Executive Summary

Wastewater Facilities Master Plan

for the

City of Lawrence
KANSAS

Project Number 54793

2012

BG CONSULTANTS
architects engineers
planners surveyors

Burns & McDonnell
SINCE 1898

July 25, 2012

Mr. David Wagner
Utilities Director
Department of Utilities
720 West 3rd Street
Lawrence, KS 66044-0708

Re: Wastewater Facilities Master Plan
City of Lawrence, Kansas
B&M Project No. 54793

Dear Mr. Wagner:

Burns & McDonnell in association with BG Consultants is pleased to submit our report titled Wastewater Facilities Master Plan in accordance with our engineering services agreement with the City of Lawrence. The report consists of two volumes as follows:

1. Executive Summary
2. Master Plan Report

This volume of the report is the executive summary. It is a concise presentation of the findings, conclusions and recommendations of the detailed plan and report. The key recommendations of the plan are as follows:

- Implement an 8 year infiltration/inflow reduction program within a targeted area of the collection system that includes the oldest parts of the system close to the Kansas River Wastewater Treatment Plant (WWTP), with the objective of reducing peak wet weather infiltration inflow rates by approximately 19 MGD.
- Construct gravity sewers, relief sewers, and pumping station and force main capacity expansions needed to convey peak flow rates occurring during wet weather periods.
- Construct a new pumping station and force mains to divert a portion of dry and wet weather flows to a new Wakarusa WWTP. Final planning for these facilities should begin by the time the utility service area population is 96,000 so they are in operation before flows to the Kansas River WWTP reach its design capacity. An initial dry weather flow capacity for the new Wakarusa WWTP of 2 MGD would be sufficient for handling flow rates forecast to occur through year 2030.
- Complete a program of clay pipe and brick manhole replacement to insure the long term integrity of the collection system.
- Plan and budget for additions to the collection system that are necessary for extending service to areas outside the existing utility service area as new development occurs.

9400 Ward Parkway • Kansas City, MO 64114-3319
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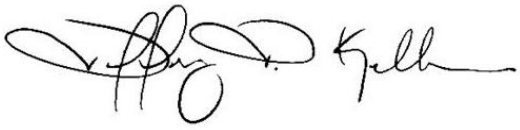
- Plan and budget for improvements to the Kansas River WWTP that will be necessary for meeting new regulatory requirements such as nutrient (nitrogen and phosphorus) removal.

This master plan was developed to be a living document, subject to revision as dictated by the timing and direction of future regulatory actions, and actual patterns of future growth and development. The collection system computer hydraulic model prepared for this master plan is one tool that may be used to assess future conditions that may differ from those assumed by the master plan.

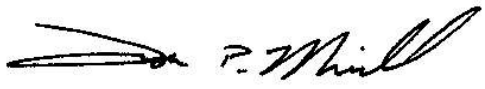
We sincerely appreciate the cooperation and direction received from your staff, including Mike Lawless, P. E. and Philip Ciesielski, P. E., throughout the development of this master plan. We would be pleased to assist you with implementing the recommendations of this plan. Thank you for this opportunity to serve the City of Lawrence.

Sincerely,

Stephen A. Yonker, P. E.
Project Manager



Jeffrey J. Keller, P. E.
Project Review Engineer



John P. Mitchell, P. E.
Project Principal

SAY/say

INDEX AND CERTIFICATION

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Wastewater Facilities Master Plan
City of Lawrence, Kansas

Project 54793

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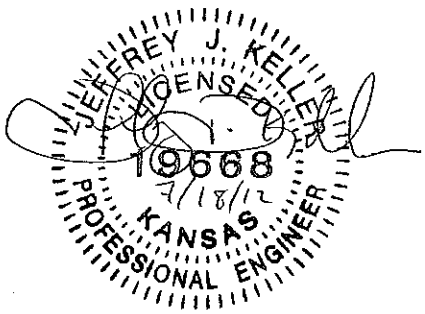
Certification

I hereby certify, as a Professional Engineer in the state of Kansas, that the information in this document was assembled under my direct personal charge. This report is not intended or represented to be suitable for reuse by the City of Lawrence, Kansas or others without specific verification or adaptation by the Engineer. This certification is made in accordance with the provisions of the laws and rules of the Kansas under Kansas Administrative Code.



Jeffrey J. Keller, P.E.
Date: 7/18/2012
(Reproductions are not valid unless signed, dated, and embossed with Engineer's seal)

Executive Summary

Wastewater Facilities Master Plan

for

Lawrence, Kansas

City of Lawrence, Kansas

BMcD Project No. 54793

City P.O. 07629

Burns & McDonnell Engineering Company, Inc.
9400 Ward Parkway
Kansas City, MO 64114

City of Lawrence, Kansas

Wastewater Facilities Master Plan Executive Summary

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Technical Memorandum No. 1 – Initial Services

Technical Memorandum No. 1 is a summary of initial services completed in partial fulfillment of the Lawrence, Kansas Wastewater Facilities Master Plan. The goals of the initial services were to establish the project team (kick-off meeting), obtain the necessary data for performing the master plan, the selection of the collection system modeling software, and the population forecast to be used for the master plan. The following documents are included as appendices in Technical Memorandum No. 1:

- Appendix 1-A - Kick-Off Meeting Agenda
- Appendix 1-B - City Data Received and Used for this Master Plan
- Appendix 1-C - Model Software Purchase Memorandum
- Appendix 1-D - Planning Area Boundary and Population Growth Forecast Memorandum
- Appendix 1-E - University of Kansas water use projections

The master planning area boundary is shown on Figure ES-1.1. The population forecast used for the master planning area is summarized as follows:

Table ES-1.1
Wastewater Utility Service Area and Master Planning Area
Population Forecasts

