City of Lawrence
UTILITIES

2015 Annual Progress Report
Integrated Municipal Wastewater Plan
Memorandum of Understanding

City of Lawrence KSS – Utilities Department
2015 Integrated Plan Report
Submitted – 3/25/16

I. Overview

On June 5, 2012, the Environmental Protection Agency (EPA) published its Integrated Stormwater and Wastewater Planning Approach Framework for the purpose of assisting "*municipalities on their critical paths to achieving the human health and water quality objectives of the Clean Water Act by identifying efficiencies in implementing requirements that arise from distinct wastewater and stormwater programs, including how to best prioritize capital investments*" (Framework).

In July 2012, in consultation with Burns & McDonnell and BG Consultants and following detailed assessment of wastewater infrastructure and future needs, the City of Lawrence, Kansas (City) developed its Integrated 2012 Wastewater Utilities Plan (Integrated Plan) detailing a scope and implementation schedule for infrastructure improvements, enhancements and expansion. The Integrated Plan addresses the City's wastewater capacity, management, operation and maintenance. It further contains an inflow and infiltration reduction program to correct sanitary sewer deficiencies on a prioritized, site-specific basis. In addition to the Integrated Plan, City staff prepared reports on water and wastewater capital improvement plan options and the revenue requirements, annual field maintenance operations, and the capital improvement program.

In January 2014, on advice from and in consultation with the Kansas Department of Health and Environment (KDHE) and following Integrated Plan modifications consistent with Framework goals, the City and KDHE executed a 20-year Memorandum of Understanding (MOU) providing for *inter alia*:

- Adoption of the Integrated Plan as the Initial Integrated Municipal Wastewater Planning document and core document for future modifications.

- Incorporation of the Integrated Plan into the NPDES Permits (Permits) for the Lawrence Kansas River Wastewater Treatment Plant (Kansas WWTP) and the Wakarusa River Wastewater Treatment Plant (Wakarusa WWTP), with provision for Integrated Plan review and modification at each five-year Permit renewal.

- An implementation schedule reflecting the parties' best estimate of improvement projects and respective start dates (Attachment 1).

- Annual City updates on Integrated Plan progress.

This Report provides information about Integrated Plan progress in 2015 and planned activities for 2016. The Report also contains updated information about MOU Attachment 1 and the Permits. The below-identified projects are contained in or responsive to Attachment 1. Work continues in 2016 for those projects still in progress, with new projects being identified on an ongoing basis through system assessment.

II. Progress Update

a. UT1304 Wakarusa WWTP and Conveyance Corridor (Attachment 1,Item 2)

- Project Description – Design and construction of the new Wakarusa River Wastewater Treatment Plant (Wakarusa WWTP), the new Pump Station 10, related force mains, and improvements to the existing Kansas River Wastewater Treatment Plant (Kansas River WWTP). This project provides a second wastewater treatment plant and enhanced operational flexibility, with pump station functionality to divert flows between treatment plants as needed to meet changing operational needs. The project provides for future community growth, meets the regulatory requirements for wet weather treatment and nutrient removal, and increases system reliability and resiliency in transporting and treating wastewater without negatively impacting the community or the environment.

- Project Details - In 2014, after eight years of planning, design and preliminary improvements, the project moved into construction phase. In addition to the contractors identified below, qualified department staff is performing various inspection services; designing the automation, integration and programming systems; installing pipeline; and acquiring various equipment both as cost-saving measures and for enhanced in-house operational knowledge of new infrastructure functionality. Recent progress is illustrated in the following timeline.

  July 2014 – June 2015 - Wakarusa WWTP site fill and access road improvements.

  September 2014 – December 2015 (substantial completion) - Force main construction connecting Pump Station 10 to the Wakarusa WWTP (approximately 15,600 feet each of 16-inch force main and 24-inch force main); fiber installation from the intersection of North 1250 and O'Connell Roads to Pump Station 10 (approximately 12,800 feet).

