

# Strategic Water Resource Development Plan

*Summary of Wastewater Treatment Systems*

*Blue Grass Area Development District*

*Water Resource Development Commission*

*March, 2000*

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## BLUEGRASS AREA DEVELOPMENT DISTRICT

699 Perimeter Drive  
Lexington, KY 40517  
(606) 269-8021

### ADD SEWER SUMMARY

#### ADD Sewer Service (map)

- Estimated 1999 population of 632,000--67% on public sewer
- Estimated 2020 population of 706,000--68% on public sewer
- Proposed projects would add over 6,600 new households to public sewer service during 2000-2020
- Estimated funding needs for public sewer 2000-2005--\$181,000,000
- Estimated funding needs for public sewer 2006-2020--\$188,000,000

Blue Grass Area Development District had an estimated population of 631,849 (263,248 households) in 1999 with a projected population of 705,934 (315,125 households) in 2020. Public sewer systems serve 425,000 area residents, or 67 percent of the population. Proposed sewer line extensions for the period 2000-2020 would provide service to an additional 6,600 households. About 207,000 people in the region rely on onsite treatment systems.

Estimated populations and public sewer service for the seventeen counties in the region is given below:

County	1999 Pop	On Public	2000 Pop	On Public
Anderson	18,800	7,700 (41%)	25,100	10,300 (41%)
Bourbon	19,200	11,500 (60%)	18,800	11,300 (60%)
Boyle	26,100	17,200 (66%)	27,300	18,000 (66%)
Clark	32,100	18,600 (58%)	35,600	20,600 (58%)
Estill	15,400	4,500 (29%)	15,300	4,600 (30%)
Fayette	230,300	223,400 (97%)	238,300	231,200 (97%)
Franklin	45,300	30,800 (68%)	46,100	33,200 (72%)
Garrard	14,200	4,100 (29%)	18,200	5,600 (31%)
Harrison	17,400	7,800 (45%)	18,800	8,500 (45%)
Jessamine	36,400	21,100 (58%)	46,500	29,300 (63%)
Lincoln	22,500	4,000 (18%)	26,100	9,400 (36%)
Madison	60,500	32,700 (54%)	72,800	43,700 (60%)
Mercer	20,700	8,700 (42%)	22,900	12,100 (53%)
Nicholas	7,100	2,100 (29%)	7,400	2,600 (35%)
Powell	12,900	4,800 (37%)	15,100	6,300 (42%)

# EXISTING & PROPOSED SEWER SERVICE

**BGADD  
Kentucky**

Prepared By:

**Water Resource Development Commission**

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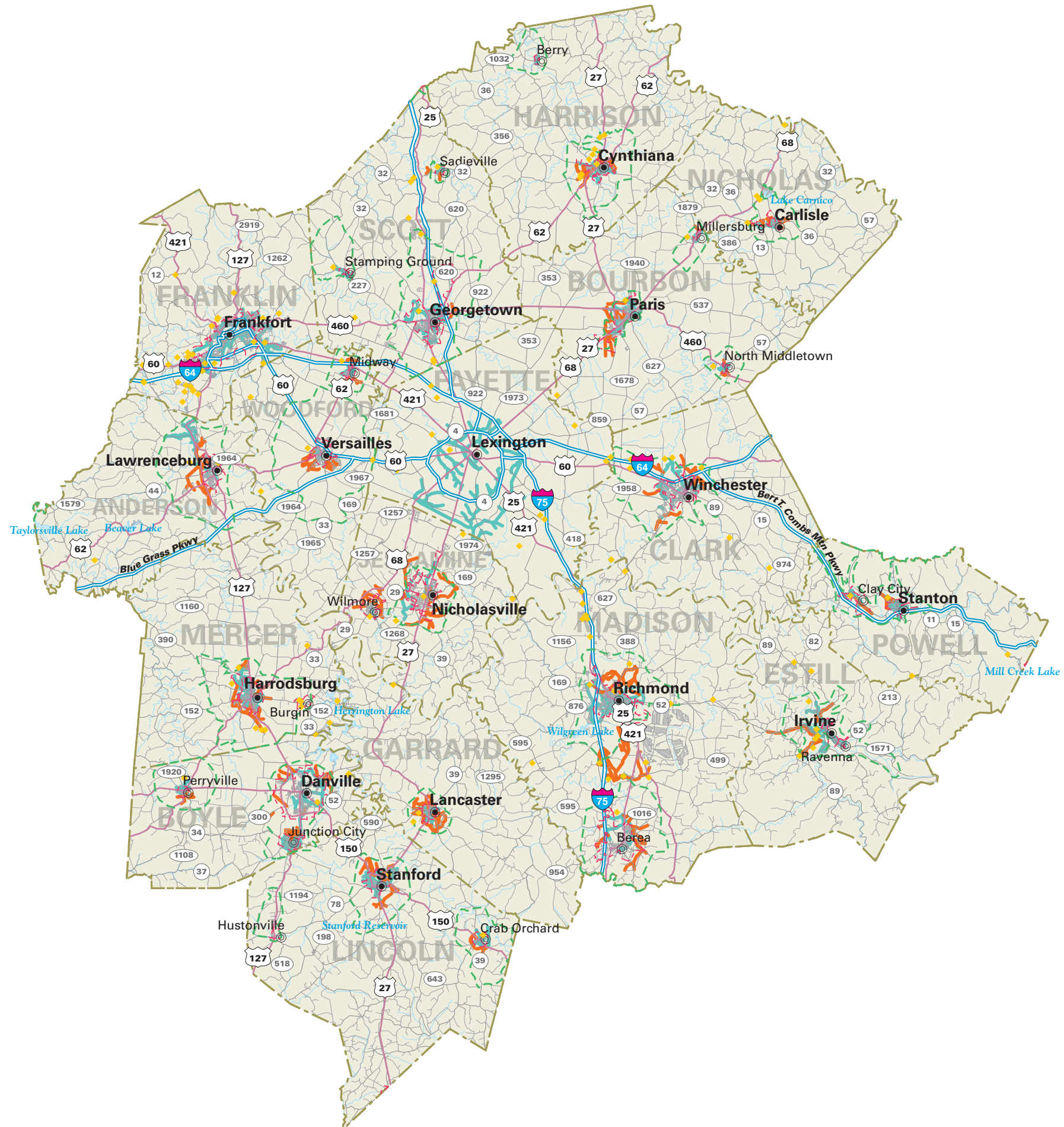
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LIMITATION OF LIABILITY: The Water Resource Development Commission has no reason to believe that there are any inaccuracies or defects in information incorporated in this work and make no representations of any kind, including, but not limited to, the warranties of merchantability or fitness for a particular use, nor any such warranties to be implied, with respect to the information or data furnished herein.

- - - - - 201k Facility Planning Area
- - - - - Incorporated City Boundary
- ♦ Sewage Treatment Plant



**SEWER SERVICE**  
— Existing Sewer Service  
— Proposed Sewer Service

Scott	30,200	15,700 (52%)	44,600	23,200 (52%)
Woodford	22,700	10,200 (45%)	27,000	12,200 (45%)
Region	632,000	425,000 (67%)	706,000	482,000 (68%)

34 public sewer systems serve the region:

Estimated costs for public sewer expansions and associated system upgrades are:

## Proposed Projects 2000-2005

System	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
ANDERSON							-
Lawrenceburg	50	2,000	300	-	-	-	2,300
Alton Water/Sewer District	-	-	2,000	-	-	-	2,000
County Total	50	2,000	2,300				4,300
BOURBON							-
North Middletown	3	40	250	200	-	-	490
Paris	-	-	-	-	-	-	-
Millersburg	-	-	100	50	-	-	150
County Total	3	40	350	250			640
BOYLE							-
Danville		2,800	1,800				4,600
Junction City	15	130	250				380
Perryville	6	36	75				111
County Total	21	2,966	2,125				5,091
CLARK							-
Winchester	-	-	1,625	14,000	-		15,625
ESTILL							-
Irvine						600	600
Estill County W & S Dist #1		2,025	250	110	1,700	-	4,085
County Total		2,025	250	110	1,700	600	4,685
FAYETTE							-
Lexington	-	-	40,000	21,500		13,600	75,100
FRANKLIN							-
Frankfort	861	18,100	1,000	2,500	-	-	21,600
GARRARD							-
Lancaster	38	400	120	-			520
HARRISON							-
Cynthiana		760	300	5,500			6,560
JESSAMINE							-
Wilmore		390	500			390	1,280
Nicholasville	85	1,500	500	800			2,800
Jessamine County SD							-
Ashgrove Pike Area	271	3,800					3,800
County Total	368 + pot	5,690	1,000	800		390	7,880
LINCOLN							-
Stanford	23	104	-	450			554
Crab Orchard		100	100				200
Western Lincoln Co San. Dist.							-
Hustonville to Junction City	800	7,000					7,000
County Total	823	7,204	100	450			7,754
MADISON							-
Richmond		1,800	-	700	900		3,400
Berea			1,100				1,100
Northern Madison Co San Dist	300	3,400					3,400
Madison County San Dis #2	600	3,800					3,800
County Total	900	9,000	1,100	700	900		11,700
System	New Customers	Cost (\$1000)	Line Upgrade	Treatment Expansion	New Treatment	Lift Stations,	Total Costs



*Appendix B - Bluegrass Area Development District • DRAFT*

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	Served		(\$1000)	(\$1000)	(\$1000)	and other (\$1000)	(\$1000)
<b>MERCER</b>							-
Harrodsburg	41	300	1,250	800			2,350
County Total	41	300	1,250	800			2,350
<b>NICHOLAS</b>							-
Carlisle		775	400				1,175
Nicholas County San. Dist #1							
County Total		775	400				1,175
<b>POWELL</b>							-
Stanton	43	400	1,200				1,600
Clay City	40	300	500				800
Powells Valley	73	1,600					1,600
County Total	156	2,300	1,700				4,000
<b>SCOTT</b>							-
Georgetown			2,300	2,735			5,035
Stamping Ground			70	1,000			1,070
County Total			2,370	3,735			6,105
<b>Woodford</b>							
Versailles	52	460	750	200	-		1,410
Midway		140	262	-	4,000		4,402
County Total	52 + pot	600	1,012	200	4,000		5,812

Proposed Projects 2006-2020

System	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
<b>ANDERSON</b>							-
Lawrenceburg	-	1,350	1,000	4,200	-	-	6,550
County Total	-	1,350	1,000	4,200	-	-	6,550
<b>BOURBON</b>							-
North Middletown		140	200	-	-	-	340
Paris	-	-	750	2,400	-	370	3,520
Millersburg	6	70	300	100	-	-	470
County Total	6	210	1,250	2,500	-	370	4,330
<b>BOYLE</b>							-
Danville	33	850	4,200	1,500			6,550
Junction City	5	300	600	-			900
Perryville	19	300	-	250			550
County Total	57	1,450	4,800	1,750			8,000
<b>CLARK</b>							-
Winchester	39	3,000	3,875	4,000			10,875
County Total	39	3,000	3,875	4,000			10,875
<b>ESTILL</b>							-
Irvine	27	330	300	1,700			2,330
County Total	27	330	300	1,700			2,330
<b>FAYETTE</b>							-
Lexington	-	-	24,000	9,200	-	18,600	51,800
County Total	-	-	24,000	9,200	-	18,600	51,800
<b>FRANKLIN</b>							-
Frankfort	-	-	3,000	-	-		3,000
County Total	-	-	3,000	-	-		3,000
<b>GARRARD</b>							-
Lancaster	87	1,500	280	450	-		2,230
County Total	87	1,500	280	450	-		2,230
<b>HARRISON</b>							-
Cynthiana	29	1,100	700	1,300	-	1,100	4,200
Berry		200	-	-	-	-	200
County Total	29	1,300	700	1,300	-	1,100	4,400
<b>JESSAMINE</b>							-
Wilmore	12	1,200	500	1,300			3,000
Nicholasville		2,500	900	3,500			6,900
Catnip Hill Road Area	300	2,000	-	-			2,000
County Total	351 + pot	5,700	1,400	4,800			11,900
<b>LINCOLN</b>							-
Stanford	68	1,700	500	1,600	-	-	3,800
Lake Village Water Association	300	3,000					3,000
Burgin	400	3,000					3,000
Crab Orchard		100	100				200
County Total	768 + pot	7,800	600	1,600	-	-	10,000
<b>MADISON</b>							-
Richmond	196	3,000	3,800	3,900	12,000	7,600	30,300
Berea		4,922	-	3,000	-	-	7,922
North Madison County San Dist	350	3,000	-	-	-	-	3,000
County Total	546	10,922	3,800	6,900	12,000	7,600	41,222
System	New Customers	Cost (\$1000)	Line Upgrade	Treatment Expansion	New Treatment	Lift Stations,	Total Costs

*Appendix B - Bluegrass Area Development District • DRAFT*

	Served		(\$1000)	(\$1000)	(\$1000)	and other (\$1000)	(\$1000)
<b>MERCER</b>							-
Harrodsburg	213	2,100	700	1,800	-		4,600
Lake Village Water Association	300	3,000	-	-			3,000
Burgin	400	3,000	-	-			3,000
County Total	913	8,100	700	1,800			10,600
							-
<b>NICHOLAS</b>							-
Carlisle		250	-	1,800			2,050
Nicholas County San District #2.	100	1,000	-	-			1,000
County Total	100 + pot	1,250	-	1,800			3,050
							-
<b>POWELL</b>							-
Stanton	-	-	450	500			950
Clay City		250	300	250			800
Powells Valley	69	600	-	-			600
County Total	69	850	750	750			2,350
							-
<b>SCOTT</b>							-
Georgetown	-	-	8,660	-	-	115	8,775
Stamping Ground		150	-	-	-	-	150
Sadieville	2	400	-	-	-	-	400
County Total	2 + pot	550	8,660	-	-	115	9,325
							-
<b>Woodford</b>							-
Versailles	20	300	1,400	3,900	-	-	5,600
Midway	-	-	112	300	-	-	412
County Total	20	300	1,512	4,200	-	-	6,012

## ANDERSON COUNTY

### Anderson County Sewer Service (map)

- Estimated 1999 population of 18,800--40% on public sewer
- Estimated 2020 population of 25,100--40% on public sewer
- Proposed projects would add 50 households to public sewer during 2000-2020
- Estimated funding needs for public sewer 2000-2005--\$4,300,000
- Estimated funding needs for public sewer 2006-2020--\$6,550,000

Anderson County had an estimated population of 18,763 (7,480 households) in 1999 with a projected population of 25,060 (10,712 households) in 2020. Public sewer is provided to about 40 percent of the county's residents. About 4,400 households in the county use on-site wastewater treatment. About 50 new customers could be added to public sewer service through proposed new line extensions in 2000-2020.

### ANDERSON COUNTY SEWER PLAN

#### *Proposed Projects 2000-2005*

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
ANDERSON							-
Lawrenceburg							-
/SX21005001	50	2,000	300				2,300
Alton Water/Sewer District							-
/SX21005003			2,000				2,000
<b>County Total</b>	<b>50</b>	<b>2,000</b>	<b>2,300</b>				<b>4,300</b>

#### *Proposed Projects 2006-2020*

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
ANDERSON							-
Lawrenceburg							-
SX21005002		1,350	1,000	4,200			6,550
<b>County Total</b>	<b>-</b>	<b>1,350</b>	<b>1,000</b>	<b>4,200</b>	<b>-</b>	<b>-</b>	<b>6,550</b>

#### CITY OF LAWRENCEBURG SANITARY SEWER SYSTEM

In 1983-84, Lawrenceburg constructed a completely new wastewater treatment plant west of US 127 Bypass and north of KY 44 near the confluence of two minor tributaries of Hammond Creek. The receiving stream, an unnamed tributary of Hammond Creek, is

# SEWER SERVICE AREAS ANDERSON COUNTY Kentucky



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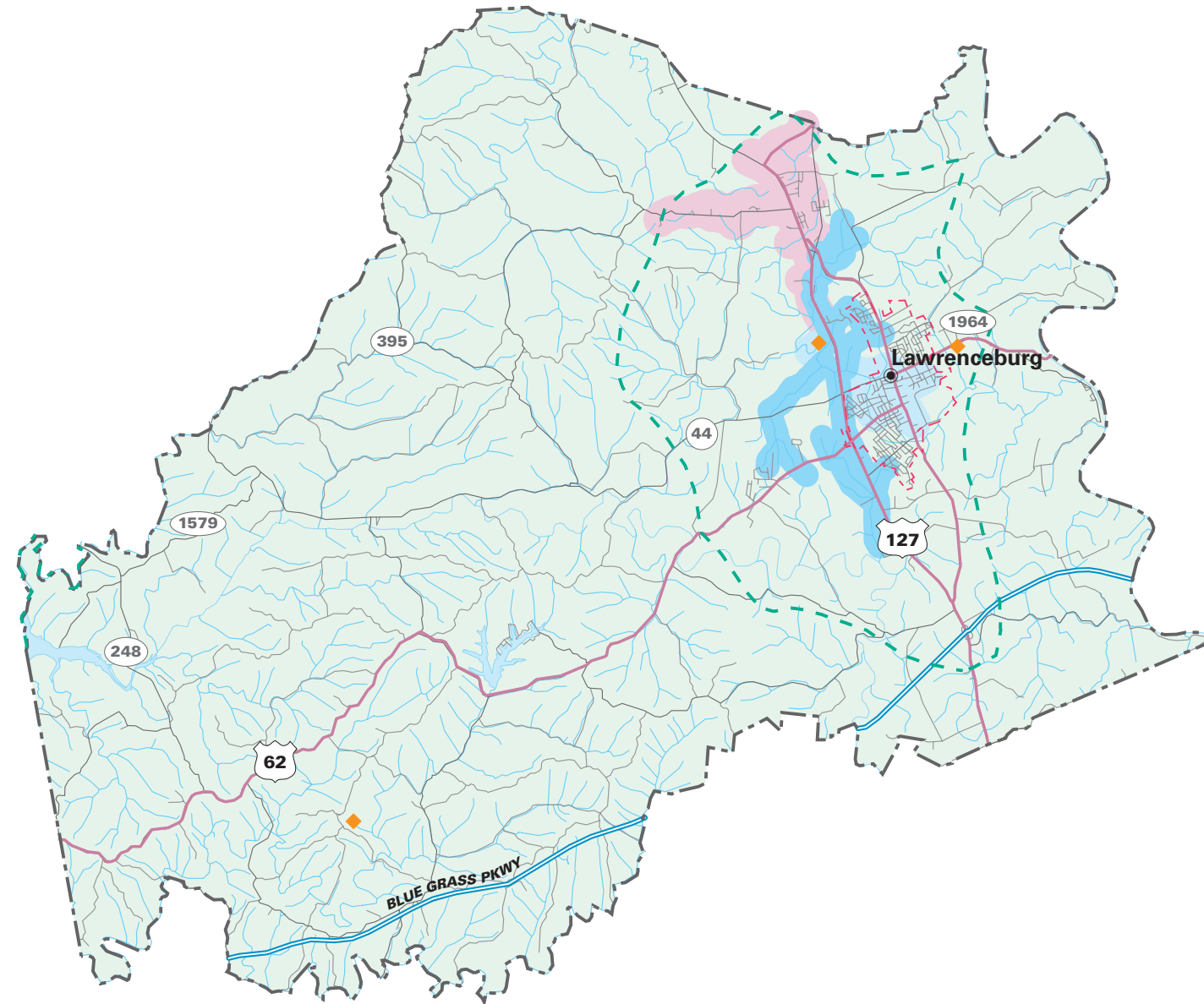
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Kentucky Area Development Districts



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- 201k Facility Planning Area
- Incorporated City Boundary
- Sewage Treatment Plant



**SEWER SERVICE STATUS BY OWNER**

EXISTING SERVICE AREA	PROPOSED SERVICE AREA	
		LAWRENCEBURG MUNICIPAL SEWER
		ALTON WATER AND SEWER DISTRICT

considered to be an intermittent stream. The receiving stream enters Hammond Creek at mile point 5.18. In turn, Hammond Creek is a tributary of Salt River.

The wastewater treatment plant has a rated capacity of 1.9 million gallons per day (MGD). Plant components consist of grit removal, screening, four trains of rotating biological contactors, secondary sedimentation, chlorination, dechlorination, anaerobic sludge digestion, sludge drying beds and land application of liquid sludge (normally) and dry sludge (less frequently). The plant's peak hydraulic wastewater treatment capacity is 3.0 MGD. Because the treatment plant discharge is to an intermittent stream, the city's effluent limits are quite stringent.

Treatment plant performance in 1995, 1996, and 1997 compared very favorably to the limits contained in the treatment plant's state-issued discharge permit. Average laboratory results showed no permit limit exceedences during any of the recent three years. Laboratory results of the treatment plant effluent in 1995, 1996, and 1997 are compared to the treatment plant's effluent limits as follows:

Parameter	KPDES Limits	Average Annual Value		
		1995	1996	1997
Dissolved Oxygen	7 mg/1 minimum	8.4 mg/1	8.4 mg/1	8.7 mg/1
Total Suspended Solids	30 mg/1 maximum	6.7 mg/1	7 mg/1	7 mg/1
Ammonia – Summer	4 mg/1 maximum	0.35 mg/1	0.37 mg/1	0.49 mg/1
Ammonia – Winter	11 mg/1 maximum	0.39 mg/1	0.31 mg/1	0.45 mg/1
Coliform	200/100 ml maximum	10/100 ml	18/100 ml	13/100 ml
BOD	15 mg/1 maximum	9 mg/1	9 mg/1	7.5 mg/1
Flow	1.90 MGD	1.137 MGD	1.216 MGD	1.09 MGD

Extreme wet weather flows sometimes challenge the plant’s wet weather hydraulic capacity of 3.0 MGD.

The plant has six certified operators. One is Class IV-certified and five are Class III-certified.

Lawrenceburg has an industrial pre-treatment ordinance which presently applies to:

- Universal Fasteners
- Allgood Foods
- Edwards Sausage
- Kentucky Overall
- Florida Tile, and
- General Cable.

Edward Sausage and Kentucky Overall have occasionally paid a surcharge for pollutant exceedences of the city’s pretreatment ordinance.

Like many other cities in Kentucky, Lawrenceburg has had difficulty in staying in continuous compliance with Division of Water bio-monitoring requirements. The city has been conducting a TRE (toxicity reduction evaluation) to determine why the test species, a water flea, can survive in the wastewater treatment plant effluent but cannot consistently reproduce.

Lawrenceburg has permitted the connection of the Alton Water and Sewer District’s force main at a point near the city’s wastewater treatment plant. Lawrenceburg charges the Alton Water and Sewer District \$1.35 per 1,000 gallons of metered sewage flow. The sewer

district's metered flow varied over a broad range in a recent year. The low month metered sewage flow was 2.4 MG/month; the high month, 5.0 MG/month.

At present time, the city is 100 percent sewerred. Subdivision developers must provide for sanitary sewer installation (as well as water lines and fire hydrants) as a prerequisite to annexation and permission to connect to the city's water and sewer system. Most growth within the corporate limits is south of the city center. The city has 18 sewage pumping stations.

Inflow and infiltration have been a serious twin problem but is perhaps less serious now than previously. Several thousand feet of sewer interceptors have been replaced with large diameter, tighter sewers. Recent era replacement sewers include 24-, 21-, and 18-inch sewers. An 18-inch interceptor sewer has been extended south on Main Street to a point 600 feet south of the Broadway intersection. A separate 18-inch diameter interceptor sewer has been extended south from the 24-inch sewer to a point near Whitney Avenue and Humston Drive. Future interceptor sewer replacement, further upstream as far as Broadway, is being considered. Sewer service voids exist in suburban areas such as US 127 Business in the Stringtown area and immediately west of US 127 Bypass generally in the area bounded by US 62 and KY 44.

As a matter of policy, Lawrenceburg has decided to deny the provision of municipal sewer service to areas which do not receive water service directly from the city. This has left in limbo the annexation and subsequent urbanization of areas in which water service is presently provided by one of the *close-in* water districts.

Lawrenceburg has sewer customers of the following numbers and types:

Residential	2,866
Commercial	173
Industrial	11
Alton Water and Sewer District	1
Total	3,051

All sewer customers, with the exception of the Alton Water and Sewer District, are within the city's corporate limits.

Inside city sewer rates are as follows:



First 2,000 gallons per month	\$7.80 minimum bill
Next 8,000 gallons per month	3.10/1,000 gallons
Next 20,000 gallons per month	2.70/1,000 gallons
Next 30,000 gallons per month	2.40/1,000 gallons
Next 40,000 gallons per month	1.95/1,000 gallons
Next 100,000 gallons per month	1.85/1,000 gallons
Next 300,000 gallons per month	1.75/1,000 gallons
Next 500,000 gallons per month	1.67/1,000 gallons
All over 1,000,000 gallons per month	1.25/1,000 gallons

Outside city sewer rates are the same except that the minimum charge is \$8.89.

The city's 1997 audit shows the following concerning the financial aspects of the municipal sewer system:

Gross revenues from sales of sewer service	\$806,400
Maintenance and operating costs (exclusive of depreciation)	\$590,700
Net sewer revenues	\$215,700

The 1997 debt service payment on the city's long term water *and* sewer system indebtedness was \$284,800.

A residential tap-on fee for sewer service within the corporate limits is \$475.

Lawrenceburg is the county seat and the only city in one of Kentucky's fastest growing counties. With appropriate infrastructure—and often that boils down to sewer service availability—Lawrenceburg can experience significant and beneficial growth during the 20-year period of this plan.

**Proposed Projects 2000-2005**

**SX21005001**

This project will serve approximately 50 houses and includes the following:

1. Recommend as a part of the Immediate Plan is the installation of interceptors in three specific areas:

One is northwest of the city center where the installation of a 15- and 12-inch diameter sewer--for the most part east of US 127 Bypass--would enable northside growth while also diverting some existing sewage flow from existing interceptor sewers and conveying it further north before the proposed interceptor turns west toward the existing treatment plant site.

A second interceptor sewer is planned further north of the city center. Proposed is a combination of 15, 12, and 10-inch sewers that would open for residential, commercial, and industrial development areas near the convergence of US 127

Bypass and US 127 Business as well as areas further north on the east side of US 127 and west of Hammond Road. As the flow in the proposed sewers would move south and west along a minor tributary of Hammond Creek, it would finally reach a point--probably as US 127 Bypass bridges the creek--that a new sewage pumping station would be required to be installed to convey the collected sewage south along US 127 Bypass so it can join the existing 24-inch line near the treatment plant site.

The third interceptor proposed for installation during the period of the Immediate Plan would involve a combination of 15-, 12-, and 10-inch gravity sewers located for the most part west of US 127 Bypass. The natural drainage pattern of most of this is south toward the Salt River and away from Lawrenceburg's wastewater treatment plant. The sewage flow would be collected at a point southwest of the city center and, with the installation of a substantial sewage pumping station, a proposed force main would convey the sewage north along US 127 Bypass to a point about 1,000 feet south of the KY 44 intersection with US 127 Bypass where the sewage could again flow by a proposed gravity interceptor sewer--to the existing 24-inch interceptor sewer and on to the treatment plant. The 1997 estimated project cost of interceptor sewers, pumping stations, and force mains discussed above is \$2.0 million.

2. Sewer system rehabilitation should be an ongoing process and program. Recommended is that Lawrenceburg plan on spending the equivalent of \$60,000 annually in an effort to rehabilitate its sewers so as to reduce the deleterious effects of inflow and infiltration on both the sanitary sewer system and the wastewater treatment plant. For the 1997 Immediate Plan period, that would amount to \$300,000.

### **Proposed Projects 2006-2020**

#### **SX21005002**

Although only five houses lie along the roads proposed for sewer service, this project is intended to serve areas in and around Lawrenceburg that will potentially be developed. This project is described as follows:

1. Long Term period interceptor sewer extensions include sewers on the city's near northwest side as well as west of US 127 Bypass. Proposed are 10- and 12-inch diameter sewers in the US 62 and KY 44 areas west of US 127 Bypass together with a 15-inch diameter sewer between the US 127 Bypass and the Norfolk Southern tracks on the near northwest side of the city center. Both proposed interceptor sewers would terminate at the existing large diameter interceptor sewer reasonably close to the wastewater treatment plant site. The 1997 estimated project cost of the proposed interceptor sewers is \$700,000.
2. Sewer system rehabilitation should be an ongoing process and program. Recommended is that Lawrenceburg plan on spending the equivalent of \$60,000 annually in an effort to rehabilitate its sewers so as to reduce the deleterious effects of inflow and infiltration on

both the sanitary sewer system and the wastewater treatment plant. For the 1997 Long Term period, that would amount to \$900,000.

3. Collector sewers to serve the Stringtown area are recommended to be installed within the Long Term period. The 1997 estimated project cost is \$650,000.
4. Also recommended as a part of the Long Range Plan is the replacement of approximately 2,200 linear feet of old and troublesome 10-inch diameter sewer that follows a drainage way between Lynn Drive and Humston Drive. The replacement line should be a 15-inch sewer. The 1997 estimated project cost is \$100,000.
5. During the period of the Immediate Plan, Lawrenceburg's 14-year old wastewater treatment plant should satisfactorily meet the community's needs. Care should be exercised during this time period to reduce inflow and infiltration to the extent possible. During the Long Term period, an expansion of the treatment plant by 100 percent—to a new and larger capacity of 3.8 MGD seems advisable. It is unlikely that the city will choose to expand the facility as a Rotating Biological Contactor facility. In all likelihood, Lawrenceburg would choose oxidation ditch technology and would expect the expansion to operate in tandem with existing facilities. An expansion of the wet weather hydraulic capacity to at least 6.0 MGD also would appear advisable. The 1997 estimated project cost of these improvements is \$4.2 million.

#### ALTON WATER AND SEWER DISTRICT SANITARY SEWER SYSTEM

The Alton Water District expanded its service role in the 1980's when it became the Alton Water and Sewer District. Under EPA's alternative/innovative systems construction grant program, the Alton Water and Sewer District was able to install a vacuum sewer system to provide sanitary sewer service to about two thirds of the district's water customers at that time. Sewage is vacuumed from discrete areas of the collection system to vacuum collection stations. From those collection stations, sewage is pumped in a generally southward direction through a 6-inch line for eventual discharge to Lawrenceburg's 24-inch interceptor sewer immediately upstream of the Lawrenceburg wastewater treatment plant.

The water/sewer district has been troubled with inflow/infiltration problems. Metered sewage flows piped to Lawrenceburg in a recent 12 month period varied from a low of 2.4 million gallons per month to a high of 5.0 million gallons per month. This wide variation of sewage flows is symptomatic of varying amounts of inflow/infiltration entering the system.

The Alton Water and Sewer District pays \$1.35 per 1,000 gallons for sewage accepted by Lawrenceburg for treatment. To whatever extent that inflow/infiltration is a problem, the Alton Water and Sewer District pays \$1.35 per 1,000 gallons regardless of whether the wastewater is actually sanitary sewage or whether it is rainwater or groundwater. Average

daily sewage flows of 153,000 gallons were metered at the point of delivery to the Lawrenceburg municipal sewer system in 1997.

There are 501 sewer customers of which 474 are residential, 25 are commercial, and 2 are industrial. General Cable and Florida Tile, both of whom are located north of Lawrenceburg, are Alton Water and Sewer District customers despite the fact that Lawrenceburg provides retail water service to these two industries. Both industries have sewage meters. Other industries who are Alton sewer customers are GM Tool, HBC Daly, Ferrill Gas, Anderson Tool and Die, Nuco Tool Manufacturing, and Charles Tipton Tool.

One of the basic problems with any vacuum sewage collection system is that there is so little opportunity to add new customers. Sewer district officials contend that the sewer system is at near-capacity.

Sewer rates for the Alton Water and Sewer District must, just like water rates, have the approval of the Kentucky Public Service Commission. Current rates went into effect in 1996. Customers pay a rate of \$6.27 per 1,000 gallons. Rates are the same for residential and industrial customers. New customers pay a \$600 tap-on fee for sewer service.

The Alton Water and Sewer District's fiscal year 1997 financial report shows the following information:

Sewer Revenues	\$203,000	
Maintenance and Operating Expenses		\$275,000
Net Revenue	\$(72,000)	

The District's debt service for the year 1997 amounted to \$40,000.

When the Alton Water and Sewer District was endeavoring to achieve grant financing for its start-up phase through the US Environmental Protection Agency, funds from EPA's alternative-innovative technology set-aside appeared to be the best bet and perhaps even the District's only feasible choice. Using alternative-innovative technology led the Alton District to utilize vacuum sewer technology. The vacuum sewers are small diameter sewers, which can follow the rolling terrain. The small diameter vacuum sewers have limited growth capability. Urbanization has occurred rapidly in parts of the suburban service area. As a result, the capacity of parts of the sewage collection system is being approached with the

present vacuum stations. In addition, fluctuating monthly sewer flows metered at the point that Lawrenceburg receives sewage from the Alton Water and Sewer District indicate serious inflow problems within the Alton system of sewers.

**Proposed Projects 2000-2005**

**SX21005003**

While Alton Water and Sewer District policymakers would like to scrap the vacuum sewer system and replace it with a conventional gravity system as a means of reducing operation and maintenance headaches and excessive inflow, the cost of the replacement of the entire sewage collection system would seem to be prohibitive if the replacement is to be financially supported only by sewer ratepayers. Suggested instead is that selective replacement of selected pumping and vacuum stations be undertaken together with selective repair or replacement of the most troublesome areas of the vacuum sewer collection system. The 1997 estimated cost of modifications and upgrades as discussed above is \$2,000,000.

No sewer system improvements or rehabilitation is proposed during the Long Term period.

**ON-SITE TREATMENT SYSTEMS**

**SI21005001**

This area consists of rural Anderson County beyond the service areas of the City of Lawrenceburg sanitary sewer system and the Alton Water and Sewer District sanitary sewer system. It is unlikely that public sewer line extensions will reach this area of Anderson County by 2020. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. Reasons for the high cost are the number of households (4,400), a low customer per mile ratio, rugged terrain, and the long distance from these houses to treatment facilities and existing sewer systems. Suggested instead is that a Revolving Loan Fund Program be established or that the U.S. Army Corps of Engineers 531 program be extended for the installation of a septic tank for each house that does not presently have sanitary sewer service, or could currently have a failing septic system. The generalized proposed cost of this option is \$22,000,000, or \$5,000 per household.

## BOURBON COUNTY

### Bourbon County Sewer Service (map)

- Estimated 1999 population of 19,200--60% on public sewer
- Estimated 2020 population of 18,800--60% on public sewer
- Proposed projects would provide additional public sewer service during 2000-2020
- Estimated funding needs for public sewer 2000-2005--\$640,000
- Estimated funding needs for public sewer 2006-2020--\$4,330,000

Bourbon County had an estimated population of 19,231 (7,737 households) in 1999 with a projected population of 18,822 (8,202 households) in 2020. Public sewer is provided to about 60 percent of the county's residents. About 3,150 households in the county use on-site wastewater treatment. 10 known customers and an unknown additional number of customers could be added to public sewer service through proposed new line extensions in 2000-2020.

### BOURBON COUNTY SEWER PLAN

#### *Proposed Projects 2000-2005*

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
<b>BOURBON</b>							-
North Middletown /SX21017005	3	40	250	200			490
Paris /SX21017001		U. C.					-
Millersburg /SX21017003			100	50			150
County Total	3	40	350	250			640

#### *Proposed Projects 2006-2020*

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
<b>BOURBON</b>							-
North Middletown SX21017006	Pot	140	200				340
Paris SX21017002			750	2,400		370	3,520
Millersburg SX21017004	6	70	300	100			470
County Total	6	210	1,250	2,500	-	370	4,330

#### CITY OF PARIS SANITARY SEWER SYSTEM

With Paris' location at the confluence of Stoner Creek and Houston Creek, the city's gravity interceptor sewer network winds upstream from the former location of the municipal wastewater treatment plant at the dead-end of Elizabeth Street. A single 18-inch and then

# SEWER SERVICE AREAS

## BOURBON COUNTY

### Kentucky

**Prepared By:**  
**Water Resource Development Commission**

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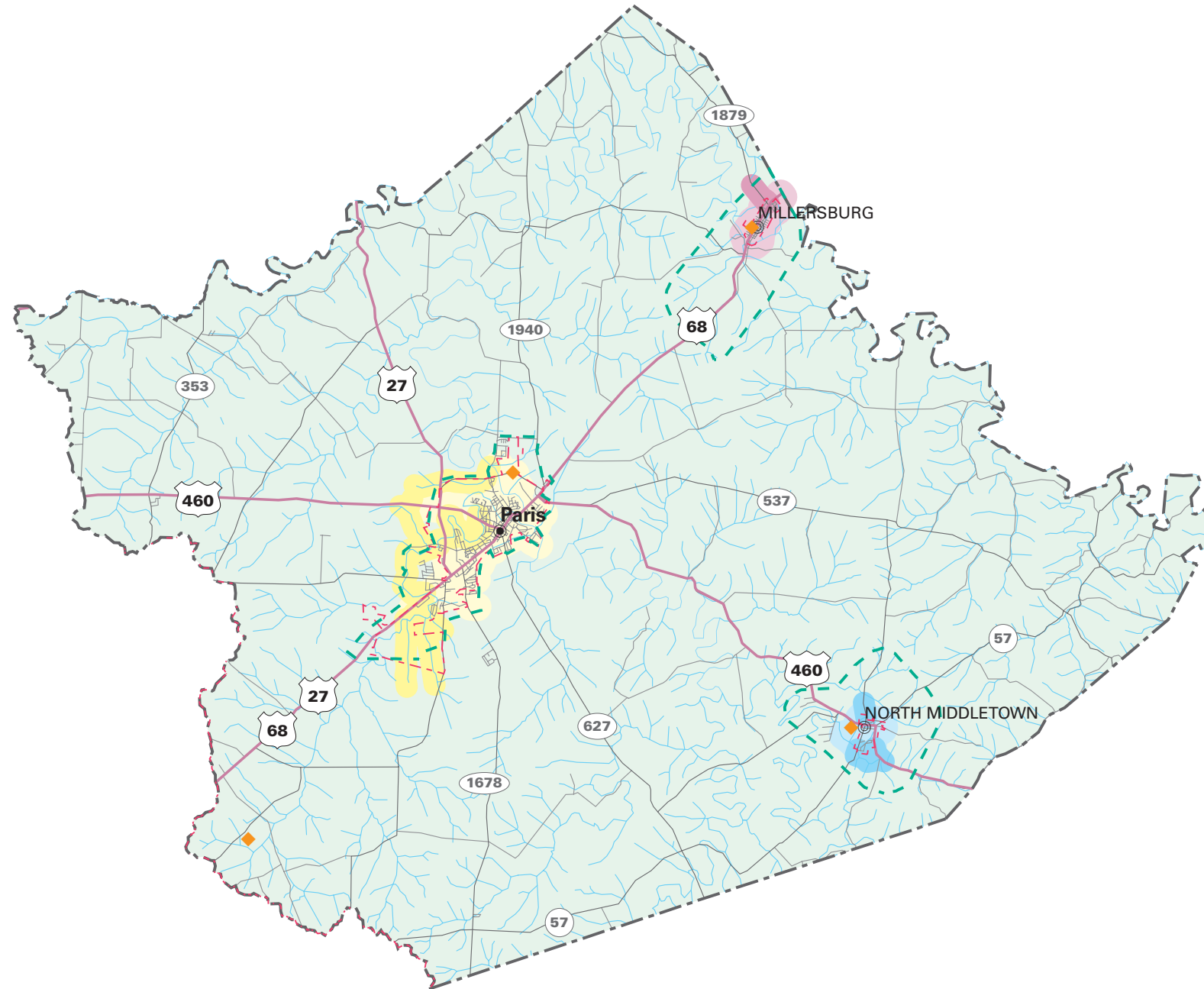
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LIMITATION OF LIABILITY: The Water Resource Development Commission has no reason to believe that there are any inaccuracies or defects in information incorporated in this work and make no representations of any kind, including, but not limited to, the warranties of merchantability or fitness for a particular use, nor any such warranties to be implied, with respect to the information or data furnished herein.

- - - 201k Facility Planning Area
- - - Incorporated City Boundary
- ◆ Sewage Treatment Plant



#### SEWER SERVICE STATUS BY OWNER

EXISTING SERVICE AREA	PROPOSED SERVICE AREA	OWNER
<span style="background-color: yellow; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>	<span style="background-color: yellow; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>	PARIS MUNICIPAL SEWER
<span style="background-color: lightblue; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>	<span style="background-color: lightblue; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>	NORTH MIDDLETOWN MUNICIPAL SEWER
<span style="background-color: pink; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>	<span style="background-color: pink; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>	MILLERSBURG MUNICIPAL SEWER



21-inch interceptor sewer extends southward (and upstream) from the former wastewater treatment plant site to the confluence of the two creeks where it splits into two interceptors. The longer of the two interceptor sewers follows Stoner Creek and its tributaries upstream, crossing the CSX railroad tracks near Rosemary Lane and finally ending as a 12-inch interceptor at the Clintonville Road. A shorter interceptor sewer follows Houston Creek upstream and ends as a 15-inch sewer near the intersection of Short Street and Cypress Street. The sewer system presently contains 14 sewage lift stations.

From the former wastewater treatment plant location, sewage is pumped through a 16-inch diameter force main to the current wastewater treatment plant which is located across Stoner Creek (on the north side) from the former treatment plant site. The new treatment plant is located on a large rectangular tract of land bounded by Stoner Creek on the south and west, by the CSX rail line on the east, and by the Paris Bypass (US 68) on the north. Access to the treatment plant is from the Bypass. The sewer network contains 13 public and one private sewage pumping stations.

Paris has experienced significant problems with respect to inflow and infiltration of its sewer system network. A Wastewater Facilities Plan Update was completed in 1996 by consulting engineers in the employ of the city. The Plan has concluded that no more than three minor drainage basins within the municipal sewer system should be selected for a complete rehabilitation of all located sources (of inflow/infiltration) followed by a remetering of these basins with a comparison to sewage flows measured prior to the onset of sewer line rehabilitation. The rationale is that until some rehabilitation is accomplished, the city will not know whether it is more cost effective to rehabilitate all sewer sub-basins or to transport and treat excess flows. This thought process, of course, affects decisions concerning future interceptor sewer sizing and wastewater treatment plant sizing. The ongoing planning work is being completed under the terms of an Agreed Order that Paris entered into with the Kentucky Division of Water in 1994.

Observations by Paris sewer utility personnel include the following:

1. Wastewater discharges of backwash water and sludge from the potable water treatment plant should cease. By some means, the solids created in that treatment process need to reach the city's municipal sanitary sewer system.



2. Planned are sewer line extensions north of the city to serve the Stoner Creek Mobile Home Park east of Peacock Road and south of Isgrig Lane.
3. Significant growth expected south of the city along Lexington Road-Bethlehem Road corridor could best be served by some redirection of the sewage pumped from that station. This southside growth is completely across the city from the wastewater treatment plant. The current pumping arrangement causes hydraulic overloads downstream in the gravity sewer system.

Sewage bypassing can and does occur presently at certain pumping stations and at low-lying manholes. No sewage is bypassed at the wastewater treatment plant.

Paris abandoned its former wastewater treatment plant at the end of Elizabeth Street in 1989 as that facility was located in the floodway. At that time, a new wastewater treatment plant was inaugurated on the city's north side.

The treatment plant has a rated capacity of 2.7 MGD with a maximum hydraulic capability of 5.0 MGD. Treatment facilities include mechanical bar screens and fine screens, grit removal, two oxidation ditches, intra-channel clarifiers, chlorination, dechlorination, and post-aeration before discharge of the treated effluent to Stoner Creek at milepoint 14.5. The stream use classification at the point of discharge is for Warmwater Aquatic Life. The stream low flow condition was determined to be only 0.6 cubic feet per second.

Sewage sludge is processed by gravity thickeners, a belt filter press, and by ultimate disposal in a contained landfill in Montgomery County.

Current Wastewater Facilities Planning work calls for the early removal of the intrachannel clarifiers, the addition of two 80-foot diameter secondary clarifiers, and the construction of a raw activated sludge/waste activated sludge pumping station.

Treatment plant performance in 1995, 1996, and 1997 reveals some exceedences with regard to the city's treatment plant effluent limits in its state-issued wastewater discharge permit.

Laboratory results from the treatment plant effluent are compared to effluent limits as follows:

Parameter	KPDES Limit	Average Annual Value		
		1995	1996	1997
Dissolved Oxygen	6 mg/1 min.	6.5 mg/1	6.3 mg/1	6 mg/1

Total Suspended Solids <sup>1;3</sup>	30 mg/1 max.	32 mg/1	16 mg/1	15 mg/1
Ammonia - Summer	2 mg/1 max.	0.37 mg/1	0.33 mg/1	1.77 mg/1
Ammonia - Winter	5 mg/1 max.	0.60 mg/1	2.78 mg/1	2.89 mg/1
Coliform	200/100 ml max.	10/100 ml	31/100 ml	12/100 ml
BOD <sup>2;4</sup>	10 mg/1 max.	19.2 mg/1	11.6 mg/1	9 mg/1
Flow	2.2 MGD	1.03 MGD	1.62 MGD	1.2 MGD

<sup>1</sup>Exceedences noted in June, September, and November, 1995

<sup>2</sup>Exceedences noted in June and November, 1995

<sup>3</sup>Exceedences noted in December, 1996

<sup>4</sup>Exceedences noted in January, March, April, November, and December, 1996

One set of monthly exceedences was attributed to an illegal dumping of diesel fuel. The other exceedences were attributed to washout conditions at the wastewater treatment plant which were caused by excessive inflow and infiltration.

In 1997, there were six monthly exceedences to the BOD limit, two monthly exceedences to the summer ammonia limit, and two monthly exceedences to the total suspended solids limit.

While treatment plant records for 1995 show an average daily flow of 1.03 MGD, plant operational personnel suggest that a higher figure would likely have been more accurate. After a treatment plant influent meter was installed, and average daily flow advanced to 1.62 MGD in 1996. Recorded flows in 1997 fell back to 1.2 MGD on an average day.

Paris is required to biomonitor its treatment plant effluent. The city has remained in compliance with respect to biomonitoring and has not yet been required to conduct a toxicity reduction evaluation (TRE).

Like most Kentucky cities of its size, Paris does have a pretreatment ordinance. Those sewer users who are presently involved in providing pretreatment prior to discharge to the public sewer are Central Light Alloy (CLA), Central Manufacturing Company (CMC), Mallinckrodt, Bourbon Laundry, Bourbon Hospital, and ITW Ramset.

The city has seven state-certified wastewater treatment plant operators. The chief operator is a Class IV. Three are Class III operators, and one is a Class I.

The city had 3,333 sewer customers in late 1996. No distinction is made on utility records between customers of various types.

Monthly sewer rates, which will take effect in January 1999 and which are the same for both inside and outside city customers, are as follows: For the first 2,000 gallons, there is a minimum charge of \$10.66. For every 1,000 gallons above the first 2,000, there is a charge of \$5.33 for each additional 1,000 gallons.

Gross revenues from the sale of sewer service in 1995 were \$699,000. Operation and maintenance costs (exclusive of depreciation) were \$484,000. Net sewer revenues before debt service was \$215,000. Annual principal and interest payments are recorded only for Paris' combined water, sewer, sanitation, and electric system. That annual debt service payment for 1995 was \$916,000.

### ***Proposed Projects 2000-2005***

#### **SX21017001**

Although only four houses lie along the roads proposed for sewer extensions, much of the city of Paris will benefit from the sewer rehabilitation, line extensions, and wastewater treatment plant upgrades proposed in this project.

1. Paris' 1996 Regional Wastewater Facilities Plan Update has been approved by the Kentucky Division of Water. Hydraulic expansion of the wastewater treatment plant is proposed to be undertaken in two phases. The initial phase—recommended to be undertaken well within the period of the Immediate Plan—involves the abandonment of the present system of intrachannel boat clarifiers in favor of construction of two external clarifiers. This change alone would increase the plant's average daily design flow to 2.7 MGD from the present capacity of 2.2 MGD. According to the Facilities Plan, this treatment plant modification and expansion will give the plant sufficient capacity for approximately 10 years. The initial phase of construction at the wastewater treatment plant has an estimated 1997 project cost of \$2,800,000.
2. Through a significant analysis of the system of sanitary sewers, it has been determined that many, if not most, sewer sub-basins are subjected to excessive inflow and infiltration. Within the period of the Immediate Plan, recommended is the rehabilitation of sewers within number sub-basins 1, 3, 5, and a portion of 8. Sub-basin 1 is essentially the downtown area. The area is approximately three blocks wide and extends northward from 12th Street to a point near the confluence of Houston Creek and Stoner Creek. Sub-basin 3 is immediately north of Sub-basin 1 and is encircled by the CSX rail line and Stoner Creek. The former wastewater treatment plant site at the dead-end of Elizabeth Street is in Sub-basin 3. Sub-basin 5 is immediately west of Sub-basin 1 and is generally described as areas within the bend of Houston Creek (in the

Stewart Street-Lilleston Street vicinity) together with areas of the city in the Peacock Road area west of the CSX rail line. Sub-basin 8, located in the eastern quadrant of the city, includes Scott, Maysville, and Bell Streets. An estimated project cost of \$2.1 million is suggested for Immediate Plan sewer rehabilitation in Sub-basins 1, 3, 5, and portions of 8. Private sewer line rehabilitation is proposed to be pursued systemwide concurrently with localized public sewer rehabilitation as discussed above. Proposed is that the effectiveness of public sewer rehabilitation measures described above be determined upon their completion. Depending upon the actual hydraulic relief actually realized, a decision would then be made to continue the rehabilitative efforts elsewhere—on a worst-first basis or to invest the additional financial resources in larger pumps, sewers, and more hydraulic capacity at the treatment plant. The 1996 Facilities Plan Update suggests that an additional \$1.22 million be invested in sewer rehabilitation during the period of the Immediate Plan.

