2009

Mission Hills Stormwater Pipe System Masterplan Update

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Mission Hills Stormwater Pipe System Masterplan Update

Final Report

Prepared for the City of Mission Hills, Kansas

April 9, 2009

Prepared By

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Executive Summary

Prior to this study, the City's stormwater system has not been evaluated in a comprehensive manner since the last stormwater masterplan completed in 1980. Since that time, there have been many upgrades, replacements and changes to the stormwater pipe systems of the City.

System Inventory

The stormwater structures for the entire City were inventoried and catalogued. More than 98 percent of the structures were physically inspected. The remaining structures were either unable to be opened, not found, or located on private property that was unable to be accessed. This process included identifying the structures location, condition, physical characteristics and pipe information. Some structure properties were obtained from historic records and plans. These structures included those on private property that could not be accessed, structures located within the driving lanes of 63rd Street and State Line Road, and structures that could not be physically opened.

A total of 725 structures were inventoried for the City. This number is comprised of 460 inlets, 160 junctions, and 105 outfalls. Inlets are structures that allow water into the stromwater pipe system. Junctions are manholes or concrete boxes used to change elevation or direction of the pipe. Outfalls are the outlets of the pipe system into the creeks.

The structures were ranked based on their condition during the inventorying process. Structures listed in "Good" condition are structures that are either relatively new or have been reconstructed so that they are new in terms of their useful life. Structures in the "Fair" condition are structures defined as having some structural deficiencies, but appear to have more than 10 years of useful service left. Structures in "Poor" condition are structures that are in imminent danger of failure of have critical structure deficiencies that reduce its ability function. These structures require immediate attention, repair and/or replacement.

System Capacity

Following the completion of the System Inventory, the stormwater systems were evaluated on their ability to convey runoff. The design storm event that was evaluated was the 10-year storm, or storm that has a 10 percent chance of occurrence in any year. This is generally accepted level of protection for stormwater pipe systems, unlike channels which are typically designed for the 100-year runoff. The results of this capacity analysis are presented and stormwater systems and pipe segments that have insufficient capacity to convey the runoff from the 10-year design storm.

In order to complete the System Capacity analysis, the hydrology, or amount of runoff, flowing to each of the stormwater inlets was calculated using the procedures outlined in the Kansas City Chapter of the American Public Works Association Section 5600 Storm Drainage Systems and Facilities (APWA, 2006). Based on this criteria, the hydrology was made up of four main components: precipitation, losses (infiltration), runoff and transport/routing.

Once the runoff to each inlet was calculated, the resulting runoff flows were routed through each pipe system to determine if the capacity of each pipe is adequate to convey the runoff from the 10-year storm. To complete this analysis, the Environmental Protection agency (EPA) Storm Water Management Model (SWMM) version 5.0 was used to compute the hydraulic parameters of the pipe systems.

The computer model uses the pipe system characteristics, such as pipe material, diameter and slope, entered by the user to determine the capacity of each pipe segment. The model also determines the required elevation of the water in each inlet and manhole necessary to push the runoff calculated in previous steps through the pipe. If this elevation exceeds the top or opening of the structure, the structure is identified as flooding and the pipe is identified as having insufficient capacity.

Based on the capacity analysis of all the pipe systems in the City, it was determined that 271 pipes do not have adequate capacity to convey the runoff from the 10-year storm event.

System Improvement Costs

The System Inventory identified 725 stormwater structures in the City's stormwater systems. Of these, 359, or 49.8 percent, were judged to be in good condition. It was estimated that it would cost approximately $887,000 to repair and replace the "Fair" and "Poor" conditions structures to put them in "Good" condition.

The System Inventory also identified more than 2,300 feet of corrugated metal pipe (CMP) that is likely nearing the end of its useful life. The cost to replace this pipe with reinforced concrete pipe is approximately $800,000.

Based on the System Capacity analysis, it was determined that 271 segments of stormwater pipe do not have sufficient capacity to convey the 10-year storm runoff. These segments are located in 68 pipe systems throughout the City. In order to get these pipe systems to have adequate capacity to convey the 10-year storm runoff, approximately $20,847,000 of improvements are required.

The resulting funding required to get the City's stormwater pipe systems to a "Good" condition will require approximately $22,534,000.

Conclusions & Recommendations

It is important to note that the costs presented in this report are based on replacing and upgraded stormwater pipe systems using traditional methods. It is equally important to realize that other structural and non-structural best management practices should be investigated prior to constructing improvements. Often, BMPs can be constructed for less than traditional infrastructure and offer the added benefit of improving stormwater quality.

Based on the state of the stormwater system in the City, it is recommended that a maintenance plan be developed and adopted by the City as soon as possible. The condition of the stormwater infrastructure will only worsen as time goes on. Addressing the deficiencies and maintenance issues sooner rather than later will save the City a great deal of money over the long-term.

It is also recommended that the City investigate other revenue sources to help address the needed stormwater improvements. Many cities in the metro area have adopted stormwater utilities and other stormwater fees to help replace and maintain their stormwater infrastructure.

Introduction

This report outlines the inventory and capacity analysis of the City of Mission Hills' stormwater pipe system. The previous stormwater masterplan was completed in 1980. Over the period from 1980 to now, there have been many upgrades, replacements and changes to the stormwater pipe systems of the City.

The following report outlines the methodology used to inventory the City's stormwater pipe systems and the results of the inventory. The stormwater structures are characterized by their condition and illustrated on maps of the City. In addition, the pipe segments of the stormwater system are also characterized by pipe type and illustrated on maps of the City.

Following the Inventory section, the methodology used to analyze the capacity of the stormwater systems is outlined. The results of this capacity analysis are presented and stormwater systems and pipe segments that have insufficient capacity to convey the runoff from the 10-year design storm (storm that has a 10 percent chance of occurrence in any year).

Finally, the costs of system improvements are presented based on the inventory and capacity analysis.

Structure Inventory

The stormwater structures for the entire City were inventoried and catalogued. More than 98 percent of the structures were physically inspected. The remaining structures were either unable to be opened, not found, or located on private property that was unable to be accessed.