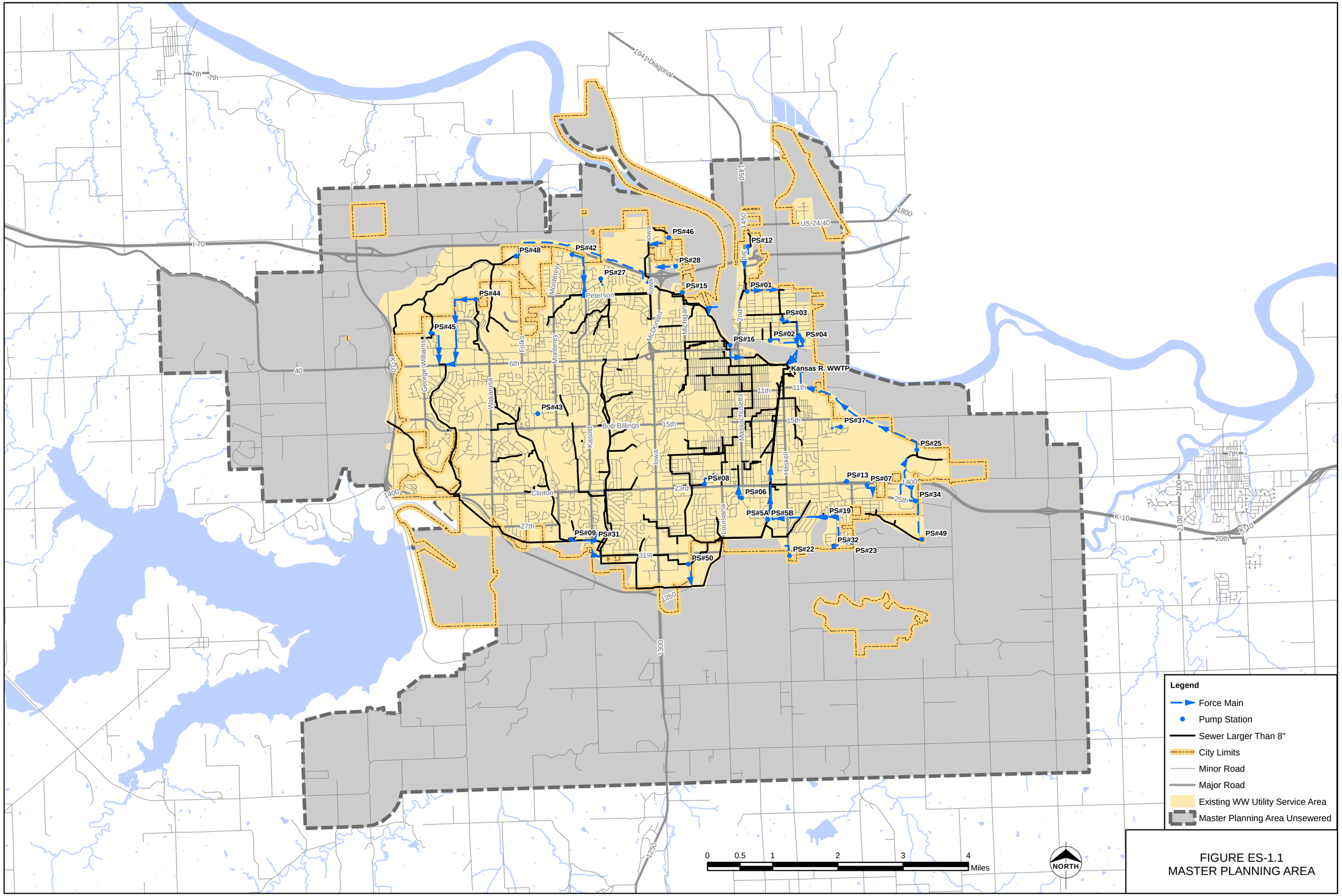
Year	Utility Service Area	Master Planning Area
2010	92,727	94,564
2020	106,667	113,051
2030	119,529	129,176
Buildout	251,971	251,971

B. Technical Memorandum No. 2 – Existing Wastewater Collection System Evaluation

1. Existing Wastewater Collection System Evaluation Goals

Technical Memorandum (TM) No. 2 is a summary of an evaluation of the existing wastewater collection system completed in partial fulfillment of the Lawrence, Kansas Wastewater Facilities Master Plan. The goals for this TM were to:

- Document the components of the existing system.
- Delineate system drainage basins that are useful for system analysis.


1941 Diagonal
7th
I-70
40
K-10
George Williams
Wakarusa
Folks
Monterey
Peterson
Iowa
McDonald
Michigan
Kasold
Bob Billings
6th
15th
23rd
27th
31st
Clinton
Louisiana
Massachusetts
Haskell
2nd
3rd
11th
25th
20th
1450
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2100
1800
US-24/40
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Kansas R. WWTP
PS#43
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PS#07
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PS#34
PS#5A
PS#5B
PS#19
PS#09
PS#31
PS#32
PS#49
PS#22
PS#23
PS#50
0
0.5
1
2
3
4
Miles
NORTH
Legend
Force Main
Pump Station
Sewer Larger Than 8"
City Limits
Minor Road
Major Road
Existing WW Utility Service Area
Master Planning Area Unsewered
FIGURE ES-1.1
MASTER PLANNING AREA

- Document the wastewater flow and rainfall monitoring program performed by the City of Lawrence in support of this master plan.
- Analyze existing wastewater flow components including both dry and wet weather flow components such as wastewater flow, dry weather infiltration, and wet weather derived infiltration and inflow by drainage areas tributary to the wastewater flow meters installed for the City's wastewater flow metering program.
- Compare estimated levels of rainfall derived infiltration and inflow (RDII) within drainage areas and rank them on the basis of RDII level.
- Develop a computer hydraulic model of the existing collection system calibrated for both dry and wet weather flow conditions on the basis of the wastewater flow and rainfall monitoring programs performed by the City.
- Utilize the computer hydraulic model to simulate what flows would occur during a design storm wet weather event.
- Based on the existing system model simulating the design storm event, identify any system deficiencies which require corrective action to provide sufficient capacity for wet weather peak flow rates.
- Determine recommended corrective measures required to address existing system deficiencies. In some cases, alternatives may be compared to arrive at the best solution for the City's needs.

2. Rainfall-Derived Infiltration/Inflow Analysis and Drainage Area Rankings

Table ES-2.1 presents the ranking of drainage areas tributary to flow meters based on level of RDII for those drainage areas where it is possible to analyze RDII levels. Because of the existence of 31 "crossover" sewers within the City's collection system, it is only possible to analyze 16 of the 36 separately metered drainage areas. For those drainage areas where it is possible to estimate and compare RDII values, there is a strong correlation between age of sewers and pipe materials, and RDII levels. Higher RDII levels occur in older sewers and clay pipe sewers than in newer sewers and plastic pipe sewers as expected. It can be assumed this holds true for the drainage areas where it was not possible to estimate RDII values.