3. An existing gravity sewer in the East Main Street (US 68) - Legion Park area is subject to frequent washouts and other maintenance woes. Proposed during the Immediate Planning period of the Paris Wastewater Facilities Plan is the rerouting of a portion of that sewer and the construction of a sewage pumping station. The estimated project cost is \$160,000.
4. A replacement to the Ford's Mill sewage pumping station is also proposed during the period of the Immediate plan. This new and larger pumping station would pump to the Lilliston Avenue pumping station and would offer hydraulic relief to some older gravity sewers and pumping stations. Completion of this replacement of sewage pumping stations is necessary for adequate functioning of the proposed Lexington Road relief sewer. The estimated project cost is \$540,000.
5. The renovation of the Old Wastewater Treatment Plant sewage pumping station is also proposed during the period of the Immediate Plan. The estimated project cost is \$310,000.
6. The Lexington Road pumping station (located at Houston Creek and the Lexington Road) has several drawbacks. The pumping station's force main is in poor condition. The station will be expected to carry an increasingly significantly hydraulic load as major urbanization occurs further southwest along the Lexington and the Bethlehem Roads. Sewage from the existing pumping station is conveyed to the existing Claysville interceptor sewer that is already overloaded. Suggested (but not included in the city's 1996 Regional Facilities Plan Update) is the installation of an 18- and then a 21-inch diameter relief sewer that would follow Houston Creek around the city's southwest and west sides from the Lexington Road pumping station downstream to the Lilliston Avenue sewage pumping station. Sewage collected from the developing Houston Oaks subdivision as well as the existing Bourbon Parkway and Bedford Acres subdivisions can, with this sewer, be diverted from the overloaded 12-inch diameter Claysville interceptor sewer. Depending upon the chronology of construction projects, the installation of this large diameter relief sewer could eliminate the expensive need to reconstruct several existing pumping stations, which could instead be abandoned. The estimated 1997 project cost of the Houston Creek relief sewer is \$2.1 million. The implementation is proposed for the period of the Immediate Plan.

**Proposed Projects 2006-2020**

**SX21017002**

As with the project proposed in the Immediate Term, the proposed sewer lines in this project will serve only three houses. However, much of the city of Paris will benefit by the rehabilitation of sewer lines and wastewater treatment plant expansion proposed in this project. This project includes the following:

1. During the period of the Long Term Plan, the second phase of construction of the wastewater treatment plant is proposed to be undertaken. This second phase involves the hydraulic expansion of the wastewater treatment plant to 3.9 MGD. This expansion by 1.2 million gallons daily would represent a 44 percent increase in capacity from what would be at the onset of the second phase a 2.7 MGD wastewater treatment plant. The expansion to a 3.9 MGD treatment plant would be with the utilization of compatible technology. The 1997 estimated project cost of the second phase wastewater treatment plant is an additional \$2,400,000.
2. Proposed for implementation during the period of the Long Term Plan are two additional interceptors on the west and north sides of Paris. Proposed are:
  - a. a 10-inch and 12-inch diameter sewer west of US 27/US 68 Bypass and both north and south of US 460. This sewer would discharge to the Houston Creek relief sewer.
  - b. a 10-inch and 12-inch diameter sewer that would flow west to east in the vicinity of the US 27/US 68 wye northwest of the city center. This proposed sewer would end at a proposed pumping station on Stoner Creek's west bank near the Peacock Road bridge.The 1997 estimated project cost of the Long Term Plan additions to the interceptor sewer system is \$750,000.
3. Also, during the period of the Long Term Plan, the Woodmont Drive pumping station, the Rio Vista pumping station and Mallinkrodt pumping station are proposed for replacement at a 1997 estimated project cost of \$370,000.

**CITY OF MILLERSBURG SANITARY SEWER SYSTEM**

Millersburg has had a sanitary sewer system since 1929. Sewage treatment facilities, however, were added only in 1984. The sewer system was extended at the time that the treatment works were constructed so that it presently serves the entire community. As the northside Clark Hills subdivision has been built in recent years straddling the Bourbon-Nicholas County line, city sewer service has been extended to serve the development. In fact, Millersburg municipal sewer service is now available in the southwestern corner of Nicholas County into which the subdivision has grown. With small exceptions, the sewer system is composed of 8-inch diameter gravity sewers. Tiny grinder pumps have been installed at the

westside ends of Eighth Street and Tenth Street as well as in Clark Hills Subdivision to serve a few isolated low-lying houses at each location. Some of the older sewers are reported to be in poor condition and to be a continuous source of inflow and infiltration. Sewer customers number 376.

Millersburg's sewage treatment plant is located at the dead-end of Second Street near the east bank of Hinkston Creek, the stream which receives the plant's treated effluent at milepoint 77.5. Improvements were made to the treatment plant in 1990 after it was discovered that treatment plant design engineers had not been given parameters that were sufficiently stringent to accommodate the low flow nature of Hinkston Creek. There are many days of most years that no dilution water is available for effluent discharged to the creek because of the upstream water supply impoundment that cuts off the natural flow of the creek.

With the exception of a 500,000 gallon concrete equalization and sludge storage basin that is below ground, most of the Millersburg sewage treatment plant consists of above ground steel tankage. The plant operates as an extended aeration facility. Treatment components consist of flow equalization, clarification, aerobic sludge digestion, chlorination and dechlorination. The purpose of the addition of the equalization basin was to smooth out flow variations and organic loadings as well as to permit Millersburg to meet the ammonia limit in its state permit even when the treatment plant is fully loaded. The plant has a rated capacity of 200,000 gallons per day. Effluent is chlorinated and then is dechlorinated with sulfur dioxide prior to discharge to Hinkston Creek.

Treatment plant performance in 1995, 1996, and 1997 compared very favorably to the limits contained in the city's state-issued wastewater treatment plant discharge permit. Laboratory results of the treatment plant effluent in 1995, 1996, and 1997 are compared to the city's effluent limits as follows:

Average Annual Value

Parameter	KPDES Limit	1995	1996	1997
Dissolved Oxygen	7.0 mg/1 min.	10.9 mg/1	9.8 mg/1	9.4 mg/1
Total Suspended Solids	30 mg/1 max.	3.0 mg/1	3.1 mg/1	2.3 mg/1
Ammonia - Summer	2 mg/1 max.	0.39 mg/1	0.38 mg/1	0.67 mg/1
Ammonia - Winter	8 mg/1 max.	2.04 mg/1	2.07 mg/1	0.97 mg/1
Coliform	200/100 ml max.	0	10/100 ml	0/100 ml
BOD	10 mg/1 maximum	3.1 mg/1	3.4 mg/1	2.7 mg/1
Flow	0.20 MGD	0.099 MGD	0.111 MGD	0.113 MGD

There were no permit exceedences in 1997. Millersburg has a single state-certified wastewater treatment plant operator who is a Class III. The operator conducts all standard monthly laboratory analyses. The city discharge monitoring reports show no permit exceedences for any constituent for any of the months of 1995 or 1996. The plant operator reports that there is no bypassing of sewage before it reaches the treatment plant. No sewer customers are required to pre-treat. The city is not required to conduct bio-monitoring tests on its effluent. The city is not involved in any enforcement actions with the Division of Water.

Sewage sludge is landfarmed by the city which has its own landfarming permit. Sewer needs identified by the city's operator involved the effective repair or replacement of the broken and leaky sewers in the older parts of Millersburg.

The charge for sewer service parallels the city's water service charges. Effective in October 1995, the charge became \$6.52 per 1,000 gallons with a minimum bill of \$6.52.

Financial information for fiscal year 1997 is as follows: Gross revenues from the sale of sewer service were \$106,600. Operating sewer and maintenance costs were \$58,000. Net sewer revenues were \$48,000. The annual sewer system debt service payment for this same period was \$38,000.

**Proposed Projects 2000-2005**

**SX21017003**

1. Even with a two percent increase in metered sewage flows in 1997 as compared to 1996, the wastewater treatment plant is only hydraulically loaded at about 57 percent of its rated 24-hour capacity. The facility is presently operated well within its state-permitted treatment limits. With slow to moderate growth predicted during the 20-year planning period, it seems likely that the existing wastewater treatment plan could be adequate throughout the full planning period. Some evidence of metal surface deterioration was noticed during the field visit. Adequate financial resources, estimated at \$50,000 during the period of the Immediate Plan, is recommended to be made available to protect and restore metal surfaces during the planning period so as to extend the treatment plant's useful life.
2. Just as for most sanitary sewer systems, Millersburg does experience excess flows that are attributable to inflow and infiltration. To protect the community's investment in its wastewater treatment plant, it is suggested that Millersburg continue to monitor the magnitude of inflow and infiltration problems and deal with those problems with sewer rehabilitation measures as it becomes cost effective to do so. Toward this end, it is suggested that Millersburg allocate \$100,000 per five year period for sewer rehabilitation measures. For the period of the Immediate Plan, this effort would require \$100,000.

**Proposed Projects 2006-2020**

**SX21017004**

Although only six houses presently lie along the roads proposed for sewer extensions, much of the city of Millersburg will benefit from the sewer rehabilitation, line extensions, and wastewater treatment plant upgrades proposed in this project. The project is as follows:

1. Sewer service appears to be generally available in all areas which are expected to be urbanized during the planning period. The single exception to this is the Cynthiana Road (KY 1879) where a 2,500 foot, 8-inch diameter gravity sewer extension is proposed for installation during the period of the Long Term Plan. The estimated project cost of that extension is \$70,000.
2. \$100,000 during the period of the Long Term Plan is recommended to be made available to protect and restore metal surfaces during the planning period so as to extend the treatment plant's useful life.
3. Just as for most sanitary sewer systems, Millersburg does experience excess flows that are attributable to inflow and infiltration. To protect the community's investment in its wastewater treatment plant, it is suggested that Millersburg continue to monitor the magnitude of inflow and infiltration problems and deal with those problems with sewer rehabilitation measures as it becomes cost effective to do so. Toward this end, it is suggested that Millersburg allocate \$100,000 per five year period for sewer rehabilitation measures. For the period of the Long Term, this effort would require \$300,000.



**CITY OF NORTH MIDDLETOWN SANITARY SEWER SYSTEM**

North Middletown’s sewer system was built in 1964. It was, and still is, an ambitious project for a city of North Middletown’s size. The only significant addition of the intervening years has been Lynnmar Subdivision on the city’s south side—nestled between KY 57 (to Clintonville) and US 460 (to Mt. Sterling). The system is totally a gravity system. There are no unsewered developed areas within the city. All sewers are eight-inches in diameter. Despite remedial efforts in 1989 to reduce inflow and infiltration in the system, high sewer flows during and following heavy rainfall continue to trouble the system. Operational personnel suspect that there might be a broken sewer pipe in the system somewhere near a creek or a drainage way because high flows in the sewer system start rapidly and conclude rapidly after a run-off producing storm.

North Middletown has 277 sewer customers, all of whom reside within the corporate limits.

From 1964 to 1989, treatment consisted of three sewage stabilization lagoons which were designed to be operated in series. In 1989, an extended aeration package treatment plant was installed at the head of the lagoon treatment plant. The expanded wastewater treatment plant is rated at 85,000 gallons per day with a peaking factor of 2.5. The package treatment plant includes a bar screen and grinder, aeration basin, secondary clarification, and aerated sludge holding. Post-aeration, chlorination, flow monitoring, and dechlorination are provided in a separate, concrete structure. Following the extended aeration unit, wastewater goes to Lagoon 2, then to Lagoon 1 and then is discharged to Indian Creek immediately above that small stream’s confluence with Stoner Creek. The system has one Class IV certified wastewater treatment plant operator.

Treatment plant performance in 1995, 1996, and 1997 was judged to be variable when compared to the limits established by the city’s state-issued wastewater discharge permit.

That comparison follows:

Parameter	KPDES Limit	Average Annual Value		
		1995	1996	1997
Dissolved Oxygen	7.0 mg/l min.	8.0 mg/l	7.9 mg/l	8.2 mg/l
Total Suspended	30 mg/l max.	18.9 mg/l	55.6 mg/l	43.7mg/l

Solids				
Ammonia – Summer	2 mg/1 max.	2.0 mg/1	3.8 mg/1	4.06 mg/1
Ammonia – Winter	5 mg/1 max.	2.5 mg/1	2.7 mg/1	3.52 mg/1
Coliform	200/100 ml max.	1080/100 ml	708/100 ml	1864/100 ml
BOD	10 mg/1 max.	6.8 mg/1	14.4 mg/1	12.5 mg/1
Flow	0.085 MGD	0.074 MGD	0.133 MGD	0.121 MGD

During 1995, one monthly exceedence noted for total suspended solids; two for ammonia; five for coliform; and one for BOD. During 1996, three monthly exceedences were noted for total suspended solids; three for ammonia; six for coliform; and five for BOD. During 1997, five monthly exceedences were noted for BOD; three for the summer ammonia limit and two for the winter ammonia limit; two for total suspended solids; and nine for the coliform limit. During wet weather when incoming flows at the wastewater treatment plant are highest, the package treatment plant takes all the sewage flow that it can. Incoming flows exceeding the package plant’s hydraulic capacity are split off to the lagoons.

Excess sewage sludge is wasted to a sludge tank truck which hauls the sludge to Paris for dewatering by that city’s filter press. The filter cake is then disposed of lawfully in a Montgomery County landfill.

Inflow/infiltration remediation ranks as the greatest need for the sewer system, according to operating personnel. Enforcement action against the city by the Kentucky Division of Water seems likely.

Since April 1989, the following sewer rates have been in effect:

First 2,000 gallons/month	\$11.25 minimum bill
Next 3,000 gallons/month	\$4.05/1,000 gallons
Next 5,000 gallons/month	\$3.15/1,000 gallons
Next 40,000 gallons/month	\$2.70/1,000 gallons
All Over 50,000 gallons/month	\$2.57/1,000 gallons

Gross revenues from the sale of sewer service for fiscal year 1997 were \$65,300. Operating and maintenance expenses were \$81,600. Net sewer revenues were \$(16,300).

**Proposed Projects 2000-2005**

**SX21017005**

Treatment plant performance worsened in 1997 as compared to 1996. As a result, it is likely that state regulators will step in and require plans for improvement. Suggested first is that hydraulic flows be studied and locations of cost effective inflow/infiltration reduction be pinpointed. Since average flows measured at the wastewater treatment plant increased by almost 80 percent from 1995 to 1996, it seems likely that either flow measurements are incorrect or the city's inflow/infiltration problem has become seriously aggravated.

1. Based upon growing water purchases from the city's wholesale water supplier, the Kentucky-American Water Company, it seems likely that a hydraulic expansion of the city's wastewater treatment plant may be required. Recommended is a hydraulic expansion of the city's wastewater treatment plant to 150,000 gallons per day. This could be accomplished by the addition of a second extended aeration-type treatment unit in parallel with the existing plant. The city's success (or lack of success) in reducing excess hydraulic flows could result in a smaller wastewater plant expansion than that proposed above. The 1997 estimated project cost of the addition of a modular 65,000 gallons per day extended aeration treatment plant (to increase hydraulic capacity to 150,000 gpd) is \$200,000. No capital expenses are proposed for the period of the Long Term Plan.
2. Even though there was a sewer rehabilitation effort in North Middletown in 1989, the increase in hydraulic flows measured at the wastewater plant in recent years would indicate that the end result of the sewer rehabilitation has been other than successful. Additional sewer rehabilitation is proposed during the period of the Immediate Plan. It is suggested that an estimated project cost of \$250,000 would be reasonable.
3. Also during the period of the Immediate Plan, a short 8-inch gravity sewer line extension north of the city on KY 13 is proposed. The proposed sewer could extend to the hilltop. Other than sewer lines which might be extended by developers, no other Immediate Plan sewer extensions are proposed. The 1997 estimated project cost of the KY 13 sewer extensions is \$40,000. This extension will only serve approximately three existing houses along the road in this project. However, many new households could potentially be served by this project if development occurs in this area of North Middletown.

**Proposed Projects 2006-2020**

**SX21017006**

1. An expenditure of another \$200,000 during the Long Term period on sewer rehabilitation appears warranted.
2. During the period of the Long Term , sewer extensions east along Indian Creek (south of the city) and south along US 460 are proposed. Such an extension would permit additional acreage to be developed with gravity sewer service to the existing wastewater treatment plant southwest of the city. The 1997 estimated project cost of sewers is \$140,000. Much like the project proposed in the Immediate Term, this extension will

only serve approximately two existing houses along the road in this project. However, many new households could potentially be served by this project if development occurs in this area of North Middletown.

#### ON-SITE TREATMENT SYSTEMS

##### **SI21017001**

This area consists of rural Bourbon County beyond the service areas of the Cities of Paris, Millersburg, and North Middletown's sanitary sewer systems. It is unlikely that public sewer line extensions will reach this area of Bourbon County by 2020. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. Reasons for the high cost are the number of households (3,150), a low customer per mile ratio, rugged terrain, and the long distance from these houses to treatment facilities and existing sewer systems. Suggested instead is that a Revolving Loan Fund Program be established or that the U.S. Army Corps of Engineers 531 program be extended for the installation of a septic tank for each house that does not presently have sanitary sewer service, or could currently have a failing septic system. The generalized proposed cost of this option is \$15,750,000, or \$5,000 per household.

## BOYLE COUNTY

### Boyle County Sewer Service (map)

- Estimated 1999 population of 26,100--66% on public sewer
- Estimated 2020 population of 27,300--66% on public sewer
- Proposed projects would connect over 100 new households to public sewer during 2000-2020
- Estimated funding needs for public sewer 2000-2005--\$5,091,000
- Estimated funding needs for public sewer 2006-2020--\$8,000,000

Boyle County had an estimated population of 26,107 (10,539 households) in 1999 with a projected population of 27,300 (11,711 households) in 2020. Public sewer is provided to about 66 percent of the households. About 3,600 households use on-site systems. About 100+ customers could be added to public sewer service through new line extensions in 2000-2020.

### BOYLE COUNTY SEWER PLAN

#### *Proposed Projects 2000-2005*

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
<b>BOYLE</b>							-
Danville /SX21021001	3-SD's+14	2,800	1,800				4,600
Junction City /SX21021003	15	130	250				380
Perryville /SX21021005	6	36	75				111
<b>County Total</b>	<b>35+</b>	<b>2,966</b>	<b>2,125</b>				<b>5,091</b>

#### *Proposed Projects 2006-2020*

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
<b>BOYLE</b>							-
Danville SX21021002	33	850	4,200	1,500			6,550
Junction City SX21021004	5	300	600				900
Perryville SX21021006	19	300		250			550
<b>County Total</b>	<b>57</b>	<b>1,450</b>	<b>4,800</b>	<b>1,750</b>			<b>8,000</b>

### CITY OF DANVILLE SANITARY SEWER SYSTEM

Danville's sewerage system is one of only four significant publicly-owned sewerage system in Boyle County. The other three are the City of Junction City, the City of Perryville, and Northpoint Training Center. Collected sewage from the Junction City municipal sewer

# SEWER SERVICE AREAS

## BOYLE COUNTY

### Kentucky

**Prepared By:**  
**Water Resource Development Commission**

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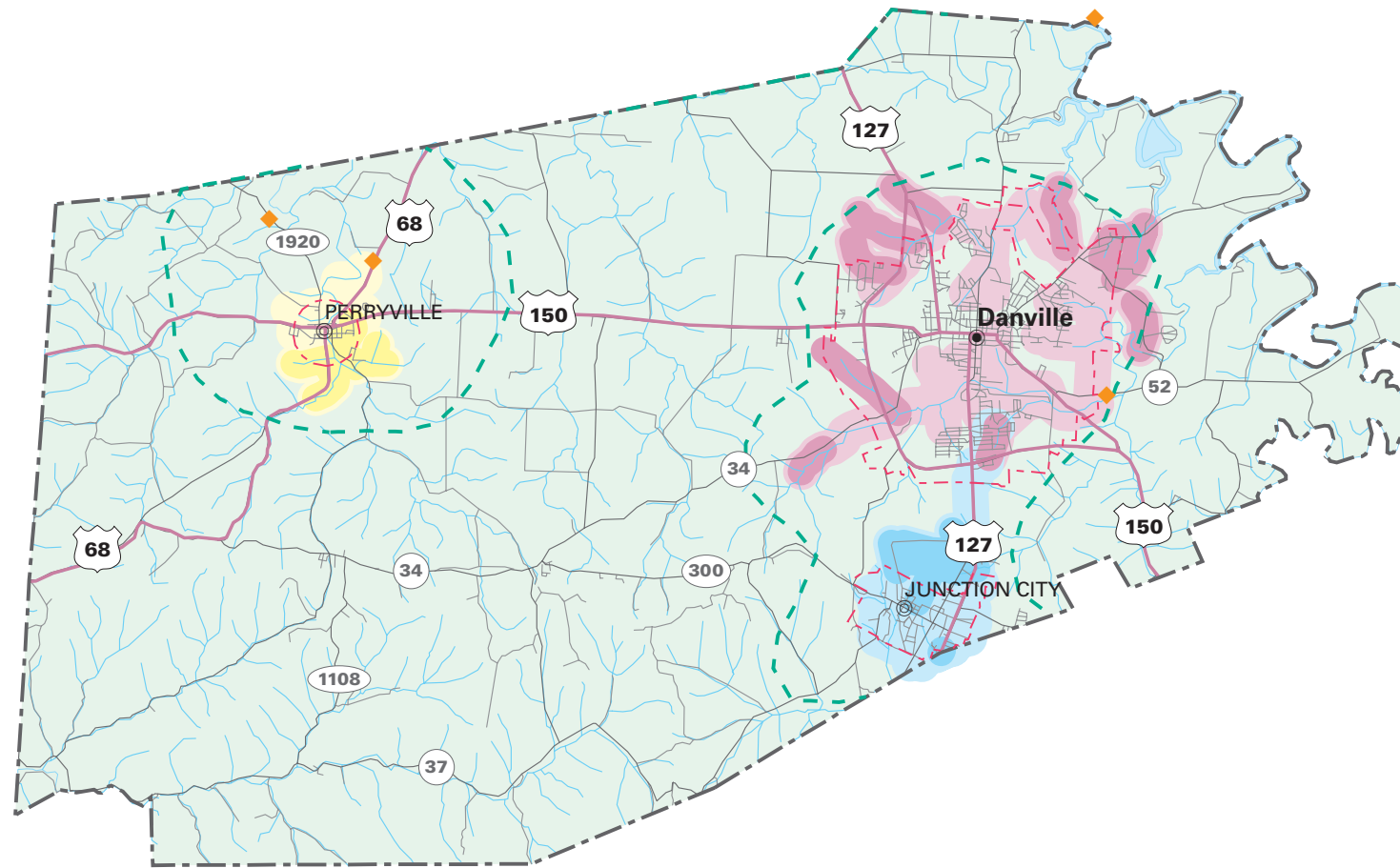
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LIMITATION OF LIABILITY: The Water Resource Development Commission has no reason to believe that there are any inaccuracies or defects in information incorporated in this work and make no representations of any kind, including, but not limited to, the warranties of merchantability or fitness for a particular use, nor any such warranties to be implied, with respect to the information or data furnished herein.

- - - 201k Facility Planning Area
- - - Incorporated City Boundary
- ◆ Sewage Treatment Plant



#### SEWER SERVICE STATUS BY OWNER

EXISTING SERVICE AREA	PROPOSED SERVICE AREA	OWNER
<span style="background-color: yellow; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>	<span style="background-color: yellow; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>	PERRYVILLE MUNICIPAL SEWER
<span style="background-color: lightblue; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>	<span style="background-color: lightblue; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>	JUNCTION CITY MUNICIPAL SEWER
<span style="background-color: pink; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>	<span style="background-color: pink; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>	DANVILLE MUNICIPAL SEWER



system is conveyed to the Danville interceptor sewer and is treated at the Danville municipal wastewater treatment plant.

According to Danville utility personnel, the Danville system serves 5,448 customers if Junction City is treated as a single sewer customer. Two significant, well-defined residential developments, both of which were annexed to the city in recent years, remain unsewered. Quest Engineers' 1994 Facilities Plan Update counted 102 unsewered homes in Bluegrass Estates (in northwest Danville) and another 103 homes in Weisiger Woods (in northeast Danville). The city has fewer than five sewer customers outside of its corporate limits. One of those is the former Alum Springs landfill west of the city. The landfill had a leachate problem, which was resolved in 1996 by the collection and conveyance of the leachate to the municipal wastewater treatment plant.

Most drainage within Danville and its growth area is either northerly or easterly with the Spears Creek or the Clarks Run drainage basins. Danville's 1976 Wastewater Facilities Plan identified approximately 92 miles of sewer lines at that time—ranging in size from 6-inch to 24-inch. A number of miles of additional sewer lines have been installed in the last 22 years, primarily due to:

1. the extension sewers to previous unserved areas and
2. the installation of new interceptor sewers to accommodate increases in flow and to eliminate extraneous sewage pumping stations.

Due to improvements within the system of interceptor sewers, the number of sewage pumping stations has been reduced from more than 20 in 1976 to the current number of four stations. According to the 1994 Quest Engineers study, information about the four pumping stations is as follows:

<b>Station Name</b>	<b>Location in Danville</b>	<b>Number of Pumps</b>	<b>Pump Capacity in GPM</b>	<b>Major Facility</b>
Spears Creek	North	8	4 @ 450, 4 @ 800	Yes
Clarks Run	ESE	4	2 @ 1,200, 2 @ 3,700	Yes
East Danville	East	2	400 ea.	No
Horkey Field	East	2	200 ea.	No

A troublesome West Danville pumping station was eliminated by a 1996 construction project that permitted sewage which is collected to that point to be conveyed by gravity further east to the existing gravity sewer system.

Present day sewers are as large as 36-inches in diameter just upstream of the wastewater treatment plant east of Danville on Clarks Run. Sewage entering the Spears Creek, the Horkey Field, the East Danville, and the Clarks Run sewage pumping stations reaches the municipal wastewater treatment plant by force mains and without further gravity conveyance.

The existing interceptor sewer for approximately one half of the city follows Clarks Run in a west to east flow pattern. The Clarks Run interceptor sewer begins as a 12-inch diameter sewer west of US 150 Bypass and slightly beyond the western corporate limits in the vicinity of the American Greetings plant. From that point the interceptor follows the creek in its downstream (easterly) route. At the Norfolk Southern Railway, the sewer upsizes to a 15-inch diameter line. Near Hustonville Road, it becomes an 18-inch diameter sewer; at South 2nd Street, it becomes a 27-inch diameter sewer. Immediately west of Stanford Avenue, the sewer becomes 36-inches in diameter and continues east with Clarks Run to the Clarks Run pumping station near the wastewater treatment plant. Five branches to this major interceptor sewer range in size from 10-inches in diameter to 24-inches in diameter.

Because of the deleterious effects upon the sewerage system of inflow and infiltration, a 10 million gallon equalization basin was constructed at the site of the former wastewater treatment plant near the east end of Terrill Drive. The Terrill Drive equalization basin is upstream and west of the Clarks Run sewage pumping station.

The 12-inch diameter East Main Street interceptor flows west to east along that street from about McRoberts Street to the East Main Street sewage pumping station. The Seminole Trail interceptor sewer—also 12-inches in diameter—similarly flows west to east along the street from Nakomis to the Horkey pumping station. Finally, the Spears Creek drainage basin is served by what is essentially a two-pronged interceptor sewer. The western branch follows the US 150 Bypass from near Whirlaway Avenue to a point near where KY 33 North bridges Spears Creek. Line sizes in the western branch of the Spears Creek interceptor sewer



range from 10-inches to 18-inches in diameter. The eastern branch of the Spears Creek interceptor sewer follows a branch of the creek and Shakertown Road in a south to north flow pattern to meet the western branch near the KY 33 bridge of Spears Creek. Line sizes of the eastern branch interceptor sewer range in pipe diameter from 12-inches to 24-inches. From the point that the western branch and the eastern branch of the Spears Creek interceptor sewers join, the sewer continues on as a 24-inch sewer to a point near the north corporate limits of Danville—ending at the Spears Creek pumping station.

The East Main Street interceptor sewer, the Seminole Trail interceptor sewer, and the Spears Creek interceptor sewer each end at their own sewage pumping stations. Sewerage collected to those three pumping stations is conveyed in a north-to-south direction by a 14-inch force main which terminates at the city's wastewater treatment plant.

City personnel report that sump pumps that are prevalent in much of the sewer system have been identified as a contributing source of much of the extraneous flow to the sewer system. For several years, the city has had an ongoing sewer system rehabilitation effort underway. Most efforts to date have involved internal sewer grouting and manhole grouting as ways of reducing inflow and infiltration. The city engineer claims that sewer flows during and immediately following peak storm events have been reduced by 4 MGD during a peak storm event as a result of the city's recent and ongoing sewer rehabilitation efforts.

The 1994 Quest Engineers study identified significant interceptor sewers with potential capacity deficits over the 20-year life of that planning effort. More than three fourths of the footage of targeted interceptor sewers is located in the Clarks Run drainage basin. Most of the remainder of the potential problem sewers are in the Spears Creek drainage basin.

In 1980, Danville abandoned its trickling filter wastewater treatment plant on Terrill Drive in favor of a new and modern treatment facility further east of the city along Clarks Run. The present facility is located immediately east of US 150 (Stanford Road) and south of KY 52. The new oxidation ditch treatment facility was originally rated at 2.7 MGD. In 1987, however, the facility's rated capacity was increased to 3.5 MGD with the construction of an on-site equalization/facultative lagoon. The maximum hydraulic capacity of the treatment

plant is 8.5 MGD. The treatment plant discharges at mile point 6.63 of Clarks Run. Clarks Run is a major tributary of Dix River (Herrington Lake).

When sewage is pumped into the treatment plant, it goes first to the on-site equalization and facultative lagoon. The normal capacity of this aerated basin is 19 MG but it can be increased to 25 MG during peak flows by raising the maximum water surface elevation. Accordingly, the lagoon offers 6 million gallons of storage for the equalization of peak flows.

From the equalization and facultative lagoon, wastewater goes to three grinders operating in parallel. Water then goes to oxidation ditches. Those two ditches, operating in parallel, provide biological treatment through an extended aeration process using long hydraulic and solids retention times and low organic loading rates. Each of the two ditches has a volume of 1.1 MG and provides a 15-hour retention time at design flow conditions (3.5 MGD) with both ditches in operation.

Effluent from the oxidation ditches goes to the final clarifiers of which there are two. Solids collected in the final clarifiers are either returned to the oxidation ditches or are wasted. From the final clarifiers, wastewater goes to either of two chlorine contact chambers for disinfection. Thence the wastewater is dechlorinated by the addition of sulfur dioxide, is reaerated, and is discharged to Clarks Run.

For the solids portion of the wastewater, a polymer is added to promote solids concentration before the waste goes to a 30 foot square gravity thickener. Thickened sludge is stored in two solids holding tanks prior to pumping to the sludge drying beds or to the sludge storage lagoon. Thickened sludge from the solids holding tank is pumped to the 1.2 MG sludge storage lagoon for further digestion and storage prior to landfarming by the injection method. An alternate sludge disposal method is to pump sludge from the solids holding tank to any of seven sludge drying beds before ultimate disposal at an approved contained landfill in Lincoln County.

Danville's wastewater treatment plant has been running at or near its 3.5 MGD rated capacity for several years. Annual average flows in recent years have been as follows:

1995	3.43 MGD
1996	3.75 MGD

1997

3.55 MGD

During 11 of 12 months of 1995, sewage flows measured at the municipal wastewater treatment plant were in excess of the plant’s rated capacity of 3.5 MGD on at least one day of the month. During four months of 1995, the average daily flow (for the month) exceeded the plant’s rated capacity of 3.5 MGD. High flow months in 1995 were January, February, March, and May. During six months of 1996, the average daily flow for the month exceeded the plant’s rated capacity. High flow months in 1996 were January, March, April, May, June and December.

Treatment plant performance in 1995, 1996, and 1997 compared favorably to the limits contained in the treatment plant’s effluent limits established by its state-issued discharge permit. Average laboratory results show no permit exceedences during 1995 and 1996. One monthly permit exceedence was noted in 1997—with regard to BOD. Laboratory results of the treatment plant effluent in 1995, 1996, and

1997 are compared to effluent limits as follows:

Average Annual Values

Parameter	KPDES Limit	1995	1996	1997
Dissolved Oxygen	7.0 mg/1 minimum	9.2 mg/1	8.4 mg/1	8 mg/1
Total Suspended Solids	30.0 mg/1 maximum	14.2 mg/1	13.0 mg/1	11 mg/1
Ammonia - summer	2.0 mg/1 maximum	0.6 mg/1	0.5 mg/1	0.47 mg/1
Ammonia - winter	5.0 mg/1 maximum	1.6 mg/1	1.1 mg/1	0.67 mg/1
Coliform	200/100 ml	14/100 ml	2/100 ml	3/100 ml
Biochemical Oxygen Demand	10 mg/1 maximum	4.9 mg/1	4.9 mg/1	5.3 mg/1

Danville has a pretreatment ordinance in effect. Pretreatment of wastewaters is undertaken at Denyo, Philips Lighting, ATR Wire, Caterpillar, and Matsushita. The city has 9 state certified wastewater treatment operators; 4 Class IV, 2 Class III, and 3 are Class II certified.

The city is required to conduct biomonitoring analyses on its sewage treatment plant effluent. Danville has also been required to conduct a toxicity reduction evaluation (TRE).

City personnel report that Danville has been passing its biomonitoring tests in recent times. During times when the city was having trouble obtaining satisfactory biomonitoring results, it was determined that unsatisfactory tests were related to high flows at the wastewater treatment plant. Unlike some area wastewater treatment plants, Danville has detected no correlation between unsatisfactory biomonitoring tests and the presence of minute amounts of pesticides in the water.

Monthly sewer rates in effect in Danville are these:

For residential and commercial customers, the minimum monthly rate is \$2.93. The sewer rate per 100 cubic feet of water consumed is \$1.19. Junction City buys sewage treatment service from Danville at the residential/commercial rate, i.e., Junction City is charged \$1.19 per 100 cubic feet of sewage that is metered as it enters the Danville sewer system.

For wholesale and industrial customers, the minimum monthly rate is \$331.62. The rate over 100 cubic feet of water consumed is \$1.54 per 100 cubic feet. In addition, industrial customers are charged an additional fee when their wastewater exceeds certain pre-set limits which are approximate norms for normal domestic sewage.

Gross revenues from the sale of sewer service for fiscal year 1997 were \$1,286,000.

Maintenance and operating costs for the sewer system (exclusive of depreciation) were \$942,500. Net sewer revenues before debt service were \$343,500. The annual principal and interest payment on Danville's long-term sewer system bonded debt in fiscal year 1997 amounted to \$104,000.

### ***Proposed Projects 2000-2005***

#### **SX21021001**

1. Based upon a 1994 Wastewater Facilities Plan Update, Danville is prepared to expand its wastewater treatment facilities beginning in late 1998 provided the City has the appropriate approvals in hand from the Kentucky Division of Water. Proposed is that the 24-hour rated plant capacity be increased to 6.5 MGD with a new and expanded peak hydraulic capacity of 16.0 MGD. Proposed additions to the existing wastewater treatment works would include:
  - a. two off-site equalization/aerated lagoons. One of the lagoons would be at the former wastewater treatment plant site on Clarks Run east of 2nd Street.
  - b. two influent mechanical bar screens
  - c. three electromagnetic influent flow monitors
  - d. improvements to the two existing oxidation ditches that would permit them to be re-rated at a higher capacity

- e. two new 85-foot diameter final clarifier
- f. four new return activated sludge pumps
- g. two new flow splitter boxes
- h. the conversion to ultra-violet disinfection from the present chlorination system of disinfection
- i. a new reaeration ladder immediately before final discharge of the effluent to Clarks Run.

Danville proposes to continue its present sludge management program. The city currently uses landfarming (injection of liquid sludge) as its principal method of disposal. Alternately, during periods of inclement weather, liquid sludge is stored at the wastewater treatment plant. The existing sludge drying beds are available for sludge storage. Dewatered sludge could, if the need arose, be transported to an approved landfill for ultimate disposal.

The 1997 estimated project cost of Immediate Plan improvements to the city's wastewater treatment facilities is \$6.0 million.

- 2. Danville shares a common situation with most area communities in that it requires an almost constant effort to contain inflow and infiltration so as to limit sanitary sewer overflow situations. Suggested is that Danville allocate \$600,000 during the Immediate Plan period.
- 3. As a part of its 1994 Wastewater Facilities Planning Update, the city has developed conceptual plans for the sewerage of two significant unsewered subdivisions. The subdivisions together with the cost of the proposed sewer projects are these

Weisiger Woods	\$1.73 million
Blue Grass Estates	<u>.87 million</u>
Total	\$2.60 million

Sewer installation is suggested during the period of the Immediate Plan period. No collector sewer construction is proposed for the Long Term period since the financial responsibility of sewer construction to serve developing subdivisions is considered to be the responsibility of the developer.

- 4. The 1994 Wastewater Facilities Plan Update identified 14 interceptor sewers that are expected to experience capacity deficits at some point during the 20-year planning period. The study concluded that "prior to proposing capital improvements to increase collection system capacity (interceptor sewers or pumping stations), a more detailed evaluation is needed". In the absence of a more specific engineering conclusion, it is suggested that \$1.2 million be reserved for such work during the Immediate Plan period.
- 5. New interceptor sewers are suggested as well. Sure and steady growth is predicted for Danville and its interceptor sewer system. Growth is expected in almost every direction from the city center. During the period of the Immediate Plan, modest

interceptor sewer construction is proposed at the following locations. Two are generally west of US 127 Bypass northwest of the city center and one is near the Lexington Road immediately east of Weisiger Woods Subdivision. The 1997 estimated cost interceptor sewers suggested for the Immediate Plan period is \$200,000.

New sewer line extensions will serve approximately 14 households.

### **Proposed Projects 2006-2020**

#### **SX21021002**

1. While the wastewater treatment plant expansion planned for 1998-2000 is expected to meet the city's treatment needs for the 20-year planning period, it seems likely that some capital outlay will be necessary during the Long Term planning period to meet changing standards and/or to facilitate efficient and effective operation. It is suggested that \$1.5 million be allocated for non-specific improvements to the wastewater treatment plant during the 15-year period of the Long Term Plan.
2. Danville shares a common situation with most area communities in that it requires an almost constant effort to contain inflow and infiltration so as to limit sanitary sewer overflow situations. Suggested is that Danville allocate another \$2.0 million during the Long Term planning period for a continuation of inflow/infiltration reduction efforts.
3. The 1994 Wastewater Facilities Plan Update identified 14 interceptor sewers that are expected to experience capacity deficits at some point during the 20-year planning period. The study concluded that "prior to proposing capital improvements to increase collection system capacity (interceptor sewers or pumping stations), a more detailed evaluation is needed". In the absence of a more specific engineering conclusion, it is suggested that \$2.2 million be reserved during the Long Term planning period.
4. During the 15-year Long Term planning period, more substantial interceptor sewer construction is suggested. Sewer line extensions will serve approximately 33 households and proposed for consideration are the following:
  - a. a 12-inch and then a 10-inch sewer extending further west along Lebanon Road (KY 34). This sewer would continue to parallel Clarks Run.
  - b. in the northwest corner of the city, three 10-inch interceptor extensions into minor drainage ways of the Spears Creek drainage basin
  - c. northeast and east of the city center, three additional 10-inch diameter sewer interceptors are suggested. For all three, the drainage pattern is on the downstream side of the city's three major sewage pumping stations (exclusive of the pumping stations at the wastewater treatment plant). For that reason, all three of these proposed interceptor sewers would terminate at the proposed sewage pumping stations for pump-back to the wastewater treatment plant.
  - d. on the south side of the city, proposed is a 12-inch interceptor sewer extension to better serve the US 150 Bypass area and points south.

Interceptor sewers proposed for installation during the Long Term planning period have a 1997 estimated project cost of \$850,000.

#### JUNCTION CITY SANITARY SEWER SYSTEM

Junction City was a late-comer to the world of municipal sewer systems. Its sewer system was initially constructed in 1974-75. Because of the relative proximity of Danville and its more extensive system of sanitary sewer and sewage treatment facilities, Junction City was encouraged to install its sanitary sewers and to convey the collected sewage to Danville for treatment. The City of Junction City is virtually 100 percent sewered. In addition, some few customers outside the city receive sewer service as well. At the present time, sewer customers number 885. Of these 885 customers, 862 are residential, 21 are commercial, and 2 are industrial.

Gravity sanitary sewers are all 8-inches in diameter. Force mains are 4-inches and 6-inches in diameter. There are five sewage pumping stations. The four from the original 1974-75 construction were completely restored and re-outfitted as a part of the 1995-96 water and sewer system improvement project. The five sewage pumping stations are

1. Henry Street (completely new in 1994)
2. Knob Lick (refurbished in 1995-96)
3. Mitchell Street (refurbished in 1995-96)
4. York Lane (refurbished in 1995-96)
5. Toombs Curve (refurbished in 1995-96)

The entire system of sewers eventually drains to the Toombs Curve pumping station on the city's north side and immediately east of old US 127. From that point, all of Junction City's sewage is pumped to the Danville sewer system for treatment.

All of the wastewater pumped from the Toombs Curve pumping station—including whatever quantity of inflow and infiltration entering the sanitary sewer system—is metered by Danville. Junction City pays Danville for that metered quantity a sum equivalent to \$1.47 per 1,000 gallons. Despite sewer rehabilitation efforts over the years, inflow and infiltration continue to be significant twin problems to the Junction City sewer system—problems that cause a financial drain on the municipal sewer system. In one recent year, the wastewater metered as having been pumped to Danville was five times greater in February as it was in

December. This disparity demonstrates the relationship of sewage flow to rainfall and runoff.

Since sewer rehabilitation efforts have met with only modest success in terms of reducing inflow and infiltration during and following periods of heavy rainfall, utility personnel suggest that any future capital expenditures in this area be targeted at improving the city's stormwater drainage system. An improved stormwater drainage system, it was reasoned, would tend to convey stormwater into creeks and drainage ways and away from the sanitary sewer system.

Since Junction City does not operate sewage treatment works, it is not required that Junction City have a state-certified operator. The city has no significant industrial sewer users and therefore has no pre-treatment ordinance.

Growth in and around Junction City which could result in added sewage flows may likely be in reasonable proximity to new US 127 both within the existing corporate limits and north of the present corporate limits in the vicinity of the old US 127-new US 127 switch-over. Existing sewers are deemed to have adequate carrying capacity to accommodate growth projected during the 20-year planning period.

Since June, 1995, sewer charges have been \$6.42 per 1,000 gallons with a \$6.42 minimum monthly bill.

The city charges a tap fee of \$300 for connection to the sewerage system.

Gross revenues from sewer service charges for fiscal year 1997 were \$230,000. Maintenance and operating costs were \$170,000. Net sewer revenues before debt service were \$60,000. Principal and interest on the water *and* sewer utility's long term bonded debt in FY 1997 amounted to \$233,000.

Even though the local desire is sometimes expressed for a Junction City wastewater treatment plant separate and apart from Danville's, it does not appear that such would be in the public interest. Because of the Kentucky Division of Water's increased emphasis on the regionalization of treatment works, it is doubtful if a separation from the Danville wastewater treatment facilities would even be approvable. Accordingly, a continuation of the



connection to the Danville sanitary sewer system and the Danville wastewater treatment system is recommended through the 20-year planning period.

**Proposed Projects 2000-2005**

**SX21021003**

1. The source of continuing controversy involving Danville as the treating entity of Junction City's sewage usually stems from high sewer bills to Danville caused by excessive inflow and infiltration to the Junction City sewers. Danville charges Junction City a flat rate of \$1.47 for each thousand gallons of wastewater as the water enters the Danville municipal sewer system. For this reason, Junction City is billed the same rate for a unit of rainwater or stormwater as it is billed for a similar unit of sanitary sewage. It is to Junction City's distinct financial advantage to reduce insofar as possible the inflow and infiltration that reaches the Junction City sewer system. For the period of the Immediate Plan, it is suggested that Junction City invest \$250,000 in a continuous program of sewer rehabilitation so as to control or even reduce the adverse affects of inflow and infiltration.
2. Insofar as sewer extensions are concerned, it is suggested that the Knob Lick pumping station be relocated in a southeasterly direction to a point south of KY 300 (Stanford Road) and east of Old US 127. To this proposed pumping station, gravity sewer service could be provided to areas adjacent to and near Old US 127 and New US 127 south of the present sewer-served area. The force main from this new pumping station could extend north along Old US 127 to connect to the existing gravity sewer which flows directly to the Toombs Curve pumping station. Also within the period of the Immediate Plan, two sewer extensions are suggested on the city's north side—as extensions to the Bonta Lane and Kendall Street sewers. The 1997 estimated project cost of improvements suggested for the Immediate Plan period is \$130,000. Sewer line extensions will serve approximately 15 households.

**Proposed Projects 2006-2020**

**SX21021004**

1. During the Long Term planning period, the Mitchell Street and Henry Street pumping stations could be abandoned if gravity sewers were to be installed to permit that sewage to flow by gravity in a southeasterly direction to the new larger sewage pumping station discussed above. In addition, as Junction City and Danville grow even closer together, west-to-east flowing gravity sewers are suggested for installation in an area on Junction's City's immediate north side. Sewers could be connected by gravity to the Toombs Curve pumping station which conveys all of Junction City's sewage to Danville. The 1997 estimated project cost of sewer system improvements/extensions proposed for the Long Term planning period is \$300,000 and will serve approximately 5 households.
2. The source of continuing controversy involving Danville as the treating entity of Junction City's sewage usually stems from high sewer bills to Danville caused by excessive inflow and infiltration to the Junction City sewers. Danville charges Junction City a flat rate of \$1.47 for each thousand gallons of wastewater as the water

enters the Danville municipal sewer system. For this reason, Junction City is billed the same rate for a unit of rainwater or stormwater as it is billed for a similar unit of sanitary sewage. It is to Junction City's distinct financial advantage to reduce insofar as possible the inflow and infiltration that reaches the Junction City sewer system. During the Long Term period, \$600,000 should be allocated for sewer system rehabilitation.

#### CITY OF PERRYVILLE SANITARY SEWER SYSTEM

A sewer system was constructed in 1969 together with a 100,000 gallons per day extended aeration treatment plant immediately outside the city's north side corporate limits. Perryville has 345 sewer customers. The *in-city* extended aeration treatment plant was subsequently abandoned in 1989 in favor of treatment facilities elsewhere.

Perryville's system of sanitary sewers has not changed significantly since the development of the initial Boyle County Water and Sewer Plan in 1973. Practically all sewers are 8-inches in diameter. The primary interceptor sewer follows the Chaplin River northward to the former wastewater treatment plant site near the northside corporate limits. There are three pumping stations, one behind City Hall (replacing a former troublesome sewer siphon), at East 3rd Street near Leonard Street, and at the former treatment plant site.

Despite the fact that the oldest part of the sanitary sewer system is only 29 years old, inflow and infiltration are reported to be significant problems.

The Division of Water decided in the late 1980's that the city's extended aeration treatment plant would not permit the city consistently to meet the terms of its wastewater discharge permit. Initially, improvements were planned for the extended aeration treatment plant. When construction bids for that work exceeded the funds that were available, the decision was made to convert a nearby abandoned rock quarry into a lagoon wastewater treatment plant. The wastewater storage volume available in the quarry allows the city to discontinue sewage discharges to the Chaplin River for months on end during times of the year that low river flows could otherwise cause the city to be in violation of water quality standards.

The quarry/treatment plant is approximately one mile further north from the site of the former treatment plant. All sewage flow is pumped through an 8-inch diameter force main to the new treatment site.

Treatment plant performance in 1995, 1996, and 1997 compared very favorably to the limits established by the city's state-issued wastewater discharge permit. Laboratory results of the treatment plant effluent for those three years are compared to the city's effluent limits as follows:

Parameter	KPDES Limit	Average Annual Value		
		1995	1996	1997
Dissolved Oxygen	7 mg/1 minimum	8.9 mg/1	9.3 mg/1	9.9 mg/1
Total Suspended Solids	30 mg/1 maximum	6.9 mg/1	11.1 mg/1	9.9 mg/1
Ammonia – Summer	4 mg/1 maximum	1.9 mg/1	0.9 mg/1	1.4 mg/1
Ammonia – Winter	10 mg/1 maximum	2.6 mg/1	2.3 mg/1	2.6 mg/1
Coliform	200/100 ml maximum	10/100 ml	5/100 ml	4/100 ml
BOD	10 mg/1 maximum	5.1 mg/1	5.7 mg/1	4.4 mg/1
Flow	0.100 MGD	0.100 MGD	0.088 MGD	0.067 MGD

Plant flows are measured at the Chaplin River outfall. In 1997, one monthly permit exceedence was reported with respect to BOD. Effluent is chlorinated and then dechlorinated prior to discharge. Because of the lagoon-type treatment afforded, there is no sludge to remove from the process and there are no ultimate sludge disposal problems.

Perryville has two state-certified wastewater treatment operators. One is Class II certified and one is Class I certified. System problems identified include excess flows due to inflow and infiltration, and sewers on flat grades that tend to experience blockages.

Current sewer rates, which are the same for both inside and outside city customers, are as follows:

First 1,000 gallons per month \$4.50 (Minimum Bill)  
 Next 4,000 gallons \$5.50/1,000 gallons  
 Next 5,000 gallons \$6.75/1,000 gallons  
 Next 10,000 gallons \$8.10/1,000 gallons  
 All over 20,000 gallons \$8.90/1,000 gallons

Pertinent data on the financial operation of the Perryville sewer system for fiscal year 1997 are as follows:

Gross revenues from the Sale of Sewer Service	\$89,600
Operating and Maintenance Costs	\$42,500
Net Sewer Revenues	\$47,100

Principal and Interest on the sewer system debt was \$41,300.

Self-reported flows at the municipal wastewater treatment plant have taken a curious downward turn since 1995 when the plant was reported operating at its 100,000 gallons per day design capacity. The reduction in flow at the treatment plant is difficult to explain. From the city's treatment plant records and from near-term prospects for growth tributary to the wastewater system, it would appear, however, that the existing wastewater treatment plant should be capable of adequately serving the community through the immediate planning period.

**Proposed Projects 2000-2005**

**SX21021005**

1. A continuation of the city efforts to contain and reduce the entry of groundwater and stormwater to the sanitary sewer system is suggested for the period of the immediate plan period. An investment of \$75,000 is suggested for that effort.
2. Modest sewer extensions are proposed on the city's east side for the period of the Immediate Plan period at a 1997 estimated project cost of \$36,000. These extensions will serve approximately 6 households.

**Proposed Projects 2006-2020**

**SX21021006**

1. During the period of the Long Term Plan, more extensive additions to the municipal sewer system are suggested. For the most part, areas which could likely receive gravity sewer service are on the city's south and southeast sides. The 1997 estimated project cost for the installation of suggested sewer extensions is \$300,000 and will serve approximately 19 households.
2. Within the Long Term planning period, hydraulic expansion at the lagoon-type treatment plant may prove necessary. Expansion to a capacity of 150,000 gpd may be needed. This expansion in hydraulic capacity may be able to be accomplished by the addition of a package treatment unit at the front end of the existing lagoon treatment plant so that the sewage will have been partially treated before it reaches the lagoon itself. The estimated 1997 project cost is \$250,000.

