | | 100% | 2.6 |
| 13 | System condition rated "Fair" or "Obstructed" | 13 | 5 | 5.37 | | 100% | 26.85 |
| | | | | | | | |
| | Project Total Benefit Points | | | | | | **119.45** |

** % flood or erosion reduction achieved based on # structures removed or % of necessary base flood level*

| Applies to # | Frequency Multiplier | Multiplier Value |
|---|---|---|
| 2-7 | One time in ten years or by 10- to 100-year design storm | 1 |
| 2-7 | Two times in ten years or by 5- to 10-year design storm | 2 |
| 2-7 | Three or more times in 10 years or less than under 5-year design | 3 |
| 13,14 | One multiplier point per 100' of system replaced | 1 |

| Other Factors | Y or N? |
|---|---|
| Benefits other infr. | Y |
| Outside cost support | N |
| Regional benefits | N |
| Aesthetics | N |

| Applies to # | Severity Description | Multiplier Value |
|---|---|---|
| 1 | Number of known deaths *=1 for each death | 8 |
| 2,3 | No. of buildings flooded historically or by 100-year design storm | 0.5/bldg |
| 4,5,6 | Restricts emergency vehicles | 1.5 |
| 8 | Nuisance erosion creates maintenance problems | 1 |
| 8 | Moderate erosion, failure of structure or facility within next 5 years possible | 2 |
| 8 | Severe erosion, failure of structure or facility imminent | 3 |
| 10-11 | Collapse causes flooding of land by 100-year design storm | 1 |
| 10-11 | Collapse causes flooding of garages/outbuildings by 100-year design storm | 1.5 |
| 10-11 | Collapse causes 1-3 habitable buildings to be flooded | 2 |
| 10-11 | Collapse causes 4-6 habitable buildings to be flooded | 3 |
| 10-11 | Collapse causes more than 6 habitable buildings to be flooded | 4 |

# Stormwater Masterplan
# Project Rating Table

City of Louisburg, KS  Project Area: N. 14th & N. Metcalf

City of Louisburg - Stormwater Masterplan

Description of Problem: Reported home flooding at 1407 Sycamore Dr. Pipes on Metcalf in this area are obstructed. Runoff from the field east of Metcalf flows through culvert that is partially obstructed, then to a small sidewalk culvert. Then flows west to an area with no definable channel. From there it flows through the backyard of residents in this area.

Special Comments: A large amount of runoff comes from the crop field on the east side of Metcalf.

## Project Benefit Rating

| Factor # | Description of Problems Addressed by Project | Eliminates Factor | Rating Points | Frequency Multiplier | Severity Multiplier | % Resolved by Project* | Total Points |
|---|---|---|---|---|---|---|---|
| 1 | Loss of Life | | 40 | | | | |
| 2 | Flooding of habitable building | 3 | 40 | 3 | 0.5 | 100% | 60 |
| 3 | Flooding of arterial street of more than 7 inches | 5,6,7 | 30 | | | | |
| 4 | Flooding of collector street of more than 7 inches | 4,6,7 | 25 | | | | |
| 5 | Flooding of residential street of more than 7 inches | 4,5,7 | 20 | | | | |
| 6 | Widespread or long-term ponding in streets | 4,5,6 | 20 | | | | |
| 7 | Erosion threatens habitable buildings, utilities, streets, bridges | 9 | 30 | | 1 | 100% | 30 |
| 8 | Erosion significant in unmaintained areas | 8 | 10 | | | | |
| 9 | Erosion causes imminent drainage structure collapse | 11,12 | 30 | | | | |
| 10 | Erosion causes marginal drainage structural collapse | 10,12 | 15 | | | | |
| 11 | Erosion causes failure of drainage structure | 10,11 | 10 | | | | |
| 12 | System condition rated "Poor" | 14 | 10 | | | | |
| 13 | System condition rated "Fair" or "Obstructed" | 13 | 5 | 3.4 | | 100% | 17 |
| | | | | | | | |
| | Project Total Benefit Points | | | | | | **107** |

** % flood or erosion reduction achieved based on # structures removed or % of necessary base flood level*

| Applies to # | Frequency Multiplier | Multiplier Value |
|---|---|---|
| 2-7 | One time in ten years or by 10- to 100-year design storm | 1 |
| 2-7 | Two times in ten years or by 5- to 10-year design storm | 2 |
| 2-7 | Three or more times in 10 years or less than under 5-year design | 3 |
| 13,14 | One multiplier point per 100' of system replaced | 1 |

| Other Factors | Y or N? |
|---|---|
| Benefits other infr. | Y |
| Outside cost support | N |
| Regional benefits | N |
| Aesthetics | N |

| Applies to # | Severity Description | Multiplier Value |
|---|---|---|
| 1 | Number of known deaths *=1 for each death | 8 |
| 2,3 | No. of buildings flooded historically or by 100-year design storm | 0.5/bldg |
| 4,5,6 | Restricts emergency vehicles | 1.5 |
| 8 | Nuisance erosion creates maintenance problems | 1 |
| 8 | Moderate erosion, failure of structure or facility within next 5 years possible | 2 |
| 8 | Severe erosion, failure of structure or facility imminent | 3 |
| 10-11 | Collapse causes flooding of land by 100-year design storm | 1 |
| 10-11 | Collapse causes flooding of garages/outbuildings by 100-year design storm | 1.5 |
| 10-11 | Collapse causes 1-3 habitable buildings to be flooded | 2 |
| 10-11 | Collapse causes 4-6 habitable buildings to be flooded | 3 |
| 10-11 | Collapse causes more than 6 habitable buildings to be flooded | 4 |

# Stormwater Masterplan
# Project Rating Table

City of Louisburg, KS  Project Area: W. Amity & W. Crestview

City of Louisburg - Stormwater Masterplan

Description of Problem: Known problem area for Louisburg. Possible erosion downstream of end section.

Special Comments: Known problem area for Louisburg. Possible erosion.

## Project Benefit Rating

| Factor # | Description of Problems Addressed by Project | Eliminates Factor | Rating Points | Frequency Multiplier | Severity Multiplier | % Resolved by Project* | Total Points |
|---|---|---|---|---|---|---|---|
| 1 | Loss of Life | | 40 | | | | |
| 2 | Flooding of habitable building | 3 | 40 | | | | |
| 3 | Flooding of arterial street of more than 7 inches | 5,6,7 | 30 | | | | |
| 4 | Flooding of collector street of more than 7 inches | 4,6,7 | 25 | | | | |
| 5 | Flooding of residential street of more than 7 inches | 4,5,7 | 20 | | | | |
| 6 | Widespread or long-term ponding in streets | 4,5,6 | 20 | | | | |
| 7 | Erosion threatens habitable buildings, utilities, streets, bridges | 9 | 30 | | 1 | 100% | 30 |
| 8 | Erosion significant in unmaintained areas | 8 | 10 | | | | |
| 9 | Erosion causes imminent drainage structure collapse | 11,12 | 30 | | | | |
| 10 | Erosion causes marginal drainage structural collapse | 10,12 | 15 | | | | |
| 11 | Erosion causes failure of drainage structure | 10,11 | 10 | | | | |
| 12 | System condition rated "Poor" | 14 | 10 | | | | |
| 13 | System condition rated "Fair" or "Obstructed" | 13 | 5 | 0.53 | | 100% | 2.65 |
| | | | | | | | |
| | Project Total Benefit Points | | | | | | **32.65** |

