



# City of Lawrence

## 2019 Annual Progress Report Integrated Municipal Wastewater Plan Memorandum of Understanding

Prepared by Municipal Services & Operations  
Environment, Health and Science  
March 31, 2020

## 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 2019 and planned activities for 2020. The Report also contains updated information about MOU Attachment 1 and Permits. The below-identified projects are contained in or responsive to Attachment 1. Work continues in 2019 for those projects still in progress, with new projects being identified on an ongoing basis through system assessment.

Between 2014 and 2016 the City of Lawrence completed sanitary sewer flow monitoring and data analysis at 11 locations around the University of Kansas (KU) campus to define the existing base, inflow and infiltration flow rates into the City’s sanitary sewer system. Since it is impractical to perform flow monitoring at all 38 KU connections to the City’s system, the 11 flow monitors isolated approximately 60% of KU’s service area into 9 basins with varying development age and pipe material. Results from the data analysis showed wet weather flow rates that ranged from

similar to the City system in the Western Districts to as much as 4 times higher in the North District. Flow monitoring results were shared with KU each year, extrapolated across all of KU's service area. KU used the results to develop and prioritize a phased sanitary sewer collection system inspection, rehabilitation, and improvement program. A program summary and timeline are discussed in Section IV.

City of Lawrence Municipal Services and Operations (MSO) include Stormwater management and Farmland Remediation operations. In the near future, the City of Lawrence intends to pursue inclusion of many regulatory environmental requirements into the Integrated Plan and under a common management system. This would include pertinent legal requirements for all City held permits and legal responsibilities related to the Farmland Remediation project as well as MS4 Stormwater permits and plans. It is anticipated that the current Integrated Plan's MOU and associated permits will need modification over time. Additional information is contained in Section V and VI.

## **II. Progress Update**

### **A. UT1892CIP Naismith Valley Interceptor and Pump Station 8 Abandonment**



- Project Description – The Naismith Valley Interceptor and Pump Station 8 (PS 8) Abandonment project includes construction of a gravity sewer to intercept flows currently entering PS 8 and convey them south to Pump Station 10 (PS 10). The project also includes abandonment of PS 8 and associated piping located at 2233 Alabama St. Abandonment of PS 8 was identified and recommended in the 2003 Wastewater Master

Plan, a 2006 CIP Project Evaluation, and the 2012 Wastewater Master Plan. The combination of an aging PS 8, capacity restrictions, and construction of the Wakarusa River Wastewater Treatment Plant warrants the need to intercept PS 8 flows and convey them south to the Lower Naismith Valley Interceptor, PS 10, and the Wakarusa WWTP.

- Project Details – The Naismith Valley Interceptor project will install approximately 6,000 linear feet of 15-inch to 36-inch Interceptor sewer and abandon existing Pump Station 8.
- Design Engineer – Black & Veatch
- Contractor – To Be Determined
- Status – Design Phase, Construction Phase expected to start in Fall 2020
- Project Cost - \$450,000 for design in the 2018 CIP and \$4,160,000 in the 2019 CIP moved to 2020

## **B. MS-20-0004 Field Operations Facility**

- Project Description – The City Field Operations Facility project includes the design and construction of a new facility to house City field staff, equipment, and inventory.
- Project Details – The City issued a Request for Proposals (RFP) in 2019 for preliminary and conceptual design of a new City Field Operations Facility. An extensive selection process resulted in an agreement with the Dake Wells consultant team for conceptual design of a new facility at the City-owned Farmland site. Completion of the conceptual design is expected in fall of 2020.
- Design Engineer – Dake Wells Architecture
- Contractor – To Be Determined
- Status – Preliminary Design and Concept Phase, Design Phase expected to start in Fall 2020, Construction Phase expected to start in Fall 2021
- Project Cost - \$580,000 for preliminary design and concept phase, \$3,980,000 in the 2020 CIP, future funding requirements to be determined.

