



## 2.0 Required Collection System Improvements

This section describes the significant wastewater collection system improvements as they relate to the differences between Alternatives 1, 2, and 3. This evaluation compares only the collection system differences between alternatives and does not consider the total scope of improvements required for the study area that are equivalent for each alternative. In subsequent figures herein, the collection system differences used for cost comparison are shown in red and collection system facilities that are equivalent for each alternative are shown in green or black. All alternatives are based on maintaining the Alabama Pumping Station and not diverting this flow south to the Wakarusa Pumping Stations.

### 2.1 Alternative 1 – All Flow to Existing Kansas River WWTP

Collection system improvements required for Alternative 1 – All Flow to Existing Kansas River WWTP are shown in Figure II-1. Major new facility improvements used for differential cost comparison include the following:

#### New Facilities to Convey West Lawrence Flow

- 31st Street Relief Sewer (Kasold Street to Louisiana Street)
- Wakarusa Pumping Station 5C (Wet weather pumping station only)
- Wakarusa Pumping Station 5C Force Main (Wet weather force main only)

The 31st Street Relief Sewer would require difficult construction down an existing developed street. Wakarusa Pumping Station 5C (PS-5C) would have a firm capacity of 10.0 mgd and would serve as a wet-weather pumping station when the capacity of Wakarusa Pumping Stations 5A & 5B are exceeded. Site location requirements for this pumping station would be significant as it would be located near 31st Street and Louisiana Street adjacent to the Baker Wetlands, Haskell Indian Nations University, and the proposed South Lawrence Trafficway. As shown on Figure II-1, route location requirements for the 24-inch and 36-inch force main for Pumping Station 5C would also be significant as the alignment would be in the congested street routes of Louisiana Street, 23rd Street, and Haskell Avenue. The force main must be increased in size to 36-inches along Haskell Avenue from 23rd Street to the Kansas River WWTP to account for the additional flow from the force main serving areas south of the Wakarusa River. The 36-inch force main would have a downhill slope from 23rd Street to the Kansas River WWTP.

The 24-inch force main should not be routed along 31st Street between Louisiana Street and Haskell Avenue because Douglas County does not have right-of-way for the road in this area. The county only has a road easement which will revert back to Haskell Indian Nations University if 31st Street is relocated with the South Lawrence Trafficway extension.



Figure II-1 Alternative 1 Wastewater Flows to Kansas WWTP (242 KB PDF)



### New Facilities to Convey South Wakarusa Flow

- Wakarusa South Interceptor Sewer (Parallel to Wakarusa River)
- Wakarusa South Pumping Stations WRS-1 & WRS-2
- Wakarusa South Pumping Station Force Mains (Convey to PS-5C force main)

As shown in Figure II-1, a new interceptor sewer is required south of the Wakarusa River from Kasold Street to Louisiana Street to collect flow from trunk sewers (shown in green) in the Wakarusa South watershed. The interceptor sewer would range in size from 30-inches to 42-inches in diameter.

Additionally, two pumping stations would be required to convey flow from south of the Wakarusa River to the PS-5C force main connection point at 23rd Street and Haskell Avenue. Pumping Station WRS-1, with a firm capacity of 11.0 mgd, would serve the majority of the Wakarusa South area and would be located south of the Wakarusa River just west of Louisiana Street. A 24-inch diameter force main would convey flow from this pumping station east to Haskell Avenue and north along Haskell Avenue to the connection point at 23rd Street. Pumping Station WRS-2 would have a firm capacity of 2.0 mgd and would serve the area east of Haskell Avenue and south of the Wakarusa River. It would be located just west of O'Connell Road. The 10-inch force main from this pumping station would be connected to the 24-inch force main at Haskell Avenue. Both Wakarusa South pumping stations would require similar designs for pump system curves and headloss in order to use the same 24-inch pipe along Haskell Avenue. Construction for these pumping stations and force mains would not be difficult as these areas are not developed at this time and the force mains would not need to be constructed within streets.

## **2.2 Alternative 2 – Wakarusa River WWTP (Site A) & Kansas River WWTP**

Collection system improvements required for Alternative 2 – Wakarusa River WWTP (Site A) and Kansas River WWTP are shown in Figure II-2. Major new facility improvements used for differential cost comparison include the following:

### New Facilities to Convey West Lawrence Flow

- Four Seasons Force Main Extension (South along Kasold Street)

The 20-inch diameter Four Season Force Main would be extended south along Kasold Street to the Wakarusa South Interceptor located south of the Wakarusa River.

### New Facilities to Convey South Wakarusa Flow

- Wakarusa South Interceptor Sewer (Parallel to Wakarusa River)



- Wakarusa South Pumping Station WRS-1
- Wakarusa South Pumping Station Force Main (Convey to Wakarusa River WWTP)

As shown in Figure II-1, a new interceptor sewer is required south of the Wakarusa River from Kasold Street to Louisiana Street to collect flow from trunk sewers (shown in green) in the Wakarusa South watershed. The interceptor sewer would be approximately 42-inches in diameter.

The interceptor sewer would convey flow to the Wakarusa South Pumping Station WRS-1 located just west of Louisiana Street. This pumping station would have a firm capacity of 20.0 mgd and would serve as an influent pumping station to the Wakarusa WWTP (Site A). The force main would consist of a 30-inch diameter pipeline extending from Louisiana Street to approximately O'Connell Road.