** % flood or erosion reduction achieved based on # structures removed or % of necessary base flood level*

| Applies to # | Frequency Multiplier | Multiplier Value |
|---|---|---|
| 2-7 | One time in ten years or by 10- to 100-year design storm | 1 |
| 2-7 | Two times in ten years or by 5- to 10-year design storm | 2 |
| 2-7 | Three or more times in 10 years or less than under 5-year design | 3 |
| 13,14 | One multiplier point per 100' of system replaced | 1 |

| Other Factors | Y or N? |
|---|---|
| Benefits other infr. | Y |
| Outside cost support | N |
| Regional benefits | N |
| Aesthetics | N |

| Applies to # | Severity Description | Multiplier Value |
|---|---|---|
| 1 | Number of known deaths *=1 for each death | 8 |
| 2,3 | No. of buildings flooded historically or by 100-year design storm | 0.5/bldg |
| 4,5,6 | Restricts emergency vehicles | 1.5 |
| 8 | Nuisance erosion creates maintenance problems | 1 |
| 8 | Moderate erosion, failure of structure or facility within next 5 years possible | 2 |
| 8 | Severe erosion, failure of structure or facility imminent | 3 |
| 10-11 | Collapse causes flooding of land by 100-year design storm | 1 |
| 10-11 | Collapse causes flooding of garages/outbuildings by 100-year design storm | 1.5 |
| 10-11 | Collapse causes 1-3 habitable buildings to be flooded | 2 |
| 10-11 | Collapse causes 4-6 habitable buildings to be flooded | 3 |
| 10-11 | Collapse causes more than 6 habitable buildings to be flooded | 4 |

# Stormwater Masterplan
# Project Rating Table

City of Louisburg, KS  Project Area: N. 5th & N. Broadway

City of Louisburg - Stormwater Masterplan

Description of Problem: Most driveway culverts are obstructed and/or corroded. Homeowner at 408 N. Broadway complains of ponding in his front and side yards during heavy rain events. His driveway culverts are also corroded and obstructed.

Special Comments: Most pipes in this area are obstructed.

## Project Benefit Rating

| Factor # | Description of Problems Addressed by Project | Eliminates Factor | Rating Points | Frequency Multiplier | Severity Multiplier | % Resolved by Project* | Total Points |
|---|---|---|---|---|---|---|---|
| 1 | Loss of Life | | 40 | | | | |
| 2 | Flooding of habitable building | 3 | 40 | | | | |
| 3 | Flooding of arterial street of more than 7 inches | 5,6,7 | 30 | | | | |
| 4 | Flooding of collector street of more than 7 inches | 4,6,7 | 25 | | | | |
| 5 | Flooding of residential street of more than 7 inches | 4,5,7 | 20 | | | | |
| 6 | Widespread or long-term ponding in streets | 4,5,6 | 20 | | | | |
| 7 | Erosion threatens habitable buildings, utilities, streets, bridges | 9 | 30 | | | | |
| 8 | Erosion significant in unmaintained areas | 8 | 10 | | | | |
| 9 | Erosion causes imminent drainage structure collapse | 11,12 | 30 | | | | |
| 10 | Erosion causes marginal drainage structural collapse | 10,12 | 15 | | | | |
| 11 | Erosion causes failure of drainage structure | 10,11 | 10 | | | | |
| 12 | System condition rated "Poor" | 14 | 10 | 0.24 | | 100% | 2.4 |
| 13 | System condition rated "Fair" or "Obstructed" | 13 | 5 | 4.39 | | 100% | 21.95 |
| | | | | | | | |
| | Project Total Benefit Points | | | | | | **24.35** |

** % flood or erosion reduction achieved based on # structures removed or % of necessary base flood level*

| Applies to # | Frequency Multiplier | Multiplier Value |
|---|---|---|
| 2-7 | One time in ten years or by 10- to 100-year design storm | 1 |
| 2-7 | Two times in ten years or by 5- to 10-year design storm | 2 |
| 2-7 | Three or more times in 10 years or less than under 5-year design | 3 |
| 13,14 | One multiplier point per 100' of system replaced | 1 |

| Other Factors | Y or N? |
|---|---|
| Benefits other infr. | Y |
| Outside cost support | N |
| Regional benefits | N |
| Aesthetics | N |

| Applies to # | Severity Description | Multiplier Value |
|---|---|---|
| 1 | Number of known deaths *=1 for each death | 8 |
| 2,3 | No. of buildings flooded historically or by 100-year design storm | 0.5/bldg |
| 4,5,6 | Restricts emergency vehicles | 1.5 |
| 8 | Nuisance erosion creates maintenance problems | 1 |
| 8 | Moderate erosion, failure of structure or facility within next 5 years possible | 2 |
| 8 | Severe erosion, failure of structure or facility imminent | 3 |
| 10-11 | Collapse causes flooding of land by 100-year design storm | 1 |
| 10-11 | Collapse causes flooding of garages/outbuildings by 100-year design storm | 1.5 |
| 10-11 | Collapse causes 1-3 habitable buildings to be flooded | 2 |
| 10-11 | Collapse causes 4-6 habitable buildings to be flooded | 3 |
| 10-11 | Collapse causes more than 6 habitable buildings to be flooded | 4 |

# Stormwater Masterplan
# Project Rating Table

City of Louisburg, KS  Project Area: W. 287th & S. Metcalf

City of Louisburg - Stormwater Masterplan

Description of Problem: Secondary location on W. 287th St. (county road) Heavy erosion on both sides of gravel road, directly butting up to W. 287 St. Erosion starting to eat beneath road on the north side. No guardrails. Very unsafe.

Special Comments: County road. Louisburg does not maintain.

## Project Benefit Rating

| Factor # | Description of Problems Addressed by Project | Eliminates Factor | Rating Points | Frequency Multiplier | Severity Multiplier | % Resolved by Project* | Total Points |
|---|---|---|---|---|---|---|---|
| 1 | Loss of Life | | 40 | | | | |
| 2 | Flooding of habitable building | 3 | 40 | | | | |
| 3 | Flooding of arterial street of more than 7 inches | 5,6,7 | 30 | | | | |
| 4 | Flooding of collector street of more than 7 inches | 4,6,7 | 25 | | | | |
| 5 | Flooding of residential street of more than 7 inches | 4,5,7 | 20 | | | | |
| 6 | Widespread or long-term ponding in streets | 4,5,6 | 20 | | | | |
| 7 | Erosion threatens habitable buildings, utilities, streets, bridges | 9 | 30 | | 2 | 100% | 60 |
| 8 | Erosion significant in unmaintained areas | 8 | 10 | | | | |
| 9 | Erosion causes imminent drainage structure collapse | 11,12 | 30 | | | | |
| 10 | Erosion causes marginal drainage structural collapse | 10,12 | 15 | | | | |
| 11 | Erosion causes failure of drainage structure | 10,11 | 10 | | | | |
| 12 | System condition rated "Poor" | 14 | 10 | | | | |
| 13 | System condition rated "Fair" or "Obstructed" | 13 | 5 | 0.25 | | 100% | 1.25 |
| | | | | | | | |
| | Project Total Benefit Points | | | | | | **61.25** |

** % flood or erosion reduction achieved based on # structures removed or % of necessary base flood level*

| Applies to # | Frequency Multiplier | Multiplier Value |
|---|---|---|
| 2-7 | One time in ten years or by 10- to 100-year design storm | 1 |
| 2-7 | Two times in ten years or by 5- to 10-year design storm | 2 |
| 2-7 | Three or more times in 10 years or less than under 5-year design | 3 |
| 13,14 | One multiplier point per 100' of system replaced | 1 |

| Other Factors | Y or N? |
|---|---|
| Benefits other infr. | N |
| Outside cost support | N |
| Regional benefits | N |
| Aesthetics | N |