## **C. 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 six Phase areas identified to date and phasing of the future areas based on data from ongoing flow monitoring. Public feedback and participation rates continues to be overwhelmingly positive.
- Project Details – Public sector investigation activities completed in 2017 included 264 manhole inspections and approximately 16,000 linear feet of closed-circuit television (CCTV) sewer inspections. Completed public sector sewer repairs included 42 sanitary sewer point repairs, and approximately 10,000 linear feet of cured-in-place pipe (CIPP) rehabilitation. An additional 29,000 linear feet of sanitary sewer is currently under contract to install CIPP in this area as part of the larger Citywide project UT1705. Private sector activities completed in 2017 included over 1,000 private property evaluations. Of the approximately 550 defects identified, department staff repaired approximately 50 minor defects and EcoFlow plumbing contractors repaired 309 defects. Private sector investigations are planned to continue throughout 2020.

- Design Engineer – TREKK Design Group
- Construction – Seven Pre-qualified Plumbing Contractors & City Staff
- 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) (Completed - \$7,138,000)

**D. Clay Pipe and Manhole Rehabilitation Program Projects  
(Attachment 1, Item 4b)**

**UT1902 Burrough's Creek Trail Sanitary Sewer Interceptor Rehabilitation Project**

- Project Description – Complete heavy root and debris removal and CIPP installation in approximately 5,800 linear feet of 24" sanitary interceptor sewer.
- Project Details – In the fall of 2018, City staff identified prolonged surcharging and low flow velocity in sections of the 24" diameter VCP Burrough's Creek Interceptor. Due to high flow depths, CCTV investigation and cleaning operations were not successful. In December of 2018, planned flow diversion associated with a separate project allowed significant portions of the interceptor to be inspected. These CCTV inspections showed large root balls had formed throughout the interceptor and some structural degradation in the 1950s vintage VCP. Several root masses were blocking up to 90% of the pipe capacity. City staff was not able to remove the root masses at that time. A parallel 30" interceptor was providing enough conveyance capacity where no SSO had occurred. Starting in spring 2019, Visu-Sewer Inc. began heavy root and debris removal. CIPP rehabilitation of approximately 5,500 linear feet of 24" diameter sanitary sewer was completed by September 2019.
- Design Engineer – City Staff
- Construction – Visu-Sewer Inc.
- Status – Project Completed in October 2019
- Project Cost - \$648,000 (Total)





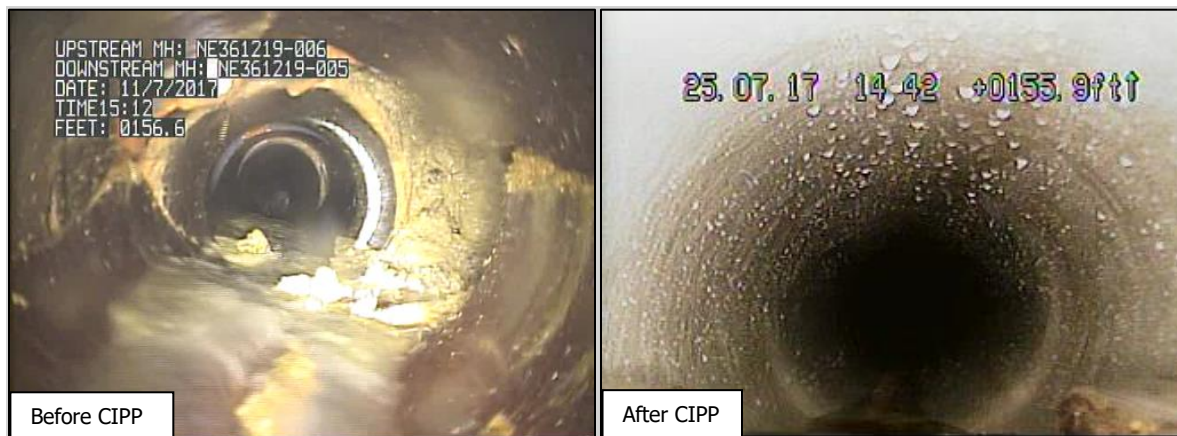
## MS-19-9908-2 Emergency Sanitary Sewer Repair - 951 Arkansas St