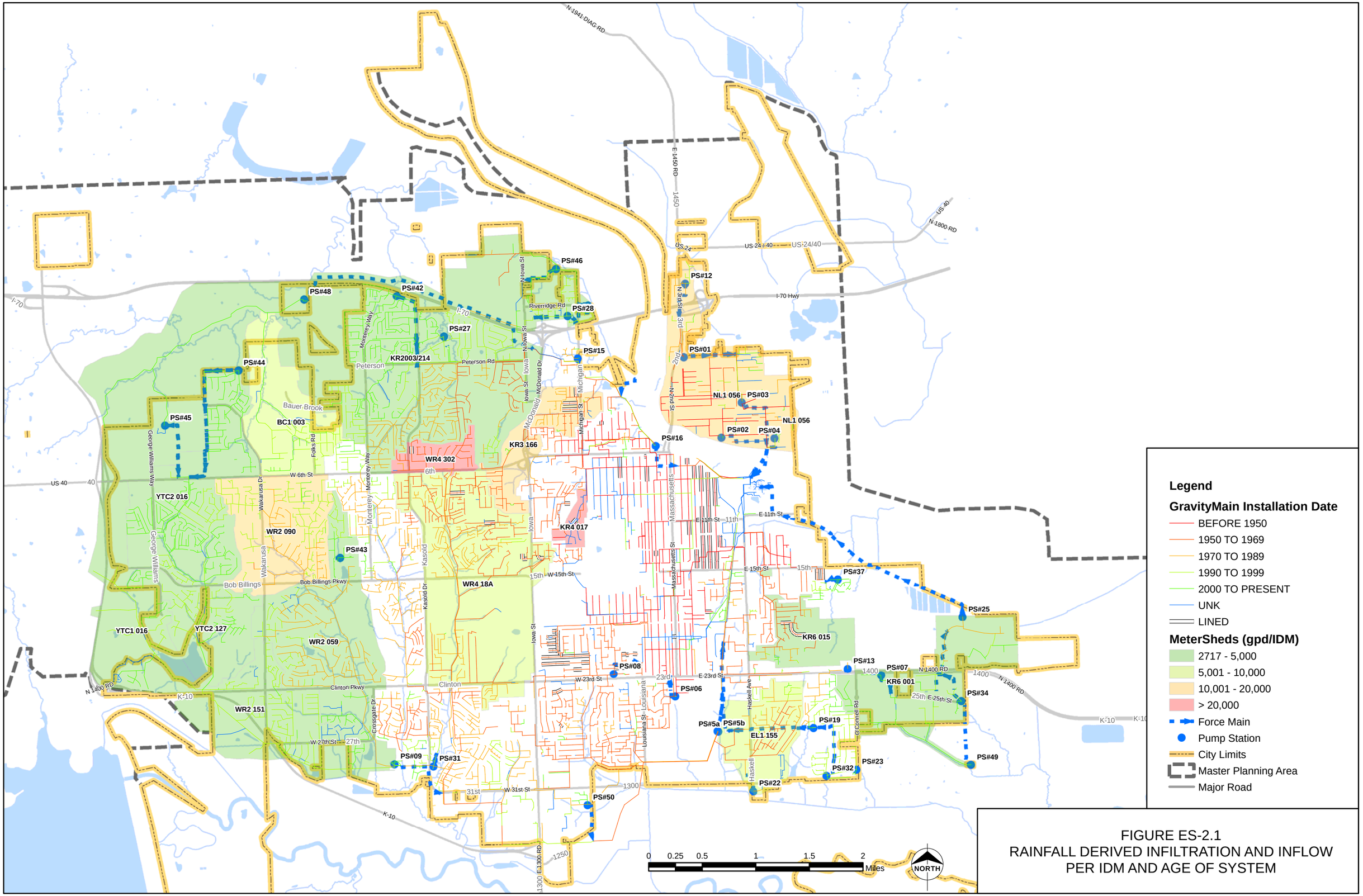
Table ES-2.1
Drainage Areas and RDII

Flow Meter	Ranking (Worst to Best)	RDII / IDM (gpd/IDM)	Material	Age of Conduits (Years)
KR4 017	1	64,538	82% VCP	45.6
WR4 302	2	45,939	80% VCP	45.7
KR6 015	3	44,488	81% VCP	43.8
NL1 056	4	18,984	77% VCP	47.2
KR3 166	5	15,502	75% VCP	45.0
WR2 090	6	11,962	95% Truss	19.6
BC1 003	7	8,467	60% Truss	11.9
EL1 155	8	8,256	57% Truss	27.2
WR4 18A	9	8,000	69% VCP	41.5
WR2 151	10	4,684	86% Truss	16.5
KR6 001	11	4,455	46% Truss	10.2
YTC1 016	12	4,002	66% Truss	12.7
YTC2 016	13	3,841	70% PVC	8.5
YTC2 127	14	3,433	74% Truss	12.5
WR2 059	15	3,387	88% Truss	21.2
KR2 003/214	16	2,717	54% Truss	20.2

A graphical summary of these results is shown on Figure ES-2.1, where the RDII rankings are color coded for each metershed (worst to best is symbolized by color from reds to yellow to greens), and the age of the system is shown using similar symbolization.

3. Existing System Analysis

A summary of the existing system hydraulic model analysis at the 10 year design storm is depicted in Figure ES-2.2. Overloaded or surcharged sewers are highlighted in yellow. A flow hydrograph predicted by the model at the KRWWTP is shown below in Figure ES-2.3. An actual flow hydrograph that occurred at the KRWWTP during a May 2009 storm event that was similar to the 10 year design storm event is also shown to illustrate the correlation between the modeled design storm event and an actual similar but lesser storm event.