June 2015 – Ongoing - Wakarusa WWTP site construction. The first significant task was excavation for the biological nutrient removal (BNR) basin, final clarifiers and UV disinfection building. Formwork, rebar installation and concrete placement are underway on the below-grade slabs and walls in these areas. Installation of sanitary sewer, process piping and electrical ductbank began Fall 2015 and is in progress sitewide.

Fall 2015 – Summer 2016 – Kansas River WWTP improvements, with laboratory expansion construction started in Fall 2015 and final clarifier equipment replacement occurring in 2016.

Fall 2015 – Ongoing – Dewatering and excavation at Pump Station 10 site located at the northwest corner of 31st and Louisiana Streets, with station construction and pipe installation ongoing throughout 2016 and 2017.

- Design Engineer – Black & Veatch/PEC/Bartlett & West
- Construction – Garney Construction (Wakarusa WWTP, Pump Station 10, Kansas River WWTP Improvements), Kings Construction (Site Fill) and BRB (Force Mains)
- Status – Completion 2018
- Project Budget - $74.1 million ($11.2 million Design and Construction Phase Services; $13.6 million Site Fill and Force Main Contracts; $45.2 million for Wakarusa WWTP, Pump Station 10, and Kansas River WWTP Improvements; $600,000 Property Acquisition; $1.5 million Power/Gas Utility Infrastructure, and $2 million City-Provided Work and Materials)

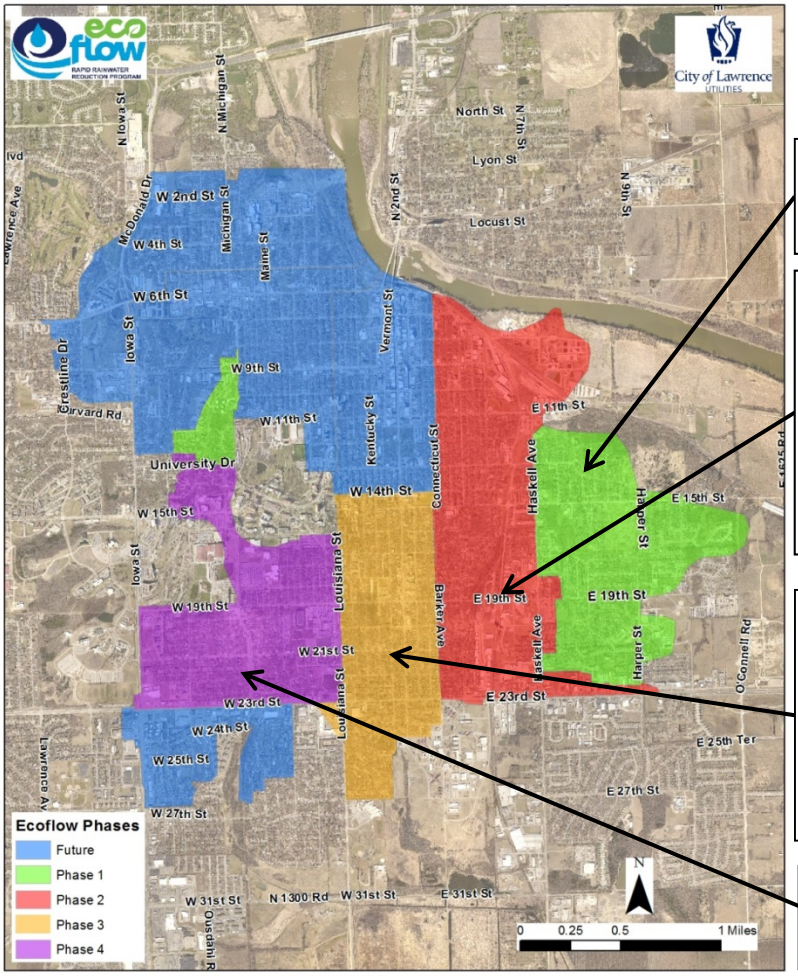
b. UT1305 Ecoflow Rapid Rainwater Reduction (Attachment 1, Item 4a)

- Project Description – Comprehensive, multiyear, multiphase, "find and fix" program to investigate and reduce rainwater entering the City's sanitary sewer system from public and private sources. Ecoflow targets discrete geographic areas inside City limits, with four Phase areas identified to date and phasing of the future areas based on data from ongoing flow monitoring. The map below shows 2015 activities and progress. Participant feedback continues to be overwhelmingly positive.