This process included identifying the structures location, condition, physical characteristics and pipe information. This information was collected using a Trimble GeoXH Geoexplorer 2008 Series data collector. The data collector has a built in geographical positioning system (GPS) that was used to identify the location of the structures.

Some structure properties were obtained from historic records and plans. These structures included those on private property that could not be accessed, structures located within the driving lanes of 63rd Street and State Line Road, and structures that could not be physically opened.

Inlets

The properties and attributes for each stormwater inlet collected during the inventory are listed below.

- Location
- Inlet type (curb, area, grate, or combination)
- Inlet condition (good, fair, poor)
- Inlet material (concrete, brick, other)
- Inlet dimensions

- Inlet opening dimensions
- Top elevations
- Pipe material
- Pipe elevations
- Pipe dimensions

These properties and attributes were used to evaluate the condition and capacity of the inlet.

Junctions

Junction structures in the stormwater pipe system serve to connect pipe systems together or provide access to points where the pipe system changes direction or elevation and no inlet has been constructed. Junction structures typically include manholes and junction boxes. There are multiple locations in the City where pipes have been connected directly to other pipes without benefit of a junction structure. The locations of these underground junctions have been estimated based on historic maps and physical observations.

Properties and attributes of the junction structures that were collected are listed below.

- Location
- Junction type (manhole or junction box)
- Junction condition (good fair, poor)
- Junction material (concrete, brick, other)
- Junction dimensions
- Top elevation
- Pipe material
- Pipe elevations
- Pipe dimensions

Outfalls

Outfalls are the structures located at the end of the pipe systems as they discharge into the City's streams. The pipe outfalls typically terminate with headwalls made of concrete, stone or brick. Others terminate with flared-end sections on the pipe. Occasionally the pipe system terminates with a pipe simply protruding from the streambank.

Properties and attributes collected for the pipe outfalls include the following.

- Outfall type (flared-end section, headwall, protruding)
- Outfall material (concrete, brick, stone)
- Outfall condition (good, fair, poor)
- Elevation
- Pipe material
- Pipe elevation
- Pipe dimensions

Structure Inventory Results

A total of 725 structures were inventoried for the City. This number is comprised of 460 inlets, 160 junctions, and 105 outfalls. The inventoried structures are illustrated in Figure 1.

Structure Condition

The structures were ranked based on their condition during the inventorying process. This ranking is based on the observations of the engineer at the time the inspection of the structure took place. It should be noted that the structure conditions should be evaluated on a yearly basis. Structures listed in "Good" condition are structures that are either relatively new or have been reconstructed so that they are new in terms of their useful life. Structures in the "Fair" condition are structures defined as having some structural deficiencies, but appear to have more than 10 years of useful service left. Repairs to these structures could extend the useful life of the structure to something well over ten years. Structures in "Poor" condition are structures that are in imminent danger of failure of have critical structure deficiencies that reduce its ability function. These structures require immediate attention, repair and/or replacement.