- Project Description: On November 26, 2019, MSO staff began investigating a sanitary sewer manhole undermined by stream erosion between apartment complexes at 951 Arkansas Street and 1000 Emery Road. Upon further investigation, staff determined that the manhole had settled, causing the sewer pipe immediately upstream to fracture. Wastewater was actively discharging into the adjacent surface stream through the pipe fracture. The destabilized manhole and adjoining sewer pipes were in peril of failure.
- Project Details – The project team reviewed several options and agreed realigning the sanitary sewer away from the stream was the best solution. Although this solution fulfilled the lowest cost of ownership for this infrastructure, it required permanent easement acquisition and reconnecting a private service lateral to a different location. On November 27, 2019, the project team stopped the ongoing discharge of sewage into the surface stream by installing a smaller pipe through the larger 12-inch diameter fractured sewer. This measure was an effective method for stopping the discharge but reduced the capacity of the sewer. Additional actions completed included notification of the sewage discharge to regulatory agencies, notifying the adjoining property owners, ordering materials, and mobilizing equipment to the planned work area. On December 2, 2019, MSO engineering staff worked with the City Attorney’s Office preparing and executing access and cooperation agreements with affected property owners. RD Johnson worked with MSO field and inspection staff to remove low-hanging trees and pothole existing infrastructure. Installing sewer pipe along the new sewer alignment will began on December 5, 2019. The project team installed new sewer, manholes, and private sewer connections within two weeks.
- Design/Build Team: City Staff (Design Engineer), GBA (stream geomorphology), RD Johnson Excavating (Contractor)
- Status – New Sewer Installation Completed January 2020. Restoration to be completed April 2020
- Project Budget - \$250,000



### UT1807 2018 Sanitary Sewer CIPP Sewer Rehabilitation

- Project Description – Sewers are identified for rehabilitation through various assessment programs, including EcoFlow and CCTV 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 61,000 linear feet of sanitary sewer ranging in size between 8 inches and 15 inches in diameter. A total of 66 public sector point repairs were completed on the sewers associated with this project. The project area is throughout the City with a focus on Phase 4 of the Rapid I/I Reduction Program.
- Design Engineer – City Staff
- Construction – SAK Construction (CIPP Installation) and Vito's Plumbing (Point Repairs)
- Status – Completed July 2019
- Project Budget - \$2,213,000 (Total), \$545,000 (Point Repairs), \$1,668,000 (CIPP)



### UT1710 Manhole Rehabilitation Project

- Project Description – This project included the rehabilitation of approximately 340 sanitary sewer manhole. The project area was throughout the City with a focus on Phase 2 and Phase 3 of the Rapid I/I Reduction Program. The rehabilitation methods included cementitious lining, epoxy lining, cured-in-place manhole lining, chemical grouting, frame/cover replacement, and frame/cover realignment. The goals of the project were to reduce the amount of rain and groundwater entering the sanitary sewer system through identified manhole defects and to protect the Burroughs Creek and other large sanitary interceptor manholes from hydrogen sulfide deterioration.
- Design Engineer – City Staff
- Contractor – Utility Solutions LLC
- Status – Completed March 2019. Ongoing warranty issue related to failing epoxy liner identified in Fall 2019. Contractor and material supplier working on resolution plan in 2020.
- Project Cost - \$572,000

### **UT1803 20<sup>th</sup> and Kasold Drive Sanitary Sewer Replacement Project**

- Project Description – Replacement of approximately 911 linear feet of 8 inch diameter VCP sanitary sewer with combination of pipe bursting and open trench construction.
- Design Engineer – BG Consultants
- Contractor – Kissick Construction Co., Inc.
- Status – Completed December 2019
- Project Budget - \$149,000 (Total), \$118,500 (Construction), \$30,500 (Design and Property Acquisition)

### **III. Other Sanitary Sewer and Stormwater Projects Completed in 2018 and Underway**

#### **PW1502 (PW17E6CIP) E. 9<sup>th</sup> Street, New Hampshire Street to Pennsylvania Street, Street, Sidewalk & Storm Sewer Improvements**