ON-SITE TREATMENT SYSTEMS

**SI21021001**

This area consists of rural Boyle County beyond the service areas of Danville, Junction City, and Perryville's sanitary sewer systems. It is unlikely that public sewer line extensions will reach this area of Boyle County by 2020. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. Reasons for the high cost are the number of households (3,600), a low customer per mile ratio, rugged terrain, and the long distance from these houses to treatment facilities and existing sewer systems. Suggested instead is that a Revolving Loan Fund Program be established or that the U.S. Army Corps of Engineers 531 program be extended for the installation of a septic tank for each house that does not presently have sanitary sewer service, or could currently have a failing septic system. The generalized proposed cost of this option is \$18,000,000 or \$5,000 per household.

## CLARK COUNTY

### Clark County Sewer Service (map)

- Estimated 1999 population of 32,100-- 58% on public sewer
- Estimated 2020 population of 35,600-- 58% on public sewer
- Proposed projects would add about 40 new households to public sewer service during 2000-2020
- Estimated funding needs for public sewer 2000-2005--\$15,625,000
- Estimated funding needs for public sewer 2006-2020--\$10,875,000

Clark County had an estimated population of 32,066 (12,587 households) in 1999 with a projected population of 35,640 (14,859 households) in 2020. Public sewer is provided to about 58 percent of the county's residents. About 5,250 households in the county use on-site treatment systems. About 39 customers could be added to public sewer service through new line extensions in 2000-2020.

### CLARK COUNTY SEWER PLAN

#### *Proposed Projects 2000-2005*

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
CLARK							-
Winchester /SX21049002			1,625	14,000			15,625

#### *Proposed Projects 2006-2020*

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
CLARK							
Winchester SX21049001	39	3,000	3,875	4,000			10,875
County Total	39	3,000	3,875	4,000			10,875

# SEWER SERVICE AREAS CLARK COUNTY Kentucky



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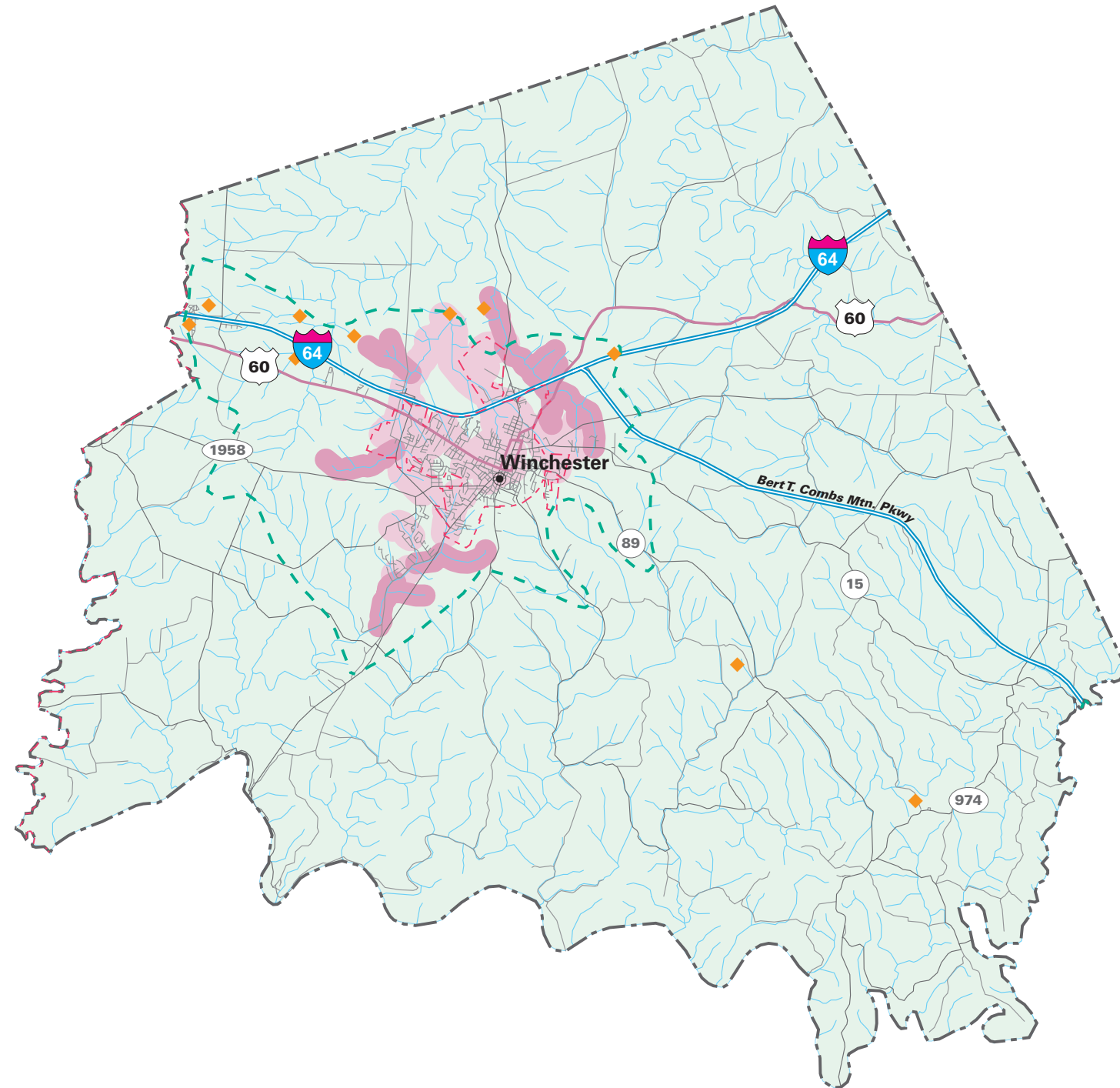
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- 201k Facility Planning Area
- Incorporated City Boundary
- Sewage Treatment Plant



**SEWER SERVICE STATUS BY OWNER**

		WINCHESTER MUNICIPAL SEWER
EXISTING SERVICE AREA	PROPOSED SERVICE AREA	

**CITY OF WINCHESTER SANITARY SEWER SYSTEM**

The Winchester sewerage system has undergone a significant metamorphosis since its initial construction. The former wastewater treatment plant on Winchester’s near north side on Evans Street has been abandoned in favor of a new treatment plant considerably further north (and downstream) on Strodes Creek.

Winchester’s sewer customers are distributed as follows:

	<i>Within City</i>	<i>Outside City</i>	<i>Total Customers</i>
Residential	6,754	1,551	8,305
Commercial	571	37	608
Industrial	36	4	40
	7,361	1,592	8,953

Bringing sewage to the wastewater treatment plant north of the city is a 54-inch oval interceptor the capacity of which is 22 MGD. Looking south (upstream), that sewer quickly divides to two—each a 30-inch diameter interceptor following its own branch of Strodes Creek upstream (south) toward the city. One of the two interceptors serves the industrial park and crosses the CSX tracks twice and I-64 once before reaching the site of the former wastewater treatment plant on Evans Street. From that point, two interceptors extend further south into the city’s center. The western branch bisects the Poynterville neighborhood and the Winchester Cemetery before ending as a 15-inch sewer on the rim of the Strodes Creek watershed at Fitch Avenue. The eastern branch follows Maple Street from Pearl Street south to Hickman Street and ends as a 10-inch sewer near Boone Avenue. Once again, the sewer extends to the rim of the watershed. An offshoot of the Industrial Park interceptor extends as a 15-inch and finally as a 12-inch diameter sewer around the city’s near northeast side. It cuts across the Mt. Sterling Road (KY 15) before it ends just east of Sylvania Electric at KY 89.

Beginning again just upstream of the new wastewater treatment plant, the second major 30-inch diameter interceptor sewer extends upstream (south) with its branch of Strodes Creek and crosses beneath I-64 in the vicinity of Van Meter Road. On the south side of I-64, the sewer splits again with the western arm generally following the Winchester Bypass as a 30-inch, then as a 27-inch, then as a 24-inch, and finally as a 21-inch interceptor to the



watershed rim near Colby Drive. An eastern arm crosses Lexington Avenue immediately east of the Winchester Bypass and then swings easterly to follow the north side of the railroad right-of-way to the vicinity of Leonard and Victory Avenues.

Not previously discussed is the fact Winchester has developed in two distinct watersheds. Colby Drive, Short Street, and Hughes Avenue which are generally a continuous east-west route from the high ground which separates natural drainage headed north for Strodes Creek and its Licking River Drainage Basin from drainage to the south toward tributaries which contribute flow to the Kentucky River. Significant growth has occurred and continues to occur south of that major watershed divide. Those sewers—some as large as 15-inches in diameter—drain southwesterly away from the city center and presently terminate at either one or the other of two major sewage pumping stations. At those points, the direction of flow is turned back and pumped north across the drainage divide and into interceptor sewers flowing (by gravity) northward toward the Strodes Creek Wastewater Treatment Plant. The two major pumping stations are the Snowfall Pumping Station and the Stoneybrook Pumping Station.

In addition, municipal sewage service is available by gravity sewers and pumping stations almost a mile east on Ecton Road, to the Greenway Drive area east of the city, to the Hud Road area west of Winchester along Lexington Road, to the former Rockwell manufacturing plant west of the city and north of I-64.

A large percentage of the older sewers in Winchester are 6-inches in diameter. (The present minimum size gravity sewer is 8-inches in diameter). A few of the 15 publicly owned pumping stations are troublesome—some because of their age; some because of capacity problems during storm events; some for both reasons. Some pumping stations bypass during serious storm events.

Winchester Municipal Utilities has conducted recent inflow/infiltration studies and has determined that excess flows in the sewer system are primarily due to inflow and not due to infiltration. When storm events come, flows in many of the sewers spike up quickly. When the storm abates, the sewage flows return to normal fairly quickly. Concluded is that much of the problem of excess flows may be attributed to catch-basins that are connected somehow

to sanitary sewers, to overflows from storm sewers to the sanitary sewer, to roof gutters and downspouts, and to sump pumps discharging waters to the sanitary sewer system. Storm sewers in Winchester are the responsibility of municipal government. Because storm sewers are not revenue producing, only limited resources have been made available annually to address storm sewer problems and their often deleterious affect upon the sanitary sewer system. Winchester Utilities has hired an inspector to identify unauthorized stormwater connections to the sanitary sewer system, e.g. sump pumps, gutters, and downspouts which impact upon the sanitary sewer system. Winchester Utilities' approach is to seek out and eliminate the large sources of inflow to the system in an attempt to get the largest possible reduction in inflow for a finite financial investment.

The conclusion of Winchester Utilities management is that the existing sanitary sewer system is capable of accommodating predicted growth for the next 20 years *provided that* inflow reduction can be accomplished within areas of existing sewer service.

Winchester's wastewater treatment plant was constructed in several phases beginning in 1974. The treatment plant actually has two points of discharge to Strodes Creek. The basic wastewater treatment plant discharges treated effluent at mile point 21.75. At certain times, effluent is *not* discharged to the creek; rather it is discharged to a large lagoon known locally as the North Effluent Retention Basin (NERB). Flow can be retained for extended time periods in the NERB for release when flows in Strodes Creek increase. The NERB discharges to Strodes Creek at mile point 21.50.

Incoming raw sewage enters the treatment plant and is pumped out of the ground by screw pumps. Flow then goes to two coarse screens which operate in parallel. A grit removal basin follows each of the coarse screens. An intermediate pumping station lifts the sewage still more—to a one cell lagoon which performs first as an activated sludge unit and then as a clarification unit. From the lagoon, wastewater is directed to secondary clarification lagoon and thence to three trains of rotating biological contactors (RBC's). From the RBC's, sewage goes to two final clarifiers which operate in parallel, thence to two tertiary filters. Finally, the wastewater is chlorinated, dechlorinated, is measured volumetrically by a parshal flume, is post-aerated, and is discharged to Strodes Creek.

The solids fraction is conveyed from the clarification lagoon, the secondary clarification lagoon, and the final clarifiers to lagoons 3 and 4 which are for sludge storage. Sludge then can be applied to sand beds for final removal to the private sector contained landfill in Estill County. During 1993 and 1995, 4,000 dry tons of sewage sludge was removed for disposal at Winchester Utilities' former landfill site. In 1998, Winchester dedicated a \$4.0 million solids handling facility that—with lime stabilization—is capable of producing Class A biosolids. That product—devoid of pathogens and heavy metals—can be used as a fertilizer substitute even on food crops. Winchester may give its biosolids away or it may try to sell the product. With the completion of the solids handling facility, it is expected that the sand beds will see less and less use.

Only at those times when laboratory analyses would seem to predict that Winchester is nearing a situation in which its effluent discharge permit might be violated does Winchester Utilities stop its direct discharge of treated effluent to the receiving stream in favor of a transfer to the 330 million gallon holding capacity NERB. For example, there was no discharge to the stream from the basic treatment plant during the first three months of 1995 while flow was transferred to the NERB. The wastewater receives additional treatment time in the NERB to be oxidized through the large surface area contact with the atmosphere. From the NERB, flow is eventually discharged as a hydrograph controlled release to Strodes Creek in proportion to the flow in the stream. The design flow of the NERB is 48 MGD.

Strodes Creek has assigned to it a stream segment use classification of *Warmwater Aquatic Habitat and Primary/Secondary Contact Recreation*. Winchester is required to assume a zero stream flow as it treats its wastewaters in anticipation of discharge to Strodes Creek.

As with most of the Bluegrass Area's larger cities, Winchester is required to conduct biomonitoring of its wastewater treatment plant effluent. During recent years, Winchester has failed its quarterly biomonitoring tests only three times. With each failure, Winchester has immediately retested. The results of each of the retests have proven to be satisfactory.

Treatment plant performance in 1995, 1996, and 1997 compared favorably to the limits established by the city's state-issued wastewater discharge permit. Laboratory results of the

treatment plant effluent in 1995, 1996, and 1997 are compared to the city’s effluent limits as follows:

Parameter	KPDES Limits	Average Annual Value*		
		1995	1996	1997
Dissolved Oxygen	7 mg/1 minimum	7.9 mg/1	9.18 mg/1	8.9 mg/1
Total Suspended Solids	30 mg/1 maximum	5.4 mg/1	4.83 mg/1	4.9 mg/1
Ammonia-Summer	4 mg/1 maximum	1.6 mg/1	0.97 mg/1	0.73 mg/1
Ammonia-Winter	5 mg/1 maximum	2.4 mg/1	1.3 mg/1	1.14 mg/1
Coliform	200/100 ml maximum	16/100 ml	3/100 ml	2/100 ml
BOD	10 mg/1 maximum	4.7 mg/1	3.6 mg/1	4.6 mg/1
Flow	4 MGD	3.726 MGD	3.520 MGD	3.41 MGD

\*During 1995, the basic treatment plant had no stream discharge to Strodes Creek during January-March. Instead, flow was conveyed to the NERB. Flow was discharged from the NERB to Strodes Creek during only five months of 1995—January, February, March, May, and June. All effluent parameters exhibited in the NERB discharge to Strodes Creek were even more acceptable than the basic treatment effluent parameters shown in the table above—except for TSS and for coliform averages which were only slightly higher but still well within the NERB effluent limits. The effluent limits for the NERB are identical in every respect to the effluent limits issued for the basic treatment plant. During 1996, flow was discharged from the NERB to Strodes Creek during January, February, and March. Effluent parameters, with the exclusion of TSS and BOD were slightly higher than the basic treatment effluent parameters depicted in the above table. Again, all effluent parameters were well within the NERB effluent limits. During 1996, there was one recorded exceedence to the BOD limit.

Average daily sewage flows have declined modestly since 1995 when treatment plant flows exceeded 90 percent of the treatment plant’s rated capacity. This narrow gap between

average daily flows and treatment plant capacity manifests itself in frequent bypasses of raw sewage at the head of the treatment plant on as many as 45 days per year.

This frequency of sewage bypassing is not acceptable either locally or with the Kentucky Division of Water. As a result, Winchester operates under the terms of an Agreed Order with the Division of Water which obligate Winchester to expand its wastewater treatment plant at an early date. The 1997 average daily flow declined to 3.416 MGD or about 85 percent of plant capacity. The peak hydraulic capacity of the interceptor sewer at the head of the treatment plant is 22 MGD. Accordingly, far more flow can reach the treatment plant during storm events than can be carried through the 4.0 MGD treatment plant. A peak flow rate of 11 MGD was measured in the influent sewer as recently as September, 1996. Since the wastewater treatment plant can only accommodate 4.0 MGD, influent flows in excess of that figure are bypassed at the head of the plant. This circumstance also means that bypassed flows are *not* measured by the treatment plant's parshal flume and are therefore not included in the average daily flow rate of 3.726 MGD for 1995, 3.520 MGD for 1996, and 3.416 MGD for 1997.

Winchester Utilities does have a pretreatment ordinance and presently has 14 industries and others enrolled in its pretreatment program. Winchester has seven state-certified wastewater treatment plant operators. Three hold Class IV certifications; two are Class II; and two hold a Class I certification.

Winchester has both an inside city sewer rate and an outside city sewer rate. The existing rates—in effect since November, 1992 are:

	<b>Inside City</b>	<b>Outside City</b>
First 350,000 cubic feet	\$2.68/100 C.F.	\$3.55/100 C.F.
All over 350,000 cubic feet	2.33/100 C.F.	3.09/100 C.F.

The tap fee schedule for connection to the sewer system is as follows:

	<b>Residential</b>	<b>Commercial/Industrial/Other</b>
Inside city	\$300	\$500
Outside city	\$1,000	\$1,500

Gross revenues from the sale of sewer service in fiscal year 1997 were \$2,600,000. Operation and maintenance costs (exclusive of depreciation) were \$1,400,000. Net sewer revenues before debt service were \$1,250,000. Annual sewer system debt service payments in fiscal year 1997 were \$836,000.

During the 1994-1997 period, extensive consulting engineering studies have been made relating to an analysis of available alternatives to expand and upgrade the municipal wastewater treatment plant. Concluded was that the existing 4.0 MGD wastewater treatment plant would be doubled in capacity to 8.0 MGD but that the expansion would occur as a two-phased project. Proposed are two 2.0 MGD expansions over the 20-year period. The proposed process components would include influent pumping, screening, grit removal, oxidation ditches, secondary clarifiers, disinfection, post aeration together with emergency effluent hydrograph control release from existing North Effluent Retention Basin. The peak hour hydraulic capacity would increase to 24.0 MGD with the initial phase.

Winchester's new wastewater facilities plan also called for the construction of sludge handling facilities that would enable Winchester to meet the EPA Section 503 regulations. Pathogens would be reduced to yield an *exceptional quality sludge*. Winchester would then expect to embark on a sludge give-away program. Landfarming and landfilling would remain as the community's fail safe method of ultimate sludge disposal. That new sludge handling facility was placed in service in early 1998.

Because of modest reductions in average daily metered sewage flows at the municipal wastewater treatment plant in 1996 and in 1997 and operating under the supposition that local efforts to reduce inflow have seen some success *and* because the 1998 inauguration of Winchester's sludge handling facilities have offered relief to the utility's near overwhelming quantity of stored sewage sludge, there is some local expectation that the first phase of the extensive and expensive wastewater treatment plant hydraulic expansion could be delayed somewhat. While this plan continues to suggest that the treatment plant expansion to 6.0 MGD will likely be necessitated during the Immediate planning period, it is conceivable that the expansion could be deferred to the early years of the Long Term planning period.

Winchester Utilities has established a ranked list for needed sewer line replacement projects and plans to spend \$125,000 annually to address the need to replace troublesome sewers. To implement these planned replacements, Winchester would spend \$625,000 during the Immediate Plan period.

Because of extensive inflow that reaches the wastewater treatment plant especially during storm periods, it is likely that Winchester will choose to rehabilitate selected sanitary sewers or will choose to make corrections to storm sewers to prevent or reduce the amount of stormwater that reaches the sanitary sewers in one fashion or another. A 1997 estimate of such project needs is \$1,000,000 for the Immediate Plan period.

Expansion of the WWTP is also suggested from the present 4.0 MGD to 6.0 MGD at an estimated cost of \$14.0 million.

### **Proposed Projects 2006-2020**

#### **SX21049001**

1. As growth and urbanization occur in Winchester areas, interceptor sewer construction is recommended. New interceptor sewers will serve approximately 39 households and are proposed for the following areas:
  - a. North of I-64; west of Van Meter Road west of the Bypass; between US 60 and Colby Road
  - b. Along Lower Howards Creek, south of Stoneybrook; on both sides of New KY 627
  - c. North of Ecton Road following Hoods Creek, crossing I-64, crossing KY 627 to a major pumping station due east of the Strodes Creek Wastewater Treatment Plant
  - d. North of I-64 and west of Van Meter Road to serve an area that would drain by gravity to the major 30-inch interceptor sewer as it approaches the wastewater treatment plant.
  - e. The 1997 estimated project cost of these interceptor sewers is estimated to be \$3.0 million.
  - f. Winchester Utilities has established a ranked list for needed sewer line replacement projects and plans to spend \$125,000 annually to address the need to replace troublesome sewers. To implement these planned replacements, Winchester would expend \$1,875,000 in the Long Term.
2. Rehabilitation of selected sanitary sewers and possible corrections to storm sewers to prevent or reduce the amount of stormwater that reaches the sanitary sewers. The estimated cost of these undertakings is \$2,000,000.
3. A second 2.0 MGD incremental increase of the WWTP at an estimated project cost of \$4.0 million.

**KENTUCKY-AMERICAN WATER COMPANY  
(FORMER BOONESBORO WATER ASSOCIATION)**

Acquired by the Kentucky-American Water Company in 1998, the former Boonesboro Water Association was one of only a handful of public non-municipal sewer systems in the Bluegrass Area. The former Boonesboro Water Association—through its Sewer Division—owned and operated a small system that served a developer-installed sewer system for the Rockwell Village Mobile Home Park. Presently, the sewer utility has 70 sewer customers. The wastewater treatment plant has a rated capacity of 40,000 GPD and presently treats 10,000 to 15,000 gallons of sewage daily. There are additional areas in need of community sewer service in the same general vicinity of western Clark County—on both sides of US 60. The wastewater treatment plant performance in 1997 as compared to the limits established by the Water Association’s state-issued wastewater discharge permit is as follows:

<b>Parameter</b>	<b>KPDES Limits</b>	<b>Average Annual Value*</b>
		<b>1997</b>
Dissolved Oxygen	7 mg/1 minimum	7.6 mg/1
Total Suspended Solids	30 mg/1 maximum	5.8 mg/1
Ammonia-Summer	2 mg/1 maximum	11.8 mg/1
Ammonia-Winter	9 mg/1 maximum	16.7 mg/1
Coliform	200/100 ml maximum	66/100 ml
BOD	10 mg/1 maximum	-

*\*In 1997, there were three monthly exceedences to dissolved oxygen limit; four monthly exceedences to the BOD limit; five monthly exceedences to the summer ammonia limit; three monthly exceedences to the winter ammonia limit; and one monthly exceedence to the coliform limit.*

**ON-SITE TREATMENT SYSTEMS**

**SI21049001**

This area consists of rural Clark County beyond the service areas of the City of Winchester and the Kentucky-American sanitary sewer systems. It is unlikely that public sewer line extensions will reach this area of Clark County by 2020. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. Reasons for the high cost are the number of households (5,250), a low customer per mile ratio, rugged terrain, and the long distance from these houses to treatment facilities and existing sewer systems. Suggested instead is that a Revolving Loan Fund Program be established or that the U.S. Army Corps of Engineers 531 program be extended for the installation of a septic tank



for each house that does not presently have sanitary sewer service, or could currently have a failing septic system. The generalized proposed cost of this option is \$26,250,000, or \$5,000 per household.

## ESTILL COUNTY

### Estill County Sewer Service (map)

- Estimated 1999 population of 15,400--29% on public sewer
- Estimated 2020 population of 15,300--30% on public sewer
- Proposed projects would add over 180 new households to public sewer service during 2000-2020
- Estimated funding needs for public sewer 2000-2005--\$4,685,000
- Estimated funding needs for public sewer 2006-2020--\$2,330,000

Estill County had an estimated population of 15,420 (6,066 households) in 1999 with a projected population of 15,345 (6,700 households) in 2020. Public sewer is provided to about 29 percent of the county's residents. About 4,350 households treat wastewater on site. Over 180 customers could be added to public sewer service through new line extensions in 2000-2020.

### ESTILL COUNTY SEWER PLAN

#### Proposed Projects 2000-2005

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
ESTILL							-
Irvine /SX21065001						600	600
Estill County W and S District #1							-
/SX21065003	151+ ind	2,025	250	110	1,700		4,085
County Total	151+	2,025	250	110	1,700	600	4,685

#### Proposed Projects 2006-2020

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
ESTILL							-
Irvine SX21065002	27	330	300	1,700			2,330
County Total	27	330	300	1,700			2,330

# SEWER SERVICE AREAS

## ESTILL COUNTY

### Kentucky



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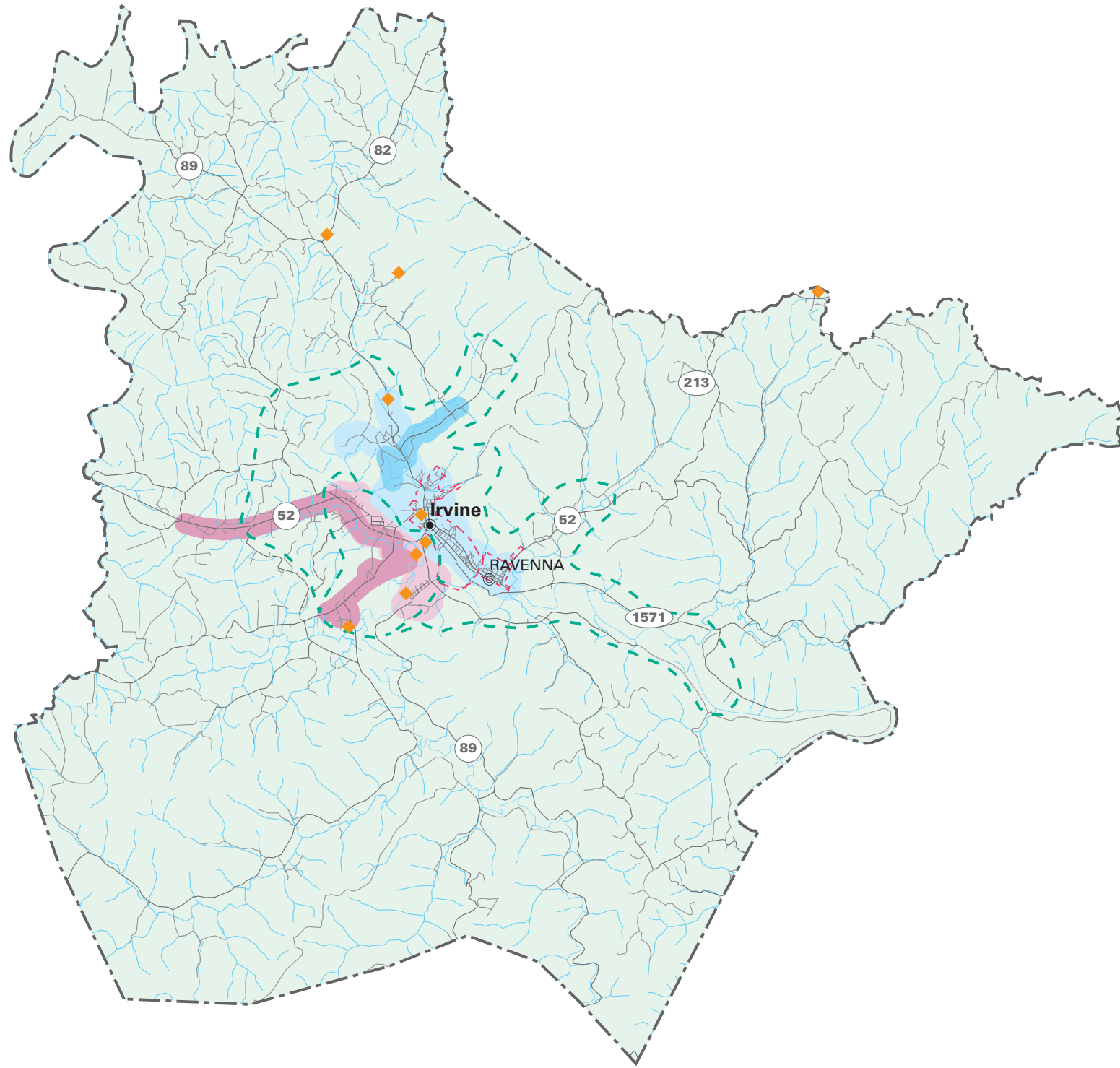
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LIMITATION OF LIABILITY: The Water Resource Development Commission has no reason to believe that there are any inaccuracies or defects in information incorporated in this work and make no representations of any kind, including, but not limited to, the warranties of merchantability or fitness for a particular use, nor any such warranties to be implied, with respect to the information or data furnished herein.

- 201k Facility Planning Area
- Incorporated City Boundary
- Sewage Treatment Plant



**SEWER SERVICE STATUS BY OWNER**

EXISTING SERVICE AREA	PROPOSED SERVICE AREA	
		IRVINE MUNICIPAL SEWER
		ESTILL COUNTY SEWER DISTRICT

CITY OF IRVINE SANITARY SEWER SYSTEM  
(COMBINED IRVINE-RAVENNA UTILITY)

Irvine Municipal Utilities Sewer system has changed little in the period since the 1973 *Estill County Water and Sewer Plan*. Recent era extensions include sewers to serve Geneva Avenue/Grindstone Branch Road, Holbrook Estates, Mountain View Apartments, and the South East Coal Industrial area. These areas added to those previously served by sewers mean that Irvine and Ravenna continue to be essentially 100 percent sewered. Presently, there are 1,854 customers, the majority of which reside within the city limits.

A major 1996-1997 construction project resulted in sanitary sewer service being extended further north out KY 89 to serve tens of homes on KY 89, the Estill County High School, and the Blue Ridge Landfill. IMU presently has seven sewage pumping stations. Most of Irvine's deficient and worn-out sewage pumping stations were replaced with larger, modern pumping facilities as a part of the 1996-1997 construction project. Some new sewage force mains and interceptor sewers were installed in 1996-1997 as well.

Irvine's sewage treatment plant offers secondary treatment. It is located only 1,700 feet west of the north side of the KY 52 bridge over the Kentucky River. The plant is located on low ground on the river side of the CSX rail line. The treatment plant, which has a rated capacity of 600,000 gallons per day, and is of the activated sludge type with the following components: grinder, primary clarifier, aeration basin, secondary clarifier, chlorination, and dechlorination.

Modest improvements were made at the wastewater treatment plant as a part of the 1996-1997 construction project. Additions included:

1. two new supplemental clarifiers
2. chlorination/dechlorination equipment
3. chlorine contact chamber
4. flow monitoring system
5. chlorine pre-fab building
6. drying beds.

Treatment plant performance in 1995, 1996, and 1997 compared favorably to the limits established by the city's state-issued wastewater treatment plant permit. Laboratory results of

the treatment plant effluent for the past three years are compared to the city's effluent limits as follows:

Parameter	KPDES Limits	Average Annual Value		
		1995	1996	1997
Dissolved Oxygen	2 mg/l minimum	4.7 mg/l	3.7 mg/l	4.3 mg/l
Total Suspended Solids	30 mg/l maximum	8.1 mg/l	4.8 mg/l	10.6 mg/l
Ammonia – Summer	20 mg/l maximum	2.3 mg/l	1.6 mg/l	3.4 mg/l
Ammonia – Winter	20 mg/l maximum	3.6 mg/l	2.0 mg/l	3.4 mg/l
Coliform	200/100 ml maximum	59/100 ml	67/100 ml	24/100ml
BOD	30 mg/l maximum	6.7 mg/l	5.2 mg/l	9.1 mg/l
Flow	0.600 MGD (rated capacity)	0.474 MGD	0.462 MGD	0.444 MGD

*A single exceedence for total suspended solids was noted in October, 1995*

*A single exceedence for coliform was noted in March, 1996.*

*Exceedences of the BOD limit and of the total suspended solids limit were noted in July, 1997.*

*The reported values for ammonia in 1997 were not separated into summer and winter values.*

Irvine has experienced significant problems with inflow and infiltration. A Sewer System Evaluation Study in 1992 identified and quantified numerous sources of inflow/infiltration. IMU has been working continuously since 1992 to make sewer repairs so as to reduce the magnitude of inflow/infiltration. Some improvement has already been noted; additional improvement is expected. At present, sewage bypassing can occur with as little as a one-inch rainfall.

Occasional sewage bypassing occurs at the following sewage pumping stations:

Cow Creek  
Kelly  
Powell Brothers.

Presumably, sewage bypassing was reduced by the 1996-1997 construction work involving sewage pumping rehabilitation and force main upsizing. The wastewater treatment plant flows may also be expected to be reduced and treatment levels improved as excess flows are reduced through sewer rehabilitation.

Irvine has two state-certified wastewater treatment plant operators who maintain Class III certification.

At the present time, no sewer customers are required to pre-treat. As the landfill is allowed to connect to the sanitary sewer system, it is, however, likely that pre-treatment will be required of that new customer.

Sewage sludge is disposed of through a successful sludge give-away program. No sludge is landfilled. Bio-monitoring of the sewage treatment effluent is presently not required.

Present sewer rates in effect are these:

	<b>Inside City</b>	<b>Outside City</b>
First 2,000 gallons per month	\$8.46(minimum bill)	\$11.27(minimum bill)
Next 1,000 gallons	\$4.43/1,000 gallons	\$6.03/1,000 gallons
Next 7,000 gallons	\$3.53/1,000 gallons	\$4.59/1,000 gallons
Next 5,000 gallons	\$3.33/1,000 gallons	\$4.31/1,000 gallons
Next 10,000 gallons	\$3.18/1,000 gallons	\$3.88/1,000 gallons
Next 75,000 gallons	\$3.10/1,000 gallons	\$3.78/1,000 gallons
Next 100,000 gallons	\$3.05/1,000 gallons	\$3.69/1,000 gallons
All Over 200,000 gallons	\$3.00/1,000 gallons	\$3.58/1,000 gallons

There is a \$300 tap fee for connection to the sewer system inside the city limits and a fee of \$350 for connections outside the city limits.

**Proposed Projects 2000-2005**

**SX21065001**

1. While the 1996-1997 replacement of many sewage pumping stations and some force mains and gravity sewers should reduce bypassing within the system of sewers by permitting the conveyance of additional volumes of wastewater to the treatment plant, the actual reduction of significant amounts of inflow and infiltration will likely prove far harder to accomplish. Suggested is that Irvine Municipal Utilities continue its long term commitment to reduce inflow and infiltration and thereby seek to reduce the volume of wastewater to be conveyed and treated. While IMU staff have begun this effort at sewer rehabilitation with their own personnel and equipment, a dollar value should be assigned to the effort regardless of whether it continues to be an in-house effort or a more conventional construction contract effort. It is suggested that \$600,000 be earmarked for this effort. Half of that sum could be targeted for expenditure during the period of the Immediate Plan with the other half being reserved for the period of the Long Term Plan.

**Proposed Projects 2006-2020**

**SX21065002**

1. During the Long Term planning period, proposed is a sewer extension west from White Oak Creek and across the proposed Irvine Bypass in the direction of Stump Road. Also proposed is a sewer line northeast from KY 89 along White Oak Road (KY 1705) to a point immediately east of Dry Branch Road. These Long Term Plan sewer extensions have a 1997 estimated project cost of \$330,000 and will serve approximately 27 households.
2. It is more difficult to project wastewater capacity adequacy for Irvine than it is for most other Bluegrass area municipalities. This is because of limited opportunities for

residential expansion within the community because of topographic constraints. Growth of the community and therefore, growth in sewage flows is more likely to be influenced by new industrial and/or commercial activity. Since some businesses would use only small amounts of water, e.g., for restrooms, kitchens, etc., others might use water in their process and therefore have higher—perhaps significantly higher—wastewater discharges. With the present hydraulic loading of the municipal wastewater treatment plant at approximately 80 percent of the plant's design hydraulic capacity, it is concluded that with improvements made as a part of the 1996-1997 wastewater treatment construction project, the existing treatment facilities *will* be adequate during the period of the Immediate Plan without further modification or capital expense.

During the period of the Long Term Plan, an expansion of the wastewater treatment plant capacity by 50 percent is proposed—to a new and larger capacity of 900,000 gallons per day—may be warranted. The 1997 estimated cost of this expansion is \$1.7 million.

3. \$300,000 for the reduction of inflow and infiltration in order to reduce the volume of wastewater to be conveyed and treated.

#### ESTILL COUNTY WATER AND SEWER DISTRICT NO. 1

The culmination of more than a decade of planning and design, the Estill County Water and Sewer District's sewerage system began operation in 1992. The \$3.7 million project, funded by the U.S. Environmental Protection Agency, the Farmers Home Administration, and the Appalachian Regional Commission, serves the suburban areas of South Irvine, West Irvine, and KY 52 from the KY 89 wye to a point immediately west of West Irvine. The system was one of the last Kentucky sewer systems to be constructed with EPA grant funds before that program converted to a revolving loan program.

The sewer system consists of approximately 61,000 linear feet of small diameter gravity sewers with few manholes. Sewer lines are only 4-inches and 6-inches in diameter. At present, all sewage enters the sewers after it goes through either a home septic tank or, in the case of Whispering Woods Subdivision, a community septic tank. The purpose of the septic tanks is to remove most of the solids *before* the sewage enters the public sewer. Periodic cleaning of the septic tanks is a responsibility of the water district.

Six duplex submersible sewage pumping stations are operated by the Estill County Water and Sewer District. The pumping stations range in size from 20 to 180 gallons per minute. The existing pumping stations appear to be sized appropriately and operate effectively.

Sewage from 442 customers is pumped to a treatment site east of Wisemantown Road and west of Station Camp Creek. The system has not yet met financial expectations in that not all customers who were supposed to connect to the public sewer system have done so.

Collected wastewaters are treated at the district’s own wastewater treatment plant. An intermittent sand filtration treatment plant is being utilized. The wastewater treatment plant’s 24-hour rated capacity is 210,000 gallons. The wastewater treatment plant effluent is conveyed by gravity for discharge to the Kentucky River at mile point 217.7 downstream of the KY 52 bridge.

Treatment plant performance in 1995, 1996, and 1997 may be considered as *spotty* as compared to the limits established by the district’s state-issued wastewater treatment plant discharge permit. Laboratory results of the treatment plant effluent in 1995, 1996, and 1997 are compared to the district’s effluent limits as follows:

Parameter	KPDES Limits	Average Annual Value		
		1995	1996	1997
Dissolved Oxygen	2 mg/l minimum	8.8 mg/l	8.5 mg/l	8.6 mg/l
Total Suspended Solids	30 mg/l maximum	12.4 mg/l	10.2 mg/l	8.6 mg/l
Ammonia–Summer	20 mg/l maximum	29.7 mg/l <sup>1</sup>	30.3 mg/l <sup>4</sup>	17.6mg/l
Ammonia – Winter	20 mg/l maximum	25.7 mg/l <sup>1</sup>	19.5 mg/l <sup>4</sup>	26.4 mg/l <sup>7</sup>
Coliform	200/100 ml maximum	78/100 ml <sup>2</sup>	10/100 ml	21/100 ml
BOD	30 mg/l maximum	23.2 mg/l <sup>3</sup>	19.9 mg/l <sup>3</sup>	13.4mg/l
Flow	0.21 MGD	0.084 MGD	0.119 MGD	0.150 MGD

<sup>1</sup>Ammonia limit was exceeded for 11 months in 1995

<sup>2</sup>Coliform limit was exceeded in April and July, 1995

<sup>3</sup>BOD limit was exceeded April through July in 1995

<sup>4</sup>Ammonia limit was exceeded for 9 months in 1996

<sup>5</sup>BOD limit was exceeded April through June in 1996

<sup>6</sup>BOD limit was exceeded once in 1997

<sup>7</sup>Ammonia limit was exceeded 9 months in 1997



Following disinfection of the treated effluent, it is dechlorinated with sulfur dioxide prior to discharge. The treatment plant does not bypass untreated sewage at any location. The District has two state-certified Class I wastewater treatment plant operators.

For ultimate sludge disposal, the district owns an oversized sludge truck to haul sludge to a 40 acre site on the Red Lick Road. The site has been approved for sludge disposal by the injection method.

In 1995, the district assumed operation of an existing sewer system in Whispering Woods Subdivision and has concluded that the Whispering Woods sewer system is a significant source of excessive inflow and infiltration.

Estill County Water and Sewer District No. 1 sewer rates in effect are these:

First 2,000 gallons per month \$13.00 minimum  
All Over 2,000 gallons \$ 6.50 per 1,000 gallons

Pertinent data on the financial operation of the utility for 1997 are as follows:

Gross Sewer Revenues \$174,000  
Operating and Maintenance Costs (exclusive of depreciation) \$ 69,000  
Net Sewer Revenues \$105,000

The water district's 1997 debt service payment was \$29,000.

Improvements are called for in the quality of treatment presently available at the district's intermittent sand filtration treatment plant as the plant has been out of compliance with its wastewater discharge permit for many recent months. Plugging of the sand filter has been reported to be a chronic problem. A Wastewater Facilities Plan Update was prepared by PEH Engineers in October, 1997 and is currently under review at the Kentucky Division of Water. Within that local planning effort, emphasis is placed upon

1. making modifications to the existing wastewater treatment plant to improve its effectiveness and efficiency
2. extending sanitary sewer service to the Wisemantown community which desperately needs community sewer service. Ironically, vocal resistance to Wisemantown's inclusion within the sewer project a decade ago caused its late removal from the original sewer construction project scope
3. expanding sewer service availability in South Irvine and in West Irvine

4. rehabilitating selected existing sewers in West Irvine for the purpose of reducing inflow and infiltration
5. extending gravity sanitary sewer service from near West Irvine's western end west along KY 52 to a point near Rice Station
6. making sanitary sewer service available at the proposed industrial park at Winston (near the Estill-Madison County line) through the installation of a sewage pumping station and a force main to convey collected wastewater east along KY 52 until the force main meets the proposed gravity sewer near Rice Station
7. expanding the district's existing wastewater plant so that it can accommodate not only additional domestic sewage but also industrial park sewage flow which might originate from the proposed industrial park at Winston.

**Proposed Projects 2000-2005**

**SX21065003**

1. The 1997 Wastewater Facilities Plan Update specifies that the existing sand filters would be modified to restore filter effectiveness by removing the earthen filter cover, venting the underdrains, and dividing the two filter beds into four beds. The predicted result of these modifications would be enhanced operability and performance as well as a downward rating of the existing 210,000 gpd treatment plant to 157,000 gpd. Since the 1997 average daily flow measured at the wastewater treatment was 150,000 gpd, it is unlikely that the Kentucky Division of Water would permit WWTP modifications that would downrate the existing facilities without concurrent additions that would expand the plant's rated capacity. This wastewater treatment plant modification is targeted for the period of the Immediate Plan and carries a 1997 estimated project cost of \$110,000.
2. The 1997 Facilities Plan Update also proposes that, in addition to existing facility modifications, a 270,000 gpd oxidation ditch type treatment plant be constructed adjacent to the existing intermittent sand filter wastewater treatment plant. Provisions would be made to the existing influent structures to provide for flow-splitting between the sand filter treatment plant and the oxidation ditch treatment plant. The flexibility that this arrangement would permit the existing filters to be utilized in their existing arrangement or, if influent flows are considerably less than the combined capacity (157,000 gpd + 270,000 gpd) of the two treatment plants, the filters could be used in series with the oxidation ditch plant to further treat the oxidation ditch effluent.
3. As proposed, the new oxidation ditch treatment plant train would begin at a new influent manhole and flow meter, grinder, and submersible pumping station. Pumps would lift the sewage to two oxidation ditches and two final clarifiers. Having two each of those units would provide treatment redundancy and operational flexibility. A return activated sludge and a waste activated sludge pumping station would be required. Following clarification, the effluent would be chlorinated and then dechlorinated prior to discharge to the Kentucky River.
4. Waste sludge from the oxidation ditch process would be directed to sludge drying beds for dewatering. Ultimately, solid waste from the oxidation ditch process would be

disposed of at the local contained landfill. The 1997 estimated project cost of the oxidation ditch treatment facilities is \$1.7 million.

5. Proposed as a part of the 1997 Facilities Plan Update are modest sewer system rehabilitation efforts in West Irvine (1997 estimated project cost, \$250,000); an expansion of sewer service availability in South Irvine and West Irvine utilizing small diameter sewer technology (1997 estimated project cost, \$500,000); and the installation of conventional gravity sewers to serve Wisemantown (1997 estimated project cost, \$565,000).
6. In addition, proposed is the extension of conventional gravity sewers west along KY 52 to near Rice Station and sewers, a pumping station, and force main at the proposed industrial park at Winston with a 1997 estimated project cost of \$960,000.

Sewer line extensions in the Immediate Plan will serve approximately 151 households.

#### ON-SITE TREATMENT SYSTEMS

##### **SI21065001**

This area consists of rural Estill County beyond the service areas of the City of Irvine and the Estill County Water and Sewer District sanitary sewer systems. It is unlikely that public sewer line extensions will reach this area of Estill County by 2020. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. Reasons for the high cost are the number of households (4,350), a low customer per mile ratio, rugged terrain, and the long distance from these houses to treatment facilities and existing sewer systems. Suggested instead is that a Revolving Loan Fund Program be established or that the U.S. Army Corps of Engineers 531 program be extended for the installation of a septic tank for each house that does not presently have sanitary sewer service, or could currently have a failing septic system. The generalized proposed cost of this option is \$21,750,000 or \$5,000 per household.

## FAYETTE COUNTY

### Fayette County Sewer Service (map)

- Estimated 1999 population of 230,300--97% on public sewer
- Estimated 2020 population of 238,300--97% on public sewer
- Estimated funding needs for public sewer 2000-2005--\$75,100,000
- Estimated funding needs for public sewer 2006-2020--\$51,800,000

Fayette County had an estimated population of 230,319 (101,079 households) in 1999 with a projected population of 238,316 (110,871 households) in 2020. Public sewer is provided to about 97 percent of the county's residents. About 3,300 households treat wastewater on site.

### FAYETTE COUNTY SEWER PLAN

#### *Proposed Projects 2000-2005*

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
FAYETTE							-
Lexington /SX21067001			40,000	21,500		13,600	75,100

#### *Proposed Projects 2006-2020*

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
FAYETTE							-
Lexington SX067002			24,000	9,200		18,600	51,800
County Total	-	-	24,000	9,200	-	18,600	51,800

#### CITY OF LEXINGTON SANITARY SEWER SYSTEM

Unlike Fayette County's dominant water utility, which is in the hands of the Kentucky-American Water Company, the sanitary sewerage system is in the hands of the Lexington-Fayette Urban County Government. At the close of 1997, there were 77,314 sewer customers. In 1996, the LFUCG ceased processing and sending free-standing sewer bills to customers of the sewer system. Rather, Urban County Government contracted with the Kentucky-American Water Company to include the local government's sewer bill as a part of the company's water bill. Effective with the autumn of 1996, all water and sewer bills began to be tendered monthly rather than quarterly as was the prior practice. The assumption was made that to tie the sewer bill to the water bill and to require the water

# SEWER SERVICE AREAS FAYETTE COUNTY Kentucky

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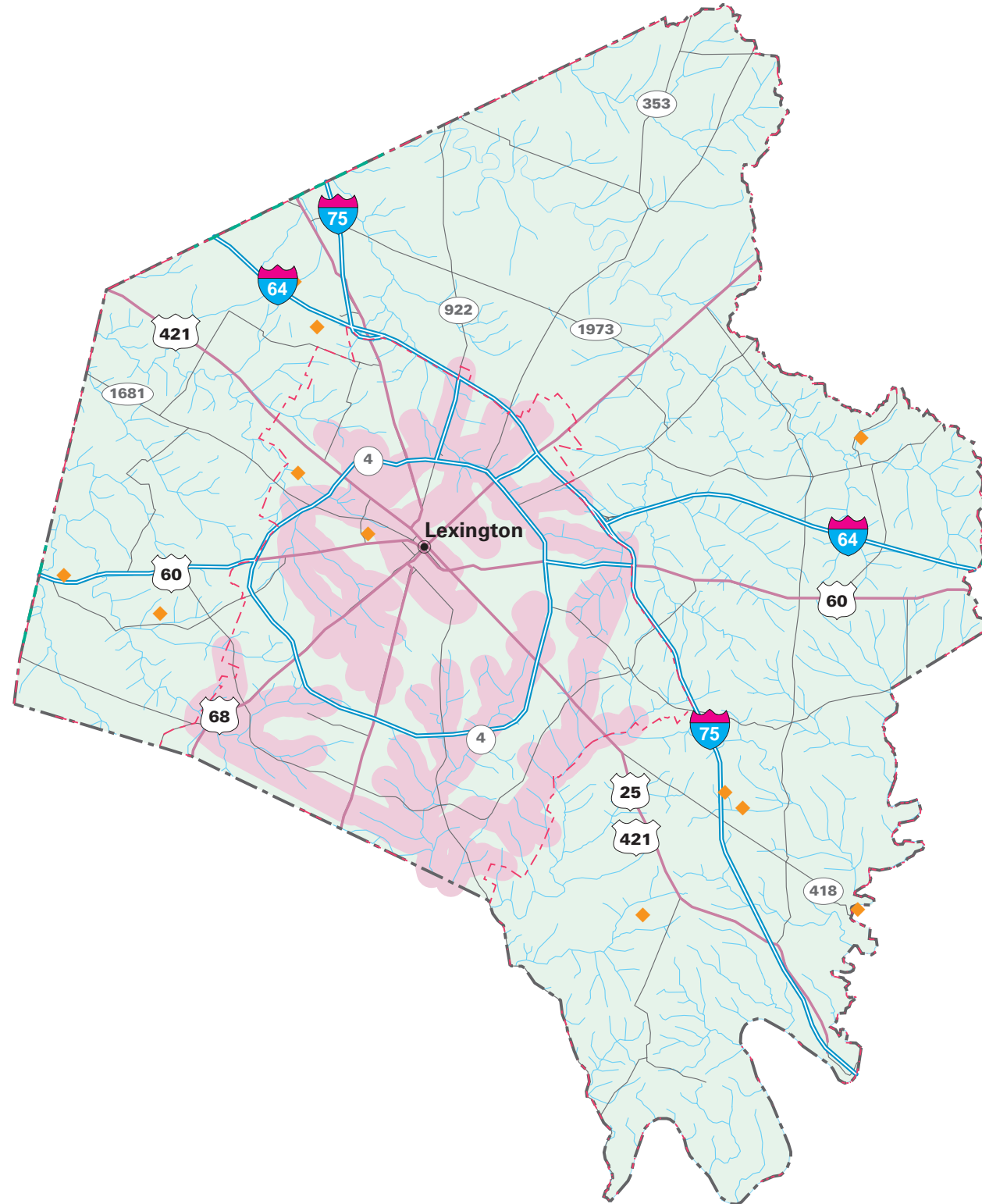
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Kentucky Area Development Districts



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-  201k Facility Planning Area
-  Incorporated City Boundary
-  Sewage Treatment Plant



### SEWER SERVICE STATUS BY OWNER

EXISTING SERVICE AREA	PROPOSED SERVICE AREA	FAYETTE URBAN COUNTY GOVERNMENT
		

company to suspend water service to any customer who failed to pay his sewer bill would improve the collection rate of LFUCG sewer bills. The change has worked to LFUCG's advantage.