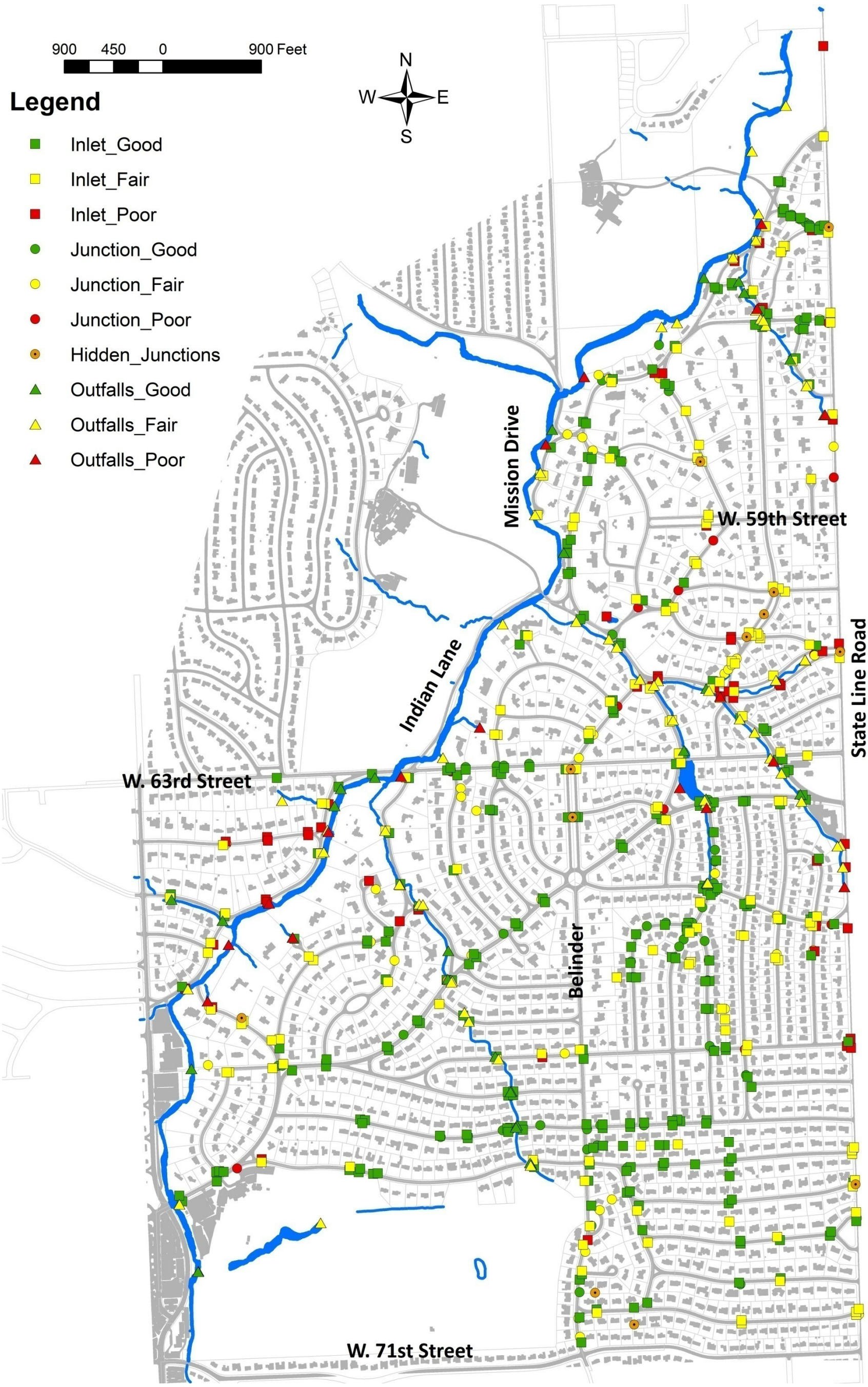

Figure 1 **Stormwater Structures in the City of Mission Hills**

Inlets

A total of 460 inlets were inventoried. Table 1 illustrates the number of inlets in the three condition categories. Inlets that were not physically inspected have been given a condition rating of fair.

Table 1 Inlet Condition

Condition	Number of Inlets
Good	258
Fair	150
Poor	52

Figure 2 illustrates the locations of the inlets according to their condition category.

As the inlets were inspected it was noted that several had sediment and debris accumulations in them that reduced their functional capacity. Figure 3 illustrates the locations of these inlets.

Junctions

A total of 160 junctions were inventoried. Table 2 illustrates the number of junction in the three condition categories. Junctions that were not physically inspected have been given a condition rating of fair. In addition, there were 14 pipe connections made without a junction structure. These direct connections were labeled “hidden” junctions.

Table 2 Junction Condition

Condition	Number of Inlets
Good	74
Fair	70
Poor	16

Figure 4 illustrates the locations of the junctions according to condition category.

Outfalls

A total of 105 outfalls were inventoried. Table 3 illustrates the number of outfalls in the three condition categories. Inlets that were not physically inspected have been given a condition rating of fair.

Table 3 Outfall Condition

Condition	Number of Inlets
Good	29
Fair	59
Poor	17

Figure 5 illustrates the locations of the outfalls according to condition category.