Legend

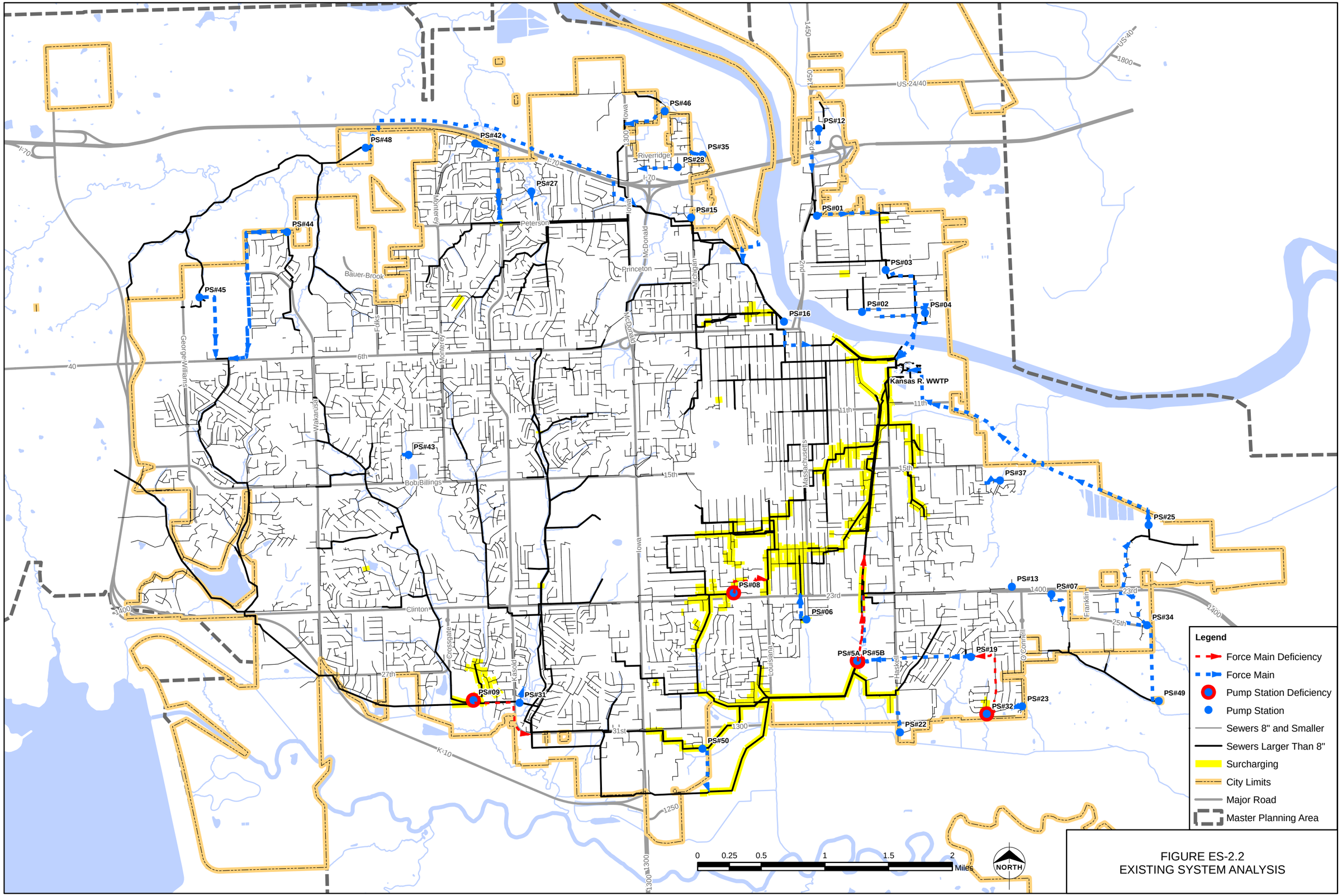
GravityMain Installation Date

- BEFORE 1950
- 1950 TO 1969
- 1970 TO 1989
- 1990 TO 1999
- 2000 TO PRESENT
- UNK
- LINED

MeterSheds (gpd/IDM)

- 2717 - 5,000
- 5,001 - 10,000
- 10,001 - 20,000
- > 20,000
- Force Main
- Pump Station
- City Limits
- Master Planning Area
- Major Road

FIGURE ES-2.1
RAINFALL DERIVED INFILTRATION AND INFLOW
PER IDM AND AGE OF SYSTEM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Kansas R. WWTP
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PS#06
PS#34
PS#5A
PS#5B
PS#19
PS#09
PS#31
PS#32
PS#23
PS#22
PS#50
PS#49
I-70
US-24/40
US-40
1450
1800
1300
1400
1250
Riverridge
Peterson
Princeton
Bauer Brook
Monterey
McDonald
Michigan
Folks
George Williams
6th
40
Wakarusa
Bob Billings
15th
Massachusetts
11th
Iowa
Clinton
23rd
25th
Crossgate
Kasold
Louisiana
Haskell
O'Connell
Franklin
27th
31st
K-10
0 0.25 0.5 1 1.5 2 Miles
NORTH
Legend
Force Main Deficiency
Force Main
Pump Station Deficiency
Pump Station
Sewers 8" and Smaller
Sewers Larger Than 8"
Surcharging
City Limits
Major Road
Master Planning Area
FIGURE ES-2.2
EXISTING SYSTEM ANALYSIS

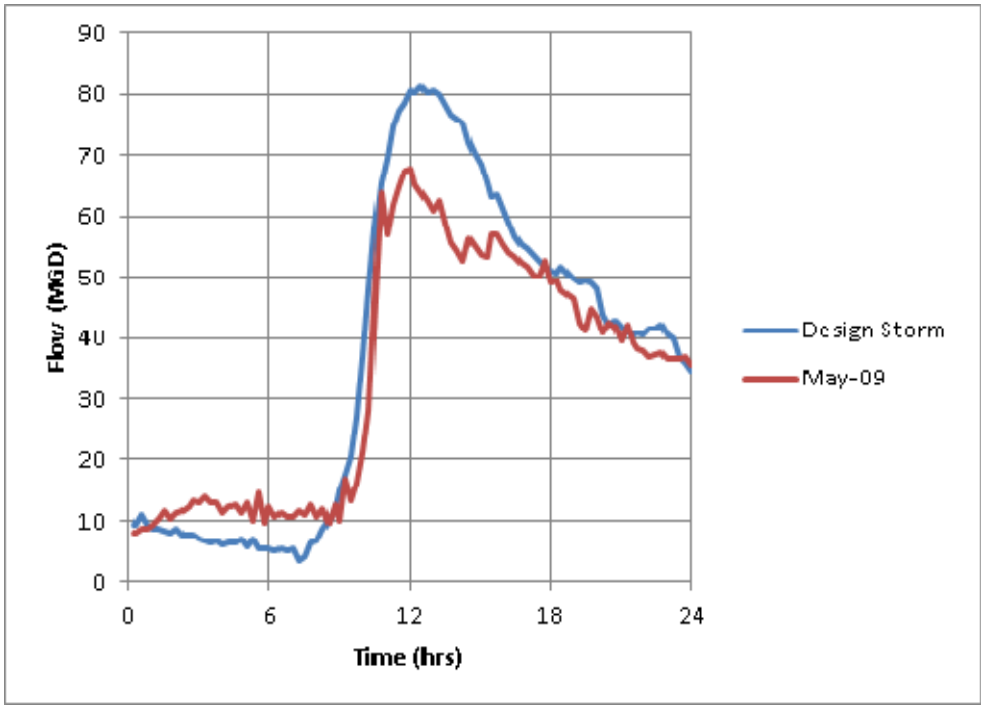


Figure ES-2.3. Existing System Design Storm and May 2009 Storm Hydrographs at the Kansas River WWTP

The model predicts an instantaneous peak flow rate of 81 MGD. Based on an analysis of the model results, the following conclusions concerning the adequacy of the existing collection system can be made:

- The instantaneous peak flow rate of 81 MGD exceeds the KRWWTP peak flow firm capacity of 65 MGD.
- Many of the sewers the model predicts to be overloaded or surcharged are upstream of pumping stations which lack firm pumping capacities at the modeled flows. This is the case for surcharged sewers upstream of Pumping Station Nos. 5A/5B, 8, 9 and 32.
- Some surcharging of sewers downstream of Pumping Station Nos. 5A/5B and 8 is due to gravity sewer capacities less than peak flow rates predicted by the model.
- The KRWWTP flow hydrograph shows a very quick flow response following the beginning of the storm event up to the instantaneous wet weather peak flow rate, followed by a relatively rapid decline in flow rate which is then followed by a period of steady sustained flow higher than dry weather flow before flows return to normal. These characteristics are typical of metered storm events. The quick response to the storm event up to the peak flow rate means there are appreciable infiltration/inflow (I/I) sources

that rapidly contribute I/I to the system that are relatively close to the KRWWTP. This suggests the rehabilitation/replacement plan set forth in Technical Memorandum No. 4 should make removal of rapid I/I sources in close proximity to the KRWWTP a higher priority than removal of other I/I sources that are located farther away from the KRWWTP.