During the development of this plan, Lexington-Fayette County authorized the concurrent development of a Wastewater Facilities Plan Update. The expansion of the Fayette County Urban Services Area in 1996, the long interval since the development of the original Wastewater Facilities Plan for Lexington, and the closing of the gap between available wastewater treatment plant capacity and average daily flows necessitated this initiative by the Urban County Government to update its Wastewater Facilities Plan. A draft of the completed Plan Update was presented to the Urban County Council in January, 1998.

While most Lexingtonians would consider the Lexington urban area as flat to gently rolling, in reality, the urban area rests on a gentle knob with major and minor drainage ways extending in almost every direction away from the city center. Minor drainage basins involved in Lexington sewage flow patterns include

Town Branch	West Hickman Creek
Cane Run Creek	East Hickman Creek
Wolf Run Creek	South Elkhorn Creek
North Elkhorn Creek (partial)	North Elkhorn Creek (partial)

The minor drainage basins are listed above in two separate columns because sewage from most areas in the left list is conveyed to the Town Branch Wastewater Treatment Plant on the north side of Old Frankfort Pike in northwest Lexington. Sewage generated from most areas in the right list is conveyed to the West Hickman Creek Wastewater Treatment Plant one half mile deep into Jessamine County.

Most sewage generated within the Town Branch basin reaches the treatment plant by gravity. Sewage generated in the Wolf Run, the Cane Run, and the portion of North Elkhorn Creek basins is collected and pumped back to the Town Branch drainage basin. Installation of sewer line extensions northwest and north to the Federal Correctional Institute (on Leestown Pike) and to Blackburn Correctional Complex (on Spurr Road) is near completion. Those extensions would eliminate smaller existing wastewater treatment

facilities at those facilities and would permit the conveyance of sewage generated there to the Town Branch Wastewater Treatment Plant.

In areas from which sewage is eventually conveyed to the West Hickman Creek WWTP, most sewage generated within the West Hickman basin reaches the wastewater treatment plant by gravity while sewage generated in the East Hickman, South Elkhorn and North Elkhorn (partial) basins is collected and pumped back to the West Hickman drainage basin.

The reduction of illicit flows to the sewer systems is an ongoing effort by Lexington. Much success has been attributed to the repair of manholes in an effort to make them more nearly watertight and thereby to reduce the deleterious effect of inflow.

Town Branch Wastewater Treatment Plant began operation in 1919 and was one of the first sewage treatment plants in the Southeast. The facility is located on the Town Branch Creek north of Old Frankfort Pike approximately one half mile inside New Circle Road. In 1935, the plant had a capacity of approximately 6.0 MGD. In 1947, two additional sludge digesters were constructed. A major expansion was begun in 1960 and completed in 1963. This construction was comprised of facilities which converted the plant into a 12 MGD activated sludge plant. In 1971 another expansion to Town Branch WWTP was begun which increased that plant's capacity to 18.0 MGD. Sludge disposal facilities were also added which ultimately eliminated the use of sludge lagoons and drying beds at this site. Construction was completed in 1974.

In 1981, a decision was made to move toward a single stage aeration system with a capacity of 30.0 MGD to meet the future needs of the service area and to meet the more stringent effluent limits. The design also added dechlorination to the facility unit processes. Due to the magnitude of the project, it was segmented both in design and construction. Design began in 1984 with design on the remaining phases starting in 1985 and completed in July, 1987. The Town Branch WWTP was designed to treat wastewater generated from approximately 60 percent of the urbanized areas of Fayette County and serving an eventual population of 130,000. Plant processes involve coarse screening, mechanical fine screens, two grit removal basins, flow measurement, 12 rectangular primary clarifiers, three primary effluent screw pumps, 20 nitrification aeration tanks, eight circular final clarifiers, another

flow measurement, two chlorine contact basins, dechlorination, and stairstep aeration before the treated effluent is discharged to milepoint 10.2 of Town Branch. In recent years, the aeration tanks have been converted to use fine air bubble defusers—primarily as a cost cutting measure. Town Branch is a tributary of South Elkhorn Creek which, in turn, is a major tributary of Elkhorn Creek. Elkhorn Creek joins the Kentucky River in Pool 3 at milepoint 51.8. Accordingly, the treated effluent from the Town Branch WWTP is not available as a water system source for those cities which utilize River Pools 8, 7, 6, 5, and 4 as their water source.

Sludge processes at the Town Branch plant involve the removal of solids from the primary clarifiers to two gravity thickeners, thence three primary anaerobic digesters, sludge blending tank, secondary digesters, and dewatering by four belt filter presses. Ultimate disposal is to a contained landfill in Grant County.

Biomonitoring is required at the Town Branch WWTP. For a time, sewer utility personnel experienced difficulty in their efforts to pass the biomonitoring tests. Finally, in August 1994, improvement was noted and the requirement for chronic toxicity testing was dropped. Biomonitoring is now conducted quarterly instead of monthly. A system-wide public awareness campaign concerning the use and misuse of pesticides and herbicides appears to be paying off in terms of improved biomonitoring test results of the Town Branch WWTP effluent.

Town Branch Wastewater Treatment Plant performance in 1995, 1996, and 1997 compared very favorably to the limits established by the Urban County’s state-issued wastewater plant discharge permit (KPDES). Results of laboratory analyses of the treatment plant effluent in 1995, 1996, and 1997 are compared to the plant’s effluent limits as follows:

Parameter	KPDES Limit	Average Annual Value		
		1995	1996	1997
Dissolved Oxygen	7 mg/l minimum	7.8 mg/l	8.0 mg/l	8.2 mg/l
Total Suspended Solids	30 mg/l maximum	7.8 mg/l	12.1 mg/l	9.7 mg/l
Ammonia - Summer	2 mg/l maximum	0.3 mg/l	0.26 mg/l	0.55 mg/l
Ammonia -	7 mg/l maximum	0.09 mg/l	0.17 mg/l	0.46 mg/l



Winter				
Coliform	200/100 ml maximum	67/100 ml	34/100 ml	35/100 ml
BOD	10 mg/1 maximum	2.2 mg/1	2.5 mg/1	2.6 mg/1
Flow	30.0 MGD	19.43 MGD	18.96 MGD	17.36 MGD

The maximum peak design flow is 64.0 MGD. The maximum weekly average design flow is 36.0 MGD. The average daily flows measured at Town Branch WWTP plant over a recent six year period are as follows:

Year	Average Daily Flow in MGD
1992	21.02
1993	19.80
1994	19.82
1995	19.45
1996	18.96
1997	17.36

It might be concluded from this that the Urban County’s ongoing efforts to reduce inflow and infiltration may well have allowed for hundreds of new sewer connections in the Town Branch WWTP sewershed while, at the same time, lower influent flows were recorded at the treatment plant.

Lexington’s West Hickman Creek Wastewater Treatment Plant is located on a 269 acre site immediately south of the Fayette County-Jessamine County line, in Jessamine County. The plant began operations in 1972 with a Kraus modification of the activated sludge process followed by 20 acres of polishing lagoons. The plant had an initial capacity of 5.0 MGD.

In 1982-1983, the plant was expanded to 16.8 MGD with a peak hydraulic capacity of 32.0 MGD. That expansion cost approximately \$30 million. In 1992, the facility was expanded again—this time to its present rated capacity of 22.3 MGD. The plant’s peak hydraulic capacity in 1998 (not allowing for recirculation) is 50.3 MGD.

The liquid treatment processes are as follows: a 78-inch influent sewer discharges sewage to coarse bar racks for screening. Three screw pumps deliver wastewater to two mechanical fine screens. From the fine screens, sewage goes to two grit removal basins, thence to seven primary clarifiers operating in parallel. Clarified sewage goes to eight first stage aeration

tanks. Sewage then goes to eight secondary clarifiers, thence to six, second stage rectangular nitrification reactors (aerators). From the second stage aeration process, sewage goes to six circular final clarifiers. Following final clarification, the sewage goes to three chlorine contact chambers, to dechlorination and to stairstep post-aeration prior to discharge to West Hickman Creek at milepoint 28.0. West Hickman Creek eventually joins East Hickman Creek to form Hickman Creek. Hickman Creek meanders in a southerly direction for the full length of Jessamine County before it empties into Pool 7 of the Kentucky River at milepoint 135.3.

Sludge processes at the West Hickman Creek treatment plant are as follows: two gravity thickeners, three primary anaerobic digesters, one secondary digester, sludge dewatering by three belt filter presses. Ultimate disposal is at a contained landfill in Lincoln County.

Biomonitoring of wastewater treatment plant effluent is required at the West Hickman Creek WWTP. The treatment facility was relieved of the responsibility of chronic toxicity testing in January, 1995. Biomonitoring is now conducted quarterly, as opposed to the previous monthly schedule. An ongoing public awareness campaign regarding pesticides and herbicide use and misuse together with an aggressive sampling and testing program appears to have had a positive affect upon the plant's biomonitoring test performance.

The West Hickman Creek Wastewater Treatment Plant performance also compared favorably to the limits established by the Urban County's state-issued wastewater plant discharge permit (KPDES). Results of laboratory analyses in 1995, 1996, and 1997 are compared to the plant's effluent limits as follows:

Parameter	KPDES Limit	Average Annual Value		
		1995	1996	1997
Dissolved Oxygen	7 mg/1 minimum	7.4 mg/1	7.3 mg/1	7.4 mg/1
Total Suspended Solids	30 mg/1 maximum	8.3 mg/1	11.6 mg/1	9.4 mg/1
Ammonia - Summer	4 mg/1 maximum	0.66 mg/1	0.13 mg/1	0.38 mg/1
Ammonia - Winter	10 mg/1 maximum	0.16 mg/1	0.16 mg/1	0.83 mg/1
Coliform	200/100 ml	20/100 ml	8/100 ml	21/100 ml

	maximum			
BOD	10 mg/1 maximum	2.2 mg/1	2.0 mg/1	2.8 mg/1
Flow	22.3 MGD	19.5 MGD	19.9 MGD	18.7 MGD

The average daily flows measured at the West Hickman WWTP over a recent six year period are as follows:

Year	Average Daily Flow in MGD
1992	16.6
1993	19.9
1994	22.1
1995	19.5
1996	19.9
1997	18.7
1998	

Even though the historical flow figures show some up and down fluctuations, it may be concluded that efforts to reduce inflow and infiltration have succeeded—at least in part—in allowing the connection of hundreds upon hundreds of new sewer customers in the West Hickman WWTP sewershed while, at the same time, sewer flows in 1997 were below 1993 levels.

Sewer rates which have been in effect since July, 1992 are:

First 400 cubic feet per month	\$1.48/100 CF
All over 1,200 cubic feet per month	1.80/100 CF

There is no minimum charge for sewer service in Lexington. For example, a zero water usage during a monthly billing period would result in a zero charge for sewer service.

As for most cities which have an industrial base, Lexington-Fayette County also imposes a surcharge for sewer customers who deliver to the public sewer a wastewater of unusually high strength. A surcharge is imposed upon customers who discharge wastewater in which:

- total suspended solids are in excess of 250 mg/1
- ammonia nitrogen is in excess of 25 mg/1
- biochemical oxygen demand is in excess of 250 mg/1

Gross revenues received from the sale of sewer service in fiscal year 1997 were \$21.90 million. Operating and maintenance costs for that same period (exclusive of depreciation)

were \$11.40 million. Net sewer revenues were \$10.49 million. Total interest payments for fiscal year 1997 amounted to \$2.51 million.

Lexington Regional Wastewater Facilities Plan was completed and presented in draft form in January 1998 to the Urban County Council and to the Kentucky Division of Water. The document itself is in multiple volumes including the various technical appendices. Only a capsule summary is presented herein.

Lexington-Fayette has two municipal wastewater treatment plants now, and the same two plants are proposed to continue to operate at their present locations on through the 20-year planning period. The Facilities Plan, prepared by PEH Engineers, suggests that the population equivalents which would contribute to the two treatment plants would be as follows for the year 2020:

Town Branch WWTP	129,594 persons
West Hickman WWTP	216,413 persons

These figures do not necessarily reflect a resident population of those magnitudes but rather are a combination of resident population together with an allowance made for the commuting (or transient) population.

Concluded was that the Town Branch WWTP is likely to prove to be adequate—from a capacity point of view—for the full 20-year planning period. With present day sewage flows accepted at the Town Branch treatment plant at only about 67 percent of the plant's hydraulic capacity, growth projected during the 20-year planning period is not expected to result in sewage flows that would exceed the treatment plant hydraulic capacity. The treatment plant consistently operates within its effluent limits. On the other hand, the organic solids handling capability of the Town Branch treatment works was judged to be nearing a needed upgrade. Proposed was that by about 2005 (the early years of the Long Term planning period), additional adjacent lands should be acquired and that solids handling facilities and more aeration tanks be added to enhance treatment efficiency and effectiveness. The estimated project cost for these improvements is \$9.2 million.

For the West Hickman Creek Wastewater Treatment Plant, a different scenario applies, according to the 1998 Regional Wastewater Facilities Plan Update. This treatment plant is

approaching its hydraulic capacity. If the present day organic solids loading of the incoming wastewaters was not considerably below that for which the treatment plant was designed, it is unlikely that the plant would be able to operate consistently within the limits of its effluent discharge permit at the present time. In fact, treatment plant performance continues to be very acceptable at the West Hickman treatment plant.

**Proposed Projects 2000-2005**  
**SX21067001**

1. Proposed as a part of the 1998 Regional Wastewater Facilities Plan effort is the expansion of the West Hickman treatment plant to 31.0 million gallons per day (MGD) from the present capacity of 22.3 MGD. In addition to the treatment plant's hydraulic expansion, process changes were also suggested. Proposed was that the West Hickman treatment plant be amended to a single stage activated sludge process (similar to the Town Branch treatment plant) and that phosphorus removal be added as a new treatment process. The estimated project cost of the proposed treatment plant expansion and upgrade is pegged at \$21.5 million. Implementation was proposed for the period of the Immediate Plan.
2. Proposed as a part of the Regional Wastewater Facilities Planning effort was that the current program aimed at the reduction of infiltration and inflow be continued indefinitely. In situations where it is cost-effective, Lexington will certainly want to continue to seek to exclude groundwater and stormwater from the sanitary sewer system. The cost of conveying such waters and providing hydraulic treatment capacity for such waters is such as to demand that serious efforts be continued to seek their exclusion from the Urban County's system of sanitary sewers. The cost of continuing the infiltration/inflow reduction effort was pegged in the Plan Update at \$7.0 million for the five year period of the Immediate Plan and another \$24.0 million during the period of the Long Term Plan.
3. Insofar as the Urban Services Expansion Areas are concerned, most proposed sewers would be within the West Hickman wastewater treatment sewershed. Proposed within Expansion Areas 1, 2A, 2B, and 2C (in the West Hickman Service Area) and within Expansion Area 3 (in the Town Branch Service Area) is the construction of major interceptor sewers and (for the most part) major sewage pumping stations. The estimated \$27.2 million project cost is expected to be incurred over about a 10 year period with roughly one-half during the period of the Immediate Plan and the other half during the first five years of the period of the Long Term Plan. Land developers are expected to be called upon to pay a significant portion of the estimated \$27.2 million cost.
4. Interceptor sewer rehabilitation in the West Hickman sewershed was also established as a priority in the Wastewater Facilities Plan Update. Through interceptor sewer rehabilitation, upsizing, replacement, or paralleling, it was concluded that the relief of hydraulic bottlenecks is justified. A sum of \$10 million has been proposed to be earmarked for that purpose, one-half to be expended in the period of the Immediate Plan and the other half during the first five years of the period of the Long Term Plan.

5. During the period of the Immediate Plan, another \$22.5 million is proposed to be earmarked for upgrades to existing sewage pumping stations and force mains. Included in this effort would be the upgrading and the equipping of the major pumping station in the North Elkhorn drainage basin in such a fashion as to enable wastewaters collected to that point to be directed to either the Town Branch WWTP or the West Hickman WWTP, all depending on which had excess capacity to accept the wastewater at any given point in time.

In addition, the major pumping station and force main in the South Elkhorn drainage basin would be upgraded to accommodate an increase in sewage flows handled there. Also included in this general category of recommended projects/expenditures is the investigation and improvements of other minor sewage pumping stations as a measure aimed at better controlling sewage overflows and bypasses.

### ***Proposed Projects 2006-2020*** **SX21067002**

1. As mentioned earlier, proposed was that by about 2005 (the early years of the Long Term planning period), additional adjacent lands should be acquired and that solids handling facilities and more aeration tanks be added to enhance treatment efficiency and effectiveness at the Town Branch WWTP. The estimated project cost for these improvements is \$9.2 million.
2. As mentioned in no. 2 of the IMMEDIATE section, proposed as a part of the Regional Wastewater Facilities Planning effort was that the current program aimed at the reduction of infiltration and inflow be continued indefinitely. The cost of continuing the infiltration/inflow reduction effort was pegged in the Plan Update at \$7.0 million for the five year period of the Immediate Plan and another \$24.0 million during the period of the Long Term Plan.
3. Proposed sewers as mentioned in no. 3 of the IMMEDIATE section, with half of the \$27.2 million project cost (\$13.6 million) to be incurred during the first five years of the Long Term period.
4. Interceptor sewer rehabilitation as mentioned in no. 4 of the IMMEDIATE section, with \$5 million to be expended during the first five years of the Long Term period.

### **ON-SITE TREATMENT SYSTEMS**

#### **SI21067001**

This area consists of rural Fayette County beyond the service area of the sanitary sewer system of the Lexington-Fayette Urban County Government. It is unlikely that public sewer line extensions will reach this area of Fayette County by 2020. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. Reasons for the

high cost are the number of households (3,300), a low customer per mile ratio, rugged terrain, and the long distance from these houses to treatment facilities and existing sewer systems. Suggested instead is that a Revolving Loan Fund Program be established or that the U.S. Army Corps of Engineers 531 program be extended for the installation of a septic tank for each house that does not presently have sanitary sewer service, or could currently have a failing septic system. The generalized proposed cost of this option is \$16,500,000, or \$5,000 per household.

## FRANKLIN COUNTY

### Franklin County Sewer Service (map)

- Estimated 1999 population of 45,300--68% on public sewer
- Estimated 2020 population of 46,100--72% on public sewer
- Proposed projects would add over 860 new households to public sewer service during 2000-2020
- Estimated funding needs for public sewer 2000-2005--\$21,600,000
- Estimated funding needs for public sewer 2006-2020--\$3,000,000

Franklin County had an estimated population of 45,321 (19,433 households) in 1999 with a projected population of 46,136 (21,496 households) in 2020. Public sewer is provided to about 68 percent of the county's residents. About 6,300 households treat wastewater on site. About 860 customers could be added to public sewer service through new line extensions in 2000-2020.

### FRANKLIN COUNTY SEWER PLAN

#### *Proposed Projects 2000-2005*

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
FRANKLIN							-
Frankfort /SX21073001			1,000	2,500			3,500
Choatville area	311	3,400					3,400
US 60 Bridgeport (Laurel Rd)	300	4,100					4,100
Evergreen Road	Pkg Plts	3,050					3,050
Farmdale Area (US 127S)	Pkg Plts	3,650					3,650
Forks of Elkhorn NE	Pkg Plts	1,900					1,900
Jett Area	250	2,000					2,000
<b>Total</b>	<b>861</b>	<b>18,100</b>	<b>1,000</b>	<b>2,500</b>			<b>21,600</b>

#### *Proposed Projects 2006-2020*

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
FRANKLIN							
Frankfort SX21073002			3,000				3,000
<b>County Total</b>	<b>-</b>	<b>-</b>	<b>3,000</b>	<b>-</b>	<b>-</b>		<b>3,000</b>

#### CITY OF FRANKFORT SANITARY SEWER SYSTEM

Until 1955, the only sewer system which Frankfort had was the combined sanitary and storm sewers which served the downtown and near downtown areas. The sewer system of that day emptied without treatment into the Kentucky River at various points. Since that time,



# SEWER SERVICE AREAS FRANKLIN COUNTY Kentucky



**Prepared By:**  
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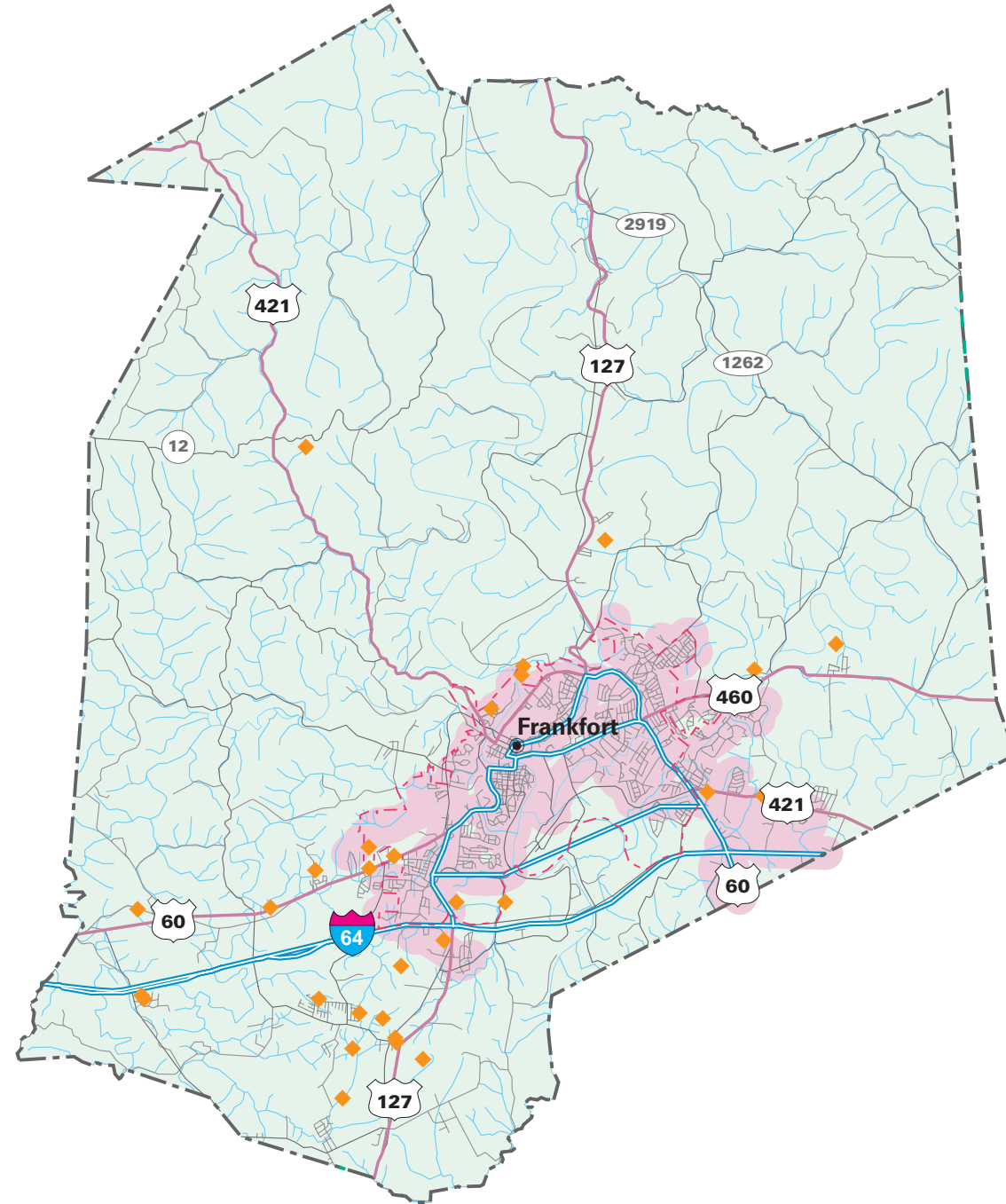
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- 201k Facility Planning Area
- Incorporated City Boundary
- Sewage Treatment Plant



**SEWER SERVICE STATUS BY OWNER**

EXISTING SERVICE AREA	PROPOSED SERVICE AREA	
		FRANKFORT MUNICIPAL SEWER

separate sanitary sewers have been extended to all other developed areas of the city and to some areas beyond.

Sewage from the different Frankfort sewer areas reaches the municipal wastewater treatment plant by various routes. Some involve separate sanitary sewers and some involve combined sewers. A verbal description of the various sewage flow patterns follows:

1. The southeast industrial area sewage is conveyed to the East Frankfort area and thence directly to the treatment plant.
2. The Ft. Boone area sewage goes to the Mero Pumping Station then to the junction box at the end of Benson Avenue and the beginning of Kentucky Avenue and thence directly to the treatment plant.
3. The Glenn's Creek area sewage goes via siphon across the Kentucky River to the end of 4th Street in South Frankfort then by gravity to the Capital Avenue pumping station then to the junction box at the end of Benson Avenue and the beginning of Kentucky Avenue and thence directly to the treatment plant.
4. North Frankfort area sewage is conveyed by combined sewers to the Bellepoint area which is also served by combined sewers. Bellepoint area sewage then goes to the treatment plant.
5. South Frankfort area sewage is conveyed by combined sewers to the Bellepoint area which is also served by combined sewers. Bellepoint area sewage then goes to the treatment plant.
6. A portion of West Frankfort area sewage is conveyed by separate sewers to the South Frankfort area which is served by combined sewers.

Frankfort has 15 combined sewer overflow (CSO) locations. Information about the 15 is as follows:

CSO Number	Combined Sewer Overflow Name	Drainage Area Acres	Estimated Houses	Population
002	Fourth Street	11.94	45	122
003	St. Johns Court	9.31	51	138
004	Murray Street	24.99	204	551
005	Logan Street	28.34	179	483
006	Capital Avenue	34.18	117	316
007	Ewing Street	180.22	659	1,779
008	Buffalo Valley	9.30	14	38
009	Washington Street	7.57	24	65
010	Mero Street	111.96	346	934
011	Kentucky Avenue #1	11.19	72	194
012	Benson Avenue*	23.12	63	170
013	Glen Willis	23.22	14	38
014	Broadway	21.94	63	170
015	Kentucky Avenue #2	31.54	22	60
016	Penitentiary Branch	122.50	576	1,555
<b>Totals</b>		651.32	2,449	6,613

\*discharges to Benson Creek. All others discharge directly to the Kentucky River.

Frankfort’s wastewater discharge permit from the Kentucky Division of Water authorizes discharge at these 15 locations under certain conditions.

The conditions are:

1. that there be no additional combined sewer construction
2. that new sewer line construction tributary to the combined sewer system be designed to minimize or delay inflow contribution to the combined sewer system. (This is being interpreted to mean that new separate sanitary sewers be routed around the combined sewer areas when possible.)
3. that Frankfort develop and implement a Combined Sewer Overflow (CSO) Abatement Program.

Frankfort has completed Phase 1 and Phase 2 of its Combined Sewer Overflow Plan. The January, 1996 HMB Engineers/Montgomery Watson study concluded that “in general, the water quality in Kentucky River water at Frankfort is very good in terms of dissolved oxygen, BOD, TSS, and ammonia. BOD, TSS, and ammonia loadings did not cause noticeable reductions in dissolved oxygen. Also, the results of river sampling showed no impact on these parameters due to combined sewer overflows. Fecal coliform standards are met during dry weather, but are exceeded during wet weather. However, the fecal coliform standards were within secondary water requirements. Dissolved oxygen standards were met at all times

during both dry and wet weather conditions.” The engineering report further recommended frequent testing for potential blockages within the combined sewer system, visual inspection of the CSOs on a regular basis, and cleaning of sewers with known siltation problems. Combined sewers are prone to having heavier grit loadings due to street runoff.

Sewer sizes in Frankfort range up to 48-inches in diameter. These large sewers are the combined sewers. The sewer system contains a large number of sewage pumping stations, all but four of which are municipally owned and maintained. In normal years, Frankfort will replace one or two pumping stations—usually due to the old age of the station or for capacity reasons.

The combined sewer situation notwithstanding, Frankfort *does* experience inflow/infiltration problems in some areas within its system of separate sanitary sewers. Areas so identified include Two Creeks, Country Lane, and the South Elkhorn sub-drainage basin. No specific sewer rehabilitation measures are underway, but the city does have and does use modern equipment for television sewer inspection and for smoke testing.

Primary areas of municipal growth (and therefore, sanitary sewer growth) include areas southward such as Lawrenceburg Road (US 127), US 421 toward Lexington, as well as the Louisville Road (US 60). Sewer utility officials rate the sewer system’s ability to accommodate future growth as *good*. In mid-1998 Frankfort sewer system utility personnel reported 11,821 customers.

In 1996, Frankfort municipal sewer service was extended to a mobile home park and to a strip commercial center on the west side of Versailles Road (US 60) 0.4 mile deep in Woodford County. By that effort, a package wastewater treatment plant was eliminated.

Frankfort’s wastewater treatment plant is located in northern Frankfort—in the Bellepoint area at the dead-end of Kentucky Avenue. The outfall is to milepoint 64.5 of the Kentucky River (in Pool 3). The stream segment classification for the river at that point is *warm water aquatic life*. The low flow stream condition at the outfall is reported by the Kentucky Division of Water to be 175 cubic feet per second.

Wastewater reaches the treatment plant through 27- and 48-inch diameter interceptors which discharge to a concrete influent chamber. All flow is then conveyed through a 48-

inch influent line (which has a capacity of 48 MGD) to the screw pumps. There are three 6-foot diameter screw pumps which lifts all the sewage flow out of the ground. The wastewater then proceeds through two mechanical bar screens. The sewage flow is then split evenly and is routed through two 12-inch parshall flumes and two parallel aerated grit chambers before being discharged to the biological treatment system (oxidation ditches).

Two parallel 3.22 million gallon oxidation ditches allow 24 hours of detention at a design flow of 6.6 MGD. Flow from each oxidation ditch is discharged through 15-foot effluent weirs to a single splitter box which combines all flow and equally splits it to the clarifiers of which there are four. Each clarifier has an 80 foot diameter and a 12-foot side water depth. Solids collected in the clarifiers may be returned to the oxidation ditches *or* may be wasted out of the treatment system. Disinfection is by ozonation.

Following disinfection, all flow is discharged to a cascading step aerator (ladder) before discharge to the Kentucky River.

Sludge that is wasted out of the clarifiers is pumped to a belt filter press, conditioned with polymer and dewatered. Ultimate sludge disposal is to the contained landfill in western Franklin County. Sludge filtrate is returned to the oxidation ditches for further treatment.

Treatment plant performance in 1995, 1996, and 1997 compared very favorably to the limits established by the city's state-issued wastewater discharge permit. Laboratory results of the treatment plant effluent for the past three years are compared to the city's effluent limits as follows:

Parameter	KPDES Limits	Average Annual Value		
		1995	1996	1997
Dissolved Oxygen	2 mg/1 minimum	9.8 mg/1	9.3 mg/1	10.7 mg/1
Total Suspended Solids	30 mg/1 maximum	9.6 mg/1	9.7 mg/1	10.9 mg/1
Ammonia - Summer	20 mg/1 maximum	0.17 mg/1	0.13 mg/1	0.12 mg/1
Ammonia - Winter	20 mg/1 maximum	0.23 mg/1	0.14 mg/1	-
Coliform	200/100 ml maximum	53/100 ml	62/100 ml	64/100 ml

BOD	30 mg/1 maximum	9.2 mg/1	9.6 mg/1	9.6 mg/1
Flow	6.6 MGD	6.3 MGD	7.5 MGD	7.0 MGD

Ammonia averages for 1997 were not separated into summer and winter periods, but were given for the entire year.

Average daily flow figures at the wastewater treatment plant were readily available for each of the last 10 years. These sewage flow figures are as follows:

<b>Year</b>	<b>Average Daily Flow</b>	<b>Year</b>	<b>Average Daily Flow</b>
1986	4.5 MGD	1992	5.6 MGD
1987	4.7 MGD	1993	5.9 MGD
1988	4.8 MGD	1994	6.1 MGD
1989	5.7 MGD	1995	6.3 MGD
1990	5.7 MGD	1996	7.5 MGD
1991	5.5 MGD	1997	7.0 MGD

The treatment plant's wet weather hydraulic maximum is 12.0 MGD. The plant is also rated to accommodate 24.0 MGD as a peak hour maximum flow.

Frankfort has eight state-certified operators. Four are Class IV; two are Class III; and two are a Class II.

Like most cities of its size, Frankfort has a pretreatment ordinance. Those sewer customers who pretreat their wastewaters prior to discharge to the municipal sewer include these:

American Wire Products	Allied Signal Corporation
Centralized Laboratory Facility	Frankfort Plastic
Centria	KYTC Sign Shop
Metal Method	Montaplast of NA
OHI-Atwood Automotive	SCAPA
Topy Corporation	Union Underwear
Webster Heating and Specialty Products	

Frankfort is required to conduct biomonitoring of its treatment plant effluent, but has consistently passed its requirement that biomonitoring shall not exceed 1.0 acute toxicity units.

Effective August 1996, monthly sewer service charges in Frankfort have been as follows:

First 2,000 gallons	\$5.88 minimum bill
All over 2,000 gallons	2.94/1,000 gallons

There is no distinction in rates between inside city customers and outside city customers.

The tap-on fee for each new residential sewer connection (defined as one with a 5/8-inch water meter) is \$641.

Gross revenues from the sale of sewer service in fiscal year 1997 were \$3,650,000. Operation and maintenance costs (exclusive of depreciation) were \$2,400,000. Net sewer revenues before debt service were \$1,250,000.

The problem of combined sewer overflows during heavy rainfall/runoff is not one that will likely be easily resolved. The city will want to continue to work with the Division of Water to monitor flows during floodtides and to continue to do what the city has already done—trying at the same time not to aggravate the CSO situation by allowing more sewage from new or developing areas to become tributary to combined sewer overflow (CSO) areas.

For a number of years, consideration has been given as to how best to provide sanitary sewer service to unsewered developed suburban areas which are presently outside the Frankfort corporate limits. In the 1980's, a sanitation district was created and community meetings were held, but little in the way of demonstrable progress has taken place. This complex problem was studied as a part of the city's 1992 Facilities Plan Update (prepared by HMB Engineers). In virtually all situations, conventional gravity sewer construction was evaluated together with a low pressure (grinder pump) sewer systems.

Wastewater treatment plant improvements are expected to be undertaken and completed within the period of the Immediate Plan. Inflow/infiltration correction is spread out over the full 20-year planning period. Interceptor/collectors sewers will likely only be constructed as the affected communities demand service. Therefore, it is assumed that 25 percent will occur during the period of the Immediate Plan with the balance differed to the period of the Long Term Plan. Collector sewer construction is targeted for the period of the Immediate Plan.

### ***Proposed Projects 2000-2005***

#### **SX21073001**

1. The city's 1992 Sewer Facilities Plan Update established a game plan for improvement/expansion of the city's wastewater facilities plant. Proposed as a part of that detailed planning effort were the following additions:

- a. splitter box, Parshall flume, and grit chamber
- b. the construction of a new oxidation ditch to operate in parallel with the two existing ditches
- c. the addition of a new belt filter press to operate in parallel with the existing presses

The total estimated project cost of wastewater treatment plant improvements as recommended by Frankfort's Wastewater Facilities Plan Update is \$2.5 million. Improvements summarized above should permit the wastewater treatment plant's design capacity to increase to 9.9 MGD from the present rated capacity of 6.6 MGD. This hydraulic expansion could allow adequate capacity throughout the 20-year planning period. Toward the end of the 20-year planning period (around year 2017), a subsequent hydraulic expansion—perhaps to 13.2 MGD—could be required. Because this subsequent treatment plant expansion could well fall outside the 20-year planning period, no estimate of cost is presented.

2. Sewer system rehabilitation—almost never-ending in nature—is a task with which most cities become involved. With the passage of time, it will become more important that flows entering and being conveyed by the system of sewers be minimized to the greatest possible extent. This means that Frankfort will want to conduct an almost constant effort to reduce the deleterious effects of excessive inflow and infiltration with various sewer rehabilitative efforts. Suggested is that Frankfort devote an average of \$200,000 to this effort annually for the entirety of the 20-year planning period-\$1.0 million during the Immediate Plan period.

### ***Proposed Projects 2006-2020***

#### **SX21073002**

1. Sewer system rehabilitation—almost never-ending in nature—is a task with which most cities become involved. With the passage of time, it will become more important that flows entering and being conveyed by the system of sewers be minimized to the greatest possible extent. This means that Frankfort will want to conduct an almost constant effort to reduce the deleterious effects of excessive inflow and infiltration with various sewer rehabilitative efforts. Suggested is that Frankfort devote an average of \$200,000 to this effort annually for the entirety of the 20-year planning period-\$3.0 million during the Long Term period.

### **ON-SITE TREATMENT SYSTEMS**

#### **SI21073001**

This area consists of rural Franklin County beyond the service area of the Frankfort municipal sanitary sewer system. It is unlikely that public sewer line extensions will reach this area of Franklin County by 2020. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must



be incurred to finance such expansive sewer system development. Reasons for the high cost are the number of households (6,300), a low customer per mile ratio, rugged terrain, and the long distance from these houses to treatment facilities and existing sewer systems. Suggested instead is that a Revolving Loan Fund Program be established or that the U.S. Army Corps of Engineers 531 program be extended for the installation of a septic tank for each house that does not presently have sanitary sewer service, or could currently have a failing septic system. The generalized proposed cost of this option is \$31,500,000 or \$5,000 per household.

## GARRARD COUNTY

### Garrard County Sewer Service (map)

- Estimated 1999 population of 14,200--29% on public sewer
- Estimated 2020 population of 18,200--31% on public sewer
- Proposed projects would add about 125 new households to public sewer service during 2000-2020
- Estimated funding needs for public sewer 2000-2005--\$520,000
- Estimated funding needs for public sewer 2006-2020--\$2,230,000

Garrard County had an estimated population of 14,225 (6,008 households) in 1999 with a projected population of 18,239 (8,401 households) in 2020. Public sewer is provided to about 29 percent of the county's residents. About 4,300 of the county's households treat wastewater on site. About 125 customers could be added to public sewer service through new line extensions in 2000-2020.

### GARRARD COUNTY SEWER PLAN

#### *Proposed Projects 2000-2005*

System	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
<b>GARRARD</b>							-
Lancaster /SX21079001	38	400	120				520

#### *Proposed Projects 2006-2020*

System	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
<b>GARRARD</b>							-
Lancaster SX21079002	87	1,500	280	450			2,230
County Total	87	1,500	280	450	-		2,230

### CITY OF LANCASTER SANITARY SEWER SYSTEM

Lancaster is similar to several other cities in the Bluegrass Area Development District in that it was built on high ground. In fact, the city is located on a ridge line where the only common attribute of drainage is that all of it is away from the center of town (see map). In some areas of the city—principally on the east side—sewage is pumped three different times before it reaches the wastewater treatment plant in the southwest quadrant of Lancaster south of West Buford Street. Lancaster has 1,658 sewer customers.

# SEWER SERVICE AREAS GARRARD COUNTY Kentucky

**Prepared By:**  
**Water Resource Development Commission**

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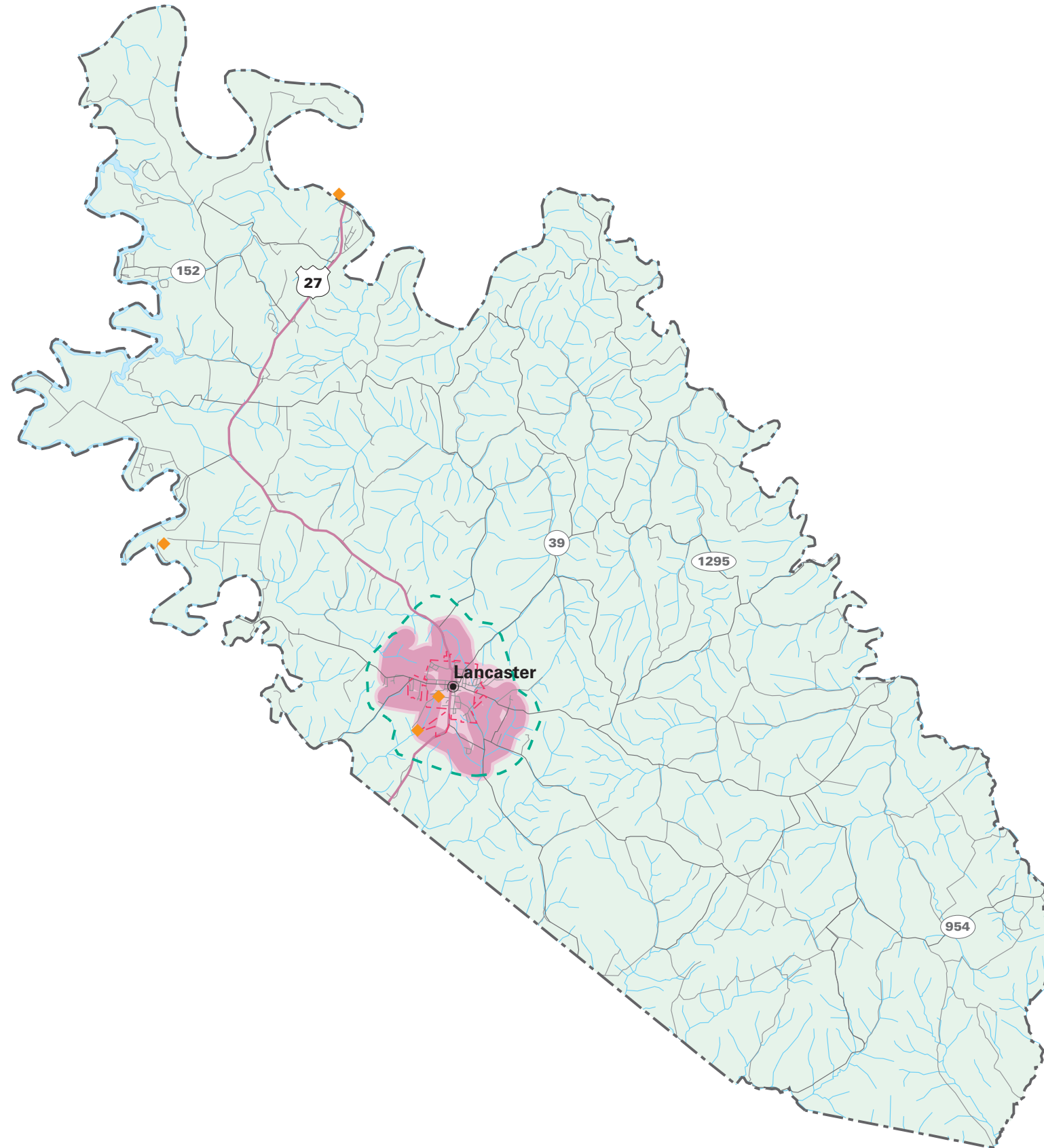
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-  201k Facility Planning Area
-  Incorporated City Boundary
-  Sewage Treatment Plant



**SEWER SERVICE STATUS BY OWNER**

		
EXISTING SERVICE AREA	PROPOSED SERVICE AREA	
		 LANCASTER MUNICIPAL SEWER

All gravity sewers are 8-inches in diameter with the exception of the 10-inch sewer south from West Maple Street to near Buford Street and the primary 15-inch interceptor sewer from the wastewater treatment plant northward to the 10-inch diameter sewer. By name and general location, the 11 sewage pumping stations are these:

<u>Pumping Station Name</u>	<u>General Location</u>
Buckeye	Northeast
Hill Court	North
Teaters Field	Extreme Southeast
Cemetery	Eastcentral
Myers Court	Near southside
Teaters Field-Maplewood	Northwest
Miles Estate	West
Industrial	West—Danville Road
Deer Run	South
Foodtown-Pleasant Retreat	Far South
County Fire Station	Far Southeast—KY 39

Extensive sewer rehabilitation has taken place since 1991. Almost 10,000 linear feet of sewer lines have been replaced in an effort to reduce the entry of excess flows to the sewer system. In addition, selected manhole covers have been raised and plastic inserts have been added to reduce surface water entry. The first seven pumping stations listed above have been refurbished and improved since 1990. The last four pumping stations are altogether new stations which have been installed in the 1990's. With the exception of three isolated houses on Doty Lane, all developed areas within the city have sanitary sewer service availability.

According to the treatment plant superintendent, only three of the sewage pumping stations bypass sewage and those bypasses are extremely infrequent and caused by periods of extreme rainfall and run-off, e.g., a 3-inch rainfall.

Wastewater Treatment Plant—Lancaster upgraded and expanded its wastewater treatment plant in 1989-1990. The current rated capacity is 1.0 million gallons per day (MGD). The plant has a peak hydraulic capacity of 2.5 MGD. The average daily flow in 1997 was 586,000 gallons. Only rarely do sewage flows top 1.0 MGD. The plant is of the oxidation ditch type.

Incoming sewage flows are pumped up out of the ground and go through the following processes: parshall flume, grit chamber, bar screen, oxidation ditch, rapid sand filter,

chlorination, dechlorination, and post-aeration before discharge to a tributary of White Oak Creek which, in turn, is a Dix River tributary. Sludge is removed in the oxidation ditch by an intra-channel clarifier. Sludge so removed goes to an aerobic digester for stabilization before being placed on sludge beds for drying. There are 12 sludge drying beds. For ultimate disposal, dried sludge is trucked to a privately operated landfill in Franklin County or in Lincoln County.

The treatment plant has so much unused capacity that the two oxidation ditches are rarely used at the same time. The off-line ditch can be used to accept surges during times of protracted wet weather.

Treatment plant performance in 1995, 1996, and 1997 compared very favorably to the limits established by the city's state-issued wastewater treatment plant discharge permit. Laboratory results of the treatment plant effluent over the past three years are compared to the city's effluent limits as follows:

Parameter	KPDES Limit	Average Annual Value		
		1995	1996	1997
Dissolved Oxygen	7 mg/1 minimum	7.5 mg/1	9.2 mg/1	10.7 mg/1
Total Suspended Solids	30 mg/1 maximum	6 mg/1	8 mg/1	8 mg/1
Ammonia - Summer	2 mg/1 maximum	0.04 mg/1	0.38 mg/1	0.68 mg/1
Ammonia - Winter	6 mg/1 maximum	0.12 mg/1	2.34 mg/1	1.31 mg/1
Coliform	200/100 ml maximum	8/100 ml	3/100 ml	2/100 ml
BOD	30 mg/1 maximum	2.1 mg/1	4.9 mg/1	3 mg/1
Flow	1.0 MGD	0.346 MGD	0.494 MGD	0.586 MGD

No permit exceedences, i.e., violations, were noted for any treatment parameter for these three recent years. It is concluded therefore that Lancaster's wastewater treatment plant consistently operated within its prescribed effluent limits.

The city is required to biomonitor its treatment plant effluent. Biomonitoring results have generally been satisfactory. On the rare occasions when the biomonitoring results have been

unsatisfactory, immediate re-testing has yielded satisfactory results. Lancaster is not under a state mandate to prepare a toxicity reduction evaluation (TRE).

There are two state-certified operators, one is certified Class III and one is certified Class I. The recent direction of city growth seems to be west out the Danville Road and south in the Deer Run subdivision area. The treatment plant superintendent identified no sewer system bottleneck which could hamper future growth of the community or future growth of the sanitary sewer system. Even though the city has a pretreatment ordinance, no customer is required to pretreat its wastewater before discharge to the municipal sewer system.

Wastewater treatment officials are justifiably proud of the job the municipal wastewater treatment plant is doing. They are likewise pleased with the reduction in inflow that has been experienced due to municipal sewer rehabilitation efforts. Planned are continued efforts to locate and reduce excess flows, which are attributable to inflow and infiltration. In the way of improvements, the wastewater superintendent would like someday to add a belt filter press that would increase treatment process flexibility by enabling the treatment plant to dewater sludge year-round without regard for outdoor weather conditions.

Sewer rates presently in effect are as follows:

First 1,000 gallons/month	\$4.91 minimum
All Over 1,000 gallons	\$4.91/1,000 gallons

The tap fee for connection to the sewer system is \$150.

Gross revenues from sewer service charges for fiscal year 1997 were \$389,000. Maintenance and operating costs (exclusive of depreciation) were \$276,000. Net sewer revenues before debt service were \$113,000. Principal and interest on the sewer utility's long term bonded debt in FY 1997 amounted to \$78,000.

**Proposed Projects 2000-2005**

**SX21079001**

1. During the Immediate Term, 8-inch diameter sewers are proposed north of Haselden Heights and east of US 27 and west of the westside industrial area and north of the Danville Road. Each of these latter two areas are in the Boone Creek drainage basin where the natural direction of drainage is north and west away from the city center and the city's wastewater treatment plant. Each of these proposed sewers would terminate with a new sewage pumping station and pumped-back sewage flow. The existing Buckeye

sewage pumping station could be abandoned in favor of one further downstream (north) of Haselden Heights, while the Teaters Field-Maplewood pumping station could be abandoned in favor of a new station west of the westside industrial area. The 1997 estimated project cost of sewers and pumping stations proposed during the period of the Immediate Plan is \$400,000. Sewer line extensions will serve approximately 38 households.

2. While Lancaster has achieved a notable degree of success in the reduction of inflow and infiltration in the sewer system by sewer rehabilitation and by sewage pumping station modifications, it is suggested that more can and should be done. The wastewater treatment plant needs more sanitary sewage—not more rainwater and groundwater. Toward the goal of further reducing inflow and infiltration, it is recommended that Lancaster devote financial resources to sewer rehabilitation. It is suggested that \$120,000 be devoted to this effort during the period of the Immediate Term. and another \$280,000 during the period of the Long Range Plan.