- Project Description – Complete road reconstruction of E. 9<sup>th</sup> Street from New Hampshire Street to Pennsylvania Street, placement of 474 feet of 15-inch diameter reinforced concrete pipe (RCP). 222 feet of 18" RCP, 230 feet of 24" RCP, 524 feet of 54" RCP and 216 feet of 68" x48" reinforced concrete pipe horizontal elliptical
- Design Engineer – Bartlett & West
- Contractor – Pavers Inc.
- Status – Construction completed November 2018
- Project Budget – approximately \$2,2 million

#### **PW1927 (PW18S1CIP) Naismith Channel Repairs**

- Project Description – Replacement of all concrete slope protection along the Naismith open channel ditch between 20<sup>th</sup> Street and 23<sup>rd</sup> Street. Repair of the flow line of the corrugated metal pipe under 23<sup>rd</sup> Street.
- Design Engineer – MSO Engineering Department
- Contractor – Wildcat Construction Inc.
- Status – Construction in progress. Estimated completion April 30, 2020.
- Project Budget – approximate \$1.05 million

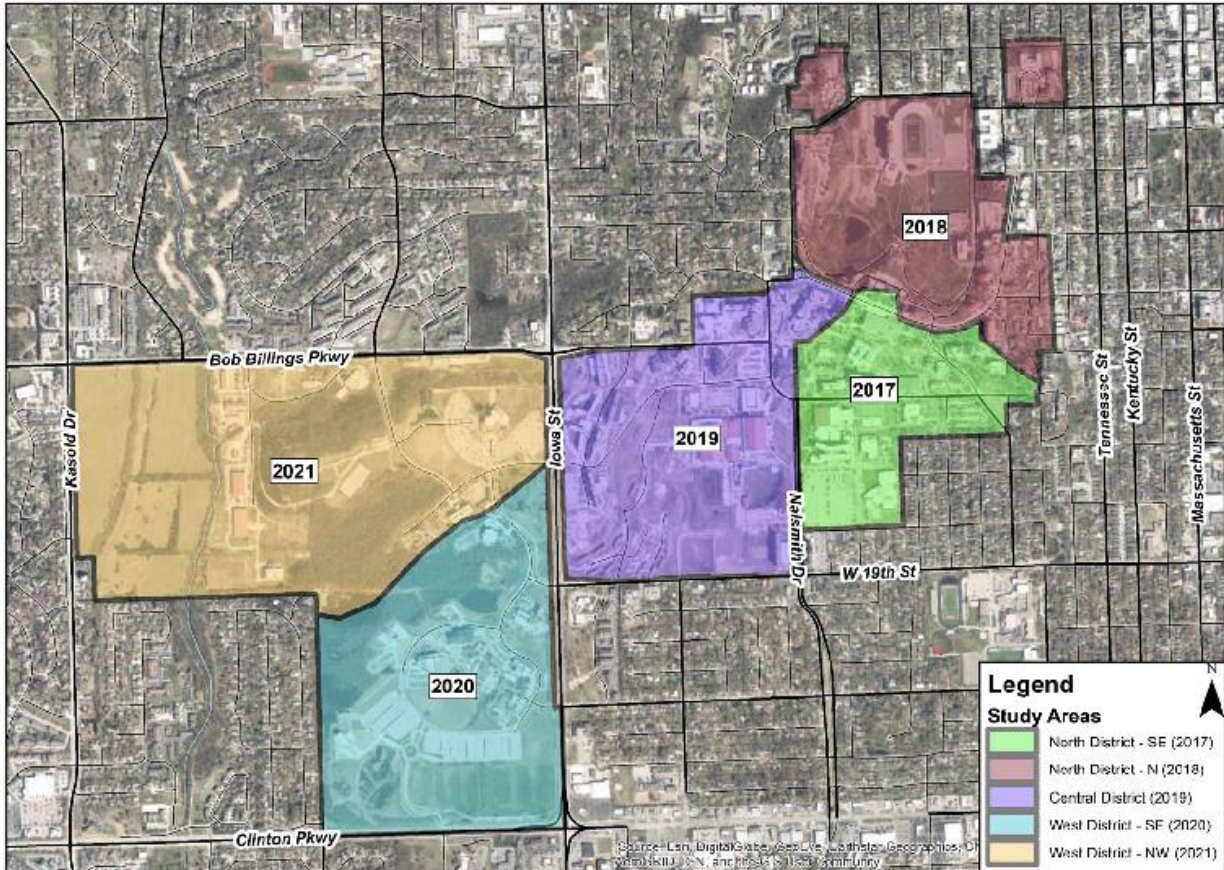
#### **UT1808 Kansas River WWTP Bar Screens Replacement Project**