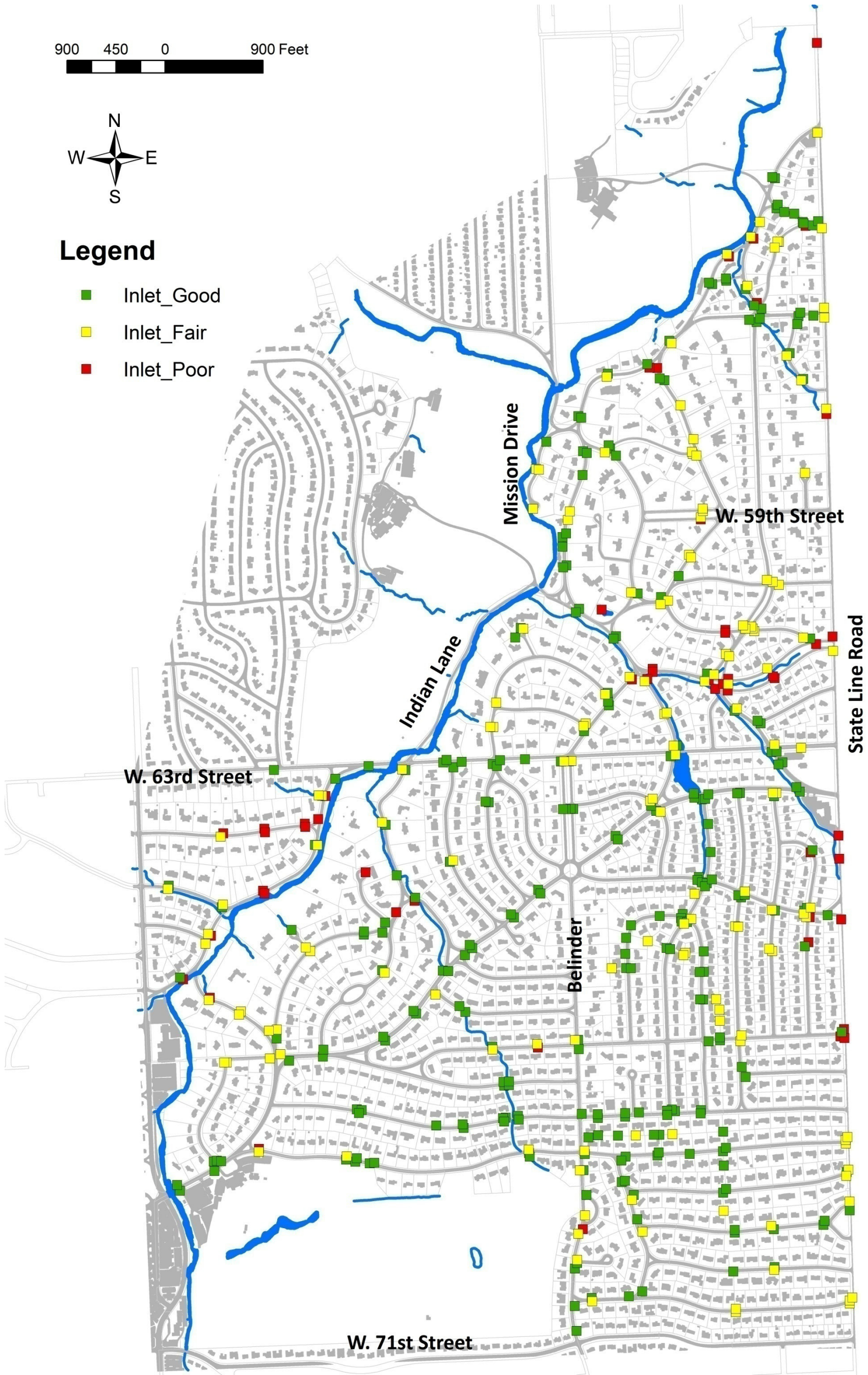

Figure 2 Inlets Illustrated by Condition

Figure 3 Inlets with Sediment and Debris

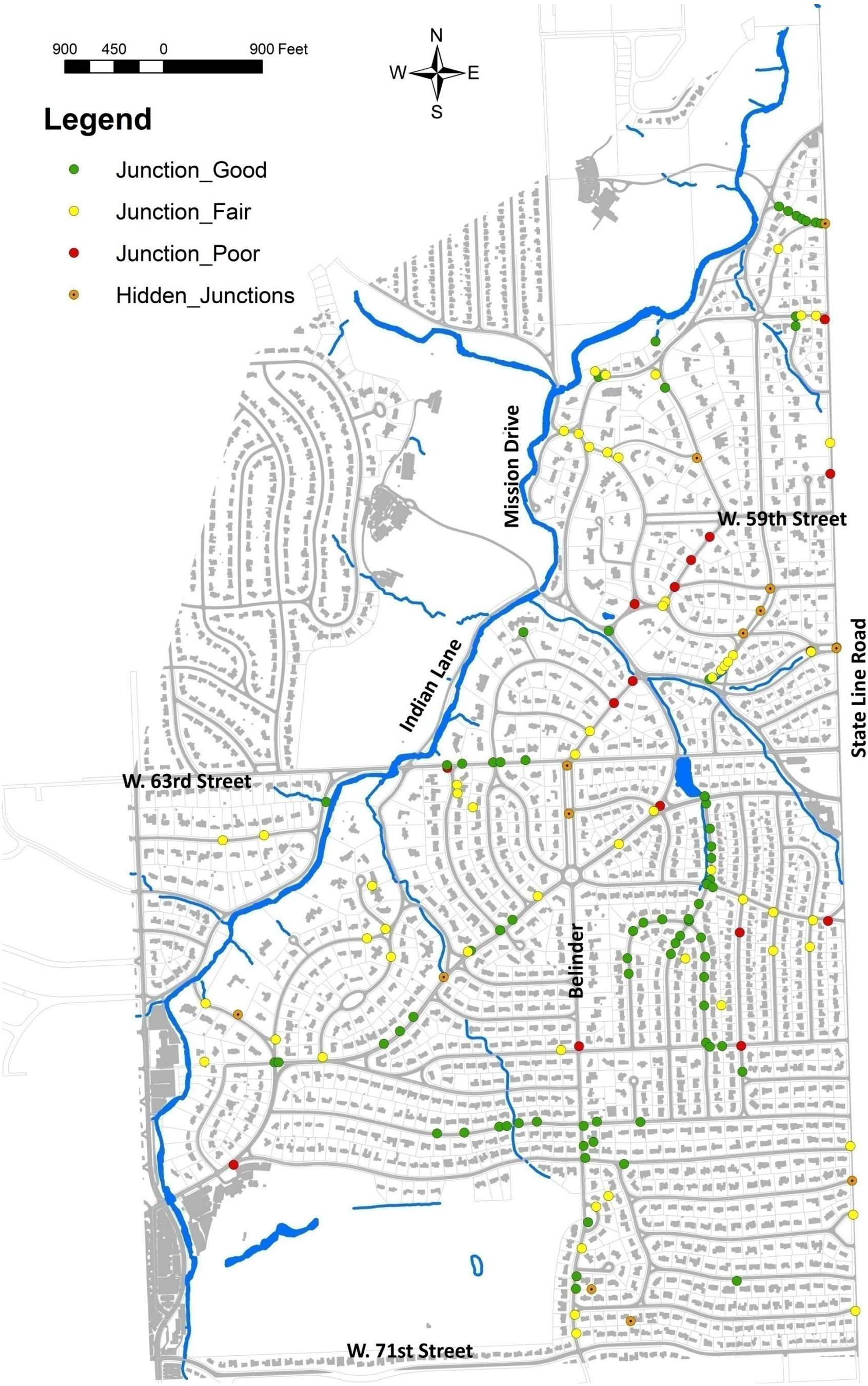

Figure 4 Junctions Illustrated by Condition

Figure 5 Outfalls Illustrated by Condition

Pipes

As each structure was inspected, the type of pipe entering and leaving the structure was recorded along with the pipe's dimensions. Figure 6 illustrates the pipes that were identified along with the inlets, junctions and outfalls. Pipe types identified include reinforced concrete pipe (RCP), reinforced concrete box culvert (RCB), polyvinyl chloride pipe (PVC), vitrified clay pipe (VCP), corrugated metal pipe (CMP), and high-density polyethylene pipe (HDPE).

There were numerous instances where the type of pipe leaving one structure was different than the pipe entering the next structure downstream. This is explained by the fact that additional sections of pipe were added to existing pipes. The purposes of these extensions were to extend older pipes to new structures or to replace damaged sections of pipe.

Approximately 56.5 percent of the pipes identified were RCP. This constitutes the majority of the pipes in the City. PVC pipe, with approximately 29.3 percent of the pipes inventoried, exhibited the next highest occurrence within the City. Table 4 shows the percentage of pipe by category in the City.

Table 4 Pipe Materials

Pipe Material	Percentage
RCP/RCB	56.5
PVC	29.3
VCP	8.2
CMP	5.3
HDPE	0.1
Unknown	0.6

There were 33 segments of CMP identified in the system. These pipe segments are illustrated in Figure 7. The maintenance issues associated with these segments will be discussed in a later section.