Table ES-2.2 presents a summary of existing system deficiencies at the design storm event.

Table ES-2.2
Summary of Existing System Deficiencies

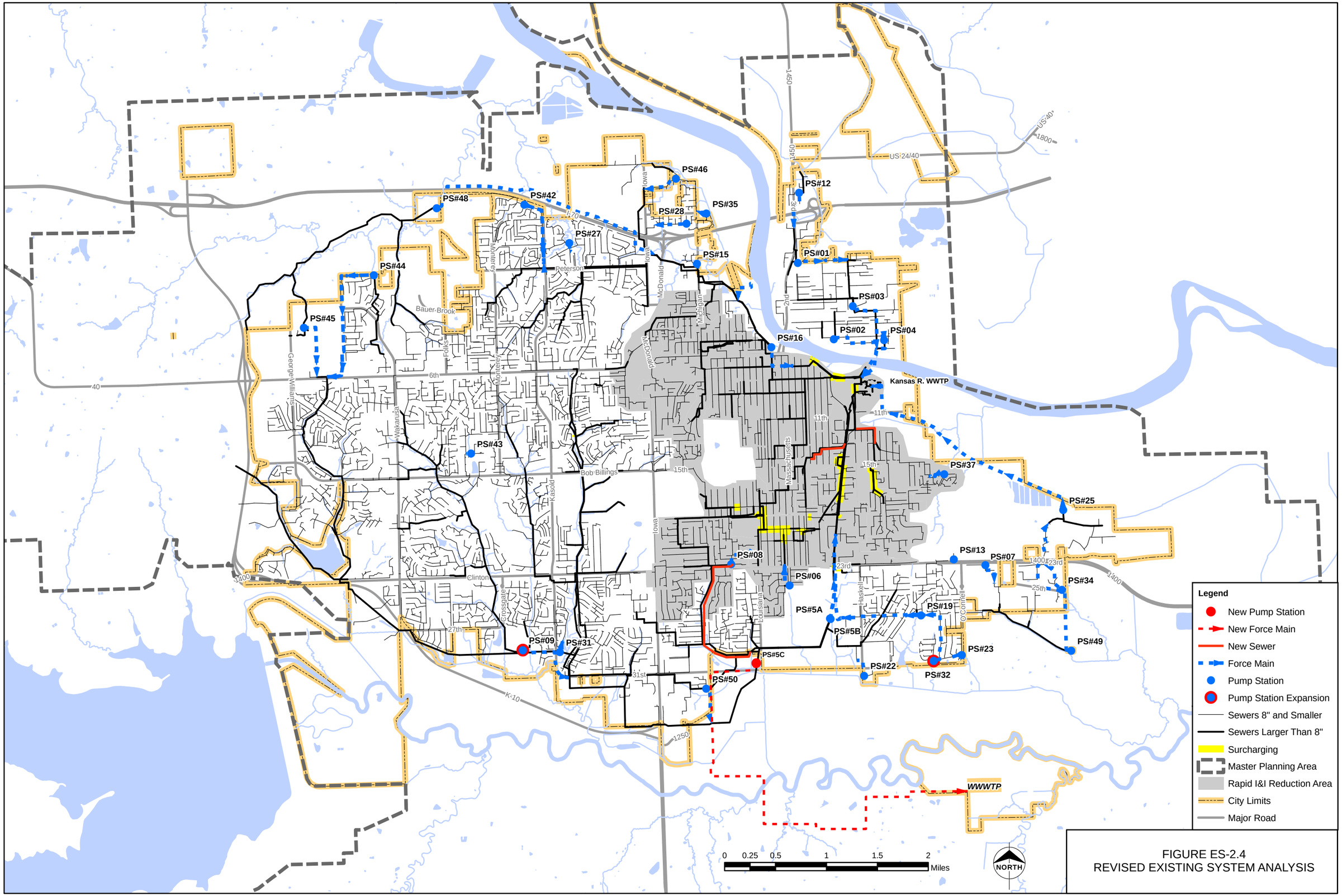
Drainage Sub-Basin	Description	Existing Peak Capacity-MGD(1)	Design Storm Peak Flow-MGD
C-2	PS 08	2.9	12.7
C-2	PS 08 Force Main	3.3	12.7
EL-1B	PS 23	0.05	0.05
EL-1B	PS 32	0.7	1.6
EL-1B	PS 32 Force Main	0.8	1.6
KR-5C	12-inch Sewer	1.0	2.9
KR-6B	Kansas River WWTP	65	81
KR-6B	21-inch Sewer	4.0	9.4
WR-1	PS 09	8.6	11
WR-6	PS 5A/5B	15.5	24
WR-6	PS 5A/5B Force Mains	15.5	24

(1) Pumping station capacities shown are based on firm pumping capacities.

The existing system analysis was refined to incorporate three significant measures that will affect the existing collection system moving forward. This strategy assumes it is not necessary to otherwise address existing system problems that will be eliminated as a result of these measures. They are:

- Address pumping capacities for pumping stations the model predicts have inadequate firm pumping capacities (Pumping Station Nos. 5A/5B, 8, 9 and 32).
- Implementation of a rapid infiltration/inflow reduction program whose goal will be to reduce system infiltration/inflow rates by approximately 35% within the targeted area and be focused on the older portions of the collection system in close proximity to the KRWWTP. This program is further described in Technical Memorandum No. 4.
- Diversion of a portion of both dry and wet weather peak flows to the future Wakarusa Wastewater Treatment Plant by 2020.

Incorporating these measures results in a revised existing system analysis as shown in Figure ES-2.4.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PS#07
PS#06
PS#34
PS#5A
PS#19
PS#5B
PS#49
PS#23
PS#09
PS#31
PS#5C
PS#22
PS#32
PS#50
WWWTP
Legend
New Pump Station
New Force Main
New Sewer
Force Main
Pump Station
Pump Station Expansion
Sewers 8" and Smaller
Sewers Larger Than 8"
Surcharging
Master Planning Area
Rapid I&I Reduction Area
City Limits
Major Road
0 0.25 0.5 1 1.5 2 Miles
NORTH
FIGURE ES-2.4
REVISED EXISTING SYSTEM ANALYSIS

Technical Memorandum No. 3 addresses the forecast of future flows for planning years 2020 and 2030, which may further increase the required capacities of these and other parts of the existing collection system, such as Pumping Station No. 23. As such, improvements to address existing conditions are included in Technical Memorandum No. 3 in order to provide for the additional capacity that may be needed for the forecast of future flows. These improvements are scheduled early in the capital improvements program set forth in Technical Memorandum No. 5.