### **Proposed Projects 2006-2020**

#### **SX21079002**

1. Lancaster has a wastewater problem that is shared by few other communities in the Bluegrass Area. That problem is that the wastewater treatment plant could and should have more sewage to operate in an optimum mode. The plant is loaded at less than 60 percent of its rated capacity on an average day. Because the treatment plant is underloaded, the city's 1989-1990 vintage wastewater treatment plant should, from a hydraulic capacity point of view, be adequate not just through the Immediate Plan but also through the entire 20-year Long Term period. Modifications are suggested, however, for the treatment plant's solids handling facilities. The addition of a belt filter press would allow for a more flexible solids handling operation. Modifications may also be required to the treatment plant's intra-channel clarifier. Suggested for the Long Term, this added treatment component has a 1997 estimated project cost of \$450,000.
2. While Lancaster has achieved a notable degree of success in the reduction of inflow and infiltration in the sewer system by sewer rehabilitation and by sewage pumping station modifications, it is suggested that more can and should be done. The wastewater treatment plant needs more sanitary sewage—not more rainwater and groundwater. Toward the goal of further reducing inflow and infiltration, it is recommended that Lancaster devote financial resources to sewer rehabilitation. It is suggested that \$280,000 be devoted to this effort during the Long Term period.
3. During the period of the Long Range Plan, the installation of additional interceptor sewers is recommended. Proposed are 8- and 10-inch diameter sewers on the city's north side (terminating at a new pumping station), minor sewers west of the exiting corporate limits, and significant sewers east, southeast and south of the central city. Proposed sewers as shown on Figure 13-3 would terminate at a new major sewage pumping station near Turkey Creek's crossing of KY 39 south of the city. These sewers—some 8-inch, some 10-inch, and some 12-inch—would provide sewer service accessibility from Conn Lane north of Richmond Street to Crab Orchard Street to Fall Lick Road (KY 1972) to KY 39. All areas on this side of the existing city are a part of the Turkey Creek

watershed. If and as these *southeast side* sewers are installed, the city would be able to eliminate as many as three existing sewage pumping stations in favor of a new and larger Turkey Creek pumping station. Abandoned could be the Cemetery, the Teaters Field, and the County Fire Station pumping stations as sewage presently collected at those pumping stations could then be allowed to be conveyed further downstream in the Turkey Creek drainage basin to a new sewage pumping station. Sewage captured at the Turkey Creek pumping station could then be pumped directly to the municipal wastewater treatment plant and could therefore avoid *pump-back* sewage flow *through* the existing sewer system. Some of the existing hydraulic load within the existing sanitary sewer system could thereby be relieved. The 1997 estimated project cost of Long Range Plan recommendations is \$1.5 million. Sewer line extensions will serve approximately 87 households.

#### ON-SITE TREATMENT SYSTEMS

##### **SI21079001**

This area consists of rural Garrard County beyond the service area of the Lancaster municipal sanitary sewer system. It is unlikely that public sewer line extensions will reach this area of Garrard County by 2020. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. Reasons for the high cost are the number of households (4,300), a low customer per mile ratio, rugged terrain, and the long distance from these houses to treatment facilities and existing sewer systems. Suggested instead is that a Revolving Loan Fund Program be established or that the U.S. Army Corps of Engineers 531 program be extended for the installation of a septic tank for each house that does not presently have sanitary sewer service, or could currently have a failing septic system. The generalized proposed cost of this option is \$21,500,000 or \$5,000 per household.



## HARRISON COUNTY

### Harrison County Sewer Service (map)

- Estimated 1999 population of 17,400--45% on public sewer
- Estimated 2020 population of 18,800--45% on public sewer
- Proposed projects would add over 50 new households to public sewer service during 2000-2020
- Estimated funding needs for public sewer 2000-2005--\$6,560,000
- Estimated funding needs for public sewer 2006-2020--\$4,400,000

Harrison County had an estimated population of 17,373 (7,038 households) in 1999 with a projected population of 18,826 (8,221 households) in 2020. Public sewer is provided to about 45 percent of the county's residents. About 3,900 households treat wastewater on site. Over 50 customers could be added to public sewer service through new line extensions in 2000-2020.

### HARRISON COUNTY SEWER PLAN

#### *Proposed Projects 2000-2005*

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
HARRISON							-
Cynthiana /SX21097001	17+ind	760	300	5,500			6,560

#### *Proposed Projects 2006-2020*

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
HARRISON							-
Cynthiana SX21097002	29	1,100	700	1,300		1,100	4,200
Berry SX21097003	unk	200					200
County Total	29	1,300	700	1,300	-	1,100	4,400

# SEWER SERVICE AREAS HARRISON COUNTY Kentucky

**Prepared By:**  
**Water Resource Development Commission**

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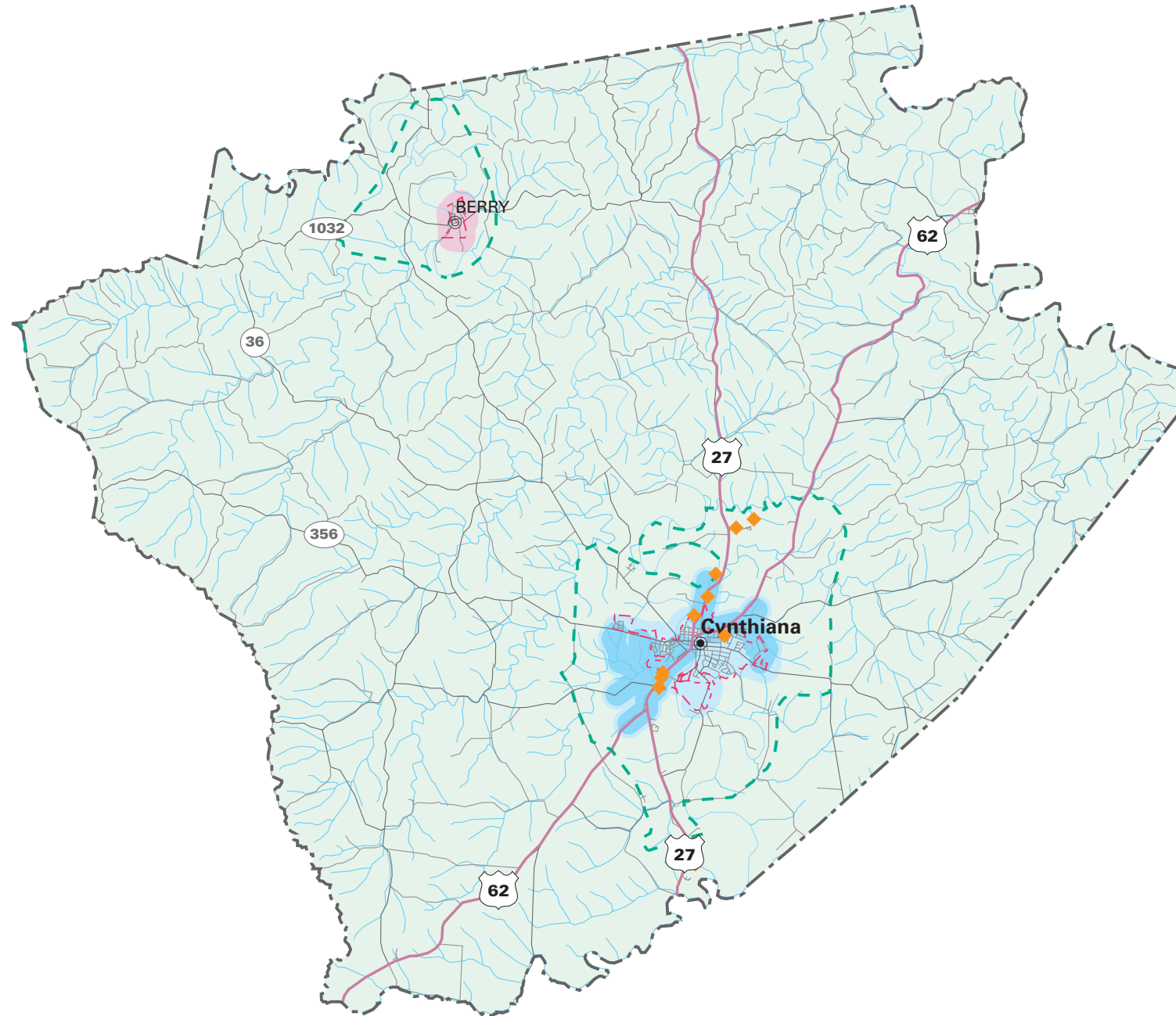
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Data Collection & GIS Input By:  
Kentucky Area Development Districts



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- - - 201k Facility Planning Area
- - - Incorporated City Boundary
- ◆ Sewage Treatment Plant



### SEWER SERVICE STATUS BY OWNER

- | EXISTING SERVICE AREA                    | PROPOSED SERVICE AREA               |                           |
|--|-------------------------------------|---------------------------|
| <span style="color: lightblue;">■</span> | <span style="color: blue;">■</span> | CYNTHIANA MUNICIPAL SEWER |
| <span style="color: lightpink;">■</span> | <span style="color: pink;">■</span> | BERRY MUNICIPAL SEWER     |

CITY OF CYNTHIANA SANITARY SEWER SYSTEM

Cynthiana is somewhat like Frankfort in that a large section of the older part of the city was originally sewered with combined storm and sanitary sewers. The area generally bounded by Church Street on the east and the South Fork Licking River on the west had, at one time, a combined sewer system. In some areas, an effort was made to construct new storm sewers and to allow the former combined sewers to serve as sanitary sewers only. That attempt has been at least partially successful. Recent smoke testing of the formerly combined sewers resulted in some smoke escaping through storm water inlets. This is indicative that there continue to be some cross connections between the sanitary sewers and the storm sewer network.

There are 18 sewage pumping stations. Principal pumping stations are the Elm Street-River Road station and the Vine Street station. The Elm Street-River Road pumping station handles much of the sewage generated on the river's west side. The Vine Street station pumps into the Oddville Avenue interceptor sewer all sewage collected in the city's northeast corner. Some sewer line capacity problems are reported. In the Robynwood area of the city's east side, some difficulty has been experienced in conveying collected sanitary sewage to the wastewater treatment plant without bypassing and without surcharges to the existing sewers.

Infiltration and inflow are reported to be problems in Cynthiana as they are in most other Bluegrass Area municipal sewer systems. Large sections of the sanitary sewer system—primarily in the east, southeast, and southern sections of the city—are served by sanitary sewers which are no larger than 8-inches in diameter.

Sewer line mapping stopped about the time of the 1980 wastewater treatment plant upgrade. For some areas added to the sanitary sewer network, the city has individual subdivision sewer maps. For other areas sewered in recent years, the city apparently has *no* sewer line maps.

There are some small urbanized but unsewered areas that remain outside of the Cynthiana corporate limits even though the city more or less surrounds them. Miley Avenue is one such area.

Cynthiana has 2,560 sewer customers. All but about 25 are located within the corporate limits.

The wastewater treatment plant was built in 1957 and is located in the northcentral part of Cynthiana at the dead end of Locust Street. The treatment plant was significantly upgraded and expanded in 1980. The rated capacity of the treatment plant is 1.5 million gallons per day (MGD). Hydraulically, the plant can accept up to about 1.97 MGD based on the 24-hour capacity of the influent pumps.

Raw sewage is pumped out of the wet well and through a bar screen. Sewage then goes through static screens. Sewage then is routed to a circular concrete flow equalization basin which is aerated. Operators report that a larger flow equalization basin would be needed to enhance treatment plant effectiveness. Once the equalization basin is full, the flow rate going through the remaining treatment components must equal the incoming flow even if that flow rate is still quite high. Sewage from the equalization basin is split and goes to twin trains of rotating biological contactors (RBC's). Effluent flow from the RBC's can be recirculated to the head of the RBC train. From the RBC's, sewage flows to a rectangular clarifier. Operators question the effectiveness of the rectangular clarifier. From the clarifier, sewage flows bypass a rapid sand filter which has been inoperative since at least 1990. The rapid sand filter may soon be repaired and returned to service however. Sewage from the clarifier is chlorinated and then—by the addition of sulfur dioxide—is dechlorinated. An 18-inch diameter sewer conveys the treated effluent some 8,000 feet north for discharge into the South Fork Licking River below the A. Keller Dam, at mile point 46.4.

From the clarifier, sludge is first routed to a sludge holding tank and thence to chemical conditioning with lime and ferric chloride. With a filter press, the sludge is dewatered to a solids content of 40 to 45 percent. Solids are then trucked to an approved contained landfill in Grant County for ultimate disposal.

Cynthiana has an approved pretreatment program and it requires pretreatment by the following sewer users: Bundy, Concept Packaging, Ladish, Grady (foundry), 3M, the local hospital, and the former city landfill for its trucked-in leachate. Cynthiana has four certified wastewater treatment plant operators. Two are Class III operators and two are Class II-certified.

The city's 1995, 1996, and 1997 wastewater discharge effluent limits are compared to laboratory averages as follows:

Parameter	KPDES Limits	Average Annual Value		
		1995	1996	1997
Dissolved Oxygen	7.0 mg/1 minimum	7.7 mg/1	7.7 mg/1	7.7 mg/1
Total Suspended Solids	30 mg/1 maximum	16 mg/1	15 mg/1	15.5 mg/1
Ammonia – summer	2 mg/1 maximum	0.9 m/1	1.2 m/1	1.4 m/1
Ammonia – winter	5 mg/1 maximum	1.6 mg/1	1.5 mg/1	2.14 mg/1
Coliform	200/100 ml	17/100 ml	55/100 ml	23/100 ml
BOD – summer	10 mg/1 maximum	6 mg/1	7 mg/1	7.5 mg/1
BOD – winter	15 mg/1 maximum	11 mg/1	11 mg/1	10.7 mg/1

No permit exceedences were noted on any of the parameters for any of the 12 months of 1995 or 1996, but one monthly exceedence occurred in 1997 on the summer ammonia limit.

Metered sewage flows are a puzzle. Flow records from the treatment plant's magnetic flow meter show the following for 1995, 1996, and 1997:

	1995	1996	1997
Avg. daily flow	0.585 MGD	0.856 MGD	0.895 MGD
Max. day	1.28 MGD	1.471 MGD	1.9 MGD

Operators strongly suspect that for years the flow meter under-measured sewage flows. Operators believe that the average daily flow is actually around 0.9 MGD. No bypassing of sewage is reported at the treatment plant. Average daily flows for periods after 1996 are apparently more credible than flow figures for earlier periods. Higher than average incoming flows caused by heavy or prolonged rains are taken through the wastewater treatment process but such flows are sometimes disruptive of treatment operations. Cynthiana does conduct biomonitoring of its effluent and has consistently passed those tests.

Sewer rates presently in effect are these:

First 2,000 gallons/month     \$4.51 minimum bill  
Next 480,000 gallons/month 1.83/1,000 gallons  
All over 500,000 gallons/month     .84/1,000 gallons

Gross revenues from sewer service charges for fiscal year 1997 were \$497,000. Maintenance and operating costs (exclusive of depreciation) were \$529,000. Net sewer revenues before debt service were (\$32,000). Principal and interest on the sewer utility's long term bonded debt in FY 1997 amounted to \$28,000.

Inflow and infiltration are twin problems to most area sewer systems; and Cynthiana is no exception. The current regulation relating to the prohibition of sanitary sewer overflows will likely only become tighter with time. Extraneous waters (ground water and surface water) can either be kept out of the sanitary sewer or the excess flow must be conveyed by the sewer and treated with the sewage once it reaches the treatment works. Most cities who choose to attack the problem of extraneous flows in the sewer system do a little of both. Sewer rehabilitation can reduce (but not eliminate) inflow and infiltration. After the benefits of sewer rehabilitation are realized, sewers and treatment works must then be sized so as to convey and treat the remaining extraneous flow along with the sanitary sewerage.

Parts of the existing wastewater treatment plant are 40 years old. The rotating biological contactor type treatment units have fallen into disfavor. Few, if any, RBC units are installed in municipal treatment works in Kentucky in the waning years of the 20th century. Another significant factor is the small tract of land available for wastewater treatment at the dead-end of Locust Street and so close to so many residences.

The above-mentioned factors give rise to a suggestion that the existing wastewater treatment plant be phased out—perhaps over a period as long as a decade—in favor of a new oxidation ditch type facility to be located further downstream (north) within a site that is in a bend of the South Fork Licking River. The suggested site is a little more than one mile north of the proposed intersection of the proposed US 27 Bypass with US 27 North (the Falmouth Road). The site under consideration is well above the 100 year floodplain and is accessible along an existing lane that intersects KY 36 northwest of the central city. This is discussed in more detail in No. 3 of the following **IMMEDIATE** section.

**Proposed Projects 2000-2005**

**SX21097001**

1. In Cynthiana's case, some attempt at flow reduction by sewer line rehabilitation is recommended. Just where the attempt should be made or where reductions in sewage flows may be expected will be the subject of a more detailed engineering study. For this planning effort, however, it is suggested that Cynthiana plan to allocate for this purpose \$300,000 during the period of the Immediate Plan.
2. It would appear that Cynthiana's growth will continue to be concentrated to a significant extent on the southwest side of the South Fork Licking River. Proposed for installation during the period of the Immediate Plan is a 15-inch diameter gravity sewer beginning at the Elm Street pumping station and following the river and then Grays Run upstream as it divides into 10-inch and 12-inch sewers. Sewers as proposed would extend opportunities for development south along US 27 as far as Connersville Road (KY 32) and the Georgetown Road (US 62). At least one existing sewage pumping station could be eliminated as well. Also proposed is a 12-inch diameter gravity sewer along KY 32 to serve the planned industrial park. The 1997 estimated project cost of these Immediate Plan proposals is \$ 760,000. Sewer line extensions will serve approximately 17 households.
3. As mentioned previously, suggested is that during the period of the Immediate Plan, Cynthiana acquire an ample site, convert the existing 18-inch outfall sewer to an interceptor sewer by constructing a major sewage pumping station immediately downstream of the DeGaris Mill Dam with a force main to the new treatment plant site. Initially, the RBC units at the existing wastewater treatment plant could be replaced with oxidation ditches, sedimentation, chlorination and dechlorination facilities at the new treatment site and that the remaining portions of the existing treatment plant could be operated for a time in tandem with the new treatment units at the new site. New treatment units should be sized to accommodate a daily flow of 2.8 MGD. The 1997 estimated project cost of the initial phase of the wastewater treatment plant upgrade is \$5.5 million.

**Proposed Projects 2006-2020**

**SX21097002**

1. During the period of the Long Term Plan, the following additions and improvements are recommended:
  - a. the installation of a 15-, 12-, and 10-inch diameter relief and interceptor sewer to follow Flat Run Creek from a new major pumping station near Flat Run Creek's crossing of US 27 North. The new sewer would extend around the city's north and east side as far as Millersburg Pike (KY 32 and 36). This new sewer interceptor could eliminate at least three existing sewage pumping stations (one of them, the major Vine Street pumping station) and it would enable additional urbanization northeast along Oddville Pike (US62) and Millersburg Pike (KY 32 and 36).
  - b. the installation of 8-, 10-, and 12-inch interceptor and sub-interceptor sewers southwest and west of the central city along Connersville Road and following

several sub-drains of Grays Run Creek. The various segments of these proposed extensions would enable fill-in urban development along both the east and the west sides of the proposed US 27 Bypass.

The 1997 estimated project cost of sewers proposed for installation during the period of the Long Term Plan is \$ 1.1 million and will serve approximately 29 households.

2. During the period of the Long Term Plan, the remaining units at the existing treatment plant site could be phased out as flow equalization, grit removal, clarification, control building, and sludge handling facilities are added to the new treatment site in the river's bend. The 1997 estimated project cost of the final wastewater treatment plant upgrade is \$1.3 million. The capacity of the wastewater treatment plant at the northside site would remain unchanged at 2.8 MGD.
3. As mentioned in the **IMMEDIATE** section, in Cynthiana's case some attempt at flow reduction by sewer line rehabilitation is recommended. Just where the attempt should be made or where reductions in sewage flows may be expected will be the subject of a more detailed engineering study. For this planning effort, however, it is suggested that Cynthiana plan to allocate for this purpose \$700,000 during the period of the Long Term Plan.

#### CITY OF BERRY SANITARY SEWER SYSTEM

The Berry municipal sanitary and sewage collection treatment system is one of the newest in the Bluegrass Area Development District.

The wastewater treatment facilities are located at the south part of the city of Berry, to the east of the South Fork Licking River. There is no discharge from the treatment plant into the river.

The treatment facilities consist of a 260,000 gallons per day aerated lagoon/land treatment system consisting of a two-stage aerated lagoon/storage lagoon, a five acre spray field with permanent set sprinklers, a pump station and groundwater monitoring wells. The sewage collection system consists of pressure sewers with septic tank effluent pumping, mainly from clusters of two adjacent houses or businesses. There are 63 pumps and approximately 5,150 linear feet of 2-inch diameter pressure sewers and 6,000 linear feet of 3-inch diameter pressure sewers. Septage from the tanks is pumped and transported for local land application. The city contracts operation of the wastewater system with one individual who is a certified Class I operator.

The sewage collection and treatment system was constructed in 1987 utilizing grant support from the US Environmental Protection's alternative-innovative technology set-aside



program for small communities. The financial contribution of the US Environmental Protection Agency (EPA) represented 85 percent of total costs. The Farmers Home Administration (FmHA) also provided grant and loan support to the Berry sewage system construction project. Grants provided by these two agencies approached 99 percent of the initial construction cost. The final cost of the project was approximately \$1.5 million.

The Berry sanitary sewage collection and treatment system served 117 customers in 1997.

Present sewer rates in effect are these:

\$14.00 for first 2,000 gallons per month  
\$ 7.00 for each additional 1,000 gallons per month

Pertinent financial data for the city's sewer system for fiscal year 1997 is as follows:

Gross Revenues from Sewer Service Charges:	\$32,000
Maintenance and Operating Costs (exclusive of depreciation):	\$28,000
Net Annual Sewer Revenues:	\$3,000
Principal and interest on the utility's long term bonded debt in 1997:	\$1,400

Berry is expected to experience only modest growth during the 20-year planning period.

From a hydraulic capacity point of view, the 260,000 gpd aerated lagoon with spray irrigation and no discharge to a waterway is expected to be adequate throughout the planning period.

### **Proposed Projects 2006-2020**

#### **SX21097003**

1. Modest sewer line extensions may well be needed during the Long Term period. It is suggested that \$200,000 be assigned to Berry for sewer system extensions during the period of the Long Term Plan.

#### **ON-SITE TREATMENT SYSTEMS**

#### **SI21097001**

This area consists of rural Harrison County beyond the service areas of the sanitary sewer systems of the Cities of Cynthiana and Berry. It is unlikely that public sewer line extensions will reach this area of Harrison County by 2020. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. Reasons for the

high cost are the number of households (3,900), a low customer per mile ratio, rugged terrain, and the long distance from these houses to treatment facilities and existing sewer systems. Suggested instead is that a Revolving Loan Fund Program be established or that the U.S. Army Corps of Engineers 531 program be extended for the installation of a septic tank for each house that does not presently have sanitary sewer service, or could currently have a failing septic system. The generalized proposed cost of this option is \$19,500,000 or \$5,000 per household.

## JESSAMINE COUNTY

### Jessamine County Sewer Service (map)

- Estimated 1999 population of 36,400--58% on public sewer
- Estimated 2020 population of 46,500--63% on public sewer
- Proposed projects would add over 720 new households to public sewer service during 2000-2020
- Estimated funding needs for public sewer 2000-2005--\$7,880,000
- Estimated funding needs for public sewer 2006-2020--\$11,900,000

Jessamine County had an estimated population of 36,420 (14,103 households) in 1999 with a projected population of 46,535 (19,709 households) in 2020. Public sewer is provided to about 58 percent of the county's residents. About 5,900 households treat wastewater on site. Over 720 new customers could be added to public sewer service through new line extensions in 2000-2020.

### JESSAMINE COUNTY SEWER PLAN

#### *Proposed Projects 2000-2005*

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
JESSAMINE							-
Wilmore /SX21113003	12 + Pot	390	500			390	1,280
Nicholasville /SX21113001	85	1,500	500	800			2,800
Jessamine County SD							-
Ashgrove Pike Area	271	3,800					3,800
County Total	368 + pot	5,690	1,000	800		390	7,880

#### *Proposed Projects 2006-2020*

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
JESSAMINE							-
Wilmore SX21113004	12	1,200	500	1,300			3,000
Nicholasville SX21113002	39 + pot	2,500	900	3,500			6,900
Catnip Hill Road Area	300	2,000					2,000
County Total	351 + pot	5,700	1,400	4,800			11,900

#### CITY OF NICHOLASVILLE SANITARY SEWER SYSTEM

If there was ever a municipal sewerage system in transition, it is Nicholasville's. With the 1996 commencement of major interceptor sewer installation in the Jessamine Creek drainage basin (on Nicholasville's west side) and with the concurrent construction

# SEWER SERVICE AREAS JESSAMINE COUNTY Kentucky

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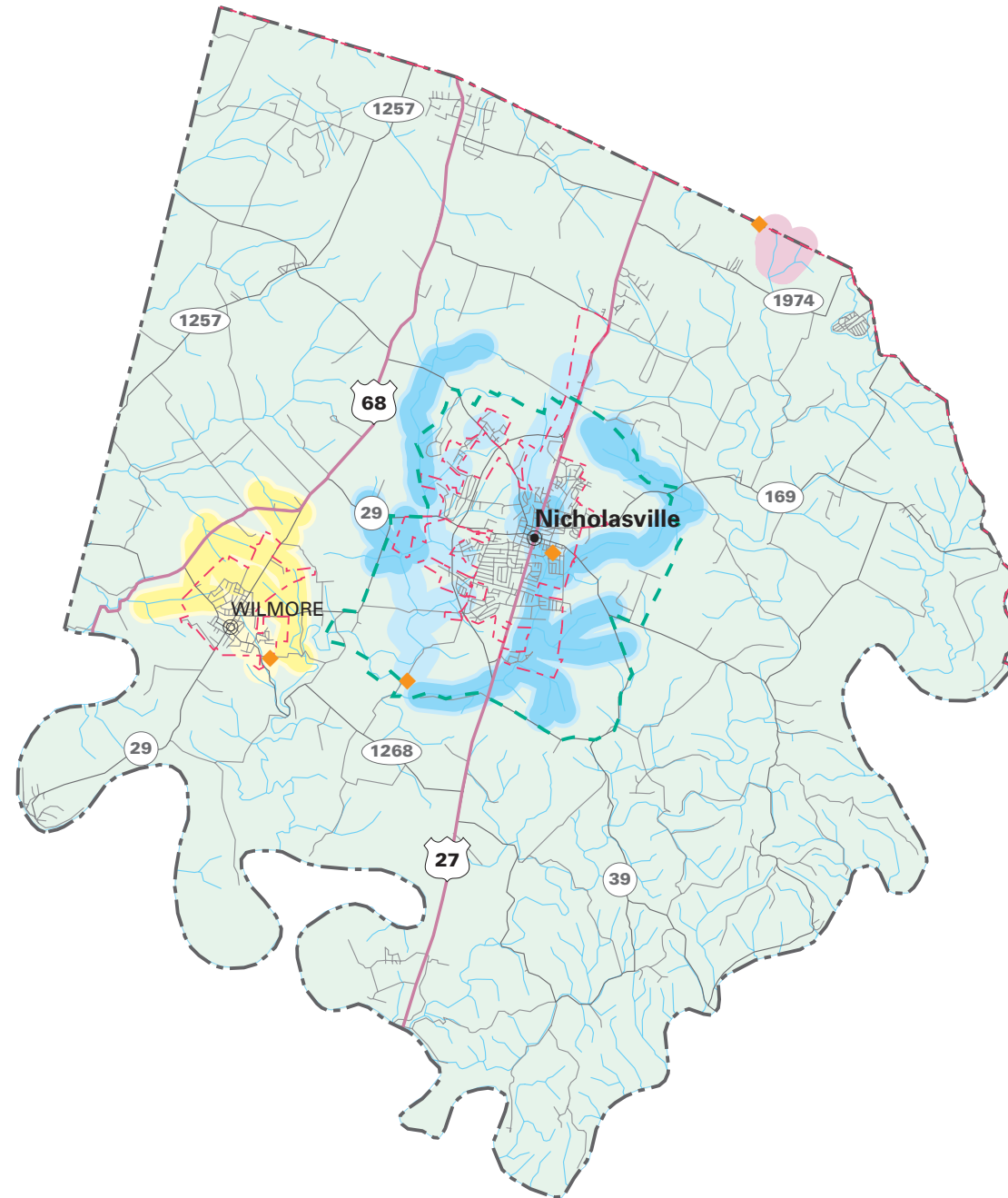
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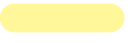

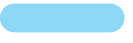


Data Collection & GIS Input By:  
Kentucky Area Development Districts



LIMITATION OF LIABILITY: The Water Resource Development Commission has no reason to believe that there are any inaccuracies or defects in information incorporated in this work and make no representations of any kind, including, but not limited to, the warranties of merchantability or fitness for a particular use, nor any such warranties to be implied, with respect to the information or data furnished herein.

-  201k Facility Planning Area
-  Incorporated City Boundary
-  Sewage Treatment Plant



SEWER SERVICE STATUS BY OWNER		
EXISTING SERVICE AREA	PROPOSED SERVICE AREA	
		WILMORE MUNICIPAL SEWER
		NICHOLASVILLE MUNICIPAL SEWER
		FAYETTE URBAN COUNTY GOVERNMENT

commencement of an altogether new 3.0 MGD wastewater treatment plant near the confluence of Town Fork and Jessamine Creek, much about Nicholasville's sewerage system is in the process of change.

Much of the sewer system has been in existence since at least 1939 when the city's original municipal wastewater treatment plant was constructed. The recent growth of the community and its sewer system has been and continues to be rapid. As a result, a depiction of all lateral sewers is not possible on the map scale that is available for this study.

Nicholasville lies within three major drainage basins—Town Fork, Jessamine Creek, and Hickman Creek. Most of Nicholasville's wastewater service area is within the two drainage basins first mentioned above. The Town Fork and the Jessamine Creek drainage basins are separated by a ridgeline that cuts through Nicholasville in what is basically a north-south direction. Until early 1998 when Nicholasville's new Jessamine Creek Wastewater Treatment Plant was placed in service, Nicholasville's only wastewater treatment plant was located in the Town Fork basin. Until that time, sewage from areas located in the Jessamine Creek basin was necessarily pumped back to the Town Fork basin for treatment. There are presently eight municipally owned and operated sewage pumping stations. That number of pumping stations was reduced somewhat as six miles of 12-inch through 36-inch diameter interceptor sewers were completed in 1997. Two additional pumping stations are owned and operated by the Jessamine County School system. These two pumping stations are used to convey sewage to the city sewer from schools west of the city and along KY 29.

Even with the inauguration of Nicholasville's new Jessamine Creek WWTP, Town Fork is presently the receiving stream for all of Nicholasville's treated sewage effluent. The stream has a very limited drainage area. It is walled and is covered for several blocks as it meanders through downtown Nicholasville. The 1996-1998 wastewater construction project is designated as Phase I of a two phase project. The second phase—initially targeted for 2003 construction—may actually be undertaken sooner if growth continues at as rapid a pace as in recent years. Phase II sewers would include 4.5 miles of 8-inch and larger diameter sewers that would connect the Brown Street (Town Fork) wastewater treatment plant, by gravity sewer flow, to the new wastewater treatment plant at the Jessamine Creek-Town Fork

confluence. This construction would eliminate another three sewage pumping stations. Phase II sewers would permit the retirement of the Brown Street wastewater treatment plant which has become almost completely surrounded by residential development. Treated effluent would continue to be discharged to Town Fork, but the point of discharge is near that creek's confluence with Jessamine Creek.

With the 1997 conclusion of the interceptor sewer construction project, two significant north to south interceptor sewer networks serve the community. In the Town Fork drainage basin, a 21-inch diameter gravity sewer delivers to the Brown Street wastewater treatment plant most of the sewage generated in the central city and in northcentral and northeast Nicholasville. The 21-inch interceptor sewer extends from the Brown Street wastewater treatment plant upstream to Oak and Main Streets at which point a 10-inch extends north on Main Street as far as Duncan Street while an 18-inch sewer extends west on Oak Street. From Oak and Second Street, a 10-inch sewer follows the creek upstream (north) to the railroad where it becomes a 12-inch diameter sewer. A separate 1997 construction project involved the further extension of this same sewer with Town Fork and the railroad north as far as Baker Lane and slightly beyond. The new 12-inch diameter gravity sewer serves McLane-Cumberland as well as a significant commercial area including a car dealership and a hotel at Elizabeth Lane. The 1998 terminus of the sanitary sewer is on the north side of Elizabeth Lane. Also tributary to the Brown Street wastewater treatment plant are large areas of Nicholasville downstream of the wastewater treatment plant and east of US 27 Business Route. Sewage from areas downtown of the wastewater treatment plant presently reaches the Brown Street wastewater treatment plant through a series of sewage pumping stations and force mains. Finally, a separate interceptor sewer—some 12-inches in diameter and some 8-inches in diameter—serves the new East Jessamine High School campus on KY 39 on Nicholasville's east side.

The hydraulic loading of the Town Fork interceptor sewer system was significantly improved (reduced) with the completion of the Jessamine Creek drainage basin interceptor sewers. A number of sewage pumping stations in the general vicinity of US 27 Bypass were abandoned when the Jessamine Creek interceptor sewers were completed. Sewage that was formerly captured at those stations and pumped back into the Town Fork drainage basin now remains

in the Jessamine Creek drainage basin where it flows by gravity in generally a southerly direction to the Jessamine Creek WWTP's influent sewage pumping station on the west side of Shun Pike. From that point, sewage is pumped the last half-mile and to the new wastewater treatment plant which is located near the confluence of Jessamine Creek and Town Fork.

From the Jessamine Creek WWTP influent sewage pumping station, a 36-inch diameter gravity sewer extends upstream (north) with Jessamine Creek to near Woods Road. At this point, an 18-inch diameter branch interceptor sewer extends eastward to Cormon Drive while the primary interceptor which follows the creek continues north as a 24-inch diameter sewer. Two 18-inch diameter sewers branch off to connect to the existing gravity sewer system (and to eliminate sewage pumping stations) at Witchita Drive and at Courchelle Drive. As the primary interceptor sewer continues to follow Jessamine Creek upstream, it downsizes to an 18-inch sewer near its crossing of KY 29. The sewer continues north and further downsizes before ending as a 12-inch sewer near Fairway West Drive. Upstream of Fairway West Drive, the interceptor sewer is fed by 8-inch diameter sewers.

Inflow and infiltration have been and continue to be problems in Nicholasville. A rainfall of as little as one inch can cause sewage bypassing at three or more pumping stations. New large interceptor sewers in the Jessamine Creek drainage basin will have a greater hydraulic capacity than do present sewers and should significantly reduce sewage bypassing.

Concurrently, the city is involved in ongoing sewer rehabilitation efforts. Nicholasville has purchased tv sewer inspection equipment. As the television camera is passed through the sewer lines, spot repairs are made to sewers and manholes where it is concluded that such rehabilitation would be cost-effective.

Nicholasville is almost 100 percent sewered. One exception exists on Mill Street where about a half dozen homes remain unsewered. There are, however, islands of unincorporated lands that remain outside the city while being totally surrounded by lands that are within the Nicholasville corporate limits. Those islands of unincorporated lands remain unsewered. Nicholasville provides sewer service to residents within the city even in situations where

water is sold to those same customers by the Spears Water Company or by the Jessamine County Water District No. 1.

Nicholasville sewer customers are as follows:

Residential	6,246
Commercial	447
Industrial	<u>19</u>
Totals	6,712

Nicholasville, together with most of Jessamine County, is experiencing explosive growth. While Nicholasville is growing in every direction from the city center, most growth is noted to the north and west of the city's center.

The original wastewater treatment plant was built in 1939. It was expanded at its Brown Street site in 1965 and again in 1983 to its existing rated capacity of 2.71 million gallons per day (MGD). The treatment plant is located in a densely developed residential area. Residences surround the treatment works on three sides. Because of the proximity of residential neighbors, malodors are a constant concern.

Treatment components at the Brown Street treatment plant consist of influent screening, influent screw pumps, static screen primary treatment, grit removal (not presently in use), rotating biological contactors, secondary clarifiers, chlorination, dechlorination, and aeration. The disinfection process is to be converted to a ultraviolet light process as part of the current treatment works construction elsewhere in the city. Treated effluent is discharged to Town Fork at mile point 5.2.

The process for handling solids involves sludge thickening, anaerobic digestion (to be converted to aerobic digestion in 1998), belt filter press, sludge drying beds, and ultimate disposal in a Franklin County contained landfill.

In early 1998, Nicholasville placed into service its new 3.0 million gallons per day (MGD) Jessamine Creek oxidation ditch-type wastewater treatment plant. Major components are mechanical screening, grit removal, oxidation ditches, secondary clarification, tertiary filtration, ultraviolet disinfection, aeration and discharge to Town Creek, at mile point 1.5 (above its confluence with Jessamine Creek). Solids are processed by anaerobic digestion.



Digested sludge is dewatered by a belt filter press. The sludge treatment features lime pasteurization and ultimate disposal in a contained landfill or by a sludge give-away program. Construction of the wastewater treatment plant is to be phased. An expansion of the new treatment plant to a rated capacity of 4.5 MGD is planned for 2003 but could occur earlier. Operational personnel struggle to keep the present Brown Street wastewater treatment plant operating within its state-issued discharge permit and to suppress odors that are a cause of concern to the many nearby neighbors. The average daily flow for 1997 was 2.09 MGD, although it is noted that sewage bypassed upstream of the wastewater treatment plant during storm periods is not measured at the treatment plant.

Laboratory results for 1995, 1996, and 1997 indicate that the existing Brown Street treatment plant is doing a reasonably satisfactory job. Results from all three recent years are compared against the city's wastewater discharge permit as follows:

Parameter	KPDES Limits	Average Annual Value		
		1995	1996	1997
Dissolved Oxygen	7 mg/1 minimum	8.5 mg/1	8.7 mg/1	8.7 mg/1
Total Suspended Solids	30 mg/1 maximum	9 mg/1	8.9 mg/1	10.1 mg/1
Ammonia-summer	4 mg/1 maximum	3.6 mg/1*	3.5 mg/1**	3.5 mg/1***
Ammonia-winter	10 mg/1 maximum	4.9 mg/1	3.8 mg/1	5 mg/1
Coliform	200/100 ml	22/100 ml	23/100 ml	46/100 ml
BOD	15 mg/1 maximum	9 mg/1	11 mg/1	12.2 mg/1
Flow	2.71 MGD	1.96 MGD	2.25 MGD	2.091 MGD

\*Two monthly exceedences were noted on ammonia—due to extreme high temperatures and extremely low flows to the WWTP during 1995.

\*\*One monthly exceedence was noted on ammonia during October, 1996.

\*\*\*Three monthly summer ammonia exceedences were reported in 1997.

The Kentucky Division of Water has issued a wastewater discharge permit for the Jessamine Creek Wastewater Treatment Plant. With the exception of the treatment plant capacity, other treatment plant parameters are the same for the Jessamine Creek treatment plant as for the Brown Street treatment plant. The frequency of laboratory analyses is, however, stepped up for the new treatment plant.

Nicholasville does have a pretreatment ordinance, but no sewer customer is required to pretreat. Nicholasville conducts biomonitoring—the results of which are not to exceed 1.0 chronic toxicity units. For the 1994-1996 period, Nicholasville’s wastewater treatment plant did not fail a single quarterly biomonitoring evaluation.

The city has seven certified wastewater treatment operators. One is a Class IV; three are Class III; one is a Class II; two hold Class I certifications. Nicholasville has been operating under the terms of an Agreed Order with the Kentucky Division of Water since 1991. Presumably, the Order will not be dissolved until the new wastewater treatment plant has demonstrated a history of satisfactory performance.

Nicholasville adjusted its sewer service charge in 1997. Current rates are as follows:

Monthly service charge: \$3.11  
Volume charge: 3.12/1,000 gallons

Nicholasville also has an *outside city* sewer rate schedule which is:

Monthly service charge \$4.67  
Volume charge: 4.68/1,000 gallons

Gross revenues from the sale of sewer service in fiscal year 1997 were \$1,728,000. Annual operating and maintenance costs for 1997 were \$610,000. Net operating revenues were \$1,118,000.

Nicholasville’s new 3.0 MGD wastewater treatment plant near the confluence of Town Fork and Jessamine Creek became operational in March, 1998. The treatment plant which had been under construction for almost two full years is located on 35 acres of a 110 acre city owned tract on Shun Pike southwest of the city center. Two more significant milestones are planned for Nicholasville’s wastewater treatment plant for the period of the Immediate Plan (0 to 5 years). One is that the city plans to abandon its Brown Street wastewater treatment plant as soon as the new Jessamine Creek plant can accept the raw sewage from the Brown Street site. This presupposes the completion of an interceptor that would permit sewage from the Brown Street site to flow by gravity sewer to the new downstream Jessamine Creek treatment plant at the confluence of the two creeks.

**Proposed Projects 2000-2005**

**SX21113001**

1. Also within the Immediate Plan period, certain improvements are planned to the newly operational Jessamine Creek wastewater treatment plant that would allow its expansion to a higher rated capacity of 4.5 MGD. The 1997 estimated project cost of this expansion is \$800,000.
2. As discussed briefly above, a connecting interceptor sewer is proposed which would begin at the Brown Street Wastewater Treatment Plant and continue downstream (southward) with Town Fork and finally westward to connect with the new Jessamine Creek Wastewater Treatment Plant near the confluence of the two creeks. The sewer would begin as a 24-inch diameter sewer and continue downstream with the creek. As subsequent minor drainage intersects the new sewer, it could be upsized to a 27-inch and finally to a 30-inch diameter sewer before it reaches the Jessamine Creek treatment plant site. One 15-inch diameter branch interceptor is proposed to extend from the proposed large diameter primary interceptor in an easterly direction roughly parallel to South Central Avenue before it reaches the new 12-inch sewer from the East Jessamine County High School. Also proposed is the installation of a 12-inch diameter relief sewer to follow a drainage way in the Lake Street area—to eliminate a bottleneck.
3. One additional interceptor sewer is proposed for construction during the Immediate Plan period. That branch interceptor is located in the Jessamine Creek drainage basin and would extend north from the newly constructed 24-inch diameter interceptor sewer to and through a new area proposed for residential development on the south side of KY 29 and immediately east of West Jessamine County High School. The 1997 estimated project cost of interceptor sewers proposed above for installation during the Immediate Plan period is \$1.5 million. Sewer line extensions will serve approximately 85 households.
4. Sewer rehabilitation and sewer bottleneck elimination are two tasks that Nicholasville should continue to pursue during the period of the Immediate Plan period. At sites—non-specific within this planning effort—Nicholasville could invest another \$500,000 during this five year planning period.

**Proposed Projects 2006-2020**

**SX21113002**

1. In the period of the Long Term Plan, it appears that ample space and allowance has been made within the newly operational Jessamine Creek wastewater treatment plant for subsequent expansions. If the growth and development in Nicholasville and Jessamine County reach expected levels, a 4.5 MGD wastewater treatment plant will not likely prove to be adequate through the Long Term planning period. Suggested is that consideration be given to a subsequent expansion of the Jessamine Creek wastewater treatment plant—to 6.0 MGD—sometime in the closing years of the Long Term planning period. The 1997 estimated project cost of such an expansion is \$3.5 million.

2. Additional significant interceptor sewer construction is proposed for the period of the Long Term Plan. Sewer line extensions will serve approximately 39 households and proposed are the following:
  - a. a 15-inch relief sewer for a 1,200 foot distance immediately north of Oak and Second Streets to eliminate a potential bottleneck
  - b. a 15-inch and finally a 12-inch diameter interceptor extending upstream along Jessamine Creek to a point near the end of Baker Lane
  - c. two 12-inch diameter sewers extending west toward Jessamine Station Pike from the new Jessamine Creek interceptor
  - d. two, 2-pronged interceptor sewers southeast of the central city in the Town Fork drainage basin. For the most part, 12-inch diameter sewers are proposed here. The two proposed sewers would empty into large diameter interceptor sewers proposed to connect the two wastewater treatment plants as a part of the Immediate Plan recommendations.
  - e. a continuation eastward of a recently installed 12-inch sewer that serves the new East Jessamine County High School on KY 39
  - f. 10-, 12-, and 15-inch diameter sewers northeast of the central city. The drainage pattern in this area is generally eastward toward Hickman Creek. Accordingly, sewers proposed for this area would convey sewage in an easterly direction—away from the city—to a proposed pumping station which, in turn, would convey the collected sewage back to the Town Fork drainage basin through a proposed force main.

The 1997 estimated project cost of new sewer construction proposed above is \$ 2.5 million.

3. In the Long Term Planning period, the rehabilitation of existing sewers will be a continuous need in Nicholasville. Subsequently, it is suggested that an additional \$900,000 be earmarked for this purpose.

#### CITY OF WILMORE SANITARY SEWER SYSTEM

The City of Wilmore assumed ownership of the Asbury College sanitary sewerage system in 1973-74 and expanded the sewage collection system to serve virtually the entire incorporated area of Wilmore. Subsequent urban developments, which have become a part of Wilmore through annexation, have been sewered by the developer as a part of the developer's agreement for annexation of new areas into the city. Wilmore has 1,414 sewer customers.

Wilmore's wastewater treatment is located on the south side of the city, approximately 1,000 feet south of the Wilmore Camp Grounds, adjacent to KY 1268. The original treatment plant was a 500,000 gallon per day extended aeration prefabricated steel type plant. That plant was modified and expanded in 1989, and the city's wastewater treatment plant now

operates as an oxidation ditch type plant. Treatment consists of grit removal, screening, oxidation ditch, two sedimentation basins, chlorination, and dechlorination. The steel tankage that served for 15 years as virtually the entire treatment plant has been converted to a gravity thickener for sludge. Sludge from the thickener goes to sludge drying beds before ultimate disposal by landfarming at an approved site in Jessamine County. Grit and screenings are disposed of at a privately operated landfill in Lincoln County. Occasionally—particularly during inclement winter months—the City will also dispose of sewage sludge by landfilling.

Discharge of the treated sewage effluent is to Town Creek at mile point 1.0. Town Creek is a tributary of Jessamine Creek. In turn, Jessamine Creek enters the Kentucky River in Pool 7 on the right bank at mile point 127.3.

Treatment plant performance in 1995, 1996, and 1997 compared very favorably to the limits established by the city’s state-issued wastewater treatment plant discharge permit. Laboratory results of the treatment plant effluent over the last three years are compared to the city’s effluent limits as follows:

Parameter	KPDES Limits	Average Annual Value		
		1995	1996	1997
Dissolved Oxygen	7 mg/l minimum	8.1 mg/l	8.5 mg/l	8.5 mg/l
Total Suspended Solids	30 mg/l maximum	6.9 mg/l	9.6 mg/l	10.0 mg/l
Ammonia – Summer	4 mg/l maximum	0.23 mg/l	1.09 mg/l	1.2 mg/l
Ammonia – Winter	10 mg/l maximum	2.4 mg/l	4.32 mg/l	1.06 mg/l
Coliform	200/100 ml maximum	4/100 ml	12/100 ml	2/100 ml
BOD	30 mg/l maximum	4.0 mg/l	4.2 mg/l	2.6 mg/l
Flow	1.0 MGD	0.587 MGD	0.665 MGD	0.633 MGD

During 1995, average recorded flows during the 12 month period were 587,000 gallons per day. On 38 days during the period, recorded flows exceeded the 1.0 MGD design flow rate.

The maximum daily flow recorded during the 12 month period was 3.088 million gallons. The treatment plant can accept a maximum hydraulic flow rate of about 3.0 MGD.

During 1996, exceedences were noted for total suspended solids during February. Exceedences were noted for ammonia during February and April of 1996. In 1997, one monthly exceedence was reported to the ammonia limit and one monthly exceedence was reported to the total suspended solids limit.

There are six state-certified wastewater treatment plant operators, one is certified Class IV, three hold a Class III certification, and two are certified Class II. Wilmore has no pre-treatment ordinance and no customer is presently required to pre-treat. The City did find it necessary to require the Veterans Center to install a grinder system to insure that large bulky items such as towels, hospital gowns, etc., do not enter the sewer system to cause sewer blockages. Wilmore is not required to conduct biomonitoring tests. All routine laboratory analyses are performed at the wastewater treatment plant by wastewater treatment plant operational staff. Wilmore has no enforcement problems or enforcement actions pending against it by the KY Division of Water.

The system of sanitary sewers has grown significantly since the college-owned sewer system was expanded to a municipal system in 1973-74. The primary trunk sewer is a combination of 10-inch, 12-inch, 16-inch, and 24-inch diameter sewers that drain southeastward from the vicinity of the city's center at College Street and Lexington Avenue. The 24-inch diameter sewer is a replacement sewer that was installed in 1997-1998 to relieve hydraulic bottlenecks and to minimize if not eliminate sanitary sewer overflows in the system. Some of the new development—on the city's southside—reaches the wastewater treatment plant directly and, as such, does not contribute to the hydraulic load on the Town Creek interceptor sewer. Most of the city's growth areas are concentrated on the city's north and east sides.

The sewer system contains seven city owned and operated sewage pumping stations and another three pumping stations that are privately owned. Like most area cities, Wilmore experiences significant inflow/infiltration to its sewer system. A large part of the extraneous flow is reported to be entering the interceptor sewer which closely parallels Town Creek. The city has spent \$30,000 in recent times on flow monitoring, smoke testing, and television

inspection of sewers, and, through those efforts, the city has developed a list of areas where inflow/infiltration reduction may be sought. On a *worst-first* basis, a number of sewer system rehabilitative efforts were accomplished as a part of the 1997-1998 sewer system improvement project. Other sewer rehabilitative needs remain.

Less than a half dozen homes within the city presently lack sewer system availability. Those homes are low-lying, isolated, or both. Wilmore operational personnel report that it takes a prolonged storm with heavy rains to cause sewage bypassing upstream of the wastewater treatment plant. Estimates are that sewage flows can reach instantaneous flows of 2.7 to 2.8 MGD before bypassing occurs in the sewer system. Infrequent bypassing of dilute sewage is reported to the KY Division of Water as required. Sewage bypasses have occurred even after the completion of the 1997-1998 sewer construction project.

Sewer rates in effect are these:

First 2,000 gallons per month \$6.13 minimum  
All over 2,000 gallons per month 3.31/1,000 gallons

The present sewer customer hook-on fee is \$1,000 per residential customer plus a charge for the cost of labor and materials for the connection.