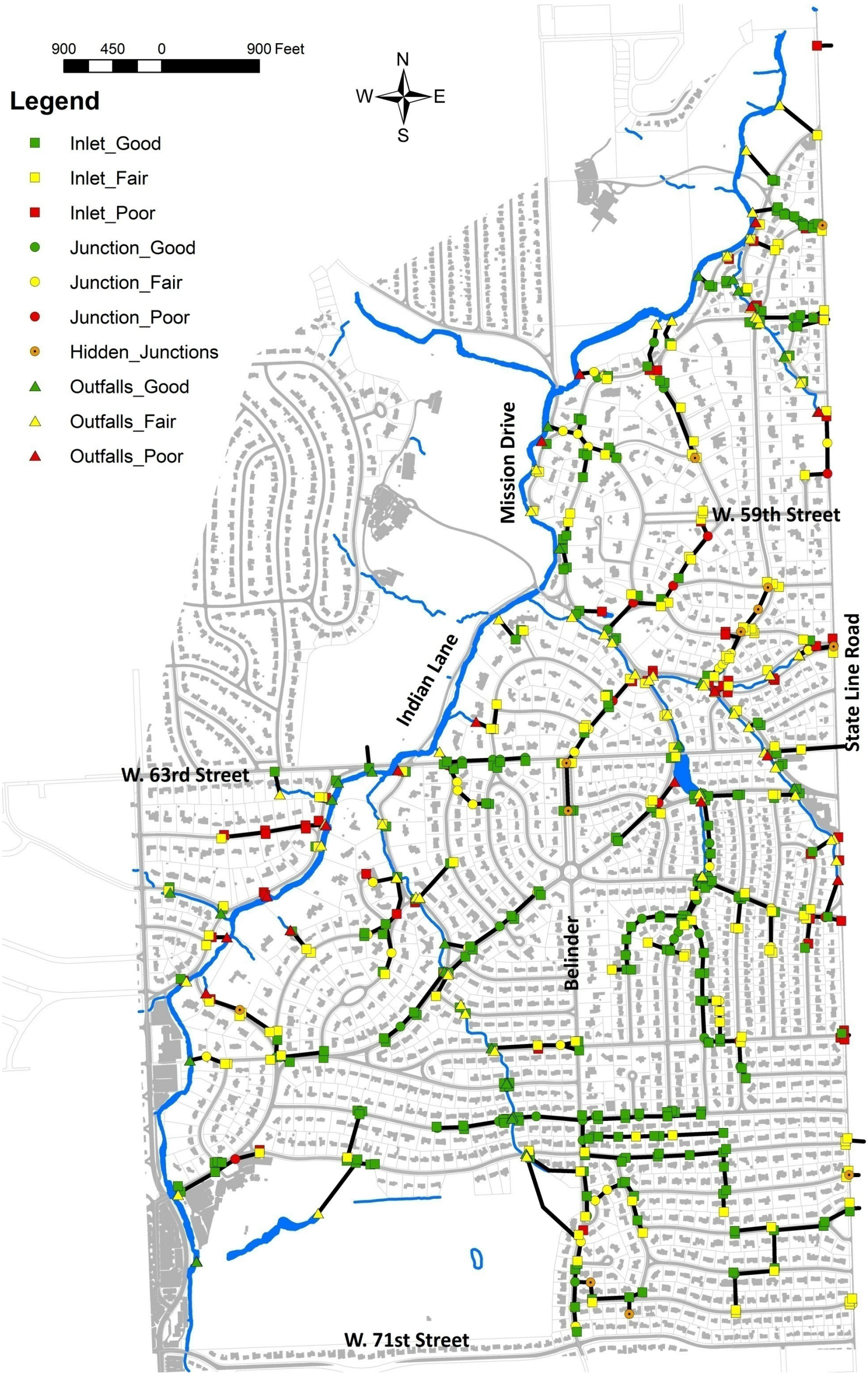

Figure 6 Stormwater Pipe Systems

Figure 7 Corrugated Metal Pipe Segments

Hydrology

The hydrology, or amount of runoff, flowing to each of the stormwater inlets was calculated using the procedures outlined in the Kansas City Chapter of the American Public Works Association Section 5600 Storm Drainage Systems and Facilities (APWA, 2006). Based on this criteria, the hydrology was made up of four main components: precipitation, losses (infiltration), runoff and transport/routing.

The precipitation was obtained for each of the design storm events that were investigated as part of this project from the "Precipitation Frequency Estimates for Kansas City Metropolitan Area" (Young and McEnroe, 2002). Design storm events for this study include storms with the return interval of 2-year, 5-year, 10-year, and 100-year storm events as defined in Table 5.

Table 5 Precipitation Return Interval and Depth

Return Interval	Precipitation (in)
2-year	3.55
5-year	4.50
10-year	5.25
100-year	7.94

In order to create a design rainfall hydrograph that distributes this rainfall depth over a period of time, the USDA Soil Conservation Service (SCS, now the Natural Resources Conservation Service) Type II, 24-hour rainfall distribution was used. This method is one of the approved methods from the APWA design criteria and is commonly used throughout the appropriate regions of the United States.

The loss method used for this study was the SCS Curve Number method. The SCS Curve Number method estimates infiltration by assigning a number (0-100) for various land use scenarios such as single family residential, parks, commercial sites and many others. More intense land uses will result in higher curve numbers which will result in higher runoff values. For instance, commercial sites have a higher curve number than single family residential and it is easy to see that the commercial sites generate more runoff than residential neighborhoods.

The resulting runoff hydrographs, or runoff time-series graphs, for each inlet structure were calculated using the U.S. Army Corps of Engineers Hydrologic Modeling System (HEC-HMS). This model is one of the acceptable models listed in APWA 5600 and is widely used across the United States. The drainage areas to each inlet are shown on Figure 8.

Figure 8 Drainage Areas to Inlets

System Capacity

Once the hydrographs for each inlet were calculated, the resulting runoff flows were routed through each pipe system to determine if the capacity of each pipe is adequate to convey the runoff from the 10-year storm. To complete this analysis, the Environmental Protection agency (EPA) Storm Water Management Model (SWMM) version 5.0 was used to compute the hydraulic parameters of the pipe systems.

There are several modeling procedures that can be used to route the flows through the pipe system. For this project, the kinematic wave method was selected. Flow routing simply means that the flow from the first inlet is routed through the pipe to the next inlet. This act of routing keeps track of the amount of time it takes for the flow to travel through the pipe. As the flow reaches the next inlet, the runoff reaching the inlet at the same time is added to the flow in the pipe.