The following are included as appendices to Technical Memorandum No. 2:

- Appendix 2-A: Flow Meter Dry Weather Flows and Diurnal Curves
- Appendix 2-B: Peaking Factors
- Appendix 2-C: Model Plot and Data Summary

C. Technical Memorandum No. 3 – Future System Evaluation and Improvement Plan

Technical Memorandum No. 3 is a summary of the forecast and distribution of future wastewater flows for the planning years 2020 and 2030; the analysis of a flow-development "trigger" that will be used to guide the scheduling for planning, design and construction for the future Wakarusa Wastewater Treatment Plant (Wakarusa); and the analysis of wastewater collection facilities improvements needed to serve growth and development forecast for planning years 2020 and 2030 plus conveyance of flows to the future Wakarusa; all in partial fulfillment of the Lawrence, Kansas Wastewater Facilities Master Plan. The goals of this technical memorandum were to:

- Determine a flow-development trigger for the start of further planning and then design and construction of the future Wakarusa which will put the new Wakarusa in service before Kansas River Wastewater Treatment Plant (KRWWTP) flows or pollutant loadings reach its capacity.
- Modify the existing collection system computer hydraulic model to reflect the forecast of 2020 and 2030 growth and associated increases in wastewater flows within the existing service area, plus extensions of the service area.
- Develop a plan of improvements to the existing collection system to address current capacity deficiencies during the design storm wet weather event and accommodate projected 2020 and 2030 service area growth.
- Develop a plan to convey flows in excess of KRWWTP capacities to the future Wakarusa.

An analysis was performed to determine a suitable flow-development trigger for initiating further planning, design and construction of the future Wakarusa. The analysis is based on an appropriate time allowance to complete further planning, design and construction, plus time for a start-up phase of plant operation and a buffer to insure the KRWWTP capacities will not be reached before the new Wakarusa is in operation. It is also based on recent population and development growth trends. The recommended flow-development trigger is a utility service area population of 96,000. At current population growth trends, this would provide approximately 5 years to complete the planning, design and construction of the new Wakarusa and would have the new plant in operation a year or more before KRWWTP capacity would be exceeded.

Based on a flow-development trigger of 96,000 service area population and the forecast of utility service area population presented in TM-1, the future Wakarusa needs to be in operation by year 2018. As such, the 2020 and 2030 collection system plans include system improvements needed to convey a portion of the utility service area flows to the future Wakarusa.

The existing collection system computer hydraulic model was modified and extended to include additional growth and development forecast for 2020 and 2030 and the additional facilities needed to convey a portion of the utility service area flows to the future Wakarusa. The plans are based on maximizing utilization of the KRWWTP, thereby minimizing the initially constructed capacities of the future Wakarusa. Figure ES-3.1 depicts the recommended plan of improvements needed to address current collection system deficiencies identified in Technical Memorandum No. 2 and provide for utility service requirements projected for years 2020 and 2030. Table ES-3.1 provides a summary of the recommended improvements required for utility service requirements based on the forecast of utility service area population presented in TM-1 for years 2020 and 2030, and when each improvement is forecast to be needed.