- Project Details –
  - Public source 2015 activities included 346 manhole inspections, approximately 220,000 linear feet of sanitary sewer smoke testing, and approximately 17,000 linear feet of closed-circuit television (CCTV) sewer inspections. Public sector sewer repairs included 18 sanitary sewer point repairs, 80 manholes and approximately 19,000 linear feet of cured-in-place pipe (CIPP) rehabilitation. Over 24,000 linear feet of sanitary sewer are identified for 2016 CIPP rehabilitation.
  - Private source 2015 activities included over 1,800 private property evaluations. Of the 600-plus defects identified in 2015 for repair, approximately 100 minor defects were repaired by department staff and 380 defects were repaired by an Ecoflow plumbing contractor.
  - An ongoing flow-monitoring component identifies sanitary sewer system areas needing repair to minimize the impact of wet weather flows. Data following 2015 repairs of targeted high-volume areas show an approximate 10% decrease in peak wet weather flow rates from 2014 to 2015, notwithstanding the significantly higher rainfall totals in 2015. For comparison purposes, the overall change in ground

conditions between 2014 and 2015 resulted in peak wet weather flow rates increasing approximately 20% on average for areas not yet targeted for repair.

- Design Engineer – TREKK Design Group
- Construction – 9 Pre-qualified Plumbing Contractors
- Status – Initial Program scope to complete 2020, with ongoing evaluation/correction of to-be-identified future areas.
- Project Budget - $19,400,000 (over the life of the project)



2015 Ecoflow Activities

PHASE 1
Completed
- Public Sector Repairs

PHASE 2
Completed
- Smoke Testing
- Private Property Investigations & Repairs
- Public Sector Investigations

Scheduled
- Public Sector Repairs

PHASE 3
Completed
- Smoke Testing

Ongoing
- Private Property Investigations & Repairs
- Public Sector Investigations

PHASE 4
Completed
- Smoke Testing

c. UT1424 CIPP Sewer Rehabilitation (Attachment 1, Item 4b)

- Project Description – Sewers are identified for rehabilitation through various assessment programs, including Ecoflow and tv inspection by city crews, based on such factors as existing defects, pipe age, pipe material, depth and ground conditions. The CIPP rehabilitation method lines the inside of old, vitrified clay pipe sanitary sewer mains – a more cost-effective rehabilitation method than open-trench excavation and replacement. For comparison purposes, project cost for an 8-inch sewer main rehabilitation has averaged $22.50 per foot compared to recent open-trench sewer replacement projects averaging over $300 per foot for 8-inch sewer main.
- Project Details – CIPP rehabilitation of approximately 40,175 linear feet of sanitary sewer and rehabilitation of 80 manholes in identified locations citywide.

- Design Engineer – City Staff
- Construction – SAK Construction, LLC
- Status – Completed 2015
- Project Cost - $1,095,913

d. UT1508 CIPP Sewer Rehabilitation – 2015 (Attachment 1, Item 4b)

- Project Description – Sewers are identified for rehabilitation through various assessment programs, including Ecoflow and tv inspection by city crews, based on such factors as existing defects, pipe age, pipe material, depth and ground conditions. The CIPP rehabilitation method lines the inside of old, vitrified clay pipe sanitary sewer mains – a more cost-effective rehabilitation method than open-trench excavation and replacement.
- Project Details – CIPP rehabilitation of approximately 43,000 linear feet of sanitary sewer in identified locations citywide.
- Design Engineer – City Staff
- Construction – SAK Construction, LLC
- Status –2015 Project in process; Estimated Completion 2016
- Project Cost - $1,500,000