The computer model uses the pipe system characteristics, such as pipe material, diameter and slope, entered by the user to determine the capacity of each pipe segment. The model also determines the required elevation of the water in each inlet and manhole necessary to push the runoff calculated in previous steps through the pipe. If this elevation exceeds the top or opening of the structure, the structure is identified as flooding and the pipe is identified as having insufficient capacity.

Based on the capacity analysis of all the pipe systems in the City, it was determined that 271 pipes do not have adequate capacity to convey the runoff from the 10-year storm event. These pipes are shown in Figure 9.

Table 6 illustrates the systems that require replacement due to capacity limitations. The table shows the common name assigned to the project and the name of the hydraulic model used to evaluate the project. Figure 10 illustrates the locations of the pipes systems.

An interesting result of this analysis is that two pipe systems recently constructed were identified as having insufficient capacity. These results were carefully checked and it was determined that a difference in the method of computing the hydrology explains the difference. Both systems were designed using the Rational Method to compute the flowrates. The Rational Method is an accepted methodology listed in APWA 5600 and widely used across the country. It is commonly accepted by engineers and hydrologists that different hydrologic computational methods can produce flowrates that are as much as 30 percent different. It appears that the flowrates for the two systems computed by the two different methods fall within this limit.

Figure 9 Undersized Stormwater Pipe Segments

Table 6 Pipes Systems with Insufficient Capacity

Pipe System Number	SWMM File	Location
1	262-89	70th Terrace and State Line Road
2	260-83	69th Terrace & State Line Road
3	310-43	69th Terr. and Overhill Rd. to 69th St. and Belinder
4	268-44	70th Terrace & Belinder Road
5	315-316	Arno Road & State Line Road
6	311-103	69th Street & State Line Road
7	238-39	69th & Belinder
8	331-40	68th Street
9	328-84	68th Street to 69th Street, East of Tomahawk
10	424-85	Tomahawk Road, 69th to Brush Creek
11	400-399	67th Street & State Line Road
12	288-42	67th Terrace
13	332-46	67th Street & Belinder
14	421-55	Indian Lane, Tomahaawk to 66th Street
15	416-52	67th Street & Cherokee
16	385-51	65th Street & Overbrook
17	383-50	65th Street & High Drive
18	372-95	65th Street & Willow Lane
19	438-54	Tomahawk Rd. from Verona Rd. to 66th St.
20	340-101	66th Terrace near Tomahawk Road
21	433-99	65th Street & Tomahawk Road
22	431-53	Tomahawk Rd. and 66th Terr.
23	455-57	Wenonga Road
24	464-60	Aberdeen to Seneca
25	490-9	66th St. between Indian Lane and Mission Road
26	489-8	65th Terrace & Indian Lane
27	483-6	65th Street & Indian Lane
28	395-82	Overbrook Road to State Line
29	296-96	Tomahawk Road, Sagamore Road to Mission Drive
30	409-13	Ensley Lane & Tomahawk Road
31	511-12	Verona to Aberdeen
32	462-61	Wenonga, South of 63rd Street
33	504-14	63rd Street & Wenonga
34	479-4	Indian Lane, South of 64th Street
35	476-2	64th Street
36	472-1	64th Street & Indian Lane
37	516-86	Mission Drive at City Hall

Pipe System Number	SWMM File	Location
39	469-27	Belinder Avenue from 64th St. to Mission Dr.
40	598-62	Intersection of Verona Rd. and Verona Terr.
41	524-17	61st Street & Mission Drive
42	536-22	Drury Lane & Brookwood Road
43	533-21	Brookwood Road between Mission Drive and State Line
44	532-19	Brookwood Road and Mission Drive
45	546-26	Ensley Land & Mission Drive
46	538-23	Brookwood Road (WB) between Mission Drive and State Line Road
47	224-24	High Drive, Stratford to Mission Drive
48	572-31	Oakwood Drive, 59th Street to Mission Drive
49	576-32	Mission Drive between Overhill Road and Indian Lane
50	591-37	Brookbank Lane Cul-de-Sac
51	590-36	Brook Bank Lane South of Belinder
52	588-35	Brookbank Lane & Belinder
53	585-34	Overhill Road and Guilford Lane
54	640-71	State Line Road, South of Pembroke Lane
55	608-65.	Oakwood Drive, Guilford Lane ot Mission Drive
56	635-69	Pembroke Lane, South of 59th Street
57	618-92	56th Street & High Drive
58	616-103	Mission Drive between Oakwood Drive and 56th Street
59	605-64	Mission Drive between Oakwood Drive and Overhill Road
60	621-80	High Drive & East Mission Drive
61	657-75	High Drive to Mission Drive
62	660-78	Mission Drive, North of 55th Street
63	663-KCMO1	State Line Road, North of Mission Drive
64	318-45	69th Street, West of Belinder
65	337-47	67th Street between 67th Terrace & Belinder
66	290-41	67th Terrace beteen 67th Street & Belinder
67	544-25	Mission Drive East of Ensley Lane
68	559-29	Overhill Road & Mission Drive

System Improvement Costs

System improvement costs were determined based on structures and pipes recommended for replacement in the previous section. It was assumed that the structures at both the upstream and downstream ends of any replaced pipe segment would also be replaced regardless of condition. While this may, or may not, actually happen, accounting for it at this stage of the project will help limit budget surprises later.

The opinions of probable project costs, including construction costs, contingencies and engineering costs, are attached in the Appendix of this report and show the itemized costs used to determine the project costs. These costs are based on March 2009 values with an Engineering News Record cost index of 8534. This index will be required to index these costs to some future cost.

The ranking for each system was computed by dividing the cost of the proposed improvements for the system by its system rating. The system rating is based on two criteria. The first criteria is based on the capacity of the system. All the systems listed have insufficient capacity for the 10-year storm runoff. These systems were furthered analyzed to determine their sufficiency to convey the 5-year storm (storm with a 20 percent chance of occurring any year) runoff and the 2-year storm (storm with a 50 percent chance of occurring in any year) runoff. The Capacity Ratings are listed in Table 7.