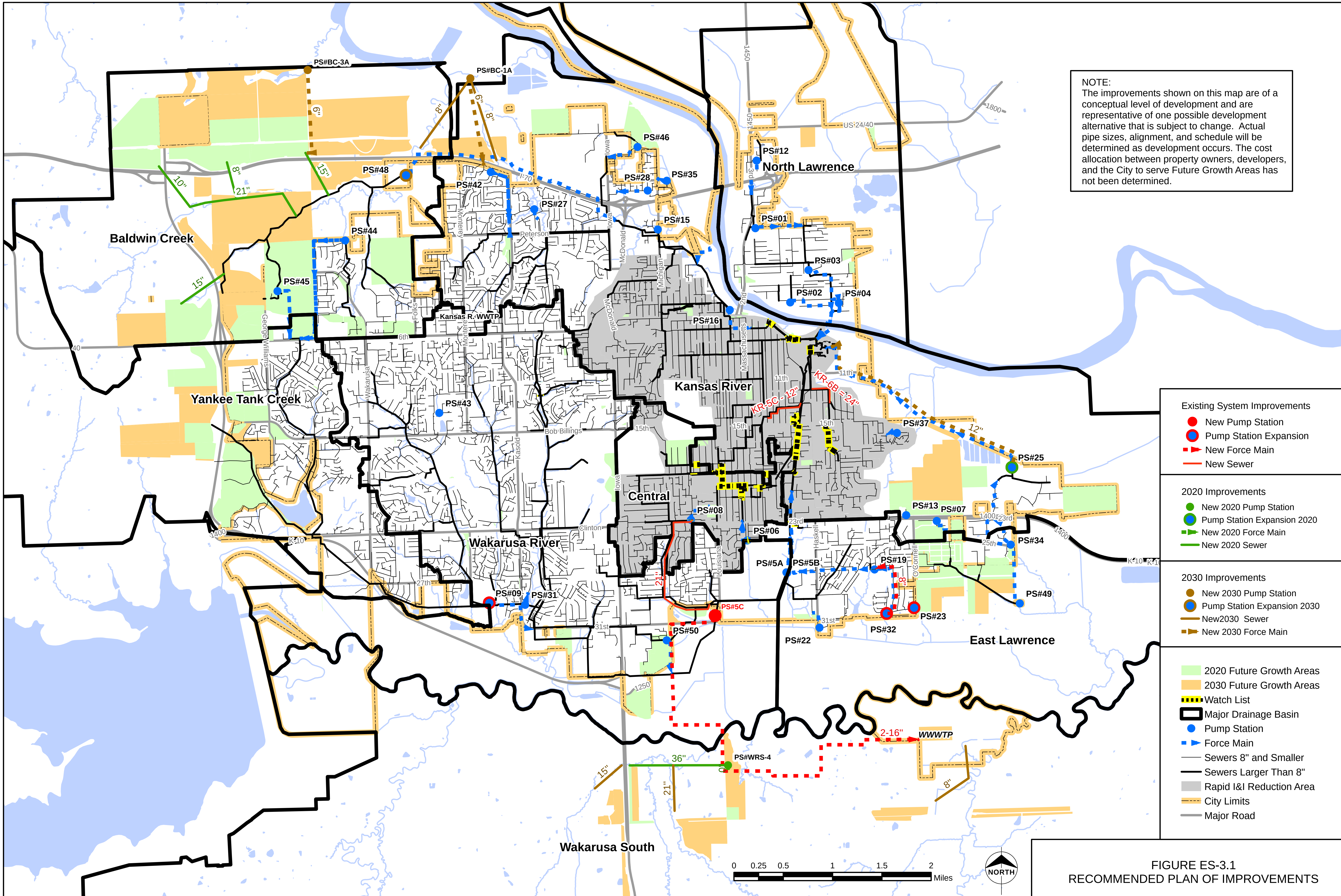

FIGURE ES-3.1
RECOMMENDED PLAN OF IMPROVEMENTS

Table ES-3.1

Summary of Recommended Improvements

Drainage Sub-Basin	Description	Existing Peak Capacity - MGD(1)	Design Storm Peak Flow -MGD			Year Needed
			2010	2020	2030	
(2)	Rapid I/I Reduction Program (1)	--	--	--	--	2016(2)
BC-1	Expand PS48 to 6.4 MGD	6.0	0.3	3.2	6.4	2030
C-2	Replace PS 08 with Gravity Sewer	2.9	6.1(3)	6.4(3)	6.6(3)	(4)
C-2	Replace PS 08 Force Main with Gravity Sewer	3.3	6.1(3)	6.4(3)	6.6(3)	(4)
EL-1	Expand PS 23 to 0.1 MGD	0.05	0.05	0.07	0.1	(4)
EL-1	Expand PS 32 to 1.7 MGD	0.7	1.1	1.7	1.7	(4)
EL-1	Parallel PS 32 Force Main	0.8	1.1	1.7	1.7	(4)
KR-5C	12-inch Relief Sewer	N/A	N/A	1.6(3)	1.6(3)	(4)
KR-6A	Expand PS 25 to 4.4 MGD	3.6	1.6	3.4	5.1	2020
KR-6A	Expand PS 25 to 6.0 MGD	3.6	1.6	3.4	5.1	2025(5)
KR-6B	24-inch Relief Sewer	N/A	N/A	4.2(3)	4.3(3)	(4)
WR-1	Expand PS 09 to 15 MGD	8.6	11	13	15	(4)
WR-6	New PS 5C to Wakarusa WWTP	N/A	8.5	10.5	10.5	2018
WR-6	New PS 5C Force Mains to Wakarusa WWTP	N/A	8.5	10.5	10.5	2018
WRS-3	New 2 MGD Wakarusa WWTP	N/A	N/A	2	2	2018
WRS-3	4 MG Storage at Wakarusa WWTP	N/A	N/A	N/A	N/A	2018

(1) Pumping station capacities shown are based on firm pumping capacities.

(2) As explained in further detail in TM-4.

(3) After completion of Rapid I/I Reduction Program

(4) As soon as funding will allow to provide capacity for design storm peak flow rate.

(5) Verify expanding PS 25 instead of directing PS 49 flow to future Wakarusa WWTP is preferred plan based on actual growth and development.

Based on the forecast of population growth within the projected utility service area and the resulting increases in wastewater flows predicted by the collection system hydraulic model, the initially constructed average dry weather flow capacity of the future Wakarusa necessary to provide sufficient wastewater treatment capacity through year 2030 is projected to be 2 MGD.

The following is included as an appendix to Technical Memorandum No. 3:

- Appendix 3-A - Minutes of September 22, 2010 meeting with the Kansas Department of Health and Environment

D. Technical Memorandum No. 4 – Wastewater Collection System Rehabilitation Plan

Technical Memorandum (TM) No. 4 was completed in partial fulfillment of the Lawrence, Kansas Wastewater Facilities Master Plan to develop the wastewater collection system rehabilitation plan and budgetary costs. The recommended scope and funding level of the rehabilitation plan is based on:

- The conclusions established by hydraulic modeling set forth in TM No. 2.
- An inventory of the wastewater collection system.
- Input from City Staff.

This TM sets forth an 18-year rehabilitation plan comprised of a higher priority Rapid I/I Reduction Program that addresses both public and private I/I sources in conjunction with a lower priority Clay Pipe and Manhole Rehabilitation Program that addresses the remainder of clay pipes and manhole rehabilitation throughout the system. The recommended funding level for the 18-year phased rehabilitation plan in 2012 dollars is summarized below in Table ES 4.1.

Table ES-4.1

18-Year Phased Rehabilitation Plan

Year	Rapid I/I Reduction Program	Clay Pipe and Manhole Rehabilitation Program	Annual Costs
1	$1,800,000	$400,000	$2,200,000
2	$2,515,000	$400,000	$2,915,000
3	$2,515,000	$400,000	$2,915,000
4	$2,515,000	$400,000	$2,915,000
5	$2,515,000	$400,000	$2,915,000
6	$2,515,000	$1,000,000	$3,515,000
7	$2,515,000	$3,000,000	$5,515,000
8	$2,510,000	$1,000,000	$3,510,000
9	$0	$4,000,000	$4,000,000
10	$0	$4,000,000	$4,000,000
11	$0	$0	$0
12	$0	$3,000,000	$3,000,000
13	$0	$3,000,000	$3,000,000
14	$0	$2,500,000	$2,500,000
15	$0	$2,500,000	$2,500,000
16	$0	$2,500,000	$2,500,000
17	$0	$2,500,000	$2,500,000
18	$0	$2,500,000	$2,500,000
Total			**$52,900,000**

E. Technical Memorandum No. 5 – Capital Improvements Program

Technical Memorandum (TM) No. 5 sets forth a program and schedule for capital improvements for the City's wastewater utility as recommended by this master plan. Improvements are needed for current utility service area requirements, for serving growth and development forecast to occur by years 2020 and 2030, and for addressing new regulatory actions expected to occur over the next 10 to 20 years. This TM sets forth a schedule for capital improvements based on a combination of priorities as follows:

- Improvements needed for meeting current capacity needs or regulatory requirements first, followed by those necessary for providing capacity for future growth and development.
- Implement improvements that will achieve the greatest benefit for the money spent first, followed by those having a lower benefit relative to cost.
- Implement improvements in a manner that is most affordable to the utility's rate payers.

Improvements are grouped into three justification categories – growth, regulatory, and reliability.

Opinions of probable project costs are based on construction and other cost allowances including contingency, engineering, surveying, legal, and other related costs and are summarized in Tables ES-5.1 and ES-5.2. Unit costs are based on an Engineering News Record Construction Cost Index (ENR-CCI) of 10,500 Kansas City, Missouri for February 2012.