III. Other Sanitary Sewer Projects Completed in 2015 or Underway

a. UT1205 – South Lawrence Trafficway Sanitary Sewer Relocations & Watermain Construction

- Project Description – Sanitary sewer and waterline relocations in conjunction with the construction of the South Lawrence Trafficway. Project was bid by KDOT and constructed by the SLT contractors for optimal coordination and efficiency.
- Project Details –Over 4,000 feet of 24-inch sanitary sewer was relocated along the South Lawrence Trafficway. Over 3,600 feet of new watermain was installed along 31st Street from Haskell Avenue to O'Connell Road and from Ousdahl Road to Louisiana Street.
- Design Engineer – HNTB
- Construction – Emery Sapp and Sons, Inc.
- Status – Utilities construction completed June 2015
- Project Cost - $3,139,120

b. UT1210 – Bob Billings Parkway Interchange Utility Relocations

- Project Description – Sanitary sewer and waterline relocations for KDOT Bob Billings Parkway Interchange construction.

- Project Details - Over 3,300 feet of sanitary sewer was relocated within the Interchange site. Waterline relocation included approximately 425 feet of new waterline to serve the Langston Heights Development.
- Design Engineer – Landplan Engineering
- Construction – King's Construction
- Status – Utilities construction completed November 2015
- Project Cost - $1,061,636 (including $430,960 paid by KDOT to the City or King's Construction directly)

c. UT1422 Kansas River WWTP Variable Frequency Drive Replacements

- Project Description – Replacement of variable frequency drives (VFD) installed on critical treatment process equipment helps ensure system reliability and functionality.
- Project Detail – Replacement of two VFDs, one for an inoperable VFD installed on one of the wastewater influent pumps and one for an aging VFD installed on a blower.
- Design Engineer – City Staff
- Construction – City Staff
- Status – Completion 2015
- Project Budget - $73,749

d. UT1506 –Pump Station 5 & Kansas River WWTP Primary Sludge Pump Station Coatings

- Project Description – Protective coatings applied to mechanical equipment and other structures prevent corrosion, maintain functionality, and extend useful life.
- Project Details – Protective coating applications to the interiors of and equipment in Pump Station 5 & Kansas River WWTP Primary Sludge Pump Station including walls, floors, stairs, pipes, pumps, and other appurtenances, with appropriate preparatory work.
- Design Engineer – City Staff
- Contractor – Performance Contracting Inc.
- Status – Completed December 2015
- Project Construction Cost - $86,176

e. UT1512 Water/Wastewater Treatment Plant VFD Replacements

- Project Description – Replacement of VFDs installed on critical treatment process equipment helps ensure system reliability and functionality.
- Project Detail – Replacement of aging VFDs installed at each of the following locations: Kansas River WWTP blower, Kansas River WWTP raw sewage pump and Kaw Water Treatment Plant low service pump.
- Design Engineer – City Staff
- Construction – City Staff
- Status – In Process; Project Completion 2016
- Project Budget - $109,020

f. UT1513 – Sanitary Sewer Replacement (Naismith Drive & Crescent Road)

- Project Description –Sewers in the project area have required significant maintenance efforts recently. Based on efforts to perform video inspection of the existing sewer running through the yard of 1501 Crescent Road, these sanitary sewer lines are in a deteriorated state and require replacement. The existing sewer lines running west from

the intersection of Naismith Drive and Crescent Road are 6-inch diameter vitrified clay pipe in service for over 60 years. They do not meet the current minimum 8-inch diameter criteria and are not suitable for rehabilitation using a CIPP liner system.