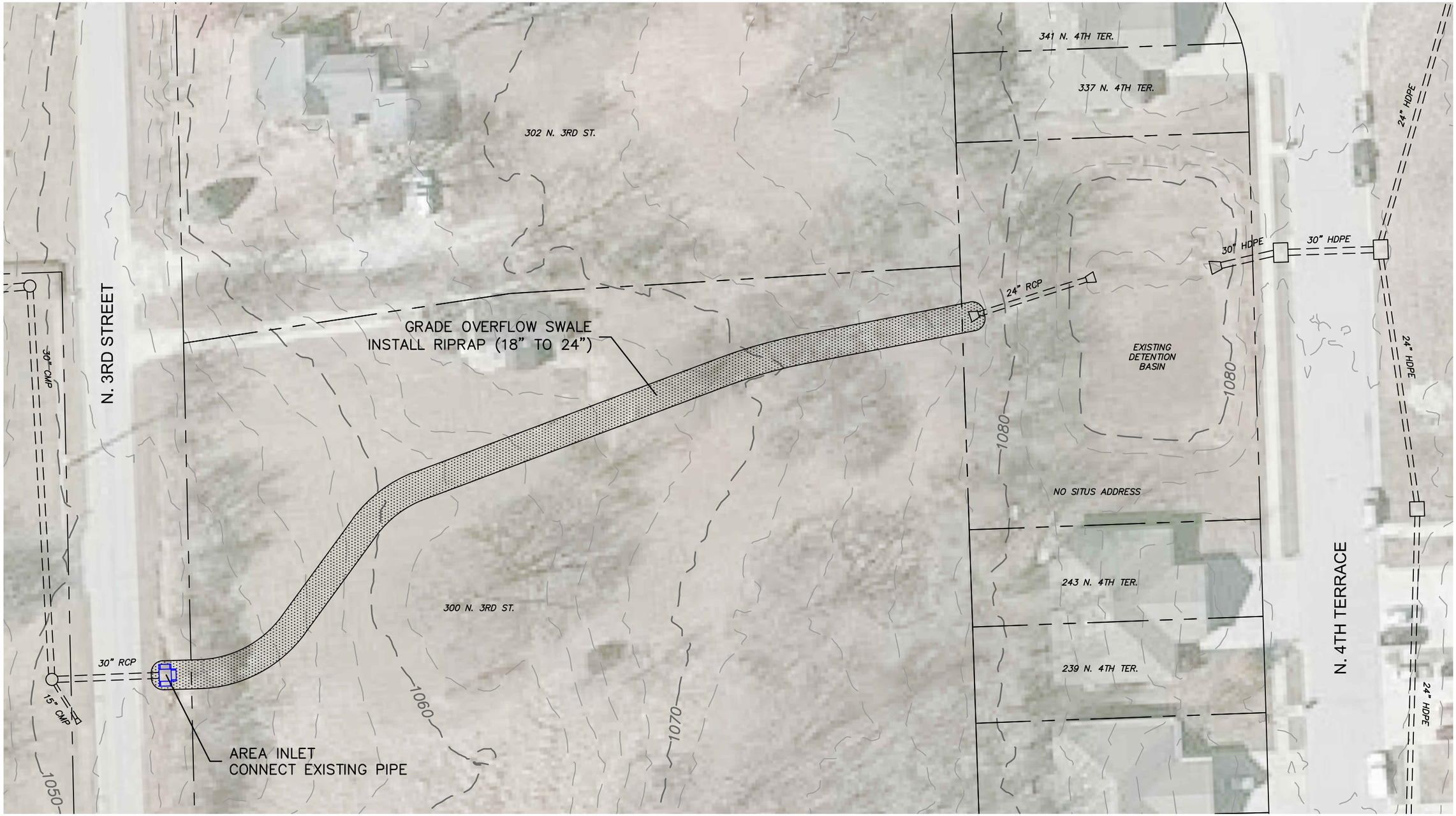
| Applies to # | Severity Description | Multiplier Value |
|---|---|---|
| 1 | Number of known deaths *=1 for each death | 8 |
| 2,3 | No. of buildings flooded historically or by 100-year design storm | 0.5/bldg |
| 4,5,6 | Restricts emergency vehicles | 1.5 |
| 8 | Nuisance erosion creates maintenance problems | 1 |
| 8 | Moderate erosion, failure of structure or facility within next 5 years possible | 2 |
| 8 | Severe erosion, failure of structure or facility imminent | 3 |
| 10-11 | Collapse causes flooding of land by 100-year design storm | 1 |
| 10-11 | Collapse causes flooding of garages/outbuildings by 100-year design storm | 1.5 |
| 10-11 | Collapse causes 1-3 habitable buildings to be flooded | 2 |
| 10-11 | Collapse causes 4-6 habitable buildings to be flooded | 3 |
| 10-11 | Collapse causes more than 6 habitable buildings to be flooded | 4 |

# APPENDIX E

## Prioritized Projects – Conceptual Solutions

| | |
|---|---|
| E1 | North Third & North Broadway |
| E2 | Shoreline & Broadmoor |
| E3 – E6 | North Ninth & North Metcalf |
| E7 | South First & South Vine |
| E8 – E9 | South Fifth & South Broadway |
| E10 – E11 | South Ninth & South Rogers |

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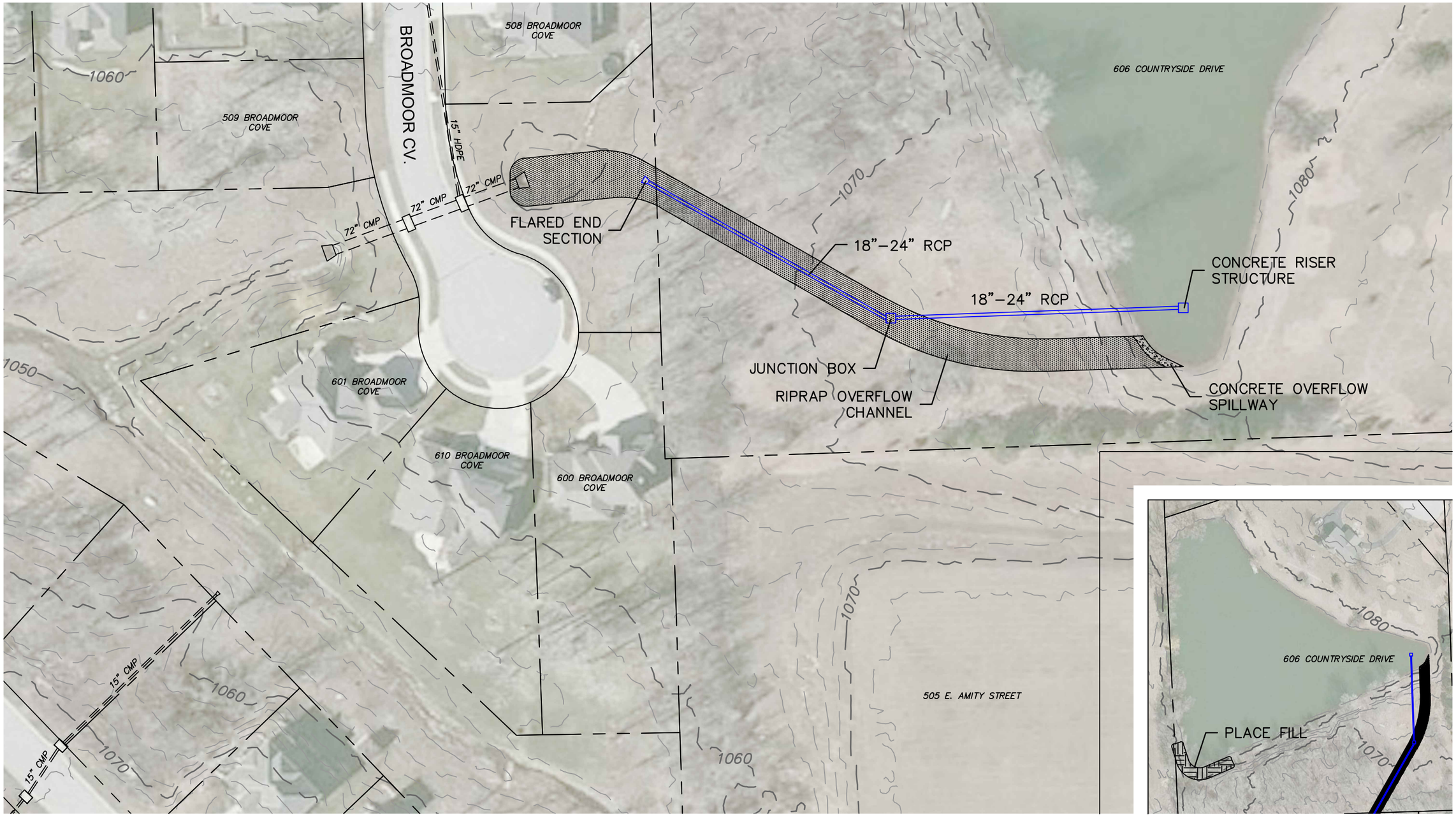