It should be noted that a gravity interceptor sewer option was studied in lieu of pumping to a Wakarusa River WWTP (Site A). This option was not cost-competitive because it would require a long sewer tunnel from just west of Haskell Avenue to half-way between Haskell Avenue and O'Connell Road, due to the depth of the sewer. The significant cost for this sewer tunnel could not be economically justified due to the small amount of additional area that could be served by this sewer during the study period.



Figure II-2 Alternative 2 Wastewater Flows to Kansas WWTP and Wakarusa WWTP  
(Site A) (Click to download 239 KB PDF)



## 2.3 Alternative 3 – Wakarusa River WWTP (Site B) & Kansas River WWTP

Collection system improvements required for Alternative 3 – Wakarusa River WWTP (Site B) and Kansas River WWTP are shown in Figure II-3. Major new facility improvements used for differential cost comparison include the following:

### New Facilities to Convey West Lawrence Flow

- Four Seasons Force Main Extension to West Wakarusa River WWTP

The 20-inch diameter Four Seasons Force Main would be extended south along Kasold Street directly to a Wakarusa River WWTP (Site B) located south of the Wakarusa River and west of Highway 59. The existing Four Seasons Pumping Station would serve as an influent pumping station to the Wakarusa River WWTP.

### New Facilities to Convey South Wakarusa Flow

- Wakarusa South Interceptor Sewer (Parallel to Wakarusa River)
- Wakarusa South Pumping Station WRS-1 (For small eastern area)
- Wakarusa South Pumping Station Force Main (Convey to interceptor sewer)

As shown in Figure III-3, new west and east interceptor sewers are required south of the Wakarusa River to convey flow to a new Wakarusa River WWTP (Site B) located just west of Highway 59. The 30-inch diameter west interceptor would convey trunk line flow east to the WWTP. The east interceptor (21 to 27 inches in diameter) would convey trunk line flow west to the WWTP.

Wakarusa South Pumping Station WRS-1 would have a firm capacity of 2.0 mgd and serve the small eastern area south of the Wakarusa River. The flow would be conveyed through a 10-inch force main to the Wakarusa South Interceptor.

## 2.4 Four Seasons Excess Flow Holding Basins

All three alternatives require effective use of the Four Seasons Excess Flow Holding Basins. The evaluation is based on use of the holding basins to reduce peak flow that must be transported to the WWTP's in all alternatives. The Four Seasons Pumping Station and Holding Basins comprise a very important lynch pin to the collection system and it is anticipated that these facilities will need to be expanded in the future. The expansions are equivalent for each alternative and are not included in the cost evaluation.





## 2.5 Detailed Summary of Collection System Alternatives

A detailed summary of the major collection system differences between alternatives is shown in Table II-1. Table II-1 does not list all facility improvements required to implement a system-wide capital improvements plan, just the facilities improvements that differ between alternatives. The completion year indicated below is the year each facility should be completed and ready for service and is based on population projections for the study area. Table II-1 lists pumping station firm capacities as well as the size and length of interceptor sewers and force mains. A pumping station and force main requested by City Staff has also been indicated for each alternative to serve the Wakarusa South area for initial development requirements.



<b>Table II-1</b>				
<b>Detailed Summary of Collection System Alternatives</b>				
Description	Station Capacity (mgd)	Pipe Size (in)	Length (ft)	Completion Year
<b>Alternative 1 – Kansas River WWTP</b>				
31 <sup>st</sup> Street Relief Sewer	-	30	12,000	2007
Wakarusa PS-5C	10.0	-	-	2006
Wakarusa PS-5C Force Main	-	24 & 36	21,300	2006
Wakarusa South Interceptor	-	30 to 42	12,100	2005
Wakarusa South PS-WRS-1	11.0	-	-	2011
Wakarusa South PS-WRS-1 FM	-	24	18,500	2011
Wakarusa South PS-WRS-2	2.0	-	-	2015
Wakarusa South PS-WRS-2 FM	-	10	4,700	2015
Initial Pumping Station and FM for Wakarusa South Area	0.65	6	7,400	2005
<b>Alternative 2 – East Wakarusa River WWTP</b>				
Four Seasons Force Main Extension	-	20	7,000	2011
Wakarusa South Interceptor	-	42	10,400	2005
Wakarusa South PS-WRS-1	20.0	-	-	2011
Wakarusa South PS-WRS-1 FM	-	30	11,400	2011
Initial Pumping Station and FM for Wakarusa South Area	0.65	6	7,400	2004
Description	Station Capacity (mgd)	Pipe Size (in)	Length (ft)	Completion Year
<b>Alternative 3 – West Wakarusa River WWTP</b>				
Four Seasons Force Main Extension	-	20	11,300	2011
West Wakarusa South Interceptor	-	30	4,300	2005
East Wakarusa South Interceptor	-	21 to 27	9,000	2005
Wakarusa South PS-WRS-1	2.0	-	-	2015
Wakarusa South PS-WRS-1 FM	-	10	9,600	2015
Initial Pumping Station and FM for Wakarusa South Area	0.65	6	7,400	2005