- Project Description – Replacement of existing mechanically cleaned bar screens, installment of new screens, washer/compactor and screw conveyor in the existing Influent Pumping Station.
- Design Engineer – Black & Veatch Corporation
- Contractor – Garney Companies
- Status – Anticipated Final Completion in May 2020
- Project Budget - \$2,100,000



#### IV. University of Kansas Sewer Rehabilitation Project

 Figure 1: Preliminary Sewersheds



- **Project Description** – The University of Kansas (KU) has initiated a 5-year recurring program in which 20% of the University’s sanitary sewer collection system will be cleaned and inspected each year. At the conclusion of each study phase, recommendations for improvements are to be made and designs developed for implementation the following summer in an “identify – design – fix” procedure. At the end of the 5th year, it is anticipated that 100% of the University’s collection system will have been cleaned and inspected. The program will then begin repeating in its 6th year.
- **Project Details** – At the start of 2019 engineering investigations had identified a backlog of approximately \$600k in sanitary sewer repair projects on the KU campus. Based on this backlog and funding limitations, KU elected to delay the third year of engineering investigation and use all available funding for repairs. Approximately \$226k in repairs were completed in 2019 including line and manhole replacement and rehabilitation work. KU is finalizing contracts for an estimated \$375k in sanitary sewer repairs and improvements for implementation during summer 2020. The 2020 work will include rehabilitation/replacement of the sanitary sewer main in 14th street from west of Jayhawk Blvd to MH SW311220-380 and rehabilitation of the sanitary sewer in Louisiana Street between 13th and 14th streets. KU has contracted with Professional Engineering Consultants for the third phase of engineering investigation which will complete our review

of the sanitary sewer system in the North and Central Districts (formerly known as Main Campus).

- Design Engineer – PEC
- Contractor – PEC, Kissick Construction
- Status – KU is finalizing contracts for an estimated \$375k in sanitary sewer repairs and improvements for implementation during summer 2020. The 2020 work will include rehabilitation/replacement of the sanitary sewer main in 14th street from west of Jayhawk Blvd to MH SW311220-380 and rehabilitation of the sanitary sewer in Louisiana Street between 13th and 14th streets. KU has contracted with Professional Engineering Consultants for the third phase of engineering investigation which will complete our review of the sanitary sewer system in the North and Central Districts (formerly known as Main Campus).

## **V. FL1701 Farmland Remediation**



- Project Description – Site improvements and updated remediation efforts for the Farmland remediation area. The scope of the project is to provide a comprehensive solution to the current nitrogen rich groundwater on the former Farmland Fertilizer Plant site and outline the capital cost, environmental impact, and long term operational costs for proposed remediation systems. Interim site updates have been implemented in-house to ensure the current remedial action plan is functional until a new plan is developed.
- Project Details – This project’s aim is to develop a new remediation strategy for groundwater impacted by nitrogenous compounds due to the operation of the former Farmland fertilizer plant. Due to variable nitrate and ammonia concentrations in the collected water, increases in the volume of contaminated water collected, changes of ownership in the properties participating in the land application program, and lack of infrastructure to expand the land application program, the Municipal Services & Operations Department opted to contract with a qualified consultant in 2018 to develop a new long term remediation plan. The new plan will be either supplemental to the current land application system, or replace it completely with a more efficient, sustainable solution.