Table 7 Capacity Rating

Return Interval Flooding	Rating
10-year	3
5-year	2
2-year	1

The second criteria was based on the condition of the structures in the system. The structures in the systems were given a Condition Rating as shown in Table 8. The ratings were then average based on the number of structures in the system.

Table 8 Condition Rating

Structure Condition	Rating
Good	3
Fair	2
Poor	1

The System Rating was computed by averaging the Capacity and Condition Ratings. The lower Ratings indicate the higher priority system improvements.

Table 9 lists the pipe systems with insufficient capacity to convey the 10-year storm runoff. This table has been listed in order of priority based on a ranking system developed for this masterplan. The table

lists the cost of the system improvements, including engineering and contingencies, and System Rating. These systems are also listed in

Table 9 Project Ranking

Pipe System Number	Location	Cost	System Rating
1	70th Terrace and State Line Road	$30,123	1.00
28	Overbrook Road to State Line	$30,523	1.00
36	64th Street & Indian Lane	$34,692	1.00
43	Brookwood Road between Mission Drive and State Line	$45,173	1.00
67	Mission Drive East of Ensley Lane	$37,611	1.00
11	67th Street & State Line Road	$129,051	1.25
45	Ensley Land & Mission Drive	$32,326	1.25
54	State Line Road, South of Pembroke Lane	$40,174	1.25
26	65th Terrace & Indian Lane	$117,967	1.33
35	64th Street	$787,754	1.40
25	66th St. between Indian Lane and Mission Road	$34,542	1.50
40	Intersection of Verona Rd. and Verona Terr.	$211,612	1.50
44	Brookwood Road and Mission Drive	$67,542	1.50
46	Brookwood Road (WB) between Mission Drive and State Line Road	$31,768	1.50
63	State Line Road, North of Mission Drive	$23,382	1.50
65	67th Street between 67th Terrace & Belinder	$18,005	1.50
47	High Drive, Stratford to Mission Drive	$682,938	1.55
61	High Drive to Mission Drive	$173,602	1.57
48	Oakwood Drive, 59th Street to Mission Drive	$967,972	1.65
49	Mission Drive between Overhill Road and Indian Lane	$141,882	1.67
6	69th Street & State Line Road	$58,272	1.75
27	65th Street & Indian Lane	$62,111	1.75
34	Indian Lane, South of 64th Street	$38,811	1.75
42	Drury Lane & Brookwood Road	$91,505	1.75
17	65th Street & High Drive	$818,828	1.81
30	Ensley Lane & Tomahawk Road	$485,292	1.83
14	Indian Lane, Tomahaawk to 66th Street	$1,020,806	1.88
23	Wenonga Road	$589,523	1.90
16	65th Street & Overbrook	$433,908	1.93
39	Belinder Avenue from 64th St. to Mission Dr.	$833,791	1.95
10	Tomahawk Road, 69th to Brush Creek	$371,729	2.00
15	67th Street & Cherokee	$41,018	2.00
20	66th Terrace near Tomahawk Road	$26,210	2.00

Pipe System Number	Location	Cost	System Rating
32	Wenonga, South of 63rd Street	$41,917	2.00
51	Brook Bank Lane South of Belinder	$41,057	2.00
53	Overhill Road and Guilford Lane	$66,572	2.00
57	56th Street & High Drive	$81,211	2.00
59	Mission Drive between Oakwood Drive and Overhill Road	$139,525	2.00
64	69th Street, West of Belinder	$33,507	2.00
66	67th Terrace beteen 67th Street & Belinder	$17,742	2.00
68	Overhill Road & Mission Drive	$43,141	2.00
2	69th Terrace & State Line Road	$1,147,227	2.10
13	67th Street & Belinder	$534,042	2.10
4	70th Terrace & Belinder Road	$1,053,444	2.13
19	Tomahawk Rd. from Verona Rd. to 66th St.	$649,477	2.20
3	69th Terr. and Overhill Rd. to 69th St. and Belinder	$741,805	2.21
5	Arno Road & State Line Road	$96,463	2.25
9	68th Street to 69th Street, East of Tomahawk	$187,050	2.25
29	Tomahawk Road, Sagamore Road to Mission Drive	$73,522	2.25
33	63rd Street & Wenonga	$48,210	2.25
56	Pembroke Lane, South of 59th Street	$44,018	2.25
60	High Drive & East Mission Drive	$69,314	2.25
22	Tomahawk Rd. and 66th Terr.	$633,887	2.33
31	Verona to Aberdeen	$521,037	2.35
38	Intersection of 63rd St. and Ensley Lane	$128,219	2.35
18	65th Street & Willow Lane	$1,446,852	2.36
55	Oakwood Drive, Guilford Lane ot Mission Drive	$1,755,900	2.40
7	69th & Belinder	$1,801,217	2.45
8	68th Street	$187,050	2.50
12	67th Terrace	$41,175	2.50
21	65th Street & Tomahawk Road	$88,526	2.50
41	61st Street & Mission Drive	$73,713	2.50
50	Brookbank Lane Cul-de-Sac	$20,398	2.50
52	Brookbank Lane & Belinder	$32,737	2.50
62	Mission Drive, North of 55th Street	$214,682	2.50
37	Mission Drive at City Hall	$44,745	3.00
58	Mission Drive between Oakwood Drive and 56th Street	$111,861	3.00

The total cost of the improvements necessary for capacity improvements of the system is $20,835,000.