- Project Details – Rehabilitation or replacement of up to 1,700 linear feet of sanitary sewer mains generally located south of Crescent Road and north of the University of Kansas's Learned Hall.
- Design Engineer – BG Consultants
- Contractor – To be determined
- Status – Under Design
- Project Construction Cost - $300,000 (estimated)

IV. MOU Attachment 1 - Project Changes

a. <u>Deferred</u>
   1. Item 1(b) Pump Station 32 expansion to 1.7 MG, 8" force main: Following assessment, this item has been postponed to a to-be-determined date, with ongoing monitoring as needed.

b. <u>Modified/Clarified</u>
   1. Item 2(e) Kaw WWTP Lab Expansion: Item 2 is modified to include this item, which is part of the new Wakarusa WWTP improvements and under construction.
   2. Item 3(a) Nutrient Removal: Following assessment, this item has been separated into new Items 3(c) and (d) to provide for a proof of concept and modification.
   3. Item 3(c) Nutrient Removal/Deammonification Proof of Concept: This revised improvement item meets regulatory needs, with a projected start date of 2019 and 2016 cost opinion of $1,000,000.
   4. Item 3(d) Nutrient Removal/Deammonification Modification: This revised improvement item meets regulatory needs, with a projected start date of 2022 and 2016 cost opinion of $26,500,000.

c. <u>New</u>
   1. Item 1(l) Pump Station 49 to Wakarusa WWTP: This new improvement item meets growth and regulatory needs, with a projected start date of 2025 and 2016 cost opinion of $1,990,000.
   2. Item 1(m) Lower Yankee Tank Capacity: This new improvement item meets growth and reliability needs, with a projected start date of 2021 and 2016 cost opinion of $2,340,000.
   3. Item 1(n) Pump Station 16 Upstream Interceptor Rehabilitation: This new improvement item meets growth and reliability needs, with a projected start date of 2020 and 2016 cost opinion of $1,090,000.
   4. Item 3(e) Side Stream Treatment - Ammonia from Belt Press: This new improvement item meets regulatory needs for nutrient removal, with a projected start date of 2022 and 2016 cost opinion of $6,500,000.

V. NPDES Permit Status

a. Permit Background

Starting in 2004, the City's Utilities Department began using an enhanced high rate clarification (EHRC) process to mitigate sewage releases during wet weather through ACTIFLO, an auxiliary, chemical ballasted, treatment system. ACTIFLO-treated effluent is combined with effluent from the Kansas River WWTP activated sludge train prior to discharge. EHRC is a critical treatment process to prevent the discharge of raw sewage on wet weather days in which influent flows exceed the 25 million gallons per day (MGD) capacity of the Kansas River WWTP biological process.

KDHE reviews and renews the City's NPDES permits every five years. In 2008, KDHE drafted a revised permit as part of that renewal process. EPA objected to aspects of the KDHE draft permit based on their 2005 interpretation of blending. EPA contended that EHRC and Lawrence's practice of blending was a "bypass" and thus illegal, despite the lack of material change to related provisions in the 2008 permit when compared to permits for the prior ten years. In 2014, after six years of discussions with EPA, KDHE (with assistance from the National Association of Clean Water Agencies and City staff) proposed a compromise permit that allows EPA to keep its position that blending constitutes a bypass, while allowing Lawrence to contend it does not.[1] The Kansas River WWTP permit was then issued on August 1, 2014, followed by the Wakarusa River WWTP permit on September 1, 2014, with both Permits currently active and in force.

b. Integrated Plan Incorporation

Section (F) *Supplemental Information* of each Permit incorporates by reference the Integrated Plan and the MOU and further acknowledges the Integrated Plan's adoption as the initial Integrated Municipal Stormwater and Wastewater Planning document for wastewater system improvements. Using Integrated Plan principles, the Permits provide a coordinated, phased-in approach for future expansions, wet weather flows, and nutrient removal requirements. The Kansas WWTP Permit requires efforts to reduce nitrogen and phosphorus through mechanical methods and report the results to KDHE by February 1, 2017. The Wakarusa WWTP Permit outlines a phased-in approach for future plant expansion. The City was also required to complete a biota study on the Wakarusa River as the receiving stream for the Wakarusa WWTP effluent.

c. Permit Update

1. Efforts to study reduction of nitrogen and phosphorus at the Kansas WWTP through existing mechanical methods are underway, with collaborative input and review from Dr. Belinda Sturm, a KU professor and civil engineer whose research emphasis is water sustainability and resource recovery. A timely report will be provided to KDHE when completed.
2. The pre-discharge biota study required by the Wakarusa NPDES permit was completed December 2015, and the final report was submitted to KDHE January 2016.