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|---|---|---|
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| DRAWN BY: JDA | | 1 of 1 |
| DATE: 01/14/2019 | | |

olsson
7301 West 133rd Street
Suite 200
Overland Park, KS 66213-4750
TEL 913.381.1170
FAX 913.381.1174

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SHEET 1 of 1

E2



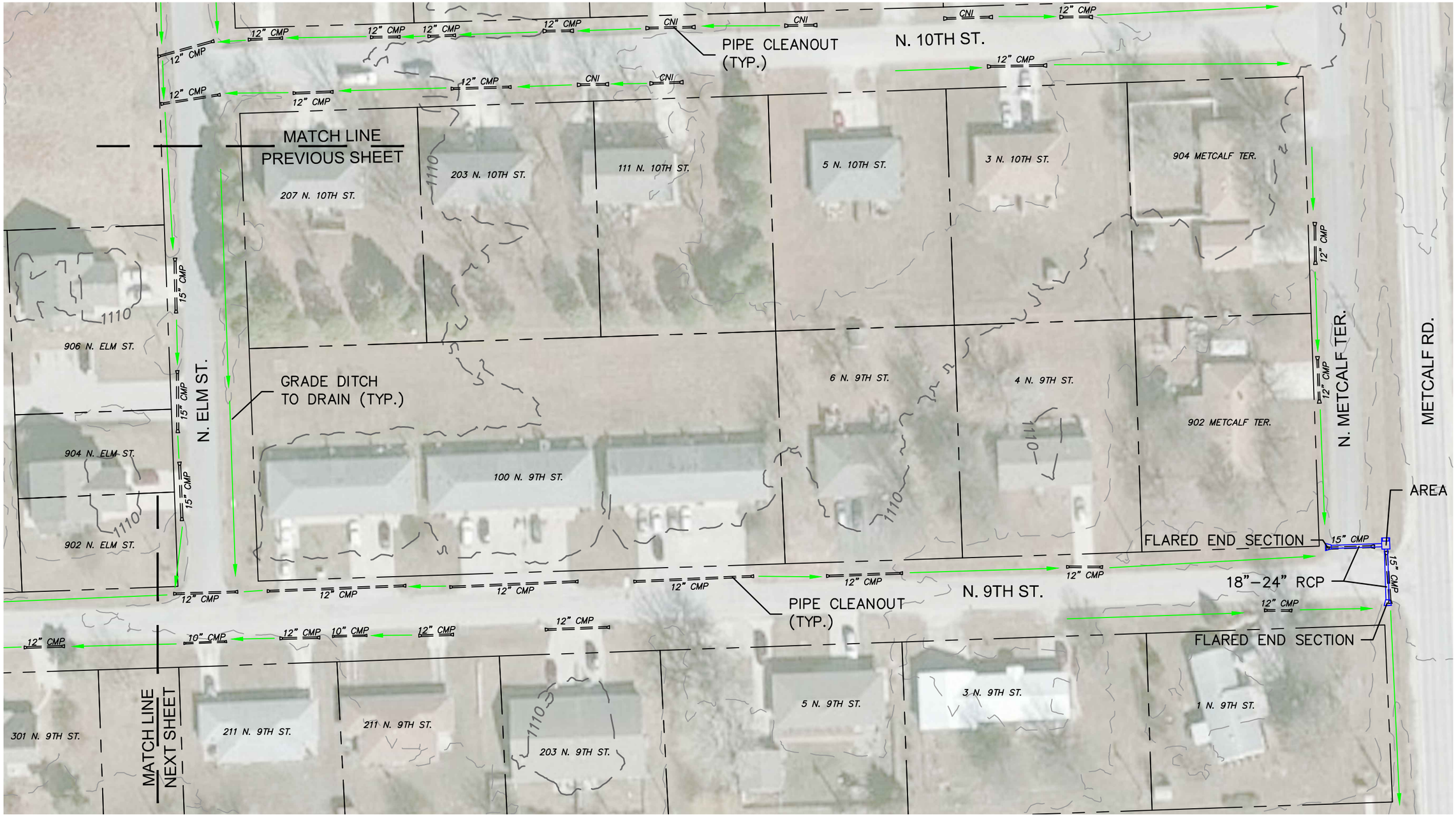

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| DRAWN BY: JDA | | |
| DATE: 01/14/2019 | | |

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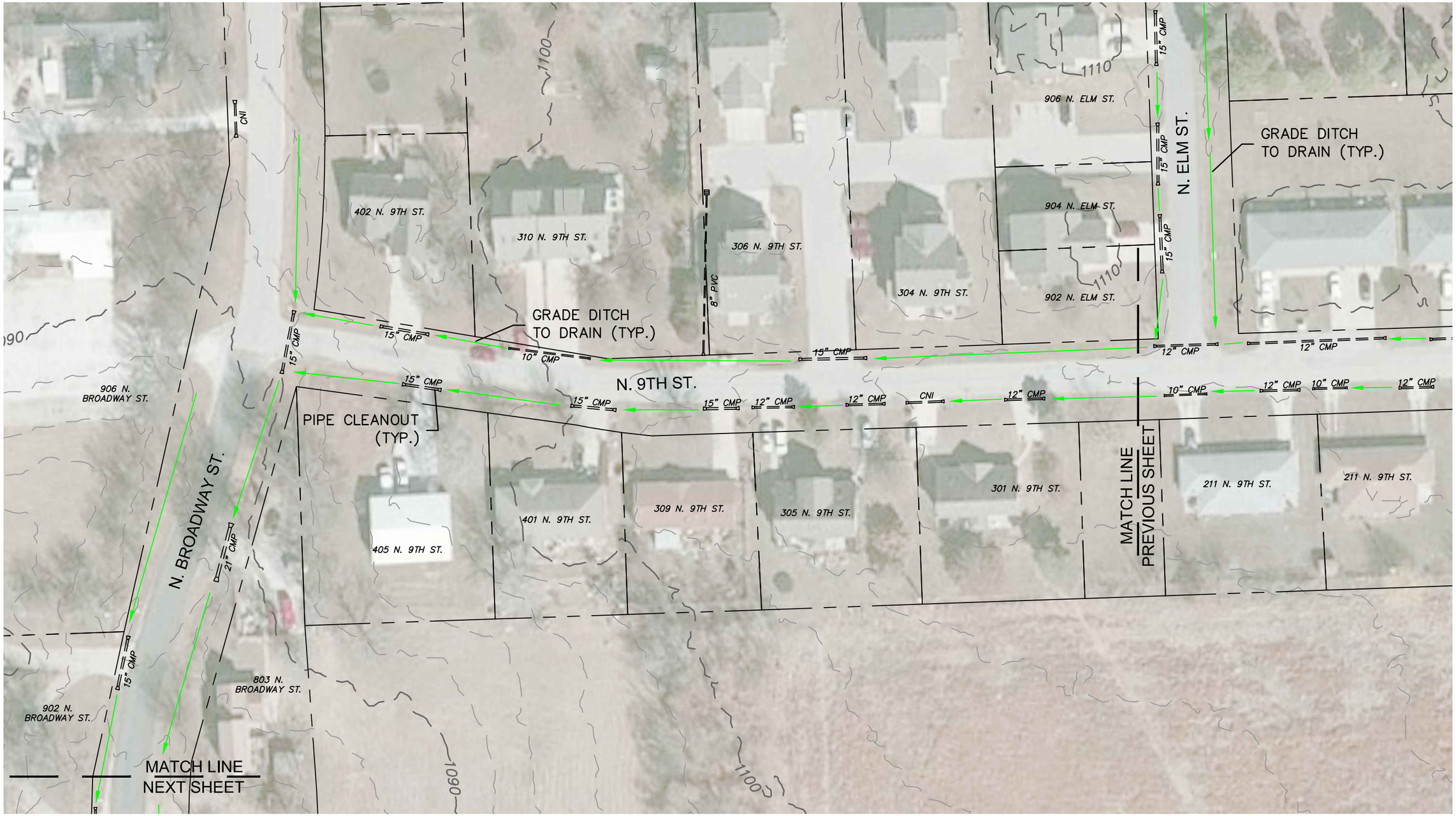