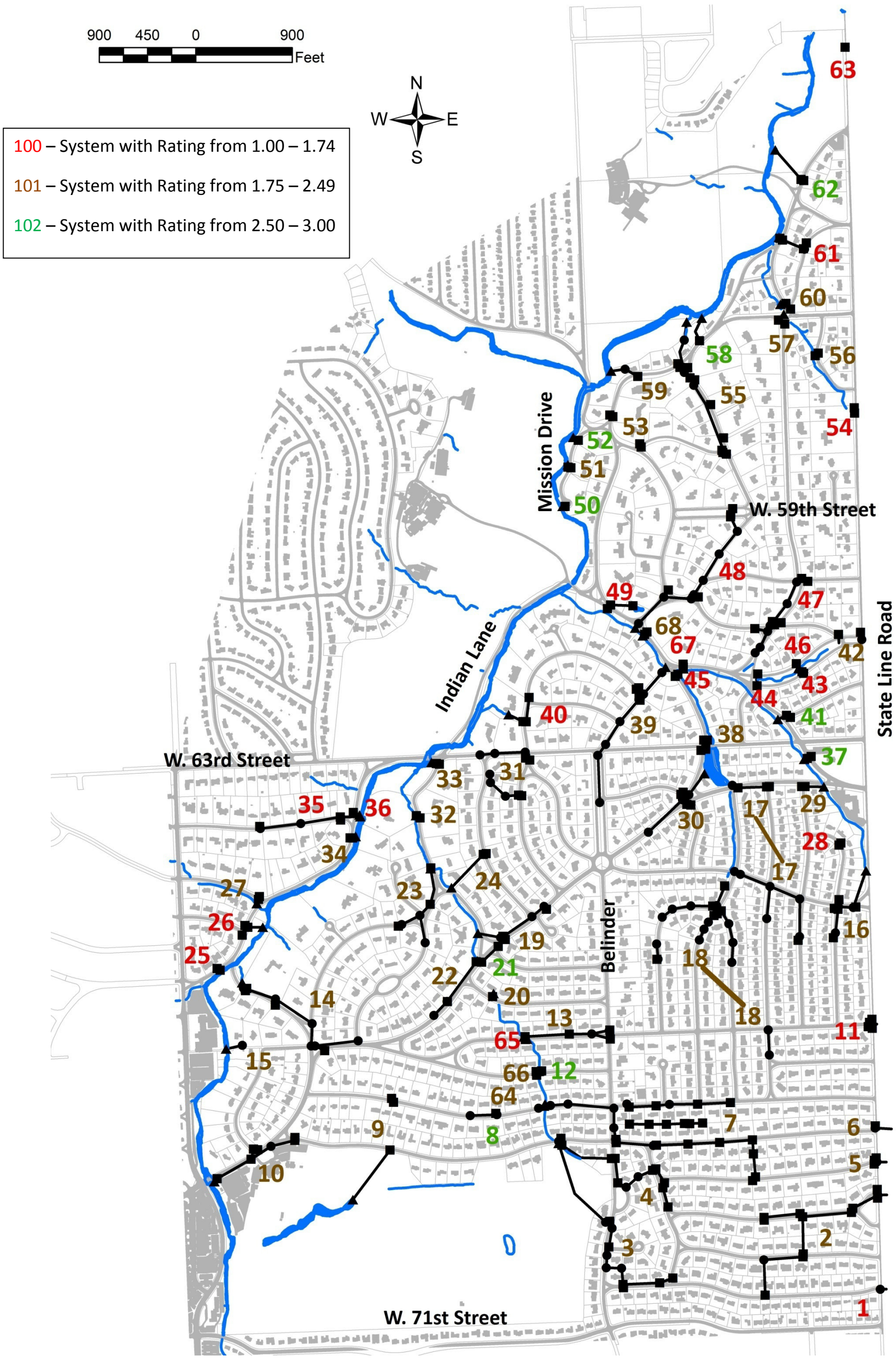

Figure 10 Pipe Systems with Insufficient Capacity

The System Inventory resulted in 265 structures that are in “Fair” condition. Based on an assumed cost of $2,000 per structure to repair the structures, it will cost approximately $530,000. The inventory also identified 85 structures that are in “Poor” condition. Based on an average replacement cost of $4,200 per structure, it would cost approximately $357,000 to upgrade the “Poor” structures in the system.

The System Inventory also identified more than 2,300 of corrugated metal pipe (CMP) in the City’s stormwater system. This type of pipe corrodes in this regions soil conditions. Based on assumptions of when the CMP pipe was constructed in the City, it is likely nearing the end of its useful life. Based on the replacement pipe costs for reinforced concrete pipe, which has a longer life, it is anticipated that the cost to simply replace the CMP would be approximately $650,000.

Conclusions and Recommendations

The System Inventory identified 725 stormwater structures in the City’s stormwater systems. Of these, 359, or 49.8 percent, were judged to be in good condition. It was estimated that it would cost approximately $887,000 to repair and replace the “Fair” and “Poor” conditions structures to put them in “Good” condition.

The System Inventory also identified more than 2,300 feet of CMP that is likely nearing the end of its useful life. The cost to replace this pipe with reinforced concrete pipe is approximately $800,000.

Based on the System Capacity analysis, it was determined that 271 segments of stormwater pipe so not have sufficient capacity to convey the 10-year storm runoff. These segments are located in 68 pipe systems throughout the City. In order to get these pipe systems to have adequate capacity to convey the 10-year storm runoff, approximately $20,835,000 of improvements are required.

The resulting funding required to get the City’s stormwater pipe systems to a “Good” condition will require approximately $22,534,000.

It is important to note that the costs presented in this report are based on replacing and upgraded stormwater pipe systems using traditional infrastructure improvements. It is equally important to realize that other structural and non-structural best management practices should be investigated. Often BMPs can be constructed for less than traditional infrastructure and offer the added benefit of improving stormwater quality.

Based on the state of the stormwater system in the City, it is recommended that a maintenance plan be developed and adopted by the City as soon as possible. The condition of the stormwater infrastructure will only worsen as time goes on. Addressing the deficiencies and maintenance issues sooner than later will save the City a great deal of money.

It is also recommended that the City investigate other revenue sources to help address the needed stormwater improvements. Many cities in the metro area have adopted stormwater utilities and other stormwater fees to help replace and maintain their stormwater infrastructure.

References

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System Summaries and Opinions of Probable Project Cost