[1] The Kansas River and Wakarusa Permits were both administratively extended during this period to allow for detailed discussion on EHRC, including an ACTIFLO demonstration and review of 10 years of performance data.

Attachment 1 (updated)

Memorandum of Understanding, Kansas Department of Health and Environment and the City of Lawrence, Kansas

	Item	Reason for Improvement Project	2016 Cost Opinion	Currently Projected Start Date *
1	**Collection System****			
a	PS 9 expansion to 14 MGD	1	$2,700,000	2020
b	PS 32 expansion to 1.7 MGD, 8" force main	1	$0	Not needed in foreseeable future, will monitor
c	PS 25 expansion to 4 MGD, Add 3rd Pump	1	$180,000	2019
d	PS 25 expansion to 6 MGD, parallel 12" force main	1	$1,690,000	2030
e	21" gravity sewer to eliminate PS 8	3	$4,100,000	2018
f	KR-5C 12" relief sewer	3	$940,000	2021
g	KR-6B 21" relief sewer	3	$820,000	2022
h	PS 23 submersible expansion to 0.1 MGD	1, 3	$360,000	2022
i	PS 48 expansion to 6.4 MGD	1	$360,000	2031
j	PS 04 Redundant Forcemain	2, 3	$1,644,000	Completed September 2014
k	Collection System Field Operations Building	3	$6,150,000	2017
l	PS 49 to Wakarusa WWTP	1, 2	$1,990,000	2025
m	Lower Yankee Tank Capacity	1, 3	$2,340,000	2021
n	PS 16 Upstream Interceptor Rehabilitation	1, 3	$1,090,000	2020
	Subtotal		**$24,364,000**	
2	**New 2.5 MGD Capacity Wakarusa WWTP**			
a	Wastewater Treatment Plant	1, 2	Combined project cost	Under construction
b	Peak Flow Storage	1, 2		Under construction
c	Roads, Utilities	1, 2		Under construction
d	New (Wakarusa) PS 10, 2 - 16" force mains	1, 2		PS 10 under construction, force mains substantially complete December 2015
e	Kaw WWTP Lab Expansion	1, 2		Under construction
	Subtotal		**$74,100,000**	
3	**Kansas River WWTP - Maintaining 12.5 MGD**			
a	Nutrient Removal	2	$0	Nutrient Removal now Pilot & Modification
b	Co-generation & Backup Power	3	$2,200	2014 - Not feasible/cost-effective
c	Nutrient Removal/Deammonification Proof of Concept	2	$1,000,000	2019
d	Nutrient Removal/Deammonification Modification	2	$26,500,000	2022
e	Side Stream Treatment - Ammonia from Belt Press	2	$6,500,000	2022
	Subtotal		**$34,002,200**	

Attachment 1 (updated)

Memorandum of Understanding, Kansas Department of Health and Environment and the City of Lawrence, Kansas

	Item	Reason for Improvement Project	2016 Cost Opinion	Currently Projected Start Date *
4	**Collection System Rehabilitation Plan**			
a	Rapid I/I Reduction Program	2, 3	$12,575,000	2013 & Ongoing (annual expenditures)
b	Clay Pipe and Manhole Rehabilitation Program	2, 3	$42,120,000	2013 & Ongoing (annual expenditures)
	Subtotal		**$54,695,000**	
	Combined Total		**$187,161,200**	

* Parties Best Projection for Start of Design or Construction

** Development Related Growth Projects Are Not Included in CIP

Reason for Improvement Project

1- Growth

2 - Regulatory

3 - Reliability