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| PROJECT NO: 018-1556<br>DRAWN BY: JDA<br>DATE: 01/14/2019 | LOUISBURG STORMWATER MASTER PLAN<br>N. 9TH & N. METCALF | olsson<br>7301 West 133rd Street<br>Suite 200<br>Overland Park, KS 66213-4750<br>TEL 913.381.1170<br>FAX 913.381.1174 |

SHEET 2 of 4

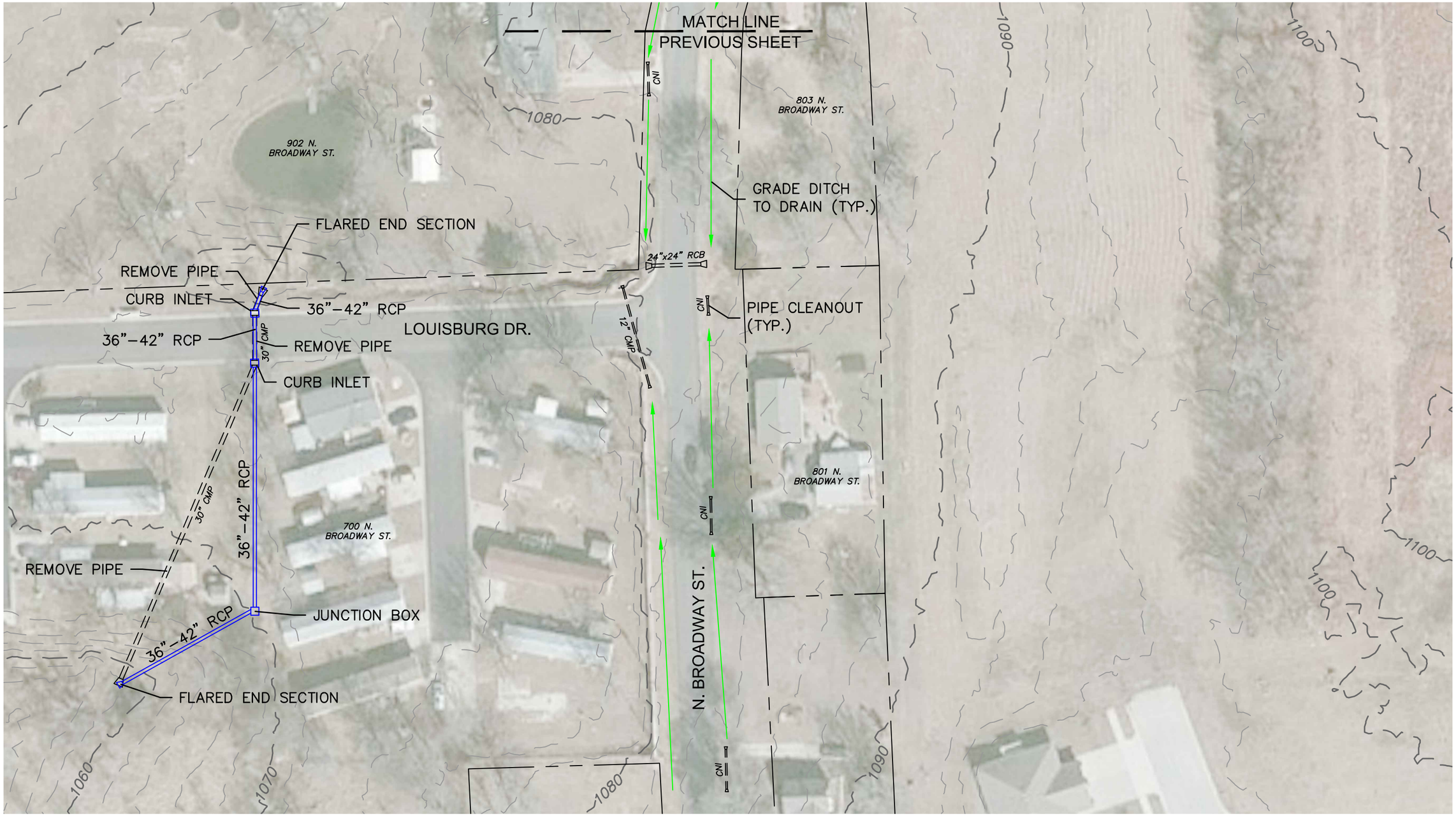
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| DRAWN BY: JDA | | 7301 West 133rd Street<br>Suite 200<br>Overland Park, KS 66213-4750<br>TEL 913.381.1170<br>FAX 913.381.1174 | 3 of 4 |
| DATE: 01/14/2019 | | | |

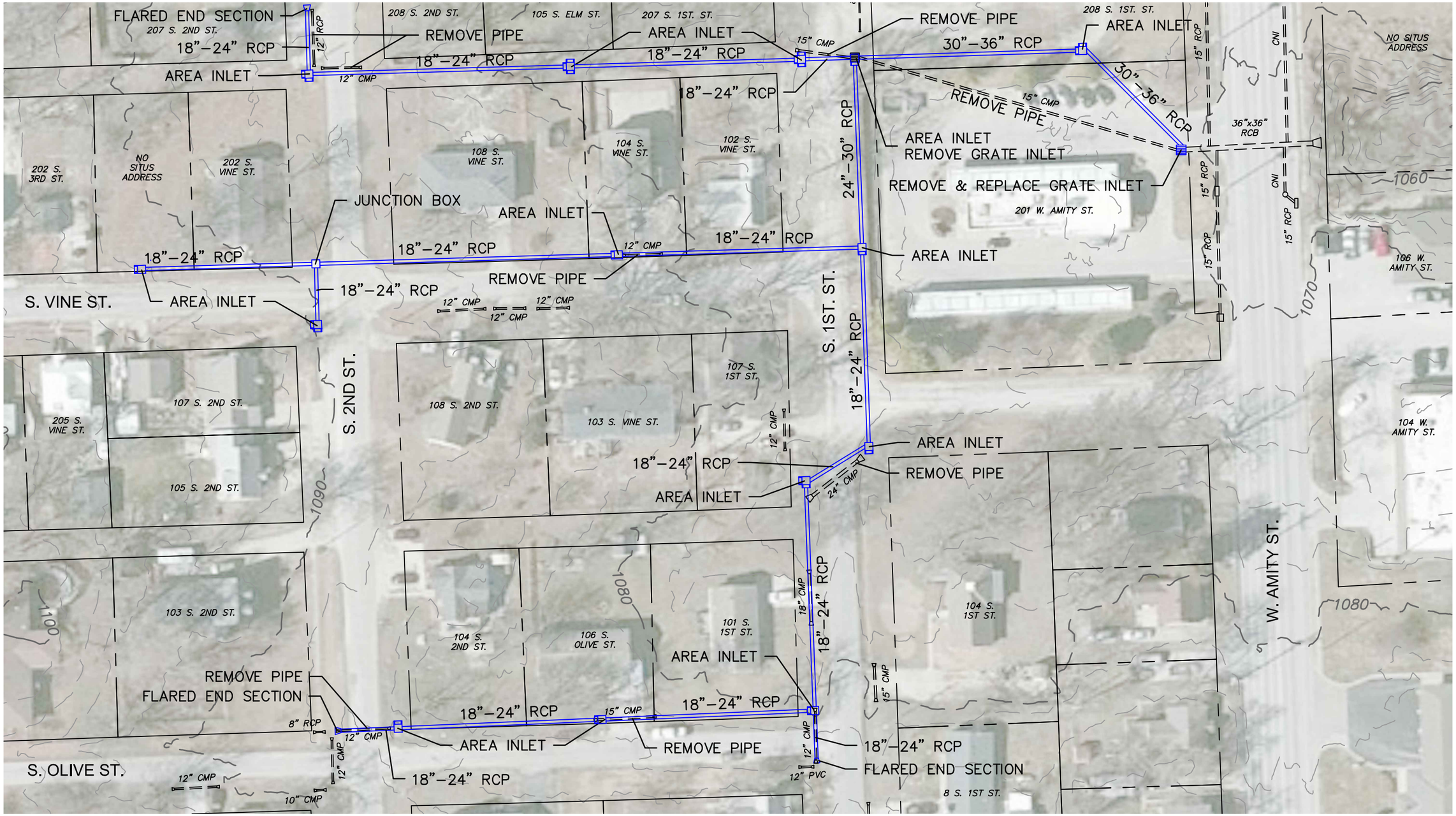



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| DRAWN BY: JDA | | |
| DATE: 01/14/2019 | | |