*Remediation Plan Development* – Phase one of this effort, approved by the City Commission on April 3, 2018, includes professional services related to site study, analysis of alternative remediation strategies and regulatory approvals for alternative strategies prepared by the selected firm, GHD Inc. The project scope includes data review, existing remediation systems evaluation, remediation alternative evaluation and recommendation, and community engagement.

Staff and GHD have worked continuously to produce a remediation alternative report that may be presented to the Kansas Department of Health and Environment (KDHE). During 2019, a data gap analysis was completed to address gaps in historical data that has been collected at the site and to improve the conceptual site model. Following the completion of this study, GHD and the City have worked to prepare a list of remedial alternatives that may be considered for implementation.

The remedial alternatives analysis will be presented to KDHE in early 2020. Following KDHE’s review and approval of this report, pilot studies will be performed in order to design an adequate remediation system to address the nitrogen laden groundwater.

- Design Engineer – City Staff/GHD
- Contractor – City Staff/TBD (after remediation alternative is approved by KDHE)
- Status – Ongoing
- Project Budget - \$875,000 for capital improvement on site



## **VI. NPDES Permit Status**

### a. Permit Background

#### Kansas River Wastewater Treatment Plant



Starting in 2004, the City's Utilities Department (now MSO) 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.<sup>1</sup> 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 recently reissued in 2019.

A new permit was issued and took effect on August, 1, 2019. The current permit contains a Schedule of Compliance (SOC) as the result of the completion and EPA approval of a Total Phosphorus Total Maximum Daily Load (TMDL) on the Kansas River, which took effect on December 15, 2017. The SOC requires the City to complete the following to meet the assigned Total Phosphorus wasteload allocations in the TMDL:

- Nutrient Removal Pilot Study due to KDHE by June 30, 2021
- Final Plans and Specifications due to KDHE by January 1, 31, 2022
- Begin Construction Upgrades by July 31, 2022
- Achiever compliance with permit final limits by July 31, 2024

Representatives from the City of Lawrence met with KDHE Bureau of Water staff in August of 2019 to discuss updates to the Integrated Plan. It was agreed that the City of Lawrence will complete the Nutrient Pilot Study and then schedule a second meeting with KDHE to discuss Integrated Planning updates and the timeframe necessary to sequence affordable upgrades to the Kansas WWTP. The final limitation to be achieved by the end of this permit cycle for Total Phosphorus is an annual rolling average of  $\leq 104.4$  lbs/day. A Request for Proposal (RFP) to conduct the Nutrient Pilot Study will be issued in early 2020.

#### Wakarusa Wastewater Treatment Plant

The original permit for the Wakarusa WWTP was issued in 2007, prior to construction of the facility. The Wakarusa WWTP first began operations and discharges to the Wakarusa River in March of 2018. The permit was renewed in 2019 with an effective date of September 1, 2019. The permit details the current description of the facility (Phase I)

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<sup>1</sup> 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.



and includes a future description of the facility once the plant is expanded with a second treatment train (Phase II). The permit includes a SOC that requires the City complete a post-plant start up Biota study after two years of operation, but before three years. With operations beginning in March of 2018, the study should commence sometime after March 2020, but before March 2021. The City of Lawrence is proposing a two year study to be completed by the Kansas Biological Survey that will be initiated in April of 2020 to meet the requirements of the SOC. With the issuance of the Kansas River Total Phosphorus TMDL, the new permit contains a limitation of  $\leq 58.5$  lbs/day of Total Phosphorus, calculated as an annual rolling average.

#### Stormwater Permit

The City's original Municipal Separate Storm Sewer System (MS4) Permit became effective on October 1, 2004. The City of Lawrence is a Phase II Community as designated by the National Pollutant Discharge Elimination System (NPDES). 2019 represented the City's fifteenth permitted year. The most recent permit was issued by the Kansas Department of Health and Environment (KDHE) and became effective December 1, 2019. The new permit has significant revisions with multiple options to pursue permit compliance through the implementation of various Best Management Practices (BMPs) detailed in the permit. The City provided KDHE comments regarding the permit during the public comment and notice period. KDHE was receptive to the majority of the comments and made revisions prior to issuing the final permit. The City will be updating the Stormwater Management Plan in 2020, which is required to be completed as part of the new permit by February 28, 2021.