Gross revenues from the sale of sewer service in fiscal year 1997 were \$443,000. Sewer system maintenance and operating costs for that same period were \$391,000. Net sewer revenues before debt service were \$52,000. Principal and interest on the sewer utility's long term bonded debt in FY 1997 amounted to \$335,000. (The city's 2 percent occupational tax is presently used to defray water-sewer capital costs and to service the long-term water-sewer debt.)

While most Kentucky cities prepared a Wastewater Facilities Plan in the middle or late 1970's and while some of those plans have already been updated (or are in the process of being updated), Wilmore is one of a very small number of middle-sized or larger cities which never produced such a plan. It is recommended that the city move ahead with this comprehensive planning effort in the 1998-2000 time frame. Even in the absence of such a locally prepared *Facilities Plan*, this planning effort nevertheless suggests certain projects and improvements to the Wilmore sanitary sewerage system.

**Proposed Projects 2000-2005**

**SX21113003**

1. It is expected that the Wilmore Wastewater Facilities Plan will identify significant additional areas within the existing system of sanitary sewers for which rehabilitation is recommended. Implementation of such efforts is proposed at an estimated cost of \$500,000.
2. Proposed during the period of the Immediate Plan is the installation of two interceptor sewers if and as this area begins to urbanize. Two interceptors are suggested—each a 12-inch and then a 15-inch, joining and continuing as a single 18-inch sewer which would terminate at a major sewage pumping station slightly north and west of US 68. From that point, the sewage flow would be contained and pumped south to the existing sewer system. The 1997 estimated cost of these recommended sewers is \$ 390,000. Sewer line extensions will serve approximately 2 households. However, many new households could potentially be served by this project if development occurs in this area of Wilmore.

**Proposed Projects 2006-2020**

**SX21113004**

1. During the period of the Long Term Plan, further expansion and upgrade of the wastewater treatment plant would appear to be necessary. Suggested is an expansion to 1.6 MGD—again using oxidation ditch technology. At the same time, the treatment plant's peak hydraulic capacity should be increased to 6.0 MGD. The estimated project cost of these improvements is \$1.3 million.
2. It is expected that the Wilmore Wastewater Facilities Plan will identify significant additional areas within the existing system of sanitary sewers for which rehabilitation is recommended. Implementation of such efforts is proposed at an estimated cost of \$500,000.
3. During the period of the Long Term Plan, additional interceptor sewer installation is proposed northwest, north, northeast, and east of the city. These sewers would terminate in three additional sewage pumping stations with the sewage flow being redirected through proposed sewer force mains back to the existing sanitary sewer network. The 1997 estimated project cost of these improvements is \$ 1.2 million. Sewer line extensions will serve approximately 12 households.

**ON-SITE TREATMENT SYSTEMS**

**SI21113001**

This area consists of rural Jessamine County beyond the service areas of the sanitary sewer systems of the Cities of Nicholasville and Wilmore. It is unlikely that public sewer line extensions will reach this area of Jessamine County by 2020. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. It appears to be impractical to extend sewer service to this area because of the unusually high cost per



potential customer that must be incurred to finance such expansive sewer system development. Reasons for the high cost are the number of households (5,900), a low customer per mile ratio, rugged terrain, and the long distance from these houses to treatment facilities and existing sewer systems. Suggested instead is that a Revolving Loan Fund Program be established or that the U.S. Army Corps of Engineers 531 program be extended for the installation of a septic tank for each house that does not presently have sanitary sewer service, or could currently have a failing septic system. The generalized proposed cost of this option is \$29,500,000 or \$5,000 per household.

## LINCOLN COUNTY

### Lincoln County Sewer Service (map)

- Estimated 1999 population of 22,500--18% on public sewer
- Estimated 2020 population of 26,100--36% on public sewer
- Proposed projects would add over 1,600 new households to public sewer service during 2000-2020
- Estimated funding needs for public sewer 2000-2005--\$7,754,000
- Estimated funding needs for public sewer 2006-2020--\$10,000,000

Lincoln County had an estimated population of 22,511 (9,109 households) in 1999 with a projected population of 26,059 (11,410 households) in 2020. Public sewer is provided to about 18 percent of the county's residents. About 7,500 household treat wastewater on site. Over 1,600 new customers could be added to public sewer service through new line extensions in 2000-2020.

### LINCOLN COUNTY SEWER PLAN

#### *Proposed Projects 2000-2005*

System	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
LINCOLN							-
Stanford /SX21137001	23	104		450			554
Crab Orchard /SX21137003	pot	100	100				200
Western Lincoln County San. Dist.							-
Hustonville to Junction City	800	7,000					7,000
County Total	823	7,204	100	450			7,754

#### *Proposed Projects 2006-2020*

System	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
LINCOLN							-
Stanford SX21137002	68	1,700	500	1,600			3,800
Crab Orchard	9	391				200	591
County Total	768 + pot	7,800	600	1,600	-	-	10,000

#### CITY OF STANFORD SANITARY SEWER SYSTEM

Essentially all developed areas of the city have sanitary sewer service. Local estimates are that fewer than a dozen homes within the corporate limits lack sewer service. That lack was

# SEWER SERVICE AREAS LINCOLN COUNTY Kentucky

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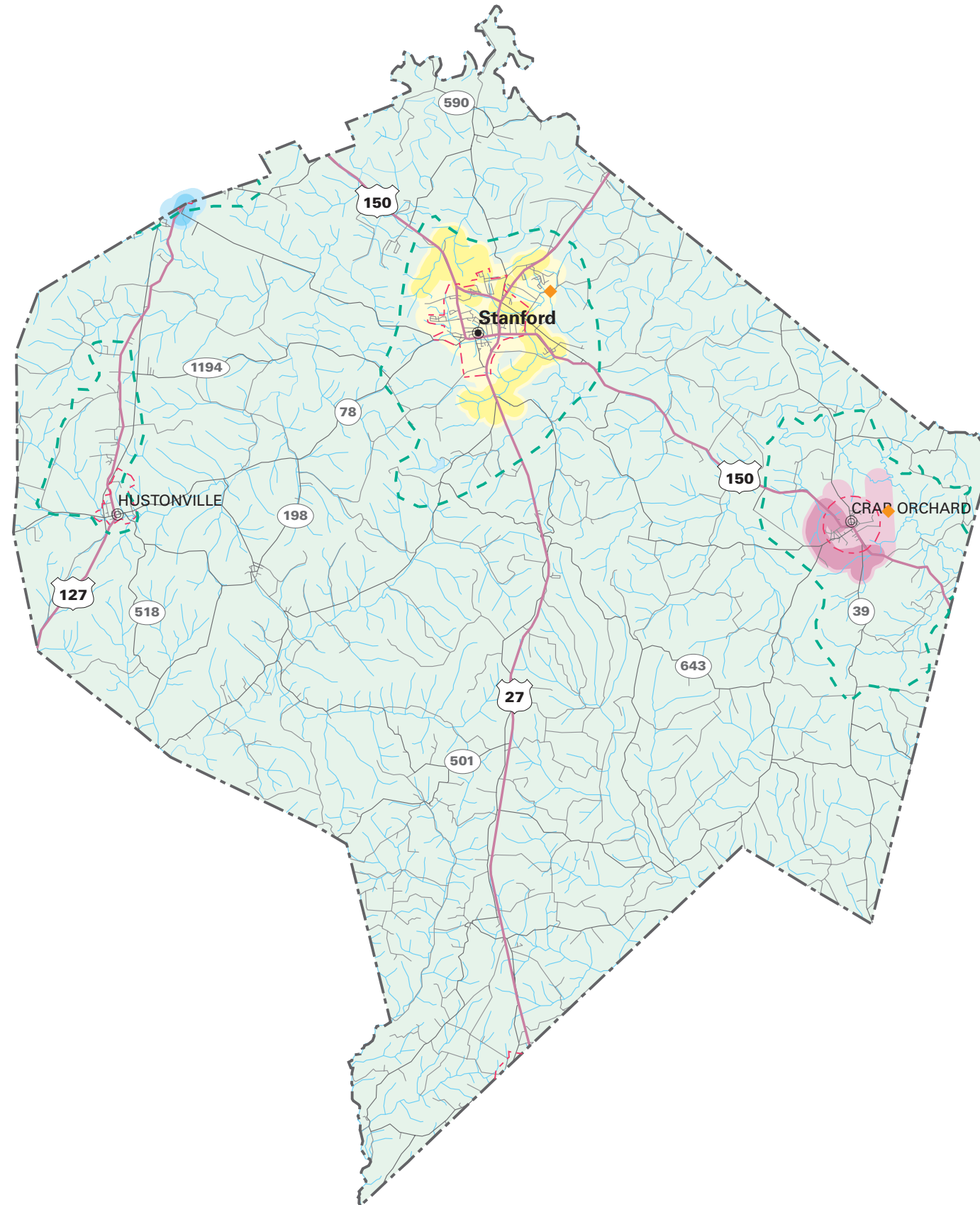
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- - - 201k Facility Planning Area
- - - Incorporated City Boundary
- ◆ Sewage Treatment Plant



**SEWER SERVICE STATUS BY OWNER**

EXISTING SERVICE AREA	PROPOSED SERVICE AREA	OWNER
<span style="background-color: yellow; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>	<span style="background-color: yellow; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>	STANFORD MUNICIPAL SEWER
<span style="background-color: lightblue; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>	<span style="background-color: lightblue; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>	JUNCTION CITY MUNICIPAL SEWER
<span style="background-color: pink; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>	<span style="background-color: pink; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>	CRAB ORCHARD MUNICIPAL SEWER

attributed to the isolated nature of the houses or their elevation being too low to access the sewer by gravity flow.

Sewer customers as of mid-1998 are as follows:

Inside City	1,334
Outside City	<u>266</u>
Total	1,600

Virtually all of the sanitary sewer system is within the drainage basin of Logan Creek or one of its major tributaries, St. Asaph Creek. Logan Creek itself is a major tributary of Dix River. The predominant drainage pattern is much to Stanford's advantage as the city has to operate and maintain only a single sewage pumping station upstream of the wastewater treatment plant. That single pumping station is located adjacent to Brock Drive near its intersection with Somerset Street. South of the city and east of US 27, the Lincoln County Middle School and High School complex operates its own sewage pumping station and pumps collected sewage to Stanford's gravity sewer system at Somerset Street.

In response to a partial sewer tap-on ban imposed by the Kentucky Division of Water, Stanford undertook a comprehensive sewer system rehabilitation project in 1993-1994 in an attempt to limit the deleterious effects of inflow and infiltration on the sewer system and the wastewater treatment plant. The effort, costing \$1.35 million, did not eliminate the problem of excess flows to the system, but significant improvement was achieved. As a result of the city's efforts, the Division of Water has lifted its partial tap-on ban. Water Commission personnel report that the continuing problem of excess flows now seems to be one primarily of inflow. During periods of wet weather, wastewater flows rise quickly and then subside fairly quickly with the end of the rainfall/run-off.

The city appears to be growing most rapidly northward along and near US 150 (Danville Road), US 150 By-pass, and New US 150 east of the US 27 intersection. Two significant new subdivisions are currently being developed within the city on its northside. Housing starts in both areas are occurring subsequent to the installation of city water lines and sewer lines.

The sewage treatment plant was originally constructed in 1964 as a 400,000 gallons per day trickling filter plant. The site then is the same as today—east of the city in a bend of Logan Creek. In 1986-1987, Stanford spent \$2.5 million on a major wastewater treatment plant upgrade and on some new interceptor sewers. The expanded, upgraded treatment plant utilized some of the components of the older wastewater treatment plant. The renovated plant has a rated 24-hour capacity of 800,000 gallons. Treatment units consist of raw sewage pumping facilities (screw pumps), preliminary treatment (comminutor and grit chamber), two oxidation ditches, two secondary clarifiers, chlorination facilities, a step aerator, and dechlorination of the effluent. An existing clarifier was modified in 1986-1987 to serve as a sludge holding tank.

Stanford does have a pre-treatment ordinance and requires one plating company to pre-treat as necessary and to monitor its discharge of lead (Pb) in its wastewater effluent. The city's pre-treatment ordinance sets maximum concentrations of heavy metals, greases, oils, BOD, TSS, and ammonia nitrogen which may be discharged to the city sewer.

Stanford is involved in a biomonitoring program as directed by the Division of Water. The wastewater treatment plant effluent is passing the biomonitoring tests.

Sewage flows recorded at the wastewater treatment plant indicate that flows continue to vary over a wide range. On days of consistently dry weather, flows at the wastewater treatment plant get as low as 200,000 to 230,000 gallons per day. Conversely, for the wet weather periods, measured flows at the wastewater treatment plant averaged in excess of 1.0 MGD. On 16 days of 1994, measured flows were 2.0 MGD or higher. Discharge of the treated effluent is to milepoint 1.0 of Logan Creek. The creek is a tributary of Dix River, which itself is part of the Kentucky River watershed.

Polymer is added to the sewage sludge prior to its dewatering on sludge drying beds. Ultimate sludge disposal is at the state-permitted contained landfill in Lincoln County.

Treatment plant performance in 1995, 1996, and 1997 compared favorably to the limits established by the city's state-issued wastewater treatment plant discharge permit. Laboratory results of the treatment plant effluent over the last three years are compared to the city's effluent limits as follows:

Average Annual Value

Parameter	KPDES Limits	1995	1996	1997
Dissolved Oxygen <sup>1</sup>	7.0 mg/1 minimum	7.9 mg/1	8.0 mg/1	8.1 mg/1
Total Suspended Solids <sup>2,3,4</sup>	30 mg/1 maximum	18.8 mg/1	10.8 mg/1	7.4 mg/1
Ammonia - Summer	2.0 mg/1 maximum	0.14 mg/1	0.14 mg/1	0.25 mg/1
Ammonia - Winter	10 mg/1 maximum	0.22 mg/1	0.43 mg/1	0.42 mg/1
Coliform	200/100 ml maximum	18/100 ml	17/100 ml	10/100 ml
BOD	10 mg/1 maximum	2.7 mg/1	2.3 mg/1	2.6 mg/1
Flow	0.80 MGD	0.527 MGD	0.649 MGD	0.607 MGD

<sup>1</sup>Exceedences noted in July, 1996

<sup>2</sup>Exceedences noted in February, 1995

<sup>3</sup>Exceedences noted in March, 1995

<sup>4</sup>Exceedences noted in January, 1996

No permit exceedences were noted in 1997.

Stanford has four state-certified wastewater treatment plant operators. One is certified Class III and the other three are certified Class II.

Identified capital needs at the wastewater treatment plant include a flow equalization lagoon to permit the spreading out over time of high flows associated with rainfall events.

Monthly sewer rates currently in effect are these:

	Inside City	Outside City
First 2,000 gallons	\$7.20 (Minimum)	\$8.28 (Minimum)
All over 2,000 gallons	2.71/1,000 gallons	3.13/1,000 gallons

Gross revenues from the sale of sewer service were \$365,800 in fiscal year 1997. Operation and maintenance costs were \$213,600. Net available sewer revenues were \$152,200. Debt service requirements for FY 1997 were \$106,800.

As US 27 continues to be improved and widened between the Kentucky River and Somerset, so it is that travel time between Stanford and Lexington (to the north) and Stanford and Somerset (to the south) will be shortened. The completion of the new reconstruction of US 150 east to connect to I-75 will provide a means for improved travel from Stanford to I-75. Then transportation improvements taken as a whole should ensure

that Stanford has an even more significant opportunity for growth after 2000 than it does presently.

**Proposed Projects 2000-2005**

**SX21137001**

1. An expansion of the city's sewer system will give possible growth areas an opportunity to occur within and near the present corporate limits of Stanford. Proposed for the period of the Immediate Plan are sewer line extensions along KY 590 north of the city and along Ridgeway Drive. Those extensions will likely take place concurrently with annexation. The estimated 1997 project cost of the proposed sewer extensions is \$104,000 and will serve approximately 23 households.
2. With only periodic permit exceedence, the Stanford wastewater treatment plant seems to be operating below its rated capacity and within its state permit limits. With the addition of an equalization basin to modify the effect of storm-related sewage flows, it is suggested that the city's 1987-1988 plant will be adequate with little or no other capital improvements through the period of the Immediate Plan. The estimated 1997 total project cost of the equalization basin is \$450,000.

**Proposed Projects 2006-2020**

**SX21137002**

1. During the period of the Long Term Plan, far more extensive sewer extensions and improvements are proposed. During this planning period, proposed are sewer projects which would permit the municipal sanitary sewer system (and thus the city itself) to grow to the south, to the southeast, to the north, and to the northwest. More specifically, interceptor sewers are proposed:
  - a. south and upstream along Logan Creek from the creek's present crossing of old US 150. These sewers would serve the Rowland area as well as the KY 698 and KY 1247 areas as those roads intersect with US 27 south of the high school.
  - b. along Hawkins Branch and its tributaries along both sides of the Danville Road (US 150). Since the natural drainage pattern is to the north and away from the city, the proposed sewer would terminate at a major pumping station for force main conveyance in a southerly direction to tie to the existing 12-inch diameter sewer at Sherwood Drive immediately south of US 150.
  - c. along Edgewood Drive to the top of the hill.
  - d. along new US 150 (following a tributary of Logan Creek) from KY 642 west to US 27. This proposed sewer would offer relief to an existing sewer which would otherwise become overloaded as a result of north and northwest side development.

The 1997 estimated project cost of proposed sewer system expansion is \$1,700,000 and will serve approximately 68 households.

2. In addition, sewer rehabilitation efforts should continue on a more or less continuous basis. Proposed is that Stanford budget \$500,000 for sewer rehabilitation during the period of the Long Term Plan.
3. During the Long Term Plan period, adequate WWTP capacity will likely become a problem. Proposed is an expansion of the wastewater treatment plant to 1.4 million gallons per day (from the present day capacity of 0.8 MGD). A continuation of the present treatment plant technology will likely prove to be desirable. The 1997 estimated project cost of Stanford's wastewater treatment plant expansion is \$1.6 million.

#### CITY OF CRAB ORCHARD SANITARY SEWER SYSTEM

The terrain of Crab Orchard is basically flat and the soil types are tight with low permeability. In 1981-1982, coping with a chronic septic tank failure rate, Crab Orchard was a glad recipient of EPA, HUD, and FmHA grant and loan support for the construction of a system of sewer lines and a lagoon-type wastewater treatment plant. There are three small pumping stations in the center city and north and the west of the city's center. Two of the three pumping stations were rebuilt as a small part of a water/sewer system improvement project in 1994-1995. Largely, Crab Orchard's sewage travels by gravity to a point southeast of the city, adjacent to US 150. From that point, sewage is pumped to the wastewater treatment plant on the city's northeast side near the end of Cedar Avenue. Discharge of the treated effluent from the city's wastewater treatment plant is to Dix River.

The wastewater treatment plant has a rated flow of 110,000 gallons per day. In mid-1998, Crab Orchard reported 347 sewer customers inside the city boundary and another six customers outside the city. All city residents are served by the municipal sewer system.

Most sewer systems are troubled by problems associated with inflow and infiltration. Crab Orchard's sewer system is not an exception. Rains of one-inch sometimes overwhelm the grinder pumping stations. Overall, however, Crab Orchard's inflow/infiltration problems may not be as serious as other sewer systems which are older.

Treatment plant performance in 1995, 1996, and 1997 compared reasonably well to the limits established by the city's state-issued wastewater treatment plant discharge permit. Laboratory results of the treatment plant effluent over the past three years are compared to the city's effluent limits as follows:



Parameter	KPDES Limits	Average Annual Value		
		1995	1996	1997
Dissolved Oxygen	2 mg/1 minimum	9 mg/1	7 mg/1	10.7 mg/1
Total Suspended Solids	30 mg/1 maximum	11 mg/1	14 mg/1	41.9 mg/1
Ammonia - Summer	20 mg/1 maximum	no discharge	3.5 mg/1	0.4 mg/1
Ammonia - Winter	20 mg/1 maximum	3.7 mg/1	1.5 mg/1	-
Coliform	200/100 ml maximum	10/100 ml	78/100 ml	230/100 ml
BOD	30 mg/1 maximum	6.5 mg/1	6.5 mg/1	17.1 mg/1
Flow	0.11 MGD	0.066 MGD <sup>1</sup>	0.072 MGD <sup>2</sup>	0.068 MGD <sup>3</sup>

<sup>1</sup>all discharge to stream during 1995 was in December, January, and February

<sup>2</sup>all discharge to stream during 1996 was in May and November

<sup>3</sup>In 1997, there were two monthly exceedences to the total suspended solids limit and one coliform exceedence.

Also in 1997, Ammonia limits were set for the entire year and were no longer separated into winter and summer periods.

Because the lagoon-type treatment affords the ability to store wastewaters for prolonged periods, there is actually a discharge to Dix River only about twice yearly—each time for 10 to 15 days.

Crab Orchard has two state-certified wastewater treatment operators. Both hold Class II certifications.

Crab Orchard’s monthly sewer service charges, in effect since June 1996, are as follows:

First 1,000 gallons of water	\$10.47 minimum
All Over 1,000 gallons	\$3.36 per 1,000 gallons

The tap fee for connection to the sewer system is \$300.

Crab Orchard’s financial information for fiscal year 1997 yields the following information:

Gross revenues from the sale of sewer service were \$83,000. Operation and maintenance costs, exclusive of depreciation, were \$54,000. Net sewer revenues were \$29,000. The city’s 1997 debt service (principal and interest) was \$28,000.

**Proposed Projects 2000-2005**

**SX21137003**

1. Proposed as a part of the period of the Immediate Plan are:

- a. the replacement of the troublesome Theodore Brant pumping station
- b. the addition of an access road to the Brodhead Road pumping station
- c. the extension of an 8-inch sanitary sewer northwest along the Stanford Road to the corporate limits, the installation of a pumping station and a 4-inch force main back to the existing sewer system.

The 1997 estimated project cost of improvements recommended above is \$200,000.

Although no new households will be presently served by sewer line extensions, the entire system will benefit from sewer rehabilitation and improvements.

### **Proposed Projects 2006-2020**

#### **SX21137004**

1. Long Term improvements involve the extension of collector sewers west and southwest toward the new US 150 as that new road traverses on this side of the city. It is likely that the new highway will result in urbanization south and southwest of the city center. Proposed are sewers following drainage ways on this side of the city. From KY 643 and KY 1770, a proposed sewer flowing northward toward the Stanford Road is proposed. From west of KY 39 South, two sewers are proposed to flow east and northeast to connect to the existing sewer near the intersection of Old US 150 East and KY 39 South. The 1997 estimated project cost of Long Term Plan proposals is \$391,000. Sewer line extensions will serve approximately 9 households.
2. Crab Orchard has ample unused treatment capacity. Since the sewer system is one of the newer ones in the Bluegrass Area, inflow and infiltration should be less a problem at Crab Orchard than at most other Bluegrass Area cities. Since growth tributary to the municipal sewer system is expected to be at a slow rate, it is likely that the treatment plant capacity will be adequate for the entire 20-year planning period. Since no facilities of this nature last indefinitely, it is suggested that Crab Orchard budget \$200,000 for unspecified improvements to its wastewater treatment plant during the period of the Long Term Plan.

#### **ON-SITE TREATMENT SYSTEMS**

#### **SI21137001**

This area consists of rural Lincoln County beyond the service areas of the sanitary sewer systems of the Cities of Stanford and Crab Orchard. It is unlikely that public sewer line extensions will reach this area of Lincoln County by 2020. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. Reasons for the high cost are the number of households (7,500), a low

customer per mile ratio, rugged terrain, and the long distance from these houses to treatment facilities and existing sewer systems. Suggested instead is that a Revolving Loan Fund Program be established or that the U.S. Army Corps of Engineers 531 program be extended for the installation of a septic tank for each house that does not presently have sanitary sewer service, or could currently have a failing septic system. The generalized proposed cost of this option is \$37,500,000 or \$5,000 per household.

## MADISON COUNTY

### Madison County Sewer Service (map)

- Estimated 1999 population of 60,500--54% on public sewer
- Estimated 2020 population of 72,800--60% on public sewer
- Proposed projects would add over 1,450 new households to public sewer service during 2000-2020
- Estimated funding needs for public sewer 2000-2005--\$11,700,000
- Estimated funding needs for public sewer 2006-2020--\$41,200,000

Madison County had an estimated population of 60,543 (24,869 households) in 1999 with a projected population of 72,809 (33,067 households) in 2020. Public sewer is provided to about 54 percent of the county's residents. About 11,550 households treat wastewater on site. About 1,450 new customers could be added to public sewer service through new line extensions in 2000-2020.

### MADISON COUNTY SEWER PLAN

#### Proposed Projects 2000-2005

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
MADISON							-
Richmond /SX21151001	pot	1,800		700	900		3,400
Berea /SX21151003			1,100				1,100
Northern Madison County San Dist	300	3,400					3,400
Madison County Sanitary District #2	600	3,800					3,800
County Total	900	9,000	1,100	700	900		11,700

#### Proposed Projects 2006-2020

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
MADISON							-
Richmond SX21151002	196	3,000	3,800	3,900	12,000	7,600	30,300
Berea SX21151004	88 + pot	4,922		3,000			7,922
North Madison County San Dist	350	3,000					3,000
County Total	546	10,922	3,800	6,900	12,000	7,600	41,222

#### CITY OF RICHMOND SANITARY SEWER SYSTEM

Richmond's system of sanitary sewers date from the 1920's. Major system expansion occurred in 1965. The next major expansion and modification occurred in 1981 and 1982 concurrent

# SEWER SERVICE AREAS MADISON COUNTY Kentucky

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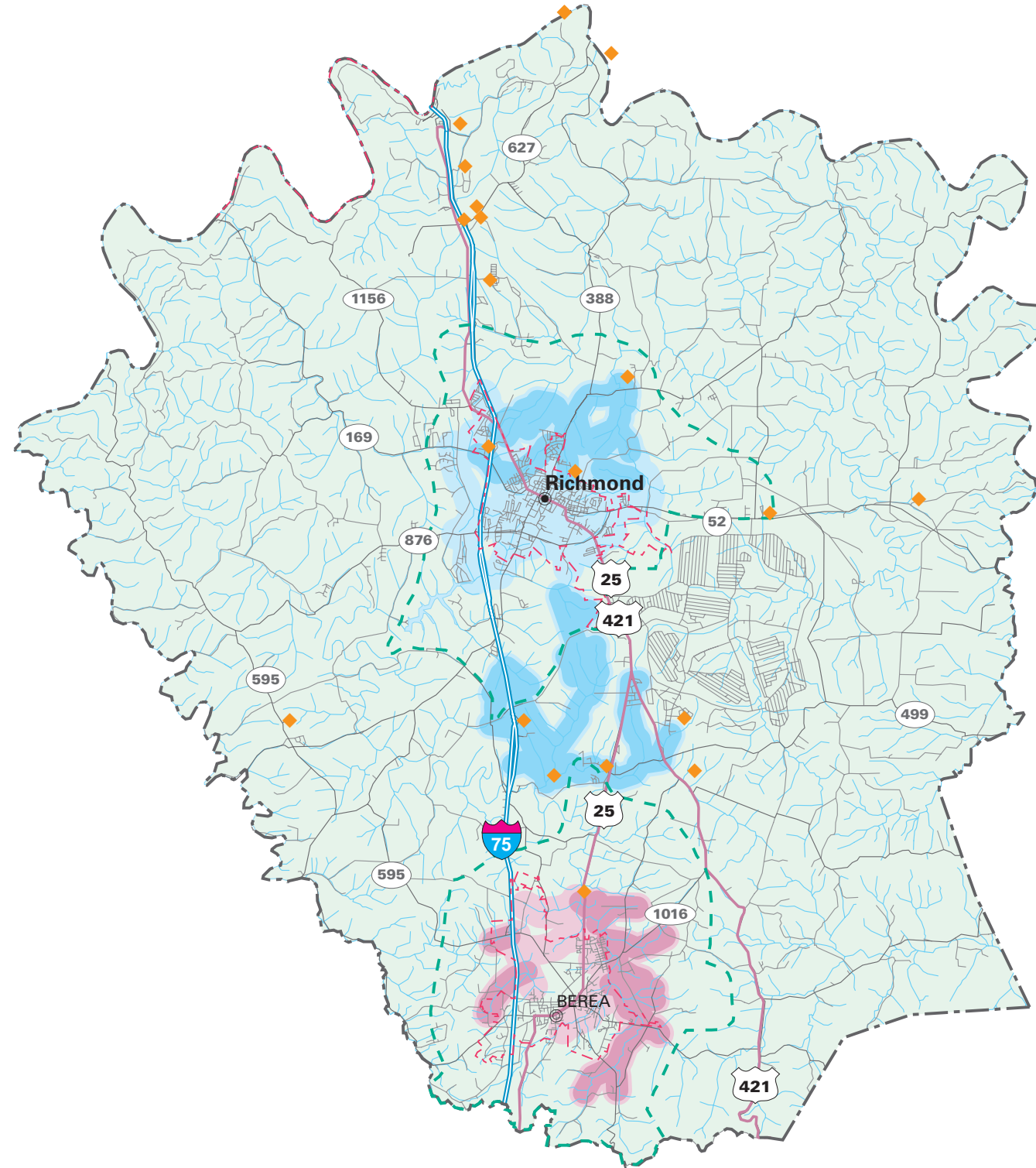
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- - - 201k Facility Planning Area
- - - Incorporated City Boundary
- ◆ Sewage Treatment Plant



**SEWER SERVICE STATUS BY OWNER**

EXISTING SERVICE AREA	PROPOSED SERVICE AREA	
<span style="color: lightblue;">■</span>	<span style="color: blue;">■</span>	RICHMOND MUNICIPAL SEWER
<span style="color: lightpink;">■</span>	<span style="color: pink;">■</span>	BEREA MUNICIPAL SEWER



with the expansion and upgrades of the two municipal wastewater treatment plants. For the most part, the center of the city lies on the high ground. Most areas north of the Eastern Bypass (KY 876) drain either northward or to smaller tributaries that flow either east or west before joining larger streams that themselves flow northward. A north-south line that follows Lancaster Avenue or Norwood Drive constitutes the sewershed boundary between sewage flows that are tributary to the Tates Creek wastewater treatment plant and sewage flows to be conveyed to the Dreaming Creek wastewater treatment plant. Sewer line diameters range in size from 6-inches to 36-inches.

There are new interceptor sewers (west of the city and east of the city) which were completed in 1997. Those interceptor sewers are known locally as the Western Growth Area Sewers and the Eastern Growth Area Sewers. Even though the new interceptor sewers involve the construction of four sizeable sewage pumping stations, there was a net decrease of eight pumping stations at the 1997 conclusion of construction. At the 1997 conclusion of interceptor sewer construction, Richmond had 36 sewage pumping stations.

Heretofore, outlying sewage pumping stations, particularly on the city's southwest, east, and northeast sides had been capturing sewage flow headed away from the two municipal wastewater treatment plants and—by pumping stations and force mains—returning that sewage toward the city center to be conveyed by older, already overlaid sanitary sewers. The new eastside and westside interceptor sewers permit the sewage collected from such peripheral areas to follow other major drains—Taylor Fork (a tributary of Silver Creek) and Irvine Lick (a tributary of Tates Creek) on the west and Otter Creek and its tributaries on the east—away from and circumnavigating the city center—to points downstream of the present urbanized area. From those two points west and east-northeast of the city center, the collected sewage is redirected by pumping to either of the two municipal wastewater treatment plants. The project cost of the Eastern and Western Growth Area Sewers was about \$5.8 million.

The Dreaming Creek Wastewater Treatment Plant sewer network carries most but not all of the hydraulic load generated by Eastern Kentucky University. Likewise, the Dreaming Creek sewers convey most of the wastewater from the numerous industries in Richmond.

Conversely, the Taylor Fork, Irvine Lick, and Tates Creek Wastewater Treatment Plant sewer network carries all city sewage generated west of I-75 and most sewage east of I-75 for a distance of about 6,000 feet east of that interstate highway. Much of this sewage is generated by commercial or light industrial sewer customers.

Inflow and infiltration are twin problems in Richmond as they are in most Bluegrass Area sewer systems, but perhaps they are not as troublesome in Richmond as elsewhere. Since most sewers tributary to the Tates Creek Wastewater Treatment Plant are of 1965 vintage or newer, inflow/infiltration is not so much of a problem there as in the Dreaming Creek sewershed. A little as a one-half inch rainfall can quickly cause capacity problems at the Dreaming Creek Wastewater Treatment Plant. Sewer lines beset with the problems of old age are identified as the primary cause of inflow and infiltration. The utility sewer rehabilitation efforts are sporadic but ongoing. Efforts are made to locate significant leaks through smoke testing and by television inspection. Remedial work has included sewer grouting, manhole repair, and sewer replacement.

Many existing pumping stations suffer most from the effects of old age. Short of a pump failure or a power failure, sewage bypassing at sewage pumping stations or in other areas upstream of the two municipal wastewater treatment plants is rare according to utility personnel. Further, it is reported that there are no urbanized areas within Richmond's present corporate limits which lack sewer service availability. With the relief offered to many of the city's interior sewage pumping stations by the two 1997 circumferential interceptor sewer projects, the existing network of sanitary sewers may, with ongoing sewer rehabilitation efforts, be able to meet the future needs during the planning period without the construction of additional relief sewers.

Due in no small part to the present completion of the city's highway bypass east and north of the city center, explosive growth is expected in the Richmond Area—at least for the near term. Significant growth is expected to the northwest, north, and northeast. Southwest of the city center—in the Barnes Mill Road area west of I-75—commercial growth is anticipated. West of I-75 between KY 876 and KY 169, residential growth is predicted. South of the city, industrial and commercial growth are expected. Growth on the city's east

side—east of Otter Creek’s crossing of KY 52—is not expected to be as significant as in most other areas.

Richmond has two wastewater treatment plants. They are the Dreaming Creek Plant in the northern part of Richmond (in the Dreaming Creek drainage basin) and the Tates Creek Plant west of I-75 in the northwest area of Richmond (in the Tates Creek drainage basin.)

The Dreaming Creek Plant is the older of the two. It is located east of Second Street and east of Madison Central High School and immediately south of the Richmond Country Club golf course. It was one of the earliest secondary treatment plants to be constructed in Kentucky. It was expanded in 1949 and was improved without expansion in 1967. In 1982, this wastewater treatment plant was upgraded and expanded to its present capacity of 3.65 million gallons per day (MGD). During wet weather, the treatment facility can accept a peak equalized wet weather flow of up to 7.31 MGD. The plant has a below ground flow equalization basin with a 3 MG capacity.

Treatment processes include a mechanically cleaned bar screen, a hopper bottom grit chamber, three primary clarifiers, three trains of seven rotating biological contactors (RBC’s), two secondary clarifiers, chlorine disinfection, dechlorination, and aeration before discharge to Dreaming Creek at milepoint 3.10. Dreaming Creek, in turn, is a tributary of Otter Creek. Otter Creek empties into the Kentucky River in Pool 10 at milepoint 177.5. Solids are handled by sludge thickening, anaerobic digestors, sludge storage, belt filter presses for dewatering, and ultimate disposal at a privately operated contained landfill in Estill County. Most of the growth and additional sewer customers expected to be generated as a result of the recent completion of the Richmond northside highway bypass is expected to be served by the Dreaming Creek Wastewater Treatment Plant.

Dreaming Creek Treatment Plant performance in 1995, 1996, and 1997 compared very favorably to the limits established by the city’s state-issued wastewater treatment plant discharge permit. Laboratory results of the treatment plant effluent over the past three years are compared to the city’s effluent limits as follows:

Parameter	KPDES Limits	Average Annual Value		
		1995	1996	1997



Dissolved Oxygen	7.0 mg/1 minimum	8.6 mg/1	8.3 mg/1	8.1 mg/1
Total Suspended Solids	30 mg/1 maximum	9.5 mg/1	5.5 mg/1	5.2 mg/1
Ammonia - Summer	4 mg/1 maximum	2.9 mg/1	2.7 mg/1	2.4 mg/1
Ammonia - Winter	10 mg/1 maximum	3.7 mg/1	2.7 mg/1	2 mg/1
Coliform	200/100 ml maximum	25/100 ml	14/100 ml	20/100 ml
BOD	25 mg/1 maximum	5.3 mg/1	5.5 mg/1	5.9 mg/1
Flow	3.65 MGD	2.455 MGD	2.784 MGD	2.692 MGD

Richmond conducts biomonitoring tests to determine if test organisms can live, thrive, and reproduce in the wastewater treatment plant effluent. The city was charged with conducting a Toxicity Reduction Evaluation (TRE) after repeated failures on the biomonitoring tests. More recently however, the city has passed its quarterly biomonitoring tests and has been released by the KY Division of Water from further activity in regard to its TRE. Quarterly biomonitoring requirements remain in place, however.

Richmond's second municipal wastewater treatment plant is the Tates Creek Plant. This facility is located northwest of the city center on Tates Creek Road (KY 169) approximately 1,500 feet west of I-75. The plant was originally constructed in 1967 and was upgraded and expanded in 1982 to its present rated capacity of 2.99 million gallons per day (MGD). During wet weather, the Tates Creek Wastewater Treatment Plant can accept a peak equalized wet weather flow of up to 6.09 MGD. The plant has an above ground equalization basin with a 3 MG capacity.

Treatment processes include a mechanically cleaned bar screen, a hopper bottom grit chamber, five primary clarifiers, three trains of rotating biological contactors, two secondary clarifiers, a chlorine contact chamber, dechlorination with sulfur dioxide, and aeration prior to discharge to Tates Creek at mile point 11.5. Tates Creek itself is a tributary of the Kentucky River, emptying to the river at milepoint 158.1 within Pool 9.

Solids at the Tates Creek Treatment Plant are handled with one sludge thickener, a primary and a secondary anaerobic digester, sludge storage, and 15 sludge drying beds. Ultimate disposal of stabilized sludge is at a privately operated contained landfill in Estill County.

The Tates Creek treatment plant performance in 1995, 1996, and 1997 compared very favorably to the limits established by the city's state-issued wastewater treatment plant discharge permit. Laboratory results of the treatment plant effluent over the past three years are compared to the city's effluent limits as follows::

Average Annual Value

Parameter	KPDES Limits	1995	1996	1997
Dissolved Oxygen	7.0 mg/1 minimum	9.2 mg/1	9.2 mg/1	9.4 mg/1
Total Suspended Solids	30 mg/1 maximum	4.9 mg/1	5.1 mg/1	3.7 mg/1
Ammonia - Summer	4 mg/1 maximum	1.1 mg/1	3.3 mg/1	2.6 mg/1
Ammonia - Winter	10 mg/1 maximum	1.8 mg/1	3.8 mg/1	2.8 mg/1
Coliform	200/100 ml maximum	14.3/100 ml	19.7/100 ml	16/100 ml
BOD	30 mg/1 maximum	4.0 mg/1	4.7 mg/1	3.5 mg/1
Flow	2.99 MGD	1.564 MGD	2.300 MGD	2.173 MGD

Just as for the Dreaming Creek treatment facility, Richmond also conducts periodic biomonitoring at the Tates Creek treatment facility. The city was charged with conducting a Toxicity Reduction Evaluation (TRE) after repeated failures on the biomonitoring. More recently, some biomonitoring has given satisfactory results while other tests continue to show unsatisfactory results. Currently, the plant is involved in plant performance monitoring in an attempt to maximize the beneficial effect of every plant process so as to be able to demonstrate consistently satisfactory biomonitoring test results.

Just as for most cities of its size, Richmond has a pre-treatment ordinance in an effort to manage and control the quality of the wastewater it allows to be discharged to the public sewer system. Of most concern to the city is the possibility that heavy metals might be discharged to the sewer system in quantities sufficient to upset the treatment plant processes or to cause the city to fail to meet its effluent limits or its biomonitoring tests. At present, pre-treatment is required of the following:

- American Tape
- National Metals
- Bluegrass Plating
- Pattie D. Clay Hospital
- Continental Metals
- P. K. Tool
- Dairy Mart # 1
- Precision Tube
- Dairy Mart # 2

Process Manufacturing #1  
 Diversified Tool  
 Process Manufacturing #2  
 D & G Services  
 Richmond Landfill  
 Electronic Assembly  
 Richmond Molded Prod.  
 Kaysun Corporation  
 Sherwin Williams  
 Kokoku Rubber  
 South Park Tool & Die  
 Mikron Industries  
 Uncle Charlie's Meats  
 Yuasa-Exide

The city has eight state-certified wastewater treatment plant operators. Three are stationed at the Tates Creek plant; four are at the Dreaming Creek plant; and one is at the Richmond Utilities offices. Five operators hold a Class IV license and three operators are Class III. Richmond is presently not involved in any wastewater enforcement actions with the KY Division of Water.

Richmond's current rates for sewer service were placed in effect in April 1996. Current monthly rates are these:

	<b>Inside City</b>	<b>Outside City</b>
First 300 cubic feet	\$5.62 minimum	\$11.24 minimum
Next 400 cubic feet	1.66/100 CF	3.32/100 CF
Next 5,000 cubic feet	1.50/100 CF	3.00/100 CF
Next 5,000 cubic feet	1.34/100 CF	2.68/100 CF
All over 10,700 feet	1.20/100 CF	2.40/100 CF

There is also a surcharge for any customer who discharges sewage of unusual strength.

Gross revenues derived from the sale of sewer service in Fiscal Year 1997 were \$2,606,000. Maintenance and operating costs were \$2,092,000. Net sewer revenues before debt service were \$55,400. Principal and interest on the sewer utility long term bonded debt in FY 1997 amounted to \$994,000.

Two developmental milestones—both transportation-related—promise to amend forever both the pattern of growth and the rate of growth for the Richmond area. They are the 1998 completion of the north and northeast sections of the Richmond Bypass and the construction of an additional interstate highway interchange south of Richmond at

Duncannon Road. Growth and urban development will likely choose to follow both of these significant transportation projects. Due in part to this situation, Richmond embarked in 1998 on an update of its regional wastewater facilities plan.

Development along the new segments of the highway Bypass north of the city will not, in all cases, likely wait for major interceptor sewer construction nor for the North Wastewater Treatment Plant, which could be five to ten years away. In the interim, short segments of gravity sewer with pump back arrangements to the existing Dreaming Creek WWTP would likely be required. These arrangements will likely be necessary in spite of the sunk cost nature of the investments.

### ***Proposed Projects 2000-2005***

#### **SX21151001**

1. Particularly on Richmond's north side, urban development may be expected to continue—with added vigor—downstream (north) of the Dreaming Creek wastewater treatment plant. Within the period of the Immediate Plan, both the Tates Creek and the Dreaming Creek are proposed to be maintained and operated. At the Dreaming Creek treatment plant, it is proposed to invest \$700,000 in new solids handling facilities including screening facilities and new sludge belt filter presses.
2. South of the Eastern Bypass much of the existing gravity sewer drainage pattern is east to west with the various tributaries of Taylor Fork. In the Duncannon Road area and, in particular, south of Duncannon Road in an area expected to develop in a mix of industry and commerce, the drainage pattern is basically in a southerly direction with Harts Fork and its tributaries and, finally, westerly with Hays Fork. Significant urbanization is expected in the Duncannon Road area. With the new Duncannon Road interchange, the KDOT Rest Area would be relocated. Indications are that rather than having two distinct rest areas—one for northbound I-75 and one for southbound I-75, a single rest area may well be constructed in the median of I-75. Indications are that the new rest area would be about 1.5 miles south of the new interchange. KDOT representatives would likely be anxious that treatment of sewage from the new rest area not be a responsibility of KDOT.

The sewage from the new I-75 Rest Area could be the impetus for Richmond to locate a new southside municipally owned and operated wastewater treatment plant in this area where so much urbanization is expected. Proposed is the location of a new wastewater treatment plant at the confluence of Hays Fork and Silver Creek. Because significant development in the area depends upon the completion of the new Duncannon Road interchange with I-75, construction of the treatment plant would necessarily be incremental. Proposed during the period of the Immediate Plan is the construction of a 500,000 gpd wastewater treatment plant with gravity interceptor sewers extending from the treatment plant site west toward the new rest

area, north toward the new interstate interchange, and northeast with Harts Fork to a point near Duncannon Road's crossing of the CSX rail line. The treatment plant is expected to carry a 1997 estimated project cost of \$900,000; the Immediate Plan period sewers; \$1.8 million. Sewer line extensions will serve approximately 6 households.

**Proposed Projects 2006-2020**

**SX21151002**

1. Early during the period of the Long Term Plan, the incremental construction of a new northside treatment plant is proposed northeast of the city center near the confluence of Dreaming Creek and Otter Creek. The first phase of construction would likely involve the construction of polishing lagoons in which the Dreaming Creek wastewater treatment plant effluent could receive additional treatment. Significant new gravity interceptor sewer construction would be required to convey sewage from the existing Dreaming Creek wastewater treatment plant downstream to the new treatment plant site (to be called perhaps, the North Wastewater Treatment Plant). Incremental construction at the North WWTP would continue to the point that the Tates Creek WWTP could be retired from service with the sewage collected there being pumped eastward across I-75 and US 25 to the drainage divide beyond which point the sewage could be conveyed by a new gravity sewer to a place on Dreaming Creek where the new sewer would join the proposed large diameter interceptor sewer which would connect the existing Dreaming Creek WWTP with the new North Wastewater Treatment Plant. When the new North Wastewater Treatment Plant becomes fully operational, the Dreaming Creek WWTP could also be retired from service leaving Richmond with a single northside wastewater treatment plant rather than the two its has today. For the North Wastewater Treatment Plant, an 8.0 MGD dry weather flow capacity is suggested by the end of the 20-year planning period. During wet weather, the new treatment plant should have the hydraulic capability to treat at least twice that amount—at least for short periods of time.

The construction of still other interceptors is also suggested for the period of the Long Term Plan. They would be located along tributaries of West Fork and along Otter Creek. The pumpback arrangement that was initiated with the completion of the Eastside Growth Area interceptor sewer could be suspended when the Otter Creek interceptor sewer is completed north to the site of the North Wastewater Treatment Plant at the confluence of Otter Creek with Dreaming Creek.

The North Wastewater Treatment Plant is expected to have a 1997 project cost of \$12.0 million; the significant northside interceptor and pumping stations, another \$7.6 million. Sewer line extensions will serve approximately 196 households.

2. During the period of the Long Term Plan, two subsequent expansions of the South Wastewater Treatment Plant are suggested—one to 1.5 MGD and, finally, toward the end of the planning period, to 3.0 MGD. Long Term Plan expansions of this wastewater treatment plant are expected to have a project cost of \$3.9 million; additional interceptor sewers, \$3.8 million. The interceptor sewer proposed to follow

Hays Fork would have the capability to eliminate the Executive Park Subdivision (Madison County Sanitation District No. 2) wastewater treatment plant, to eliminate the Blue Grass Army Depot's wastewater treatment plant, and to serve scattered urban developments at and near the intersection of US 25 and US 421.

#### CITY OF BERE A SANITARY SEWER SYSTEM

The sanitary sewerage system is owned and operated by the Berea Sewer Commission, an agency under the general guidance and influence of the Berea City Council. Berea presently has 3,295 sewer customers, an increase of about 65 percent since the original *Madison County Water and Sewer Plan* was developed in 1973.

The sewage collection system underwent a significant metamorphosis in the 1985-1987 time frame as extensive and expensive interceptor sewers and collector sewers were added. Not only did these improvements permit the city to retire from service its two existing municipal wastewater treatment plants in favor of a single new and larger treatment plant several miles downstream (north) on Silver Creek, the new interceptor sewers also allowed *all* then-existing sewage pumping stations to be abandoned. Interceptor sewers now range from 10- to 30-inches in diameter which should permit Berea to grow—generally in a northerly direction—well beyond the 20-year planning period of this study.

As a part of the massive 1987 sewer line and treatment plant project, the city's 500,000 gpd extended aeration treatment plant immediately south of KY 595's underpass of I-75 (now a full interchange called the North Berea exit) was replaced with a significant sewage pumping station and force main to convey collected sewage across a minor drainage divide and into the Silver Creek drainage basin. Subsequently, two small sewage stations have also been added to give the city a total of three sewage pumping stations before the wastewater reaches the wastewater treatment plant.

Excess flows in the sanitary sewers have been and, to some extent, continue to be troublesome to the city. During the 1995-1997 time period, an extensive Inflow/Infiltration analysis was conducted. In virtually all cases, repairs were made where smoke-testing indicated leaky public sewers. At the end of October, 1997, engineering studies suggested that sewer rehabilitation efforts successfully removed 44 percent of inflow and 16 percent of

infiltration. On the whole, a 20 percent reduction in inflow/infiltration was noticed at the conclusion of the two-year effort which cost \$225,000.

The Berea Sewer Commission is presently operating under the terms of an Agreed Order with the Kentucky Division of Water. This is not because the treatment plant is failing to meet the terms of its waste discharge permit (because there has been no failure to meet effluent limits). Rather, the Agreed Order stems from the fact that average wastewater flows often exceed the treatment plant's rated capacity. One of the terms of the Agreed Order with the Kentucky Division of Water is that new sewer tap-ons must have prior approval by the Division. To date, permission has been granted to every new request to connect. A late 1997 agreement between the City of Berea and the Madison County Fiscal Court gave the city the right to exercise extraterritorial jurisdiction for a distance of one mile beyond the Berea corporate limits. Implicit in that agreement is that the city will accept the wastewater from areas adjacent to the city contingent upon its capacity to accept the wastewater and upon the Division of Water's approval if and as required.

The Berea wastewater treatment plant, completed and placed in service in 1987, is of the oxidation ditch type. The present rated design capacity is 2.1 million gallons per day (MGD). The peak hydraulic maximum capacity of the treatment plant is 8.3 MGD. The treatment train consists of the following: screw pumps, bar screen, grit chamber with mechanical grit removal, oxidation ditch with intrachannel clarifier, parshall flume, chlorination, dechlorination, and step-type post-aeration before discharge of the treated effluent to milepoint 34.8 of Silver Creek, a Kentucky River tributary. Solids removed in the intrachannel clarifiers are pumped to the sludge thickener before dewatering by a belt filter press. Dewatered sludge, averaging 15 to 16 percent dry solids by weight, is removed from the treatment plant for ultimate disposal in a privately operated landfill in Montgomery County. Treatment plant performance in 1995, 1996, and 1997 compared very favorably to the limits contained in the city's state-issued wastewater treatment plant discharge permit. Laboratory results of the treatment plant effluent during the past three years are compared to the city's effluent limits as follows:

**Average Annual Value**



Parameter	KPDES Limits	1995	1996	1997
Dissolved Oxygen	7 mg/1 minimum	8.4 mg/1	8.4 mg/1	8.3 mg/1
Total Suspended Solids	30 mg/1 maximum	6.6 mg/1	4.3 mg/1	4.9 mg/1
Ammonia – Summer	2 mg/1 maximum	0.11 mg/1	0.16 mg/1	0.14 mg/1
Ammonia – Winter	10 mg/1 maximum	0.11 mg/1	0.11 mg/1	0.18 mg/1
Coliform	200/100 ml maximum	19/100 ml	9/100 ml	4/100 ml
BOD	10 mg/1 maximum	2.6 mg/1	2.2 mg/1	2.3 mg/1
Flow	2.1 MGD	2.4 MGD	2.5 MGD	2.2 MGD

As the tabulation shows, the average daily wastewater flow dropped to 2.2 MGD in 1997.