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| DRAWN BY: | JDA |
| DATE: | 01/14/2019 |

# LOUISBURG STORMWATER MASTER PLAN
## S. 1ST & S. VINE

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SHEET 1 of 1

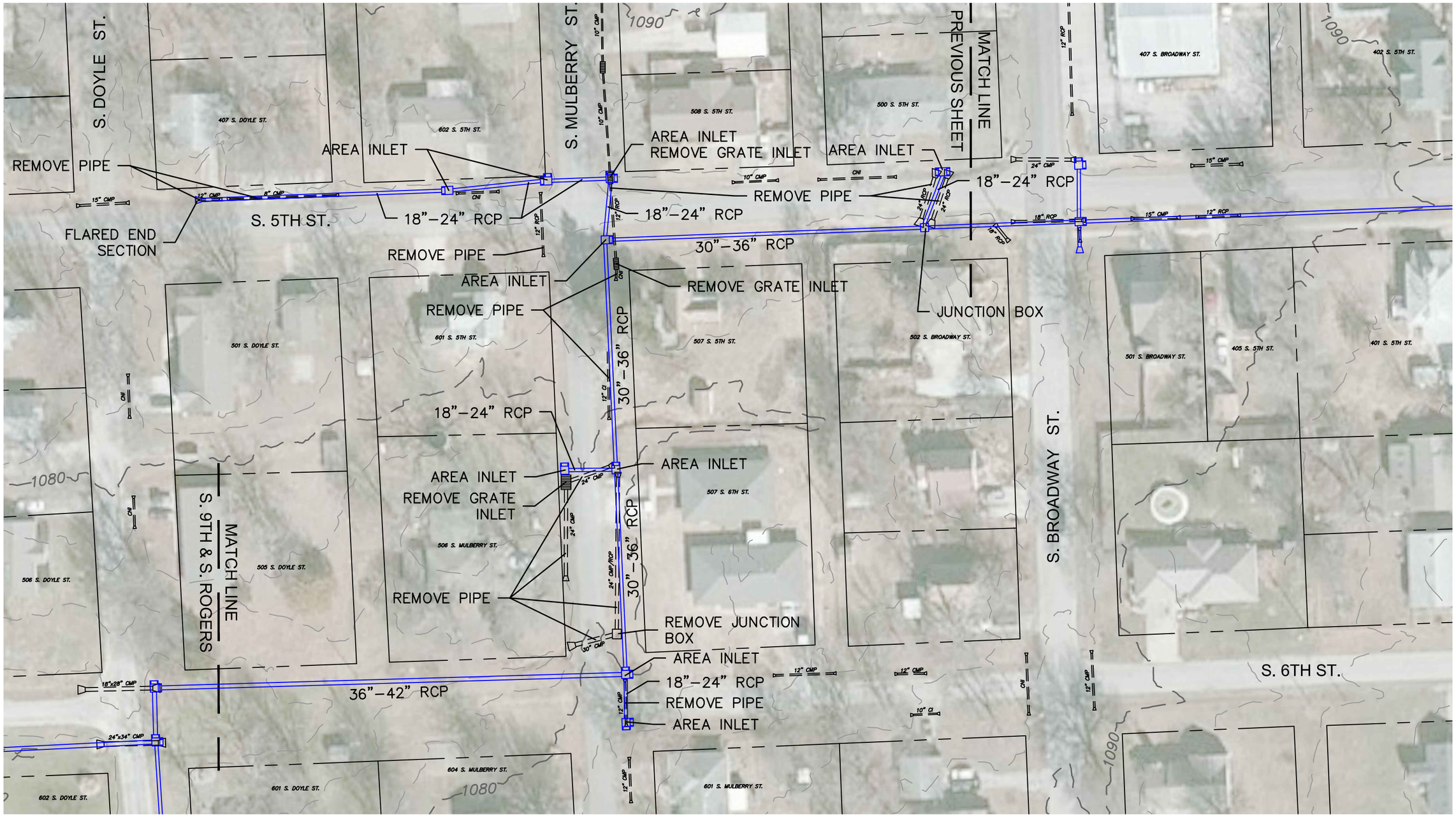



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| DRAWN BY: JDA | | |
| DATE: 01/14/2019 | | |

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FAX 913.381.1174

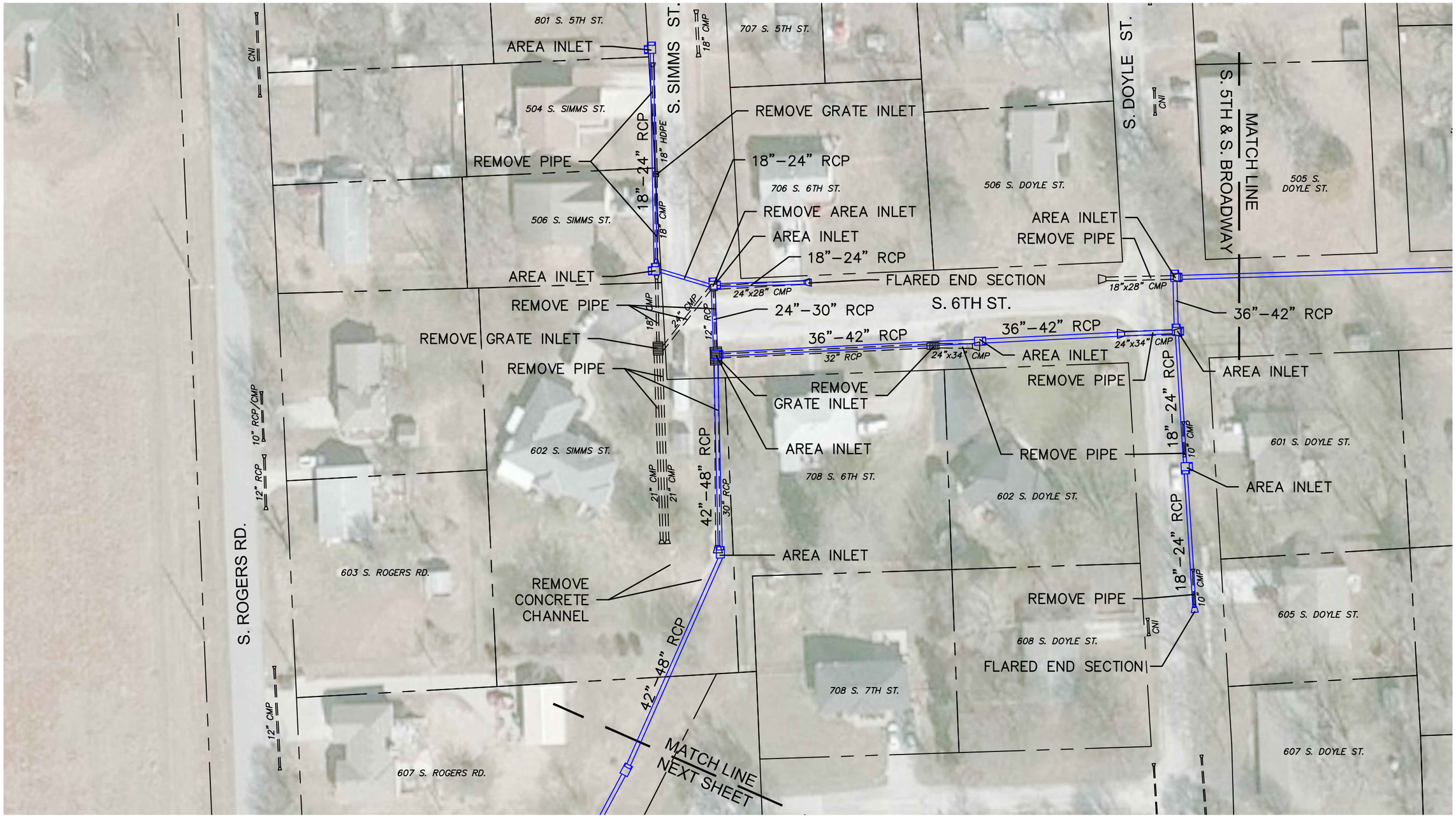



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| PROJECT NO: 018-1556<br>DRAWN BY: JDA<br>DATE: 01/14/2019 | LOUISBURG STORMWATER MASTER PLAN<br>S. 5TH & S. BROADWAY | olsson<br>7301 West 133rd Street<br>Suite 200<br>Overland Park, KS 66213-4750<br>TEL 913.381.1170<br>FAX 913.381.1174 |