#### Farmland

The City of Lawrence acquired the 467-acre former Farmland Industries site in 2010, with a commitment to manage nitrogen-laden water on the property. The primary contaminants of concern are nitrate and ammonia. These contaminants are elevated in groundwater, soil, sediments, and surface and storm water. To staff's knowledge, a National Pollutant Discharge Elimination System (NPDES) permit has been maintained for this site since 1972. The current permit took effect on April 1, 2017 and expires on November 30, 2021. The City of Lawrence has been working with a contractor and the Bureau of Environmental Remediation on identifying the best options for remediation at this site. A report detailing remediation alternatives to consider will be finalized by a contractor and submitted to the City and KDHE in the first part of 2020. The City of Lawrence will include consideration for sequencing future Farmland efforts into the forthcoming 2020 Integrated Plan revisions.

## **VII. MOU Attachment 1 - Project Changes**

- a. Modified/Clarified
  1. All items were updated to 2019 Cost Opinion.
- b. Projected modifications to the MOU attachment are under evaluation for 2021.

**Attachment 1 (updated)**

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

	<b>Item</b>	<b>Reason for Improvement Project</b>	<b>2019 Cost Opinion</b>	<b>Currently Projected Start Date *</b>
<b>1</b>	<b>Collection System**</b>			
a	PS 9 expansion to 15 MG (2)	1, 3	\$3,280,000	2021
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 MG, Add 3rd Pump (2)	1	\$260,000	2025
d	PS 25 expansion to 6 MG, parallel 12" force main (2)	1	\$2,920,000	2030
e	21" gravity sewer to eliminate PS 8	3	\$4,610,000	2018
f	KR-5C 12" relief sewer	3	\$1,390,000	2026
g	KR-6B 21" relief sewer	3	\$1,270,000	2027
h	PS 23 submersible expansion to 0.1 MGD	1, 3	\$0	Not needed in foreseeable future, will monitor
i	PS 48 expansion to 6.4 MGD (2)	1	\$640,000	2031
j	PS 04 Redundant Forcemain ***	2, 3	\$1,644,000	Completed September 2014
k	Field Operations Building	3	\$7,150,000	2019
l	PS 49 to Wakarusa WWTP	1, 2	\$2,850,000	2025
m	Lower Yankee Tank Capacity - YTC-1-1 (2)	1	\$8,650,000	2022
n	PS 16 Upstream Interceptor Rehabilitation	1, 3	\$1,320,000	2021
o	PS 9 Forcemain to PS 10	1, 3	\$6,330,000	2021
<b>Subtotal</b>			<b>\$42,314,000</b>	
<b>2</b>	<b>Wakarusa WWTP</b>			
a	Wakarusa Expansion to 5MGD	1, 2	\$26,850,000	2030
<b>Subtotal</b>			<b>\$26,850,000</b>	
<b>3</b>	<b>Kansas River WWTP - Maintaining 12.5 MGD</b>			
a	Nutrient Removal/Deammonification Pilot	2	\$610,000	2020
b	Nutrient Removal/Deammonification Modification	2	\$36,610,000	2022
c	Side Stream Treatment - Ammonia from Belt Press	2	\$9,010,000	2022

<b>Subtotal</b>			<b>\$46,230,000</b>	
<b>4</b>	<b>Collection System Rehabilitation Plan</b>			
a	Rapid I/I Reduction Program	2, 3	\$56,610,000	2013 & Ongoing (annual expenditures)
b	Clay Pipe and Manhole Rehabilitation Program	2, 3	\$22,600,000	2013 & Ongoing (annual expenditures)
<b>Subtotal</b>			<b>\$79,210,000</b>	
<b>Combined Total</b>			<b>\$194,604,000</b>	<b>0</b>

- \* Parties' Best Projection for Start of Design or Construction
- \*\* Development Related Growth Projects Are Not Included in CIP
- \*\*\* Actual Cost
- Reason for Improvement Project
- 1 - Growth
- 2 - Regulatory
- 3 - Reliability