The Berea Sewer Commission has five state-certified operators, one Class I, one Class II, two Class III, and one Class IV. Berea does have a pre-treatment ordinance and does require some industries to pre-treat before discharge to the municipal sewer. Among pre-treating industries are metal finishers.

Berea is required to conduct biomonitoring. Test results have proven to be generally satisfactory. At one point, the city was required to conduct a toxicity reduction evaluation (TRE) but it has since been released from that responsibility.

For the 12 month period ending June 30, 1995, metered flows to the wastewater treatment plant averaged 2.26 MGD—slightly in excess of the 2.1 MGD design capacity of the facilities. Meter flows exceeded the 2.1 MGD rated capacity on 138 days of that 12 month period. Concluded is that even when the treatment plant is hydraulically overloaded, it can and does consistently produce an effluent the quality of which meets Berea’s effluent limits. On most occasions, the treatment facility seems to operate best with one oxidation ditch out of service.

The organic loading of the wastewater treatment plant is only a little more than half of the textbook value of 200 mg/1 for BOD. For this reason, local officials have sought from the Division of Water a re-evaluation of the plant’s rated capacity. The service utility manager believes that there is a basis for the re-rating of the plant at a 3.1 MGD or perhaps at a 2.8

MGD rate. Based upon 1995-1997 sewer rehabilitation efforts, however, the city has been given reason to expect that the treatment plant may be re-rated by the Kentucky Division of Water at a capacity of 2.342 MGD. This would be about an 11 percent increase in the treatment plant's previously approved rated capacity.

According to local officials, developed areas of the city are still not 100 percent sewerred. Approximately 100 homes remain to be sewerred. Unsewerred areas are primarily located on Dogwood Drive, Highland Drive, North Central Avenue, and the Jackson Addition at the south end of Water Street.

Sewer rates presently in effect in Berea are these:

First 200 cubic feet	\$6.35 minimum
All over 200 cubic feet	\$2.40/100 CF

Gross revenues for sales of sewer service for fiscal year 1997 were \$1,253,000. Maintenance and operating costs (including depreciation expense) were \$675,000. Net sewer revenues before debt service were \$578,000. Principal and interest on the sewer utility's long term bonded debt in FY 1997 amounted to \$1,267,000.

Berea planned wisely in the late 1970's and early 1980's when it located its one and only treatment plant at a point on Silver Creek that was—at that time—considered to be far north of the city. Since the vast majority of the urbanized area both now and at the end of the 20-year planning period is naturally drained north to the wastewater treatment plant site, the significant investment that the City of Berea made in what was at that time a massive capital outlay for interceptor sewers seems now to have been ever so far-sighted and wise.

**Proposed Projects 2000-2005**

**SX21151003**

1. During the period of the Immediate Plan, Berea would be well served to continue its sewer rehabilitative efforts for the purpose of further reducing inflow and infiltration and continuing efforts to provide sewer service to isolated areas within the corporate limits which, for one reason or another, continue to lack such service. A capital outlay during the five year period of the Immediate Plan of \$1.1 million is suggested.

**Proposed Projects 2006-2020**

**SX21151004**

1. A Bypass highway has been proposed for Berea. If and as the Bypass is constructed, it will likely be constructed in at least three segments. The first segment would be from the I-75/KY 595 interchange east to US 25 North. The second would be from US 25 North east and south to KY 21. The final segment would be from Kentucky 21 south and west to US 25 South. Major Bypass highway construction has a direct relationship to growth and development. Sewer line extensions will serve approximately 88 households. Proposed for installation during the period of the Long Term Plan are interceptor sewers in the following general locations:
  - a. west of the I-75/KY 595 interchange along Walnut Meadow Branch to a proposed pumping station.
  - b. east of the existing wastewater treatment plant site along a minor tributary of Silver Creek.
  - c. east along a drain from the existing interceptor to Terrill Branch Drive.
  - d. east with Terrill Branch and crossing Bobtown Road (KY 1016).
  - e. east from the existing eastside interceptor and crossing Short Line Road.
  - f. east with the East Fork of Silver Creek and south with the West Fork of Silver Creek.
  - g. west from the existing Walnut Meadow Branch interceptor across I-75 to Angel Road and beyond.

The 1997 estimated project cost of these proposed interceptor sewers is \$4,922,000.

2. Berea's single wastewater treatment plant is located in such a place that it can continue to provide wastewater treatment service even for the Berea community which seems poised for significant growth during the planning period. It seems likely that the existing wastewater treatment plant—whether it is or is not further uprated in capacity beyond the 2.342 MGD rating which is expected soon to be approved—will be adequate without expansion through the five year period of the Immediate Plan. Beyond that, perhaps two increases in capacity—each about a 1.0 MGD increment—would be needed during the 15-year period of the Long Term Plan. Each incremental increase would carry a 1997 estimated project cost of \$1.5 million—for a total cost of \$3.0 million. Expansion would bring the wastewater treatment plant to a capacity of about 4.34 MGD.

**BLUEGRASS ARMY DEPOT SANITARY SEWER SYSTEM**

The Blue Grass Army Depot operates its own sewage collection and treatment system.

Treatment plant performance in 1995-97 must be considered to be variable as compared to the limits established by the Depot's state-issued wastewater treatment plant discharge permit. Laboratory results of the treatment plant effluent in 1995-97 as compared to the Depot's effluent limits are as follows:

**Average Annual Value**

Parameter	KPDES Limits	1995	1996	1997
Dissolved Oxygen <sup>1</sup>	7 mg/1 minimum	8.8 m/1	10.1 mg/1	10.1 mg/1
Total Suspended Solids	30 mg/1 maximum	4.3 mg/1	5 mg/1	5.1 mg/1
Ammonia – Summer	4 mg/1 maximum	0.4 mg/1	0.60 mg/1	0.42 mg/1
Ammonia – Winter	10 mg/1 maximum	1.4 mg/1	1.33 mg/1	0.69 mg/1
Coliform <sup>2</sup>	200/100 ml maximum	226/100 ml	5/100 ml	5/100 ml
BOD	25 mg/1 maximum	4 mg/1	4.4 mg/1	3.5 mg/1
Flow	0.100 MGD	0.100 MGD	.129 MGD	.088 MGD

<sup>1</sup>Exceedences noted in July and September

<sup>2</sup>Exceedences noted in June and December

Discharge of the treated effluent is to Hayes Fork Creek. There has been some interest by the Army in divesting the Depot of its wastewater treatment plant function if and as wastewaters could be discharged to a regional system for treatment—at an affordable price. One serious concern that has come to light in those early discussions relates to the condition of the sanitary sewers that drain the Depot lands. Most of the sewers are as old as the Depot itself—about 57 years old. Excessive inflow/infiltration could be a serious concern to any utility attempting to accept wastewater from the Depot into a regional system of sewers and treatment.

#### MADISON COUNTY SANITATION DISTRICT NO. 2 SEWER SYSTEM

This utility has several distinctions. First, it is the only functional sanitation district in the Bluegrass Area. Second, it is the smallest public water or sewer utility in the region. There are presently 77 customers.

The Madison County Sanitation District No. 2 was created in the early 1990's to give status and financial viability to a developer-installed sewerage system that serves a single rural subdivision—Executive Park—in southcentral Madison County. The sewer system, in private hands before its conversion to a public utility, was in poor physical and financial condition. A number of sewer customers were refusing to pay a sewer user charge.

Sewage treatment is provided by two side-by-side steel fabricated extended aeration wastewater treatment plants. One has a 15,000 gallons per day capacity and is approximately 32 years old. The newer plant is 15 years old and has a capacity of 10,000 gpd. Average flows were reported to be 20,000 gallons per day in 1997. Wet weather flows—even for an extremely small system of collector sewers can be five times or more than the dry weather flow. There is one sewage pumping station which presently operates without one of its two pumps. Peak flows during rainy periods can cause sewage bypassing at the pumping station, at the side-by-side sewage treatment plants, or at both. Discharge of the treated effluent is to Hayes Fork Creek.

The Madison County Sanitation District No. 2 wastewater treatment plant performance in 1997 as compared to the limits established by the District’s state-issued wastewater treatment plant discharge permit are as follows:

	<b>Average Annual Value*</b> <b>Parameter</b> <b>1997</b>	<b>KPDES Limits</b>
Dissolved Oxygen	7.0 mg/1 minimum	7.6 mg/1
Total Suspended Solids	30 mg/1 maximum	5.8 mg/1
Ammonia - Summer	4 mg/1 maximum	1.8 mg/1
Ammonia - Winter	10 mg/1 maximum	4.7 mg/1
Coliform	200/100 ml maximum	10/100 ml
BOD	25 mg/1 maximum	8.6 mg/1

\* In 1997, there was one monthly exceedence to the dissolved oxygen limit, one monthly exceedence to the summer ammonia limit, and one monthly exceedence to the winter ammonia limit.

The present monthly sewer user charge is \$30 per customer. The District presently lacks the cash reserves to have its broken sewage pump replaced. Costs of the pump replacement have been pegged at around \$10,000. All Madison County Sanitation District No. 2 sewer users are water customers of the former Kingston-Terrill Water District.

Within close proximity of Executive Park Subdivision (Madison County Sanitation District No. 2) are other urbanized areas, many residents of whom are served by malfunctioning septic tank systems. Nearby nameplate areas include:

Rolling Hills  
Crestview Subdivision

Mt. View Subdivision

all of whom are served with water by the Southern Madison Water District.

Also nearby are

Jessica Circle (a mobile home park)  
Pioneer Drive  
Blue Ridge Heights Fritz trailers  
Valley Green Terrill  
Blue Grass Homes West Rice Lane  
Kingston Elementary School

all of whom are served with water by the former Kingston-Terrill Water District.

**ON-SITE TREATMENT SYSTEMS**

**SI21151001**

This area consists of rural Madison County beyond the service areas of the sanitary sewer systems of the Cities of Richmond and Berea, and the Madison County Sanitation District No. 2. It is unlikely that public sewer line extensions will reach this area of Madison County by 2020. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. Reasons for the high cost are the number of households (11,550), a low customer per mile ratio, rugged terrain, and the long distance from these houses to treatment facilities and existing sewer systems. Suggested instead is that a Revolving Loan Fund Program be established or that the U.S. Army Corps of Engineers 531 program be extended for the installation of a septic tank for each house that does not presently have sanitary sewer service, or could currently have a failing septic system. The generalized proposed cost of this option is \$57,750,000 or \$5,000 per household.

## MERCER COUNTY

### Mercer County Sewer Service (map)

- Estimated 1999 population of 20,700--42% on public sewer
- Estimated 2020 population of 22,900--53% on public sewer
- Proposed projects would add over 950 new households to public sewer service during 2000-2020
- Estimated funding needs for public sewer 2000-2005--\$2,350,000
- Estimated funding needs for public sewer 2006-2020--\$10,600,000

Mercer County had an estimated population of 20,723 (8,563 households) in 1999 with a projected population of 22,870 (9,709 households) in 2020. Public sewer is provided to about 42 percent of the county's residents. About 4,950 households treat wastewater on site. Over 950 new customers could be added to public sewer service through new line extensions in 2000-2020.

### MERCER COUNTY SEWER PLAN

#### *Proposed Projects 2000-2005*

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
MERCER							-
Harrodsburg /SX21167001	41	300	1,250	800			2,350
County Total	41	300	1,250	800			2,350

#### *Proposed Projects 2006-2020*

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
MERCER							-
Harrodsburg SX21167002	213	2,100	700	1,800			4,600
Lake Village Water Association	300	3,000					3,000
Burgin	400	3,000					3,000
County Total	913	8,100	700	1,800			10,600

#### CITY OF HARRODSBURG SANITARY SEWER SYSTEM

Harrodsburg's sewage system is the only public sewage system in Mercer County. The system serves 3,411 customers. According to city utility personnel, fewer than ten water customers residing within the Harrodsburg corporate limits lack access to the municipal sewer system. In addition, there are 239 city water customers outside the city, mostly wedged between the

# SEWER SERVICE AREAS MERCER COUNTY Kentucky

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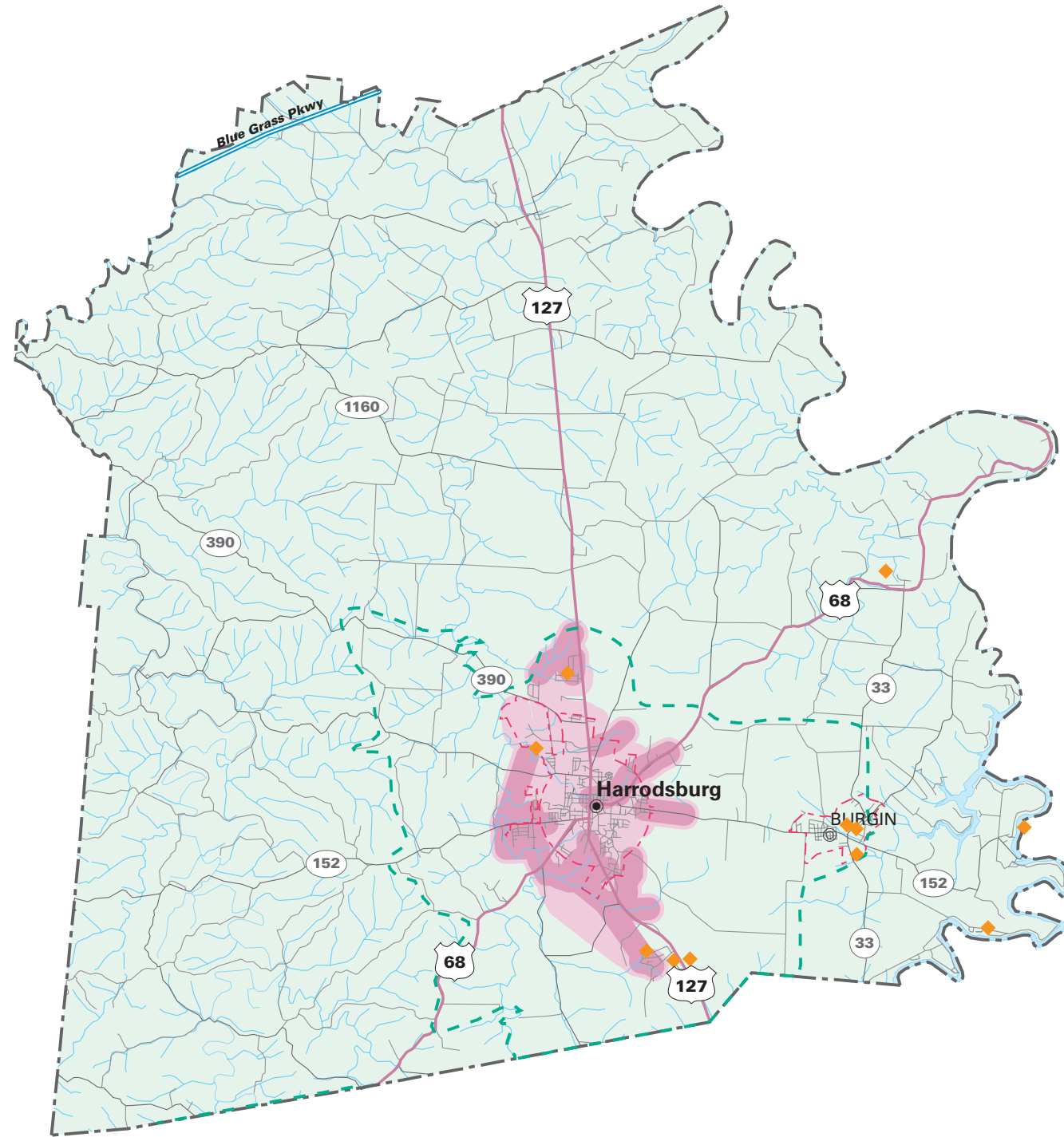
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Kentucky Area Development Districts



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- - - 201k Facility Planning Area
- - - Incorporated City Boundary
- ◆ Sewage Treatment Plant



**SEWER SERVICE STATUS BY OWNER**

<span style="color: lightpink;">█</span> EXISTING SERVICE AREA	<span style="color: pink;">█</span> PROPOSED SERVICE AREA
<span style="color: pink;">█</span> HARRODSBURG MUNICIPAL SEWER	



city and the Salt River. These households also lack sewer service. Furthermore, there are 212 city sewer customers who reside within the Harrodsburg corporate limits who are retail water customers of the Harrodsburg-supplied North Mercer Water District. This latter situation has developed over the years in areas which have been annexed to the city at a time when water service was already being provided by the North Mercer Water District.

The municipal wastewater treatment plant is located north of Cornishville Road and south of Town Creek to the west/northwest of the city. The existing interceptor sewer enters the treatment plant as a 27-inch diameter sewer generally following Town Creek. At the former sewage treatment plant site near Cornishville Road's intersection with the Norfolk Southern rail line, the interceptor downsizes to an 18-inch line. It is further downsized—to a 15-inch sewer—at Broadway and College Street. At Broadway and Chiles, the sewer downsizes to three 10-inch diameter sewers and a 12-inch diameter sewer. There are eight sewage pumping stations upstream of the sewage treatment plant. The sewer system is basically a gravity one, since most sewage pumping stations serve peripheral areas of the city. Several sewage pumping stations are reported to be troublesome—mostly due to their age and condition. Sanitary sewer overflows are reported during periods of wet weather. A new sewer line was installed in 1996 on the city's north side to serve the recently annexed Brentwood Estates and to provide sewer service availability to the Anderson-Dean Park and Senior Citizens Center on the city's north side and east of US 127. Areas outside the city which have developed with city water service but with septic tanks include River View Estates and Scenic Hill Subdivision. The city undertook a sewer rehabilitation project in the 1993-1995 time frame. During that period, potential cross-connections with potable water lines were eliminated and sewer lines and manholes were rehabilitated. Unfortunately, inflow and infiltration were not reduced to the point of eliminating sanitary sewer overflows during wet weather.

In 1979, Harrodsburg abandoned its trickling filter wastewater treatment plant which was located on a small tract south of the Cornishville Road and sandwiched between Town Creek and the Norfolk Southern rail line. A new treatment plant was constructed further west and on the north side of Cornishville Road as Town Creek takes a northern loop before emptying in to the Salt River. The treatment plant is of the rotating biological contactor

(RBC) type. Discharge of the treated effluent is to milepoint 0.2 of Town Creek. Town Creek joins the Salt River immediately downstream of the wastewater treatment plant. The treatment plant has a rated capacity of 2.68 million gallons per day (MGD) and a hydraulic maximum capacity 5.32 MGD. The average daily flow in 1995 was 0.96 MGD, 1.058 MGD in 1996, and 1.000 MGD in 1997.

There are two plastic lined equalization basins at the head of the treatment plant. These basins—with a combined capacity of 4.3 million gallons—not only allow the containment of high flows associated with storm events, they also permit the other treatment units to operate at a more or less sustained level by providing a source of supplemental sewage flow on days of abnormally low sewage flow. According to the plant personnel, the plant as it is presently operated—with some units held out of service and in reserve—at its optimum at a daily flow rate of about 1.0 MGD.

When the equalization basins are not being used to reduce and stabilize the incoming flow, sewage enters the plant at two large screw pumps which lifts the sewage from the 27-inch influent sewer line which is deep in the ground. Sewage then goes through a bar screen, through mechanical grinders and the grit chamber. From the grit chamber, sewage goes to two primary clarifiers. Because the average daily flow is considerably below the plant's rated capacity, only one clarifier is operated at a time while the second clarifier is held in reserve. The clarifier effluent then goes to six trains of rotating biological clarifiers. From the RBC's, the effluent goes to two rectangular secondary clarifiers. Once again, only one clarifier is operated at a time under normal conditions. Effluent from the secondary clarifiers goes to three polishing lagoons which operate in series. Ducks of various types habitate the polishing lagoons. At the end of the last lagoon, the effluent is first chlorinated and then is dechlorinated with sulphur dioxide. The effluent then cascades down a stairsteps-type chamber for the purpose of reaeration. The effluent then is conveyed in a 30-inch diameter pipe for ultimate discharge to Town Creek, about 1,000 feet from its mouth at the Salt River.

Flow measurement at the treatment plant is by a parshall flume after chlorination and dechlorination. The peak single day flow carried through the treatment plant in 1995 was

3.5 MGD. In only three months of that year did the peak daily flow through the treatment plant reach or exceed the plant's rated capacity of 2.68 MGD.

Treatment plant performance in the 1995-1997 time period compared very favorably to the limits contained in the treatment plant's effluent limits in its state-issued discharge permit. Average laboratory results show no permit exceedences during the three year period. Laboratory results from the treatment plant effluent over the last three years are compared to effluent limits as follows:

Parameter	KPDES Limits	Average Annual Value		
		1995	1996	1997
Dissolved Oxygen	7.0 mg/l minimum	8.8 mg/l	7.8 mg/l	8.3 mg/l
Total Suspended Solids	30.0 mg/l maximum	6.0 mg/l	6.2 mg/l	7.1 mg/l
Ammonia - summer	4.0 mg/l maximum	0.20 mg/l	1.03 mg/l	0.4 mg/l
Ammonia - winter	10.0 mg/l maximum	0.12 mg/l	0.88 mg/l	0.75 mg/l
Coliform	200/100 ml	2.5/100 ml	2.4/100 ml	2/100 ml
BOD	10 mg/l	5.3 mg/l	3.9 mg/l	3.7 mg/l

Harrodsburg has a pretreatment ordinance in effect. Pretreatment requirements are applied to Corning, Modine, Hitachi, and to the former Nu-Tone factory. The city has five state-certified treatment plant operators. Two are Class III operators; three are Class II operators.

The city is required to conduct biomonitoring analyses on its wastewater treatment plant effluent. Harrodsburg has been required to conduct a toxicity reduction evaluation (TRE) and has concluded that minute quantities of a specific herbicide have caused occasional failures of the biomonitoring analyses. The treatment plant has had acceptable biomonitoring results for five consecutive months and expects soon to be released from TRE requirements.

Harrodsburg was placed under a sewer extension ban by the Kentucky Division of Water in early 1998. The reason for the enforcement action was that sanitary sewer overflows were continuing during wet weather and that the Division chose to call Harrodsburg's attention to the problem and to cause Harrodsburg to plan for the early remediation of the problem.

One likely result of the KDOW enforcement action will be the preparation by the city of a Sewer System Evaluation Survey—to identify the causes and cures of the excess flows that plague the system.

To a lesser extent, the Division of Water also expressed concern at the condition of the wastewater treatment plant. Although no KPDES permit exceedences were identified in recent times, out-of-service treatment equipment and units appeared to raise concerns that the wastewater treatment plant was not being operated in the intended manner.

Monthly sewer rates in effect in Harrodsburg since 1980 are these:

First 250 cubic feet	\$6.25 minimum bill
Next 750 cubic feet	2.30/100 cubic feet
Next 3,000 cubic feet	2.10/100 cubic feet
Next 6,000 cubic feet	1.90/100 cubic feet
Next 25,000 cubic feet	1.75/100 cubic feet
Next 25,000 cubic feet	1.65/100 cubic feet
Next 60,000 cubic feet	1.40/100 cubic feet
All over 120,000 cubic feet	1.10/100 cubic feet

The tap fee for connection to the sewer system is \$400.

Gross revenues from sewer service charges for fiscal year 1997 were \$704,000. Maintenance and operating costs (including depreciation expense) were \$472,000. Net sewer revenues before debt service were \$232,000. Principal and interest on the sewer utility's long term bonded debt in FY 1997 amounted to \$142,000.

Because of wastewater system deficiencies identified by the Kentucky Division of Water in 1998, it will be desirable that Harrodsburg initiate a Sanitary Sewer Overflow Plan and a Sewer System Evaluation Survey. The purpose of these studies would be to identify those portions of the sewage conveyance system where it is cost-effective to repair/rehabilitate/replace for the purpose of reducing inflow and infiltration (I&I) to the sewer system. The goal of I&I reduction would be to reduce, if not eliminate, the bypassing of raw sewage at pumping stations or at other points in the sewage collection system upstream of the wastewater treatment plant. Even though the wastewater treatment plant has as one of its components equalization basins whose purpose it is to smooth out peak

sewage flows during storm periods, the bypassing of raw sewage in the collection system is not permitted.

**Proposed Projects 2000-2005**

**SX21167001**

1. From a capacity point of view, Harrodsburg is almost alone in having significant excess wastewater treatment capacity now. With a rated daily capacity of 2.68 million gallons and a 1997 average daily flow of only 1.0 million gallons *and* with the availability of equalization basins, Harrodsburg presently has treatment units that are intentionally left out of service so as to maximize treatment plant performance. The present treatment plant capacity should be adequate for the 20-year planning period. Therefore, the question is not whether the treatment plant is or is not large enough to meet the hydraulic and organic loads expected for the planning period. Rather, the question becomes one of whether or not those treatment facilities that Harrodsburg has today can last throughout the planning period without wearing out or becoming obsolete. Few, if any, treatment plants of its type (rotating biological contactors) are still being constructed. Sanctions imposed upon Harrodsburg in early 1998 relate in part to disfunctional wastewater processing equipment units at the treatment plant. It is estimated that Harrodsburg will be required to expend \$800,000 during the period of the Immediate Plan to restore to full service treatment units which are almost 20 years old.
2. Sewer system rehabilitation is likely to be necessary on a more or less continuous basis. Suggested is that \$1,250,000 be reserved for rehabilitation during the period of the Immediate Plan. Reduction of excess flows due to inflow and infiltration will reduce the need for relief sewers. Those illicit flows must either be refused entry to the sewer system or else they must be conveyed with the sewage and treated with the sewage.
3. Proposed for implementation during the period of the Immediate Plan are the following:
  - a. a 10-inch sewer extending northeasterly from Warwick Pike at Commercial Drive to the new US 127 Bypass
  - b. 8-inch diameter sewers to serve the developed area immediately north of Brentwood Estates
  - c. a 10-inch diameter sewer following the drainage way upstream immediately west and north of Brentwood Estates

The estimated project cost of Immediate Plan improvements proposed in No. 3 is \$300,000. Sewer line extensions will serve approximately 41 households.

**Proposed Projects 2006-2020**

**SX21167002**

1. Significant additional WWTP rehabilitation will likely be required during the Long Term Planning period. Project costs during that period are estimated at \$1.8 million.

A shift in treatment processes during the period of the Long Term Plan is possible if not probable.

2. Sewer system rehabilitation is likely to be necessary on a more or less continuous basis. Suggested is that \$700,000 be targeted for sewer rehabilitation during the period of the Long Term Plan. Reduction of excess flows due to inflow and infiltration will reduce the need for relief sewers. Those illicit flows must either be refused entry to the sewer system or else they must be conveyed with the sewage and treated with the sewage.
3. During the period of the Long Term Plan, the installation of additional sewers is proposed as follows:
  - a. a 15-inch diameter and then a 12-inch diameter relief sewer beginning at North College Street and Broadway and extending upstream northeasterly with Town Creek to the new US 127 Bypass at the Lexington Road (US 68):
  - b. a 10-inch sewer along Lexington Road from the new US 127 Bypass as far east as Drake Lane
  - c. the sewerage of Riverview Estates and adjacent minor subdivisions on Harrodsburg's west side
  - d. major interceptors on Harrodsburg's south and west sides that would:
    - make sewer service available as far south as the Bright Leaf development west of US 127 South
    - provide municipal sewer service availability in the vicinity of the US 127 Bypass intersection with US 127 South
    - provide sewer service in a triangular area bounded by Beaumont Avenue, Bellows Mill Road, and the US 127 Bypass
    - allow for the elimination of at least five existing sewage pumping stations (three on South College Street) and one each on Perryville Street and Mooreland Avenue) by extending an interceptor along a minor tributary of Salt River as far around the city's southwest side at Mooreland Avenue (KY 152). At that point, a new major pumping station would convey collected wastewater directly to the wastewater plant on the Cornishville Road
    - a 10-inch diameter gravity sewer along the Burgin Road (KY 152) from the new US 127 Bypass to the existing sewer at Montrose Street. This sewer would not only provide sewer access to the US 127 Bypass-Burgin Road intersection, it would also accept pumped sewage flow from Burgin if and as that community installs a collector sewer system with pump-back to Harrodsburg

The estimated cost of projects proposed in No. 4 for implementation as a part of the Long Term Plan is \$2.1 million. Sewer line extensions will serve approximately 213 households.

#### ON-SITE TREATMENT SYSTEMS

##### **SI21167001**

This area consists of rural Mercer County beyond the service area of the City of Harrodsburg's sanitary sewer system. It is unlikely that public sewer line extensions will

reach this area of Mercer County by 2020. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. Reasons for the high cost are the number of households (4,950), a low customer per mile ratio, rugged terrain, and the long distance from these houses to treatment facilities and existing sewer systems. Suggested instead is that a Revolving Loan Fund Program be established or that the U.S. Army Corps of Engineers 531 program be extended for the installation of a septic tank for each house that does not presently have sanitary sewer service, or could currently have a failing septic system. The generalized proposed cost of this option is \$24,750,000 or \$5,000 per household.

## NICHOLAS COUNTY

### Nicholas County Sewer Service (map)

- Estimated 1999 population of 7,100--29% on public sewer
- Estimated 2020 population of 7,400--35% on public sewer
- Proposed projects would add over 180 new households to public sewer service during 2000-2020
- Estimated funding needs for public sewer 2000-2005--\$1,175,000
- Estimated funding needs for public sewer 2006-2020--\$3,050,000

Nicholas County had an estimated population of 7,053 (2,932 households) in 1999 with a projected population of 7,358 (3,213 households) in 2020. Public sewer is provided to about 29 percent of the county's residents. About 2,100 households treat wastewater on site. Over 180 new customers could be added to public sewer service through new line extensions in 2000-2020.

### NICHOLAS COUNTY SEWER PLAN

#### *Proposed Projects 2000-2005*

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
NICHOLAS							-
Carlisle /SX21181001	74+ind	775	400				1,175
Nicholas County San. Dist #1							
County Total	74+	775	400				1,175

#### *Proposed Projects 2006-2020*

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
NICHOLAS							-
Carlisle SX21181002	pot	250		1,800			2,050
Nicholas County San District #2.	100	1,000					1,000
County Total	100 + pot	1,250	-	1,800			3,050

#### CITY OF CARLISLE SANITARY SEWER SYSTEM

Carlisle's sewer system was initially constructed in 1963-64. From the treatment plant located at the far western end of the city, a 12-inch diameter sewer extends upstream (eastward) generally parallel to Brushy Fork Creek. From a point on Spring Street immediately west of Dorsey Street, the interceptor sewer continues as two 10-inch diameter



# SEWER SERVICE AREAS NICHOLAS COUNTY Kentucky

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Kentucky Area Development Districts



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- - - 201k Facility Planning Area
- - - Incorporated City Boundary
- ◆ Sewage Treatment Plant



**SEWER SERVICE STATUS BY OWNER**

EXISTING SERVICE AREA	PROPOSED SERVICE AREA	
<span style="display: inline-block; width: 20px; height: 10px; background-color: #f08080; border: 1px solid black;"></span>	<span style="display: inline-block; width: 20px; height: 10px; background-color: #c06060; border: 1px solid black;"></span>	CARLISLE MUNICIPAL SEWER

lines—one south on Dorsey Street and the other generally eastward, following Main Street and KY 36. Most of the collector sewers are 8-inches in diameter. The sewer system takes great advantage of gravity in that there are no sewage pumping stations within the sewer system. Sewage is not pumped until it reaches the wastewater treatment plant. Carlisle does not bypass raw sewage at any location.

Jockey International, the city's largest water customer, treats its own industrial process wastewater on its property and discharges the effluent through an 8-inch force main to the Main Licking River about 1,000 feet downstream of Carlisle's point of water supply withdrawal. Much of Jockey's 8-inch diameter wastewater discharge line formerly served as Carlisle's water supply line until 1989 when the city installed a new 7.4 mile long, 12-inch diameter ductile iron raw water transmission line from the Licking River to the city. Sanitary sewage generated at Jockey goes to the city sewer and thence to the municipal wastewater treatment plant.

Infiltration of groundwater and inflow of storm water are significant problems at Carlisle. Utility personnel blame poor sewer construction techniques from the system's early years. City utility personnel have been at work for several years in efforts to locate and repair sources of inflow/infiltration. Some success has been noted, but much remains to be done. The city regularly reports its plans and its progress to the KY Division of Water. The types of remedial work include locating manholes, smoke-testing lines, dye-testing lines, video-taping suspected problem sewers, repairing leaks, replacing small segments of defective sewers, raising manhole covers, and top-sealing manhole covers that are submerged during storm events. Sewer trouble areas are located throughout the system but seem to be concentrated along the 10- and 12-inch interceptor sewer (which closely follows Brushy Fork Creek), Dorseyville, Walnut Street, Henryville, the high school sewer line, and Kennedy Heights.

Virtually all city water customers are city sewer customers as well. Close-in (but unincorporated) areas in need of sanitary sewer service include East Union Road and the subdivisions on the northside of KY 36 on the city's immediate east end.

Carlisle’s wastewater treatment plant was constructed in 1963-64 along with the system of sanitary sewers. In those early years, the plant was of the trickling filter type with a rated capacity of 200,000 gallons per day. In 1991-92, the plant underwent a \$2.1 million expansion and upgrade with HUD grant funds and with state loan monies. At that time, the treatment plant was expanded to 350,000 gallons per day. The treatment chain now consists of raw sewage pumping, screening, grit removal, oxidation ditch, clarification, chlorination, and dechlorination.

To process solids, the treatment plant has a sludge holding tank, a sludge digester, and sludge drying beds. Ultimate sludge disposal is by land spreading on the state approved *city farm* that is adjacent to the wastewater treatment plant.

Treatment plant performance in 1995 and 1996 compared very favorably to the limits established by the city’s state-issued wastewater treatment plant discharge permit. In 1997, however, there were three monthly exceedences in respect to the Summer Ammonia limit. Laboratory results of the treatment plant effluent in 1995, 1996, and 1997 are compared to the city’s effluent limits as follows:

Parameter	KPDES Limits	Average Annual Value		
		1995	1996	1997
Dissolved Oxygen	7 mg/l minimum	7.7 mg/l	7.8 mg/l	7.9 mg/l
Total Suspended Solids	30 mg/l maximum	1.9 mg/l	1.7 mg/l	2.2 mg/l
Ammonia – Summer	2 mg/l maximum	0.09 mg/l	1.9 mg/l	1.92 mg/l
Ammonia – Winter	6 mg/l maximum	0.04 mg/l	0.21 mg/l	1.44 mg/l
Coliform	200/100 ml maximum	12/100 ml	10/100 ml	34/100 ml
BOD	10 mg/l maximum	4.3 mg/l	3.6 mg/l	3.8 mg/l
Flow	0.35 MGD	0.305 MGD	0.335 MGD	0.279 MGD

Recorded flows exceeded 350,000 gpd on 67 days of 1994. On the high flow day for 1994, wastewater flows were measured as 1,837,000 gallons per day—more than five times the plant’s rated capacity. This high flow situation is invariably associated with rainfall events

and underlines the importance of the city's efforts to pursue sewer rehabilitation to reduce the deleterious effects of inflow and infiltration. The 17 percent reduction in average daily sewer flows from 1996 to 1997 suggests that the city may be experiencing success in its ongoing efforts to reduce inflow and infiltration in the sewer system.

The city has two wastewater treatment system operators, both of whom are certified as Class-III.

Sewer service charges in effect since June, 1992 are as follows:

	<b>Inside City</b>	<b>Outside City</b>
First 1,000 gallons per month	\$6.35 minimum	\$8.26 minimum
Next 4,000 gallons	2.81/1,000	3.65/1,000
Next 5,000 gallons	2.72/1,000	3.54/1,000
Next 5,000 gallons	2.54/1,000	3.30/1,000
Next 10,000 gallons	2.36/1,000	3.07/1,000
Next 25,000 gallons	2.09/1,000	2.72/1,000
All over 50,000 gallons	2.00/1,000	2.60/1,000

The fee for a sewer tap is dependent upon the size of the meter to be installed. The fee for a 4-inch tap is \$500 and the fee for a 6-inch tap is \$1,000. The price for the installation of meters larger than 6-inch is based upon the amount of work necessary to install the connection.

Pertinent financial data for the sewer utility's fiscal year 1997 are as follows:

Gross annual revenues from sales of sewer service in 1997 were \$198,000. Maintenance and operating costs (exclusive of depreciation) \$181,000. Net annual sewer revenues were \$17,000.

**Proposed Projects 2000-2005**

**SX21181001**

1. Plans for Carlisle's wastewater future depend first on the city's ability to reduce extraneous flows within the sewer system. Apparently, inflow is more of a problem than is infiltration because sewage flows during and immediately following a storm can and have been significant. Self-help efforts are underway to locate sources of inflow and to make the necessary corrections. If and as a significant reduction in extraneous flows can be achieved by self-help efforts, the city would be able to avoid the necessity of a construction contract aimed at sewer rehabilitation. In the event, however, that a traditional construction project cannot be avoided, it is suggested

that a \$400,000 1997 estimated project cost would be appropriate. This sewer system rehabilitation effort is targeted for the period of the Immediate Plan.

2. Also targeted for the period of the Immediate Plan are lateral sewer extensions to serve the East End Area on the north side of KY 36 and East Union Road on the city's southeast side. Approximately 2.2 miles of 8-inch diameter sanitary sewer construction and two small pumping stations would be required to serve 98 existing homes and to open for future development additional acreage on the city's east end. The 1997 estimated project cost is \$685,000.
3. An additional extension is proposed on the city's west end—once again along the north side of KY 36. An additional 0.4 mile of 8-inch diameter sewer construction is proposed there to serve the industrial park. The 1997 estimated project cost is \$90,000.

Sewer line extensions proposed in the Immediate Plan will serve approximately 74 households.

### **Proposed Projects 2006-2020 SX21181002**

1. The Carlisle corporate limits have assumed an unusual shape in that the city is quite large west to east and quite narrow south to north. Contributing to those unusual characteristics are the hills that rise sharply north and south of the Brushy Fork valley in which the city has developed. If south-north growth should occur within the period of the Long Term Plan, it could most easily occur on either side (west and east) of KY 32 which is mostly a south to north highway in the vicinity of the city. For that reason, two additional interceptor sewers are proposed as a part of the Long Term Plan. These two Y-shaped sewers could serve developing areas on the hillsides and deliver collected sewage by gravity to the existing 12-inch interceptor sewer which follows Brushy Fork Creek in an east to west direction. The 1997 estimated project cost of these new sewers is \$ 250,000. Sewer line extensions will serve approximately 3 households but will serve more in the future as development occurs.
2. While it is assumed that Carlisle will be successful in its efforts to reduce wastewater flows to its wastewater treatment plant and thereby extend its useful life beyond the five year period of the Immediate Plan, such relief will not remove the likelihood that wastewater treatment expansion will be required—probably during the period of the Long Term Plan. Recommended then is the expansion of the city's treatment facilities from its present rated capacity of 350,000 gallons per day to a new and higher capacity of 600,000 gallons per day. Concurrent with the expansion should be provisions for flow equalization such that the facility could accommodate flows as great as 1.2 MGD for periods as long as 2 1/2 days. A 3 MG equalization basin would appear to be optimal. The 1997 estimated project cost of such a wastewater treatment plant upgrade is \$1.8 million.

\*An alternative concept has been aired. This concept would involve the pumping of existing wastewater flows—following treatment—across KY 36 to the property of Jockey

International where an additional lagoon together with other improvements would be constructed to permit the co-mingling of the municipal sewage with the industrial process wastewaters of the large textile manufacturing facility. Treated wastewaters would then be pumped eastward through the factory's wastewater treatment effluent line for discharge to the Licking River at the factory's present point of wastewater discharge. Such an alternative concept would have several benefits. The lagoons on the property of the factory could offer for the city's municipal sewage the flow equalization which is presently unavailable. Secondly, the dilution of industrial process wastewaters afforded by the municipal sewage *could* facilitate an expansion of the manufacturing plant while, at the same time, allowing the factory to continue to meet the terms of its effluent discharge permit at the Licking River where chlorides concentrations have been a concern. Since this is merely an alternative methodology and requires coordination, cooperation, and approval of numerous entities and regulatory agencies, no estimate of project cost is included herein.

#### ON-SITE TREATMENT SYSTEMS

##### **SI21181001**

This area consists of rural Nicholas County beyond the service area of the City of Carlisle's sanitary sewer system. It is unlikely that public sewer line extensions will reach this area of Nicholas County by 2020. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. Reasons for the high cost are the number of households (2,100), a low customer per mile ratio, rugged terrain, and the long distance from these houses to treatment facilities and existing sewer systems. Suggested instead is that a Revolving Loan Fund Program be established or that the U.S. Army Corps of Engineers 531 program be extended for the installation of a septic tank for each house that does not presently have sanitary sewer service, or could currently have a failing septic system. The generalized proposed cost of this option is \$10,500,000 or \$5,000 per household.

## POWELL COUNTY

### Powell County Sewer Service (map)

- Estimated 1999 population of 12,900--37% on public sewer
- Estimated 2020 population of 15,100--42% on public sewer
- Proposed projects would add about 225 new households to public sewer service during 2000-2020
- Estimated funding needs for public sewer 2000-2005--\$4,000,000
- Estimated funding needs for public sewer 2006-2020--\$2,350,000

Powell County had an estimated population of 12,853 (4,825 households) in 1999 with a projected population of 15,074 (6,191 households) in 2020. Public sewer is provided to about 37 percent of the county's residents. About 3,050 households treat wastewater on site. About 225 new customers could be added to public sewer service through new line extensions in 2000-2020.

### POWELL COUNTY SEWER PLAN

#### *Proposed Projects 2000-2005*

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
POWELL							-
Stanton /SX21197001	43	400	1,200				1,600
Clay City /SX21197003	40	300	500				800
Powells Valley	73	1,600					1,600
County Total	156	2,300	1,700				4,000

#### *Proposed Projects 2006-2020*

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
POWELL							-
Stanton SX21197002			450	500			950
Clay City SX21197004	hwy	250	300	250			800
Powells Valley	69	600					600
County Total	69	850	750	750			2,350

### CITY OF STANTON SANITARY SEWER SYSTEM

In Powell County, the provision of sewer service is almost exclusively for residents of the two municipalities and for Natural Bridge State Park and Slade rest area visitors. Within Stanton, sewer service is available to about 97 percent of water customers.

# SEWER SERVICE AREAS POWELL COUNTY Kentucky

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Bob Arnold, Chairman  
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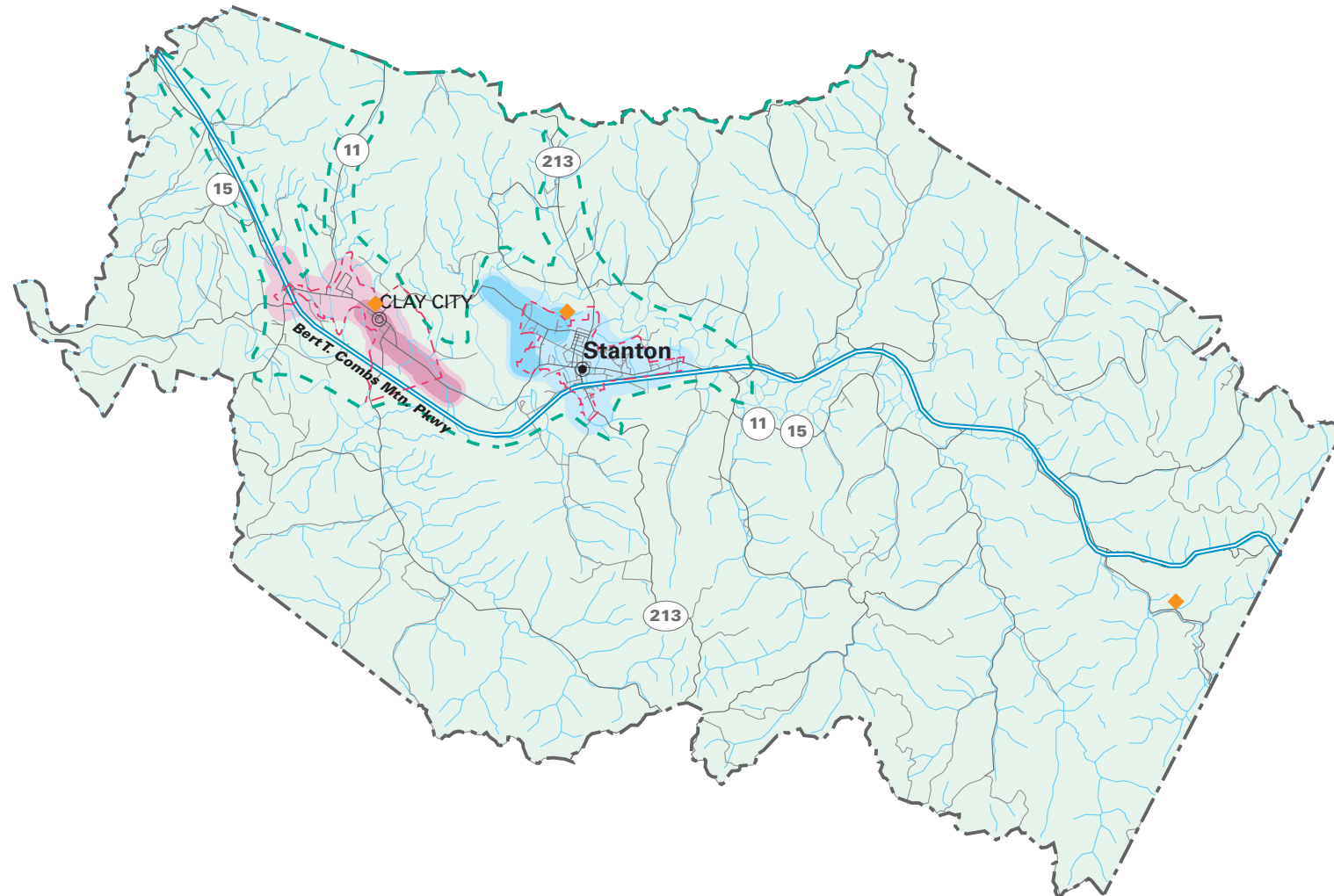
Final GIS & Cartographic Operations By:  
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Kentucky Area Development Districts



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- - - 201k Facility Planning Area
- - - Incorporated City Boundary
- ◆ Sewage Treatment Plant



### SEWER SERVICE STATUS BY OWNER

EXISTING SERVICE AREA	PROPOSED SERVICE AREA	
<span style="color: lightblue;">█</span>	<span style="color: blue;">█</span>	STANTON MUNICIPAL SEWER
<span style="color: pink;">█</span>	<span style="color: magenta;">█</span>	CLAY CITY MUNICIPAL SEWER



Except for a small portion of sewer leading to the Judy Creek sewage pumping station, almost all of the city sewer system is comprised of 8-inch diameter sewers and smaller. With the exception of piecemeal sewer line extensions—for the most part installed by developers and deeded to the city—Stanton’s system of sanitary sewers remains similar to that shown in the 1973 *Powell County Water and Sewer Plan*. The major exception to that would be interceptor sewer improvements and the Judy Creek pumping station reconstruction which occurred as a part of the construction of the wastewater treatment plant in 1987-89. Presently there are 10 sewage pumping stations in addition to the major pumping station at Judy Creek. Through the Judy Creek sewage pumping station is pumped 80 to 90 percent of Stanton’s sewage.

City records indicate that there are 31 inside city water customers who lack sanitary sewer service. Largely, they are scattered in areas too low to drain by gravity to the city sewer or in areas remote from the sewer system.

Inflow and infiltration are considerable problems with Stanton’s sewer system. There is no current program aimed at addressing excess sewage flows due to inflow/infiltration. During heavy rainfall events, there is periodic sewage bypassing upstream of the sewage treatment plant.

Stanton’s treatment plant is located on the city’s northwest side, north of KY 2026 and adjacent to Judy Creek which formerly received the city’s treated wastewater effluent. The city’s wastewater treatment plant, completed in 1989, was designed for an average flow rate of 460,000 gallons per day and a peak flow of 1.50 MGD. The facility provides advanced secondary treatment using the extended aeration process. Plant components include influent pumps, bar screen, grit chamber, equalization basin, aeration, secondary clarifiers, chlorination, dechlorination, and a 14-inch outfall line to Red River at mile point 30.6. Sewage sludge is dewatered by a belt filter press, further dried on sludge beds, and disposed of by landfilling at the Blue Ridge Landfill in Estill County.

Stanton does not have an ordinance regulating pretreatment and no sewer customer is required to pretreat. The Division of Water has not yet required the city to conduct bio-monitoring of its treated wastewater. There are two certified wastewater treatment system operators. One is certified Class-I and the other is Class-II certified.

Treatment plant performance in 1995, 1996, and 1997 compared favorably to the limits established by the city's state-issued wastewater discharge permit. Laboratory results over the last three years are compared to the city's effluent limits as follows:

Parameter	KPDES Limits	Average Annual Value		
		1995	1996	1997
Dissolved Oxygen	5 mg/l minimum	8.5 mg/l	8.7 mg/l	9.2 mg/l
Total Suspended Solids	30 mg/l maximum	12.5 mg/l	13.1 mg/l	13.7 mg/l
Ammonia – Summer	4 mg/l maximum	0.87 mg/l	1.16 mg/l	1.13 mg/l
Ammonia – Winter	10 mg/l maximum	0.83 mg/l	0.77 mg/l	1.12 mg/l
Coliform	200/100 ml maximum	22/100 ml	75/100 ml	39/100 ml
BOD	30 mg/l maximum	F5.5 mg/l	4.3 mg/l	4.5 mg/l
Flow	0.46 MGD	0.42 MGD	0.52 MGD	0.485 MGD

The increase in the wastewater treatment's average daily flow of 100,000 gpd (0.1 MGD) in one year (between 1995 and 1996) has alarmed the Kentucky Division of Water—particularly since the average daily flow for 1996 exceeded the plant's average daily capacity of 460,000 gallons. Subsequently, the KY Division of Water has determined that Stanton's sanitary sewer system is hydraulically overloaded. The City of Stanton has entered into an Agreed Order with the Division of Water spelling out specific measures which the city will undertake to reduce the hydraulic load upon its sewers and upon its sewage treatment plant. Since the date of the agreement, wastewater treatment average daily flows at the wastewater treatment plant continued in 1997 to exceed plant capacity.