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2 of 2

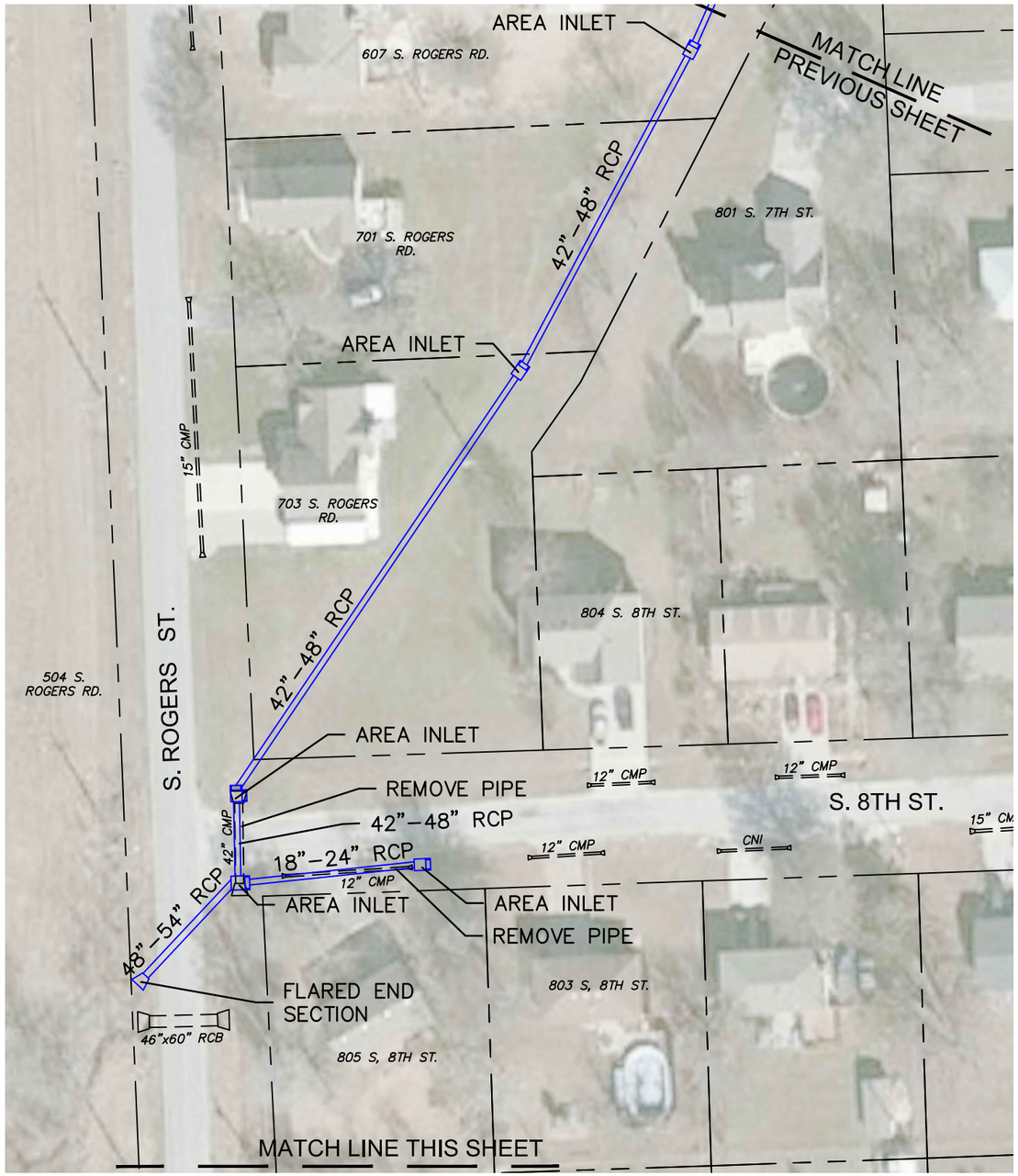



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| DRAWN BY: JDA | | |
| DATE: 01/14/2019 | | |

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| DRAWN BY: JDA | | |
| DATE: 01/14/2019 | | |

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# APPENDIX F

## Prioritized Projects – Cost Estimates


F1 Prioritized Projects Summary Table

F2 North Third & North Broadway

F3 Shoreline & Broadmoor

F4 North Ninth & North Metcalf

F5 South First & South Vine

F6 South Fifth & South Broadway

F7 South Ninth & South Rogers

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**Louisburg Stormwater Masterplan**
**City of Louisburg**
**12/17/2018**

| PROJECT LOCATION | PROJECT COSTS | SCORE | COST TO BENEFIT |
|---|---|---|---|
| N. 3RD & N. BROADWAY | $ 93,096 | 90 | 1,034 |
| SHORELINE & BROADMOOR | $ 280,930 | 231 | 1,216 |
| N. 9TH & N. METCALF | $ 354,629 | 237 | 1,496 |
| S. 1ST & S. VINE | $ 677,290 | 387 | 1,750 |
| S. 5TH & S. BROADWAY | $ 1,351,181 | 608 | 2,222 |
| S. 9TH & S. ROGERS | $ 1,112,242 | 341 | 3,262 |
| **TOTAL** | **$ 3,869,366** | | |

# OPINION OF PROBABLE COST
# N. 3RD & N. BROADWAY

**Louisburg Stormwater Masterplan**
**City of Louisburg**
**12/17/2018**

| Item Description | Units | Unit Price | Quantity | Cost |
|---|---|---|---|---|
| Mobilization | L.S. | $ 10,000 | 1 | $ 10,000 |
| Demolition & Site Preparation | L.S. | $ 5,000 | 1 | $ 5,000 |
| Swale Grading | L.S. | $ 10,000 | 1 | $ 10,000 |
| Area Inlet | EA. | $ 5,000 | 1 | $ 5,000 |
| 18"-24" Riprap | S.Y. | $ 60 | 510 | $ 30,600 |
| Sod | S.Y. | $ 9 | 450 | $ 4,050 |
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| | | | | |
| | | Subtotal | | $ 64,650 |
| | | Contingency | 20% | $ 12,930 |
| | | **Subtotal Construction Cost** | | **$ 77,580** |
| | | Survey, Permitting & Engineering | 20% | $ 15,516 |
| | | | | |
| | | **Opinion of Probable Project Cost** | | **$ 93,096** |