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Table ES-5.1

Capital Improvements Program Summary - Existing System Improvements

Item	Reason for Improvement			2012 Cost Opinion		2013 (1)	2014 (1)	2015 (1)	2016 (1)	2017 (1)	2018 (1)	2019 (1)	2020 (1)	2021 (1)	2022 (1)	2023 (1)	2024 (1)	2025 (1)	5 Year Period Ending 2030 (1)
1 Collection System**																			
a PS 9 expansion to 14 MGD	1, 2			$ 2,300,000									$ 3,147,700						
b PS 32 expansion to 1.7 MGD, 8" force main	1, 2			$ 800,000		$ 832,000													
c PS 25 expansion to 4.4 MGD, Add 3rd Pump	1, 2			$ 150,000								$ 197,400							
d PS 25 expansion to 6 MGD, parallel 12" force main	1, 2			$ 1,440,000															$ 2,917,200
e 21" gravity sewer to eliminate PS 8	3			$ 3,500,000						$ 425,800	$ 4,002,800								
f KR-5C 12" relief sewer	3			$ 800,000						$ 973,300									
g KR-6B 24" relief sewer	3			$ 700,000							$ 885,700								
h PS 23 expansion to 0.1 MGD	1, 3			$ 200,000		$ 208,000													
i PS 48 expansion to 6.4 MGD	1			$ 300,000													$ 480,300		
j Baldwin Creek West of K-10 (BC-2) - Brink - (2)	1			$ 950,000		$ 988,000													
k Collection System Field Operations Building	3			$ 4,000,000										$ 5,693,200					
Subtotal				$ 15,140,000															
2 New 2 MGD Capacity Wakarusa WWTP																			
a Wastewater Treatment Plant	1, 2			$ 30,000,000		$ 2,184,000	$ 6,489,600	$ 10,686,200	$ 11,698,600	$ 2,920,000									
b Peak Flow Storage	1, 2			$ 6,000,000		$ 499,200		$ 2,249,700	$ 3,509,600	$ 632,700									
c Roads, Utilities	1, 2			$ 6,000,000		$ 499,200	$ 2,995,200	$ 3,125,000											
d New (Wakarusa) PS 5C, 2 - 16" force mains	1, 2			$ 12,700,000		$ 924,600	$ 5,408,000	$ 5,624,300	$ 2,118,600										
Subtotal				$ 54,700,000															
3 Kansas River WWTP																			
a Nutrient Removal	2			$ 9,000,000												$ 13,855,100			
b Co-generation & Backup Power	3			$ 1,000,000		$ 600,000	$ 481,600												
Subtotal				$ 10,000,000															
4 Collection System Rehabilitation Plan																			
a Rapid I/I Reduction Program	2, 3			$ 19,400,000		$ 1,872,000	$ 2,720,200	$ 2,829,000	$ 2,942,200	$ 3,059,900	$ 3,182,300	$ 3,309,600	$ 3,442,000						
b Clay Pipe and Manhole Rehabilitation Program	2, 3			$ 33,500,000		$ 416,000	$ 432,600	$ 449,900	$ 467,900	$ 486,700	$ 1,265,300	$ 3,947,800	$ 1,368,600	$ 5,693,200	$ 5,921,000	$ -	$ 4,803,100	$ 4,995,200	$ 25,322,700
Subtotal				$ 52,900,000															
5 Annual Maintenance																			
a Wastewater Treatment Plant: 2013 - 2020	3	300,000	8	$ 2,400,000		$ 300,000	$ 312,000	$ 324,500	$ 337,500	$ 351,000	$ 365,000	$ 379,600	$ 394,800						
b Wastewater Treatment Plant - 2 Plants: 2021 - 2030	3	600,000	10	$ 6,000,000										$ 600,000	$ 624,000	$ 649,000	$ 674,900	$ 701,900	$ 3,953,900
c Pump Stations: 2013 - 2030	3	100,000	18	$ 1,800,000		$ 100,000	$ 104,000	$ 108,200	$ 112,500	$ 117,000	$ 121,700	$ 126,500	$ 131,600	$ 136,900	$ 142,300	$ 148,000	$ 153,900	$ 160,100	$ 901,800
d Sewer Main Relocations for Road Projects: 2013 - 2030	1	300,000	18	$ 5,400,000		$ 300,000	$ 312,000	$ 324,500	$ 337,500	$ 351,000	$ 365,000	$ 379,600	$ 394,800	$ 410,600	$ 427,000	$ 444,100	$ 461,800	$ 480,300	$ 2,705,400
Subtotal				$ 15,600,000															
Total				**$ 148,340,000**		$ 9,723,000	$ 19,255,200	$ 25,721,300	$ 21,524,400	$ 9,317,400	$ 10,187,800	$ 8,340,500	$ 8,879,500	$ 12,533,900	$ 7,114,300	$ 15,096,200	$ 6,574,000	$ 6,337,500	$ 35,801,000

(1) - 4% Inflation Used to Calculate 2013 to 2030 Costs

(2) - Cost allocation between property owners, developers and the City to serve Future Growth Areas has not been determined.

** Development Related Growth Projects Are Not Included in CIP

2013 - 2020 Total	**$ 112,949,100**

Reason for Improvement

1- Growth

2 - Regulatory

3 - Reliability

Table ES-5.2

Capital Improvements Program Summary - Service to Future Growth Areas

Item	Reason for Improvement			2012 Cost Opinion		2013 (1)	2014 (1)	2015 (1)	2016 (1)	2017 (1)	2018 (1)	2019 (1)	2020 (1)	2021 (1)	2022 (1)	2023 (1)	2024 (1)	2025 (1)	5 Year Period Ending 2030 (1)
1 Collection System Growth Related Projects**																			
a Baldwin Creek North of I-70 (BC-3) - (2)	1			$ 3,800,000							$ 4,808,200								
b Wakarusa US 59 & 1100 Road (WR-5) - (2)	1			$ 3,500,000								$ 4,605,800							
c Baldwin Creek North of I-70 (BC-1A) - (2)	1			$ 2,600,000															$ 5,267,100
d Baldwin Creek North of I-70 (BC-3A) - (2)	1			$ 1,000,000															$ 2,025,800
e Wakarusa US 59 & 1100 Road (WR-3, 5, & 6) - (2)	1			$ 2,000,000														$ 3,330,100	
Subtotal				$ 12,900,000															
Total				**$ 12,900,000**		**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 4,808,200**	**$ 4,605,800**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 3,330,100**	**$ 7,292,900**

(1) - 4% Inflation Used to Calculate 2013 to 2030 Costs

(2) - Cost allocation between property owners, developers and the City to serve Future Growth Areas has not been determined.

** Development Related Growth Projects Are Not Included in CIP

Reason for Improvement

1- Growth

2 - Regulatory

3 - Reliability