# OPINION OF PROBABLE COST
# SHORELINE & BROADMOOR

**Louisburg Stormwater Masterplan**
**City of Louisburg**
**12/17/2018**

| Item Description | Units | Unit Price | Quantity | Cost |
|---|---|---|---|---|
| Mobilization | L.S. | $ 15,500 | 1 | $ 15,500 |
| Demolition & Site Preparation | L.S. | $ 23,500 | 1 | $ 23,500 |
| Channel Grading | L.S. | $ 10,000 | 1 | $ 10,000 |
| Dewatering | L.S. | $ 15,000 | 1 | $ 15,000 |
| Concrete Riser Structure | EA. | $ 12,000 | 1 | $ 12,000 |
| Junction Box | EA. | $ 5,000 | 1 | $ 5,000 |
| 18"-24" Flared End Section | EA. | $ 1,200 | 1 | $ 1,200 |
| 18"-24" RCP | L.F. | $ 120 | 345 | $ 41,400 |
| 18"-24" Riprap | S.Y. | $ 60 | 1,020 | $ 61,200 |
| Sod | S.Y. | $ 9 | 500 | $ 4,500 |
| Concrete Flatwork | S.F. | $ 8 | 155 | $ 1,240 |
| Structural Concrete | C.F. | $ 650 | 7 | $ 4,550 |
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| | | | | |
| | | Subtotal | | $ 195,090 |
| | | Contingency | 20% | $ 39,018 |
| | | **Subtotal Construction Cost** | | **$ 234,108** |
| | | Survey, Permitting & Engineering | 20% | $ 46,822 |
| | | | | |
| | | **Opinion of Probable Project Cost** | | **$ 280,930** |

# OPINION OF PROBABLE COST
# N. 9TH & N. METCALF

**Louisburg Stormwater Masterplan**
**City of Louisburg**
**12/17/2018**

| Item Description | Units | Unit Price | Quantity | Cost |
|---|---|---|---|---|
| Mobilization | L.S. | $ 19,500 | 1 | $ 19,500 |
| Demolition & Site Preparation | L.S. | $ 29,500 | 1 | $ 29,500 |
| Area Inlet | EA. | $ 5,000 | 1 | $ 5,000 |
| Curb Inlet | EA. | $ 5,000 | 2 | $ 10,000 |
| 18"-24" Flared End Section | EA. | $ 1,200 | 3 | $ 3,600 |
| 36"-42" Flared End Section | EA. | $ 2,500 | 2 | $ 5,000 |
| 18"-24" RCP | L.F. | $ 120 | 65 | $ 7,800 |
| 36"-42" RCP | L.F. | $ 210 | 275 | $ 57,750 |
| Curb and Gutter | L.F. | $ 50 | 40 | $ 2,000 |
| Street Repair | S.Y. | $ 105 | 180 | $ 18,900 |
| Sod | S.Y. | $ 9 | 330 | $ 2,970 |
| Ditch Grading/Pipe Cleanout | L.F. | $ 10 | 8,425 | $ 84,250 |
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| | | | | |
| | | Subtotal | | $ 246,270 |
| | | Contingency | 20% | $ 49,254 |
| | | **Subtotal Construction Cost** | | **$ 295,524** |
| | | Survey, Permitting & Engineering | 20% | $ 59,105 |
| | | | | |
| | | **Opinion of Probable Project Cost** | | **$ 354,629** |

# OPINION OF PROBABLE COST
# S. 1ST & S. VINE

**Louisburg Stormwater Masterplan**
**City of Louisburg**
**12/17/2018**

| Item Description | Units | Unit Price | Quantity | Cost |
|---|---|---|---|---|
| Mobilization | L.S. | $ 37,500 | 1 | $ 37,500 |
| Demolition & Site Preparation | L.S. | $ 56,500 | 1 | $ 56,500 |
| Area Inlet | EA. | $ 5,000 | 14 | $ 70,000 |
| Grate Inlet | EA. | $ 5,000 | 1 | $ 5,000 |
| Junction Box | EA. | $ 5,000 | 1 | $ 5,000 |
| 18"-24" Flared End Section | EA. | $ 1,200 | 3 | $ 3,600 |
| 18"-24" RCP | L.F. | $ 120 | 1,420 | $ 170,400 |
| 24"-30" RCP | L.F. | $ 150 | 110 | $ 16,500 |
| 30"-36" RCP | L.F. | $ 180 | 215 | $ 38,700 |
| Concrete Pavement | S.Y. | $ 105 | 150 | $ 15,750 |
| Driveway Replacement | S.Y. | $ 75 | 120 | $ 9,000 |
| Street Repair | S.Y. | $ 105 | 270 | $ 28,350 |
| Sod | S.Y. | $ 9 | 1560 | $ 14,040 |
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| | | | | |
| | | Subtotal | | $ 470,340 |
| | | Contingency | 20% | $ 94,068 |
| | | **Subtotal Construction Cost** | | **$ 564,408** |
| | | Survey, Permitting & Engineering | 20% | $ 112,882 |
| | | | | |
| | | **Opinion of Probable Project Cost** | | **$ 677,290** |

# OPINION OF PROBABLE COST
# S. 5TH & S. BROADWAY

**Louisburg Stormwater Masterplan**
**City of Louisburg**
**12/17/2018**

| Item Description | Units | Unit Price | Quantity | Cost |
|---|---|---|---|---|
| Mobilization | L.S. | $ 75,000 | 1 | $ 75,000 |
| Demolition & Site Preparation | L.S. | $ 112,500 | 1 | $ 112,500 |
| Area Inlet | EA. | $ 5,000 | 16 | $ 80,000 |
| Junction Box | EA. | $ 5,000 | 1 | $ 5,000 |
| 18"-24" Flared End Section | EA. | $ 1,200 | 4 | $ 4,800 |
| 18"-24" RCP | L.F. | $ 120 | 885 | $ 106,200 |
| 24"-30" RCP | L.F. | $ 150 | 285 | $ 42,750 |
| 30"-36" RCP | L.F. | $ 180 | 450 | $ 81,000 |
| 36"-42" RCP | L.F. | $ 210 | 285 | $ 59,850 |
| Driveway Replacement | S.Y. | $ 75 | 680 | $ 51,000 |
| Street Repair | S.Y. | $ 105 | 2370 | $ 248,850 |
| Sod | S.Y. | $ 9 | 3970 | $ 35,730 |
| Sidewalk | S.F. | $ 12 | 2970 | $ 35,640 |
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| | | | | |
| | | Subtotal | | $ 938,320 |
| | | Contingency | 20% | $ 187,664 |
| | | **Subtotal Construction Cost** | | **$ 1,125,984** |
| | | Survey, Permitting & Engineering | 20% | $ 225,197 |
| | | | | |
| | | **Opinion of Probable Project Cost** | | **$ 1,351,181** |

# OPINION OF PROBABLE COST
# S. 9TH & S. ROGERS

**Louisburg Stormwater Masterplan**
**City of Louisburg**
**12/17/2018**

| Item Description | Units | Unit Price | Quantity | Cost |
|---|---|---|---|---|
| Mobilization | L.S. | $ 62,000 | 1 | $ 62,000 |
| Demolition & Site Preparation | L.S. | $ 92,500 | 1 | $ 92,500 |
| Area Inlet | EA. | $ 5,000 | 14 | $ 70,000 |
| 18"-24" Flared End Section | EA. | $ 1,200 | 6 | $ 7,200 |
| 48"-54" Flared End Section | EA. | $ 3,000 | 1 | $ 3,000 |
| 18"-24" RCP | L.F. | $ 120 | 555 | $ 66,600 |
| 24"-30" RCP | L.F. | $ 150 | 40 | $ 6,000 |
| 36"-42" RCP | L.F. | $ 210 | 300 | $ 63,000 |
| 42"-48" RCP | L.F. | $ 240 | 650 | $ 156,000 |
| 48"-54" RCP | L.F. | $ 270 | 50 | $ 13,500 |
| Driveway Replacement | S.Y. | $ 75 | 570 | $ 42,750 |
| Street Repair | S.Y. | $ 105 | 1370 | $ 143,850 |
| Sod | S.Y. | $ 9 | 4910 | $ 44,190 |
| Sidewalk | S.F. | $ 12 | 150 | $ 1,800 |
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| | | Subtotal | | $ 772,390 |
| | | Contingency | 20% | $ 154,478 |
| | | **Subtotal Construction Cost** | | **$ 926,868** |
| | | Survey, Permitting & Engineering | 20% | $ 185,374 |
| | | | | |
| | | **Opinion of Probable Project Cost** | | **$ 1,112,242** |




# LOUISBURG STORMWATER MASTERPLAN

January 2019

Olsson Project No. 018-1556