Stanton's present sewer rates are as follows:

First 1,000 gallons per month \$10.35 minimum bill  
 All over 1,000 gallons per month 3.10/1,000 gallons

The tap fee for connection to the city sewer system is \$350.

The utility's financial information for fiscal year 1997 reflects the following:

Gross Revenues from Sewer Service Sales \$361,000

Maintenance and Operating Costs (exclusive of depreciation)	\$274,000
Net Sewer Revenues	\$86,000

Stanton’s wastewater treatment plant, completed and placed in service in 1989, has a rated 24-hour capacity of 460,000 gallons. The average flow in 1995 was 420,000 gpd; in 1996, the average flow was 520,000 gpd; in 1997, the average flow was 485,000 gpd. Inflow and infiltration are significant twin problems which affect the treatment plant’s effectiveness. Since during dry months of most years, average daily recorded flows fall below 200,000 gpd, it seems that extraneous water and not sanitary sewage is the cause of high flows during periods of heavy and extended rainfall.

When raw sewage bypasses to drainage ways upstream of the treatment plant as it does at Stanton and when average daily flows measured at the wastewater treatment plant over a period of a year approach the capacity of the treatment plant, at least one of the following four things should happen:

1. Sewage flows can be reduced by effective sewer system rehabilitation.
2. Sewage treatment capacity can be increased to accommodate the increased hydraulic loading.
3. A flow equalization basin can be added at the head of the wastewater treatment plant.
4. There can be a combination of the earlier options.

Significant sewer system rehabilitation is recommended in the IMMEDIATE section of this plan. Only when a large measure of that effort has been completed will the city be able to quantify the amount of hydraulic relief achieved. It is suggested that sewer rehabilitation be aggressively pursued during the period of the Immediate Plan and that no treatment plant improvements be undertaken during that period.

**Proposed Projects 2000-2005**  
**SX21197001**

1. The Red River and the flood hazard areas along the river and its tributaries press in on Stanton along three sides. The mountains press in on Stanton’s south side. As a result, developable flood-free land is at a premium in the Stanton area. Proposed during the period of the Immediate Plan, however, are modest sewer extensions on the city’s west side. The 1997 estimated project cost of this effort is \$400,000. Sewer line extensions will serve approximately 43 households.

2. A more pressing need, however, is the rehabilitation of significant portions of the existing sanitary sewer system to reduce the deleterious effects of inflow and infiltration. In 1997, a proposal was developed to address sewer system rehabilitation needs in Stanton east of Morris Street and south of the Mountain Parkway. The proposal included the replacement of five of the city's sewage pumping stations, sealing many manholes and raising manhole covers, and replacing specific sections of troublesome sewer lines. Funding for that effort has not yet been fully approved, but the need for the rehabilitation effort is no less real. The project described above had an estimated project cost of \$700,000. This project together with other sewer system rehabilitation measures are needed during this period of the Immediate Plan. An estimated additional sum of \$500,000 is required to address sewer rehabilitation needs elsewhere in the system. Total sewer rehabilitation needs during this five year planning period then are \$1,200,000.

**Proposed Projects 2006-2020**

**SX21197002**

1. Additional sewer rehabilitation during the period of the Long Term Plan is proposed. It is suggested that an additional \$450,000 be earmarked for sewer rehabilitation during this 15-year period.
2. During the period of the Long Term Plan, it is suggested that the construction of an equalization basin at the wastewater treatment plant may be adequate to allow the city to retain excess raw sewage flows during storm events with the ability to treat those wastewaters after abnormally high sewage flows decline. With present day dry weather sewage flows lower than 200,000 gpd and with the unlikelihood that Stanton's population or normal day sewage flows would double during the 20-year planning period, the present rated capacity of the wastewater treatment plant may well prove to be adequate during the planning period provided that sewer rehabilitation efforts are reasonably successful, and that a flow equalization basin is added if needed. The 1997 estimated project cost of the equalization basin and associated piping and pumping is \$500,000.

**CLAY CITY SANITARY SEWER SYSTEM**

Like Stanton, Clay City also is virtually sewerred in its entirety. In the late 1980's, the city annexed property to and including the KY 15 interchange with the Mountain Parkway. In 1989-1990, Clay City extended sanitary sewer service into and through this Waltersville Interchange area to serve all four quadrants of that interchange. In addition, sewer service was extended north out Shipps Branch Road to serve a new industrial site. Clay City sewer service is also available at a different industrial area a mile southeast of the city on KY 15. Clay City has 11 sewage pumping stations of which three are grinder pumps (at the two industrial sites outside the city) and eight are conventional pumping stations. Of the eight conventional pumping stations, six use submersible pumps and two are dry pit/wet pit types.

Clay City’s wastewater treatment plant, originally constructed in 1962, is located near the center of the city as 7th Street dead ends at the Red River. The plant is essentially a steel tankage extended aeration plant. The facility experienced significant deterioration over the years. In 1992, HUD CDBG, FmHA, and ARC funds totaling \$480,000 were made available to upgrade (but not expand) the facility. The extended aeration treatment process concludes with chlorination followed by dechlorination with sulfur dioxide. Rehabilitation of the municipal wastewater treatment plant was completed in mid-1994 at which time the treatment plant was returned to service. The treatment facility has a rated capacity of 200,000 gallons per day. Dry weather flows are about 90,000 gallons daily, but KDOW flow records for 1997 indicate an average flow of 199,000 gpd. Because average influent sewage flows are so close to the wastewater treatment plant’s rated capacity, Clay City can likely expect to be asked to enter into an Agreed Order with the Kentucky Division of Water in 1998 or 1999. Sewage sludge is dewatered by means of a sludge press. Dewatered sludge is disposed of in a Montgomery County landfill.

Like at Stanton, inflow and infiltration are reported to be serious problems throughout the sewer system. It is reported that the main sewage pumping station bypasses occasionally due to high flows during periods of wet weather.

Clay City has a single certified wastewater treatment plant operator, who holds a Class II certification. No sewer customers are required to pre-treat their wastewater prior to discharge to the city sewer. Clay City is not presently required to conduct bio-monitoring tests of its treated effluent.

Treatment plant performance in 1995, 1996, and 1997 must be considered to be variable as compared to the limits established by Clay City’s state-issued wastewater discharge permit. Laboratory results of the treatment plant effluent for the past three years are compared to the city’s effluent limits as follows:

Parameter	KPDES Limits	Average Annual Value		
		1995	1996	1997
Dissolved Oxygen	2 mg/l minimum	5.9 m/l	7.0 m/l	7.5 mg/l
Total Suspended	30 mg/l	20 mg/l	4.47 mg/l	5.3 mg/l

Solids <sup>1</sup>	maximum			
Ammonia – year-round <sup>2</sup>	15 mg/l maximum	8.1 mg/l	5.0 mg/l	3.87 mg/l
Coliform <sup>3</sup>	200/100 ml maximum	86/100 ml	61/100 ml	58/100 ml <sup>5</sup>
BOD	25 mg/l maximum	7 mg/l	4 mg/l	5.8 mg/l
Flow	0.200 MGD	0.173 MGD	0.210 MGD	0.199 MGD

<sup>1</sup>Exceedences noted in July and September, 1995

<sup>2</sup>Exceedences noted in August and September, 1995

<sup>3</sup>Exceedences noted in July, 1995

<sup>4</sup>Exceedences noted in March, 1996

<sup>5</sup>One monthly exceedence with respect to the coliform limit

Sewer rates in Clay City are as follows:

First 2,000 gallons per month \$11.34 minimum bill  
 Next 1,000 gallons per month           4.02/1,000 gallons  
 Next 7,000 gallons per month           3.42/1,000 gallons  
 Next 10,000 gallons per month        3.12/1,000 gallons  
 All over 20,000 gallons           2.50/1,000 gallons

The tap fee for connection to the sewer system is \$350.

Clay City's fiscal year 1997 financial information yields the following information:

Gross Revenues from the Sale of Sewer Service	\$144,000
Maintenance and Operating Expenses (exclusive of depreciation)	\$118,000
Net Sewer Revenues	\$26,000

**Proposed Projects 2000-2005**

**SX21197003**

1. Clay City's problems with excess sewer flows can be compared with similar problems in Stanton as both cities have serious sewer system problems related to the deleterious effects of inflow and infiltration. Since the city is reasonably flat and since a large portion of the city is located within the 100-year floodplain, the sanitary sewers seem to be frequently and unfortunately affected by storm events. It is suggested that Clay City explore the benefits of undertaking a sewer rehabilitation project during the period of the Immediate Plan. Broken sewer lines, illegal connections, root intrusion, poor pumping stations, and leaky manholes and manhole covers probably each contribute to the problem. The estimated project cost of such a sewer rehabilitation project could be \$500,000.
  
2. Also during the period of the Immediate Plan, it is suggested that the grinder pump and the 2-inch force main from CMS and Powell Manufacturing southeast of the city be replaced with a standard submersible pumping station and a 4-inch diameter force main that would convey wastewater all the way to the wastewater treatment plant.

The arrangement would relieve the hydraulic burden presently placed on the sewer system in the city's southeast end by the present addition of this sewage near the east end of 10th Street. The estimated project cost is \$300,000. Sewer line extensions during the period of the Immediate Plan will serve approximately 40 households.

**Proposed Projects 2006-2020**

**SX21197004**

1. Sewer service is available in all four quadrants of city's westside interchange with the Mountain Parkway. Commercial or other high density urban uses are possible if not likely at the interchange during the 20-year planning period. It is suggested that \$250,000 be earmarked for additional unspecified sewers at or near the interchange together with pumping station modifications to allow for more dense urban uses than at present. This expenditure is targeted for the period of the Long Term Plan.
2. During the period of the Long Term Plan, it is proposed that an additional \$300,000 be applied to additional sewer system rehabilitation.
3. If sewer system rehabilitation is undertaken as proposed and if substantial relief were to result from the effort, it is possible that the city's 200,000 gallons per day extended aeration type treatment plant will prove to be adequate throughout the 20-year planning period. It is suggested, however, that a sum of \$250,000 be earmarked for periodical capital expenses at the wastewater treatment plant during the period of the Long Term Plan.

**ON-SITE TREATMENT SYSTEMS**

**SI21197001**

This area consists of rural Powell County beyond the service areas of the sanitary sewer systems of the City of Stanton and Clay City. It is unlikely that public sewer line extensions will reach this area of Powell County by 2020. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. Reasons for the high cost are the number of households (3,050), a low customer per mile ratio, rugged terrain, and the long distance from these houses to treatment facilities and existing sewer systems. Suggested instead is that a Revolving Loan Fund Program be established or that the U.S. Army Corps of Engineers 531 program be extended for the installation of a septic tank for each house that does not presently have sanitary sewer service, or could currently have a failing septic system. The generalized proposed cost of this option is \$15,250,000 or \$5,000 per household.





## SCOTT COUNTY

### Scott County Sewer Service (map)

- Estimated 1999 population of 30,200--52% on public sewer
- Estimated 2020 population of 44,600--52% on public sewer
- Proposed projects would add an unknown number of new households to public sewer service during 2000-2020
- Estimated funding needs for public sewer 2000-2005--\$6,105,000
- Estimated funding needs for public sewer 2006-2020--\$9,325,000

Scott County had an estimated population of 30,206 (11,798 households) in 1999 with a projected population of 44,556 (19,002 households) in 2020. Public sewer is provided to about 52 percent of the county's residents. About 5,650 households treat wastewater on site. An unknown number of new customers could be added to public sewer service through new line extensions in 2000-2020.

### SCOTT COUNTY SEWER PLAN

#### Proposed Projects 2000-2005

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
SCOTT							-
Georgetown /SX21209001			2,300	2,735			5,035
Stamping Ground /SX212009003			70	1,000			1,070
County Total			2,370	3,735			6,105

#### Proposed Projects 2006-2020

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
SCOTT							-
Georgetown SX21209002			8,660			115	8,775
Stamping Ground SX212009004	2 + pot	150					150
Sadieville	2	400					400
County Total	2 + pot	550	8,660	-	-	115	9,325

#### CITY OF GEORGETOWN SANITARY SEWER SYSTEM

Georgetown's system of sewers in 1998 bears little resemblance to the municipal sewer system at the time of the development of the original *Scott County Water and Sewer Plan* in 1973. Because of the rapid urbanization that has occurred within Scott County but

# SEWER SERVICE AREAS

## SCOTT COUNTY

### Kentucky



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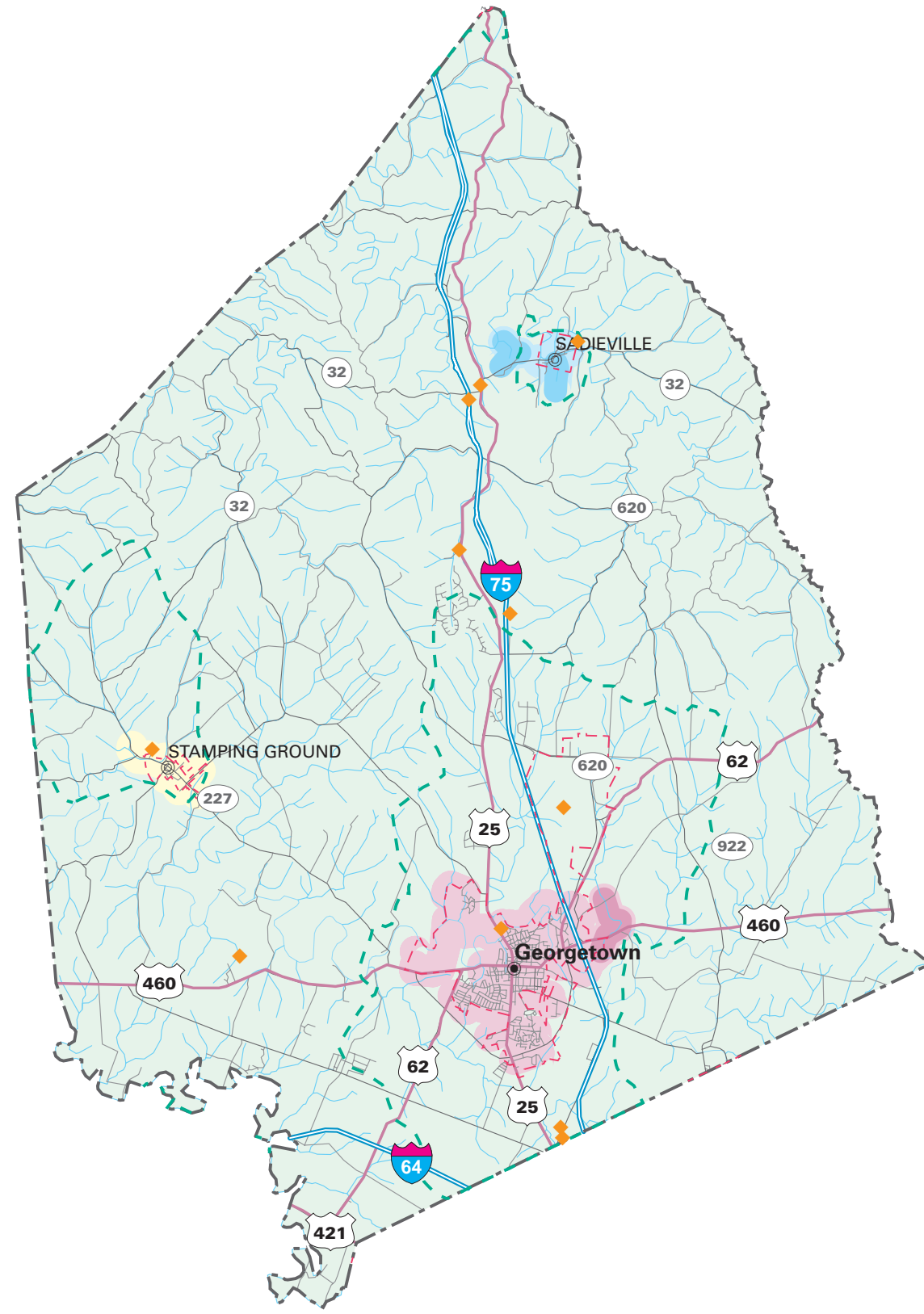
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- - - 201k Facility Planning Area
- - - Incorporated City Boundary
- ◆ Sewage Treatment Plant



**SEWER SERVICE STATUS BY OWNER**

EXISTING SERVICE AREA	PROPOSED SERVICE AREA	OWNER
<span style="background-color: #ffffcc; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>	<span style="background-color: #ffffcc; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>	STAMPING GROUND MUNICIPAL SEWER
<span style="background-color: #add8e6; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>	<span style="background-color: #add8e6; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>	SADIEVILLE MUNICIPAL SEWER
<span style="background-color: #ffb6c1; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>	<span style="background-color: #ffb6c1; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span>	GEORGETOWN MUNICIPAL SEWER

principally within and near Georgetown, the changes to the sewer utility have been staggering. While Georgetown owns and operates two wastewater treatment plants, the newer plant—referred to as WWTP No. 2—presently accepts wastewaters which come almost exclusively from Toyota Motor Manufacturing. WWTP No. 1 then serves all other residential, commercial, industrial, and institutional sewer customers.

There are 23 sewage pumping stations and the two wastewater treatment plant sites. There are also a number of privately owned and operated sewage pumping stations which discharge sewage to the public sewers.

From WWTP No. 1's location on either side of North Elkhorn Creek and immediately west of US 25, twin interceptor sewers extend upstream (south) along Water Street and then along South Broadway. At WWTP No. 1, the influent sewers are 30-inches and 18-inches in diameter respectively. As the larger sewer extends upstream within the sewershed, it downsizes to a 27-inch sewer and then to a 24-inch diameter sewer within the same general area. The 18-inch sewer sizes down to a 15-inch line, the a 12-inch line and then to a 10-inch line. Once the twin interceptor sewers reach the general vicinity of South Broadway at Clayton Avenue, the two sewers become three smaller interceptor sewers. One follows Louis B. Nunn Drive south; one follows Clayton Avenue and then Jackson Street east; one follows Pawnee Trail south. South of Pocahontas Trail and South Broadway, all sewage collected has to be pumped over a ridge and into the gravity interceptor sewer network previously described.

Because of significant urbanization on the east side of Georgetown east of North Elkhorn Creek and the Paris Road (US 460), a large diameter interceptor sewer—21-inches in diameter for most of its length—follows North Elkhorn Creek from a point east of I-75 downstream to a major sewage pumping station (known as Northeast Pumping Station No. 9) located on the creek's east bank some 0.7 mile downstream of the De Garis Mill Dam. From this point, collected sewage is pumped downstream with the creek directly to WWTP No. 1. For the most part, sewage from developing subdivisions north and west of the city's Wastewater Treatment Plant No. 1 is delivered directly to the treatment plant by pumping. The number of sewage pumping stations fluctuates both up and down on a regular basis.

Pumping station problems have been attributed to growth within particular sub-drainage basin and to the old age of some of the pumping stations. The major sewage pumping station (No. 2) on Georgetown's near west side (at US 460 west of Kentucky Avenue) has reached its capacity and is in need of upgrading.

Georgetown utility personnel have an ongoing manhole inspection program and they clean sewers on a regular basis. All sewage pumping stations have meters on the pump motors to record the numbers of hours of daily operation. As a result, an estimated daily pumpage volume can be determined for each pumping station. Georgetown does not presently own television inspection equipment with which to visually probe the interior of its sewer lines for defects or other problems.

Sewer service is thought to be available to all urbanized areas within the corporate limits. Georgetown has no outside city sewer customers with the exception of the KYDOT Rest Area on I-75 north of the city. The Department of Transportation, however, pumps its Rest Area sewage directly to WWTP No. 1. There are a few areas within the city in which *private sewers* were constructed over the years. One of the significant areas is the Robinson Avenue area—almost immediately southeast of WWTP No. 1. The responsibility for the repair or replacement of those aged privately constructed sewers—invariably inferior to sewers constructed to Georgetown's present standards—will likely fall to the Georgetown Municipal Water and Sewer Service.

Potential bottlenecks in the existing system of sewers include the following:

1. the 12-inch diameter gravity sewer that extends north from Pocahontas Trail to US 25's intersection with Clayton Avenue
2. the 27-inch diameter gravity diameter line along Water Street in the vicinity of Main Street
3. the 8-inch diameter gravity sewer which receives pumped flow from the new WalMart on Georgetown's South side.

In addition, four of the sewage pumping stations have been identified as the old wet pit/dry pit stations which means the pumps are deep underground and present a safety hazard.

Pumping Station No. 2 located near Frankfort Road west of Kentucky Avenue is more than 25 years old and is operating at or beyond its design capacity.

Infiltration has been determined to be non-excessive on a system-wide basis. Nevertheless, some isolated I/I problems have been identified. Known I/I problems were identified in the 1997 Wastewater Facilities Plan to be located in sewers which are located as follows:

1. Mt. Vernon and Bunker Hill Court to Lemons Mill Road
2. Arapaho Trail from Cherokee Trail to Highland Court
3. Mohave Trail from Cherokee Trail to the intersection with Pueblo Trail
4. Pueblo Trail from Shoshoni Trail past Iroquois Trail and Clinton Street from Montgomery Avenue to Lexington Avenue.

Growth of the city, and therefore its sanitary sewer system as well, is expected in almost every direction from the city center. Since urbanization has already virtually exhausted all land within the sewershed south of Wastewater Treatment Plant No. 1, it is expected that sewage from future developing areas will either be pumped directly to the WWTP or will be pumped over a natural drainage divide and into the existing interceptor sewer network for ultimate conveyance by those existing sewers to the treatment plant. In the last four years, the GMWSS Board has committed the utility to accept the sewage from 3,131 future dwelling units. Some of these dwellings are already built and occupied. Other developments will be years in reaching full urbanization. Nevertheless, Georgetown's agreement to provide sewer service to more than 3,000 additional dwellings is no small commitment.

Georgetown owns and operates two wastewater treatment plants. As previously stated, the larger treatment plant which serves all of the sewered community with the exception of Toyota Motor Manufacturing is located on Georgetown's near north side on either side of North Elkhorn Creek just west of the US 25 bridge crossing of that creek. This facility is known as Wastewater Treatment Plant No. 1. The city's second wastewater treatment plant is known as WWTP No. 2. Presently serving Toyota alone, WWTP No. 2 is located in a triangular site bounded by Delaplain Road (on the north), Cherry Blossom Way (on the west), and Barkley Lane (on the southeast). A 36-inch diameter 4.5 mile-long outfall sewer line conveys treated effluent from WWTP No. 2 southward along Lanes Run to a discharge point at mile point 0.55 of Lanes Run. Treated effluent is finally released to Lane's Run near the US 460 bridge across that stream. Lanes Run is a tributary of North Elkhorn Creek.

At WWTP No. 1, treatment components include screening, grit removal, oxidation ditch, rotating biological contactors (RBC's), final clarification, sand filtration, chlorine disinfection, dechlorination, and postaeration and ultimate discharge at mile point 0.05 of Royal Springs Branch, a tributary of North Elkhorn Creek. Sludge processes include thickening, digestion, dewatering by a belt filter press and ultimate disposal in a contained landfill in Franklin County.

Wastewater Treatment Plant No. 1's performance in 1995, 1996, and 1997 compared very favorably to the limits established by the city's state-issued wastewater plant discharge permit (KPDES). Results of laboratory analyses of the treatment plant effluent during the period of the past three years are compared to the city's effluent limits as follows:

Parameter	KPDES Limits	Average Annual Value		
		1995	1996	1997
Dissolved Oxygen	7 mg/l minimum	8.5 mg/l	9.3 mg/l	8.6 mg/l
Total Suspended Solids	30 mg/l maximum	1.7 mg/l	2.9 mg/l	1.7 mg/l
Ammonia – Summer	2 mg/l maximum	0.22 mg/l	0.84 mg/l	0.10 mg/l
Ammonia – Winter	5 mg/l maximum	0.50 mg/l	0.56 mg/l	0.60 mg/l
Coliform	200/100 ml maximum	34/100 ml	53/100 ml	53/100 ml
BOD	10 mg/l maximum	1.7 mg/l	1.5 mg/l	1.5 mg/l
Flow	4.50 MGD	2.349 MGD	2.610 MGD	2.996 MGD

Due to a deterioration of a number of the original RBC units, the effective biological capacity of the plant is less than its design rating of 4.5 MGD. According to the PDR Engineers 1997 Regional Facilities Plan Update, the actual design capacity of WWTP No. 1 is only slightly greater than the design capacity of the oxidation ditch component of the plant—or approximately 3.2 MGD. In effect then, the treatment plant operated at about 90 percent of its effective capacity in 1997.

WWTP No. 1 was designed to carry a peak hydraulic flow of 9.0 MGD without bypassing. During extremely wet weather, WWTP No. 1 has seen peak instantaneous flows as great as 6

to 7 MGD. Georgetown is charged with the responsibility of biomonitoring its effluent. As a result of biomonitoring results, GMWSS was required to develop a Toxicity Reduction Evaluation (TRE) for this treatment plant. The utility has passed its quarterly biomonitoring tests for more than eight consecutive quarters and has been released from the continued responsibility of additional TRE work.

Georgetown’s WWTP No. 2 is a state-of-the-art facility and was oversized because of what turned out to be somewhat high projections of Toyota’s water usage and hence its wastewater flows. WWTP No. 2 is operating at less than 45 percent of its rated capacity. The Toyota automobile assembly plant itself operates on what is basically a two shifts per day, five days per week basis. A flow equalization basin on site at Toyota is intended to allow the automobile assembly plant to contain its wastewater and release it to the Georgetown wastewater treatment plant at a somewhat constant flow rate.

Treatment processes include screening, oxidation ditch, final clarification, sand filtration, carbon absorption (which is not presently in use), ozone disinfection, and aeration. The treatment arrangement provides 100 percent redundancy. Sludge is processed by thickening, mechanical dewatering by use of a belt filter press, and ultimate disposal in a contained landfill in Franklin County.

Wastewater Treatment Plant No. 2’s performance in 1995, 1996, and 1997 also compared favorably to the limits established by Georgetown’s state-issued wastewater treatment plant discharge permit (KPDES). Results of laboratory analyses of the treatment plant effluent for the past three years are compared to the city’s effluent limits as follows:

Parameter	KPDES Limits	Average Annual Value		
		1995	1996	1997
Dissolved Oxygen*	7 mg/l minimum	7.8 mg/l	7.9 mg/l	8.2 mg/l
Total Suspended Solids	30 mg/l maximum	1.9 mg/l	1.8 mg/l	1.9 mg/l
Ammonia – Summer	1 mg/l maximum	0.08 mg/l	0.13 mg/l	0.10 mg/l
Ammonia – Winter	4 mg/l maximum	0.45 mg/l	0.05 mg/l	0.16 mg/l
Coliform	200/100 ml	69/100 ml	35/100 ml	121/100 ml

	maximum			
BOD**	5 mg/l maximum	3.0 mg/l	3.5 mg/l	3.2 mg/l
Flow	2.2 MGD	0.836 MGD	0.903 MGD	1.061 MGD

*\*one permit exceedence in July, 1995*

*\*\*one monthly exceedence in BOD limit in 1997*

Utility personnel indicate their belief that WWTP No. 2 could possibly be re-rated at a flow rate as high as 4.0 MGD with only minor modifications.

Georgetown also conducts biomonitoring at its WWTP No. 2. A TRE was prepared for this wastewater treatment plant as well. The plant has received satisfactory results on most of its recent biomonitoring analyses. Attempts have continued to demonstrate a consistent pattern of successful biomonitoring tests. GMWSS is operating under an Agreed Order with the Kentucky Division of Water with respect to biomonitoring test results at WWTP No. 2. The conclusion at this point is that trace amounts of nickel have been causing periodic toxicity. Georgetown was recently notified by the KY Division of Water that WWTP No. 2 was officially released from the TRE Program due to compliance with the chronic biomonitoring test.

System-wide, the Georgetown sewer utility has a pre-treatment ordinance as do most cities of Georgetown's size. Local sewer customers who operate on-site pretreatment facilities before discharge of their wastewaters to the municipal sewer include Toyota Motor Manufacturing, Superior Coatings, International Crankshaft, Electroshield Plating, Columbia Hospital, and Western Pacific Storage.

The Georgetown Municipal Water and Sewer Service employs 11 wastewater treatment plant operators. Of the six operators employed at WWTP No. 1, four are Class-III and two are unclassified. Of the five employed at WWTP No. 2, four hold a Class IV certification and one holds a Class IV certification.

Since April 1997, sewer rates in effect have been these:

First 2,000 gallons per month \$6.95 minimum  
 All over 2,000 gallons 4.96/1,000 gallons

The tap fee for connection to the wastewater system is \$400.



Gross revenues derived from the sale of sewer service in Fiscal Year 1997 were \$2,578,000. Maintenance and operating costs exclusive of depreciation were \$2,444,000. Net sewer revenues before debt service were \$134,000.

Within the 20-year planning period, the three centers of sanitary sewer service are expected to continue to be contained in Scott County's three municipalities—Georgetown, Stamping Ground, and Sadieville. Georgetown, the county seat and largest city, should continue to serve in the role of the growth center for Scott County.

Georgetown has a distinct advantage by having a 1997 revision to its *Regional Wastewater Facilities Plan*. In that Plan, neither of the two municipal wastewater treatment plants were judged to be adequate on an as is basis through the 20-year planning period. Based upon assumptions and calculations contained in Georgetown's *Regional Facilities Plan Update*, average daily and peak daily flows projected to be treated by the two municipal wastewater treatment plants at the end of the 20-year planning period are these:

<u>WWTP No. 1</u>		<u>WWTP No. 2</u>	
Average Daily Flow in MGD	Peak Daily Flow in MGD	Average Daily Flow in MGD	Peak Daily Flow in MGD
3.49	10.12	2.36	4.06

**Proposed Projects 2000-2005**  
**SX21209001**

1. For WWTP No. 1, proposed for the period of the Immediate Plan are the following:
  - a. the installation of ditch aerators and the subsequent elimination of all rotating biological contactors (RBC's).
  - b. the installation of additional belt filter presses for sludge dewatering. The existing belt filter presses would be retained as back-up units.
  - c. additional less expensive improvements.
2. As the deteriorating RBC treatment units are replaced with additional oxidation ditch capacity, the actual capacity of WWTP No. 1 can easily be returned to 4.5 MGD. According to the *1997 Regional Facilities Plan Update*, the estimated project cost of recommended improvements is \$735,000.
3. For WWTP No. 2, the list of recommended improvements is somewhat more substantial. Proposed for the Immediate planning period are the following:
  - a. the redirection of the Sewage Pumping Station No. 9 discharge line so that sewage collected there will go to WWTP No. 2 rather than to its present destination, Plant No. 1. This change would effectively redirect all sewage collected east

of the Norfolk Southern Railway and north and east of North Elkhorn Creek to WWTP No. 2. This includes large commercial areas on both sides of I-75. WWTP No. 2 needs the additional nutrients that can be afforded by the introduction of more sanitary sewage into what today is basically an industrial waste treatment facility. WWTP No. 1 would benefit by having its hydraulic and organic load reduced. This redirection of wastewater at Pumping Station No. 9 would support future regionalization of WWTP No. 2. A new 8-inch force main would connect Pumping Station No. 9 with WWTP No. 2.

- b. replacement of the troublesome WWTP No. 2 ozonation disinfection system with an ultra-violet (UV) disinfection system.
  - c. screening sulfuric acid system, thickener effluent pumps replacement, new ditch influent mixer, and new drain pumping station discharge.
  - d. modification to oxidation ditch aerators
  - e. other less significant improvements.
4. The estimated cost of these Immediate Plan improvements as outlined in the 1997 Regional Facilities Plan Update is \$2.0 million.
  5. Larger projected capital expenses for the Georgetown sewerage system do not relate to treatment plant improvements. Rather, it is a long list of sewer system projects that will be so costly to the community's sewer rate payers. The PDR Engineers' 1997 *Regional Wastewater Facilities Plan Update* identified the following Immediate Plan sewer projects:
    - a. upgrade of Pumping Station No. 2
    - b. Relocation of Hambrick Place sewage pumping station thereby eliminating two existing stations (no. 22 and No. 4). The new pumping station would accept sewage from Phase I and II of Hambrick Place Subdivision, a portion of Indian Acres Subdivision and Lancaster Heights Subdivision. This new pumping station would have a peak capacity of 1.3 MGD and would also involve the installation of almost three miles of 12-inch diameter force main all the way to WWTP No. 1
    - c. Robinson Avenue Sewer Replacement. This project involves the installation of approximately 4,200 linear feet of gravity sewer lines together with 6,000 feet of service laterals to replace a deficient, aged, privately constructed system of sewer that should have been replaced long ago
    - d. A continuation of the city's active sewer system rehabilitation program

The total 1997 estimated cost of projects recommended for implementation during the Immediate Plan is \$2.3 million.

**Proposed Projects 2006-2020**  
**SX21209002**

1. During the first part of the period of the Long Term Plan, additional improvements are proposed for WWTP No. 1. Proposed are:

- a. the installation of still more belt filter presses for sludge dewatering. The existing belt filter presses would then be retired
  - b. the conversion of two anaerobic digesters to aerobic units
  - c. additional less expensive improvements
2. According to the 1997 Regional Facilities Plan Update, the estimated project cost of these recommended improvements is \$760,000.
- \*WWTP No. 2's redundant oxidation ditch and secondary clarifier would also be put in service to provide additional needed capacity. With both existing oxidation ditch systems in service, the treatment plant should have more than enough capacity for the needs of the 20-year planning period. Treatment capacity at WWTP No. 2 would become 4.0 MGD for average flow conditions. At the same time, WWTP No. 2 would be capable of accepting 6.0 MGD at peak flow conditions.
3. During the Long Term Plan, the modification of Pumping Station No. 9 is proposed at an additional estimated cost of \$115,000.
4. During the Long Term Plan period, the list of proposed sewer system projects grows even longer. Proposed are the following:
- a. Mt. Vernon gravity sewer replacement
  - b. Whitaker gravity sewer to Pumping Station No. 9
  - c. Interceptor sewer and pumping station for the New Stadium Complex and for Lemons Mill Road development
  - d. Ford Bradley Farm interceptor sewer and pumping station
  - e. Conversion of the remaining dry pit pumping stations to submersible pumping stations
  - f. Derby Estates gravity sewer and McCracken Creek pumping station
  - g. Lower Lane Run pumping station
  - h. A 15-inch gravity interceptor sewer along Lane's Run from the end of the existing interceptor near the US 460 bridge north to Cherry Blossom Way
  - i. Continuation of Georgetown's program of sewer rehabilitation

The 1997 estimated project cost to implement sewer projects proposed for the Long Term Plan is \$7.9 million. Sewer line extensions will serve approximately 1 household, but will benefit the entire system through the subsequent system improvement.

#### CITY OF STAMPING GROUND SANITARY SEWER SYSTEM

When the original Water and Sewer Plan was prepared for Scott County in 1973, Stamping Ground was one of eight municipalities located in whole or in part within the Bluegrass Area Development District which had no system of sanitary sewers and sewage treatment plant. The tornado of April, 1974 did more than level much of Stamping Ground. The tornado also generated much willingness at the state and federal levels to help this tornado-

devastated community. Stamping Ground’s wastewater planning efforts were accelerated. As a result, Stamping Ground became the Bluegrass Region’s first municipality to experience sanitary sewer and wastewater treatment plant construction as a result of the landmark Federal Clean Water Act, Public Law 92-500. Stamping Ground received a sanitary sewerage system in the late 1970’s, complete and in place, with virtually no debt service. Most of the terrain of the city drains northwestward with Locust Fork Creek. The primary city pumping station, immediately west of Switzer Road’s intersection with KY 227, lifts all of the community’s sewage into the municipal wastewater treatment plant. Stamping Ground is 100 percent sewerred.

The wastewater treatment plant is located on the north side of KY 227 on the city’s northwest side and within easy sight of Main Street (KY 227). In mid-1997, the treatment plant was down rated from a previous capacity of 100,000 gallons per day to a new and lower value of 75,000 gallons per day. The treatment plant is of the rotating biological contactor-type (RBC). The contactors are housed in a building . The treatment plant, without a primary clarifier, has a secondary clarifier, a chlorinator, and sludge drying beds. Treated effluent is dechlorinated by sulfur dioxide before it is discharged to Locust Fork Creek. There is one state certified wastewater treatment plant operator, who holds a Class-II certification.

Treatment plant performance in 1995, 1996, and 1997 must be considered to be variable when compared to the limits established by the city’s wastewater treatment plant discharge permit as several permit exceedences occurred during the year. In April of 1997, the Stamping Ground sewage treatment plant failed. As a result, the following permit exceedences occurred: eight months of the dissolved oxygen limit, two months of the suspended solids limit, two months of the Summer and the Winter ammonia limits, and six months of the BOD limit. The plant was repaired and restored at a lower capacity.

Laboratory results of the treatment plant effluent for the past three years as compared to the city’s effluent limits are as follows:

Parameter	KPDES Limits	Average Annual Value		
		1995	1996	1997
Dissolved Oxygen <sup>1</sup>	7 mg/l minimum	7.4 m/l	7.3 m/l	6.7 mg/l

Total Suspended Solids	30 mg/1 maximum	14 mg/1	15.2 mg/1	19.6 mg/1
Ammonia - Summer	4 mg/1 maximum	1.5 mg/1	1.4 mg/1	6.97 mg/1
Ammonia - Winter	10 mg/1 maximum	1.6 mg/1	2.1 mg/1	5.96 mg/1
Coliform <sup>2,4</sup>	200/100 ml maximum	47/100 ml	126/100 ml	49/100 ml
BOD	15 mg/1 maximum	9 mg/1	9.5 mg/1	28 mg/1
Flow <sup>3</sup>	0.100 MGD <sup>5</sup>	0.072 MGD	0.075 MGD	0.050 MGD

<sup>1</sup>Exceedences noted in July and December, 1995

<sup>2</sup>Exceedences noted in September, 1995

<sup>3</sup>Recorded flow figures vary over a range greater than 3.7 from low month to high month in 1995

<sup>4</sup>Exceedences noted in January, 1996

<sup>5</sup>Until downrated in 1997 to 0.075 MGD

According to the plant operator, no sewage is bypassed at any sewage pumping station or at the wastewater treatment plant. The city's operator is not yet state-certified but is preparing for his examination. No customer is required to pretreat his sewage. The city is not required to conduct biomonitoring tests. Dried sludge is transported by contract hauler to a privately operated landfill in Franklin County.

While there are no sewer service voids within the city, several different housing development proposals are under consideration. One is at the dead-end of Springview Street and a second is north on Sebree Road beyond the present end of the corporate limits.

Sewer rates in effect since June, 1996 are these:

First 1,000 gallons per month \$4.00 minimum  
All over 1,000 gallons \$4.00 per 1,000 gallons

Tap fee for connection to the sewer system is \$400.

Pertinent data on the financial operation of the sewer utility for fiscal year 1997 are as follows:

Gross Revenues from Sewer Charges	\$54,000
Operating and Maintenance Costs	\$41,500
Net Sewer Revenues	\$12,500

No sewer system long term debt service payment was reported.

Stamping Ground's 19 year-old wastewater treatment plant failed in April, 1997 when a shaft of the single train of rotating biological contactors broke. With the significant efforts of many, emergency repairs were accomplished and the treatment plant was returned to full service in a matter of weeks. The rated treatment capacity of 100,000 gallons per day was diminished by approximately one-fourth in the repair process to a new and lower capacity of 75,000 gallons per day. The treatment plant failure precipitated an update of Stamping Ground's Regional Wastewater Facilities Plan which was completed in July, 1997. The Plan Update has subsequently been approved by the Kentucky Division of Water. That portion of the Scott County Sewer Plan which follows is a summarized account of Stamping Ground's 1997 Facilities Plan Update as amended.

**Proposed Projects 2000-2005**  
**SX21209003**

1. Infiltration was determined to be non-excessive as compared with EPA guidance documents. Inflow on the other hand was determined to be excessive. The source of the inflow appears to be isolated within a single sector of the 25,000 linear foot sewer collection system. That area—in the vicinity of the former distillery—is to be targeted for more detailed studies. Corrective measures will be required. An estimate of \$70,000 is suggested for remediation of the excessive inflow during the Immediate planning period.
2. Proposed for Stamping Ground's wastewater treatment plant is a replacement of most wastewater treatment plant components within the immediate planning period. Because rotating biological contactor type treatment is considered by the Kentucky Division of Water to be failed technology, because the existing treatment plant's capacity was downrated to 75,000 gallons per day, and because the average daily flow to the plant has approached the facility's new and lower rated capacity, a new and larger wastewater treatment plant has been proposed. The new plant, proposed to be an oxidation ditch type treatment facility with a rated 24-hour capacity of 140,000 gallons would be constructed within the existing treatment plant site at an estimated project cost of \$1,000,000.

More specifically, proposed in the 1997 Facilities Plan Update are the following:

- a. Replacement of the existing influent pumping station with a new chopper pumping station with two variable speed centrifugal submersible chopper pumps having a capacity in excess of 0.35 MGD. These chopper pumps would eliminate the need for a grinder
- b. Replacement of the rotating biological contactor train with a dual oxidation ditch aeration system with clarifiers and aerobic digesters designed for an average daily flow of 0.14 MGD and a peak flow of 0.35 MGD

- c. Replacement of the existing chlorination/dechlorination disinfection system with an ultraviolet light disinfection system having a peak capacity of 0.42 MGD

\*Discharge of the treated effluent would continue to be to the same point on Locust Fork Creek. No additional recommendations are made for the Long Term Plan period.

### **Proposed Projects 2006-2020**

#### **SX21209004**

1. The present sewer system is deemed to be adequate to serve existing customers as well as planned and platted *close-in* subdivisions. Sewage from four of five possible subdivisions can be served by gravity connections from future developer-installed sewer extensions. The future developments of an area east of the existing corporate limits on KY 227 will require a new sewage pumping station and force main. That effort, with its project cost estimate of \$150,000, is targeted for the Long Term planning period.

#### **CITY OF SADIEVILLE SANITARY SEWER SYSTEM**

Sadieville was able to obtain its municipal sewer system through the alternative/innovative technology set-aside grant program that was available through the US Environmental Protection Agency in the 1980's. Sadieville's sewage collection and treatment system was installed in 1984-1985. Sadieville's sewer system is a small diameter gravity system.

Gravity sewers are 4-inches in diameter with manholes spaced at extraordinarily long intervals. Each sewer customer (or in some cases, a cluster of customers) has a septic tank installed to retain solids. The wastewater portion that overflowed from the individual septic tanks to the small diameter gravity system then was supposed to have a low solids content. The expansion potential capability of such a sewer system is understandably very limited. Sadieville had 103 sewer customers in 1997.

Until late 1994, the alternative technology sewage treatment plant consisted of an underground sand filtration system with a discharge to Eagle Creek. The treatment plant was sized to accommodate only 33,400 gallons per day because of the small sewage flows expected. Through some flaw, sewage flows coming out of the small underground filtration treatment plant were slight or non-existent. The U.S. Environmental Protection Agency concluded that sewage was being lost underground and that the sewage quantity that eventually came out of the treatment plant was far less than the sewage quantity that entered it. Eventually, EPA ruled that the water quality purposes of its grant were not being

met and the agency demanded return of its grant money. The city returned no grant money. In September, 1998, EPA ruled that it would no longer try to seek repayment of the grant it had earlier made to Sadieville. There is one state wastewater treatment plant operator, who holds a Class-I certification.

Sadieville, working with its consulting engineer, sought to resolve the problem by bringing in and installing (adjacent to the underground sewage filtration system) a 33,400 GPD above ground extended aeration plant. That plant was installed and activated at year's end in 1994. The plant is presently functional. During most of 1995, the flow measuring device at the newly installed extended aeration treatment plant was found to be in error. Finally, near the end of 1995, reliable flow figures were obtained. Flow figures for 1996 and 1997 are these:

Year	Average Daily Flow	Maximum Day Flow
1996	10,700 gallons	26,400 gallons
1997	10,400 gallons	25,700 gallons

Laboratory results of the treatment plant effluent in 1996 and 1997 as compared to the city's effluent limits are as follows:

**Average Annual Value**

Parameter	KPDES Limits	1996	1997
Dissolved Oxygen	7 mg/l minimum	8.8 m/l	8.6 m/l
Total Suspended Solids	30 mg/l maximum	7.3 mg/l	7.5 mg/l
Ammonia - Summer	2 mg/l maximum	0.6 mg/l	0.47 mg/l
Ammonia - Winter	10 mg/l maximum	0.4 mg/l	0.57 mg/l
Coliform	200/100 ml maximum	6 mg/l	13 mg/l
BOD	10 mg/l maximum	3 mg/l	3.2 mg/l
Flow	0.034 MGD	.011 MGD	.010 MGD

Effective in July 1997, the city sewer user ordinance called for rates to be \$3.45 per 100 cubic feet with a \$9.20 per month minimum bill for 300 cubic feet or less of water use. The Kentucky-American Water Company collects the city's sewer service charge as a part of its individual customer water bills. The city's sewer rate ordinance specifies that the water company will suspend water service for non-payment of the city sewer bill.

There is a fee of \$250 for connection to the sewer system.



Pertinent data on the financial operation of the sewer utility for fiscal year 1997 are as follows:

Gross Revenues from Sewer Charges \$10,000  
Operating and Maintenance Costs \$18,000  
Net Sewer Revenues \$(8,000)

The city's debt service in 1997 was approximately \$3,000 in principal and interest. Sewer revenues are expected to increase somewhat with the advent of sewer billing by Kentucky-American.

Metered flows at Sadieville's aboveground package wastewater treatment plant suggest that the treatment plant adequacy—at least from a hydraulic and organic loading viewpoint—seems assured for some time.

If and as significant growth occurs in Sadieville, the system of small diameter gravity sewers (with each existing customer having or sharing a septic tank for solids retention) will almost certainly present a problem. The amount of additional wastewater (from new customers in new subdivisions) that the existing system of small diameter gravity sewers can satisfactorily accommodate is definitely limited. What this means is that new sewage from new customers will almost certainly have to be delivered directly to the wastewater treatment plant without benefit of the system of existing small diameter gravity sewers. Whether or not the city wishes to continue its system of on-site septic tanks for the purpose of keeping solids out of the central treatment system—that thought process may have to be reconsidered. With the revised treatment system involving a standard extended aeration wastewater treatment unit, the city may find it more advantageous to allow—or even encourage—more of the solids enter the treatment process to provide food for the microorganisms which actually enable the treatment. If it is concluded that the presence of additional solids in the treatment process is actually beneficial, the city may elect to require that additional sewers to the treatment plant be of the conventional type that would deliver for treatment both the liquid and the solids fraction of the wastewater. This could involve the installation of either a new 8-inch minimum diameter gravity sewer as a conveyance mechanism or a pumping station and force main to accomplish the same purpose.

**Proposed Projects 2006-2020**

**SX21209005**

1. While the hydraulic conversion mentioned above is unlikely to occur during the period of the Immediate Plan, it is suggested as a part of the Long Term Plan. A 1997 project cost estimate would be \$400,000. Sewer line extensions will serve approximately 2 households, but the entire system will be improved by the extensions.

\*With the existing wastewater treatment system as underloaded hydraulically as it presently is, no improvements/expansion of the package treatment plant appear to be required for the full 20-year planning period.

**ON-SITE TREATMENT SYSTEMS**

**SI21209001**

This area consists of rural Scott County beyond the service areas of the sanitary sewer systems of the Cities of Georgetown, Stamping Ground, and Sadieville. It is unlikely that public sewer line extensions will reach this area of Scott County by 2020. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. Reasons for the high cost are the number of households (5,650), a low customer per mile ratio, rugged terrain, and the long distance from these houses to treatment facilities and existing sewer systems. Suggested instead is that a Revolving Loan Fund Program be established or that the U.S. Army Corps of Engineers 531 program be extended for the installation of a septic tank for each house that does not presently have sanitary sewer service, or could currently have a failing septic system. The generalized proposed cost of this option is \$28,250,000 or \$5,000 per household.

## WOODFORD COUNTY

### Woodford County Sewer Service (map)

- Estimated 1999 population of 22,700--45% on public sewer
- Estimated 2020 population of 27,000--45% on public sewer
- Proposed projects would add over 80 new households to public sewer service during 2000-2020
- Estimated funding needs for public sewer 2000-2005--\$5,810,000
- Estimated funding needs for public sewer 2006-2020--\$6,010,000

Woodford County had an estimated population of 22,715 (9,082 households) in 1999 with a projected population of 26,989 (11,651 households) in 2020. Public sewer is provided to about 45 percent of the county's residents. About 5,000 households treat wastewater on site. Over 80 new customers could be added to public sewer service through new line extensions in 2000-2020.

### WOODFORD COUNTY SEWER PLAN

#### *Proposed Projects 2000-2005*

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
<b>Woodford</b>							
Versailles /SX21239001	52	460	750	200			1,410
Midway /SX21239003	pot	140	262		4,000		4,402
<b>County Total</b>	52 + pot	600	1,012	200	4,000		5,812

#### *Proposed Projects 2006-2020*

System/Project ID	New Customers Served	Cost (\$1000)	Line Upgrade (\$1000)	Treatment Expansion (\$1000)	New Treatment (\$1000)	Lift Stations, and other (\$1000)	Total Costs (\$1000)
<b>Woodford</b>							-
Versailles SX21239002	20	300	1,400	3,900			5,600
Midway SX21239004			112	300			412
<b>County Total</b>	20	300	1,512	4,200	-	-	6,012

#### CITY OF VERSAILLES SANITARY SEWER SYSTEM

While, just as in 1973, no up-to-date sewer map was available from any source, this plan represents a compilation of the best available information. The principal 24-inch diameter interceptor sewer runs from the westside sewage treatment plant as the sewer extends upstream with Glenss Creek to a point near Big Springs Park where the interceptor sewer splits into two branches. The larger of these two interceptors continues eastward with Depot

# SEWER SERVICE AREAS WOODFORD COUNTY Kentucky

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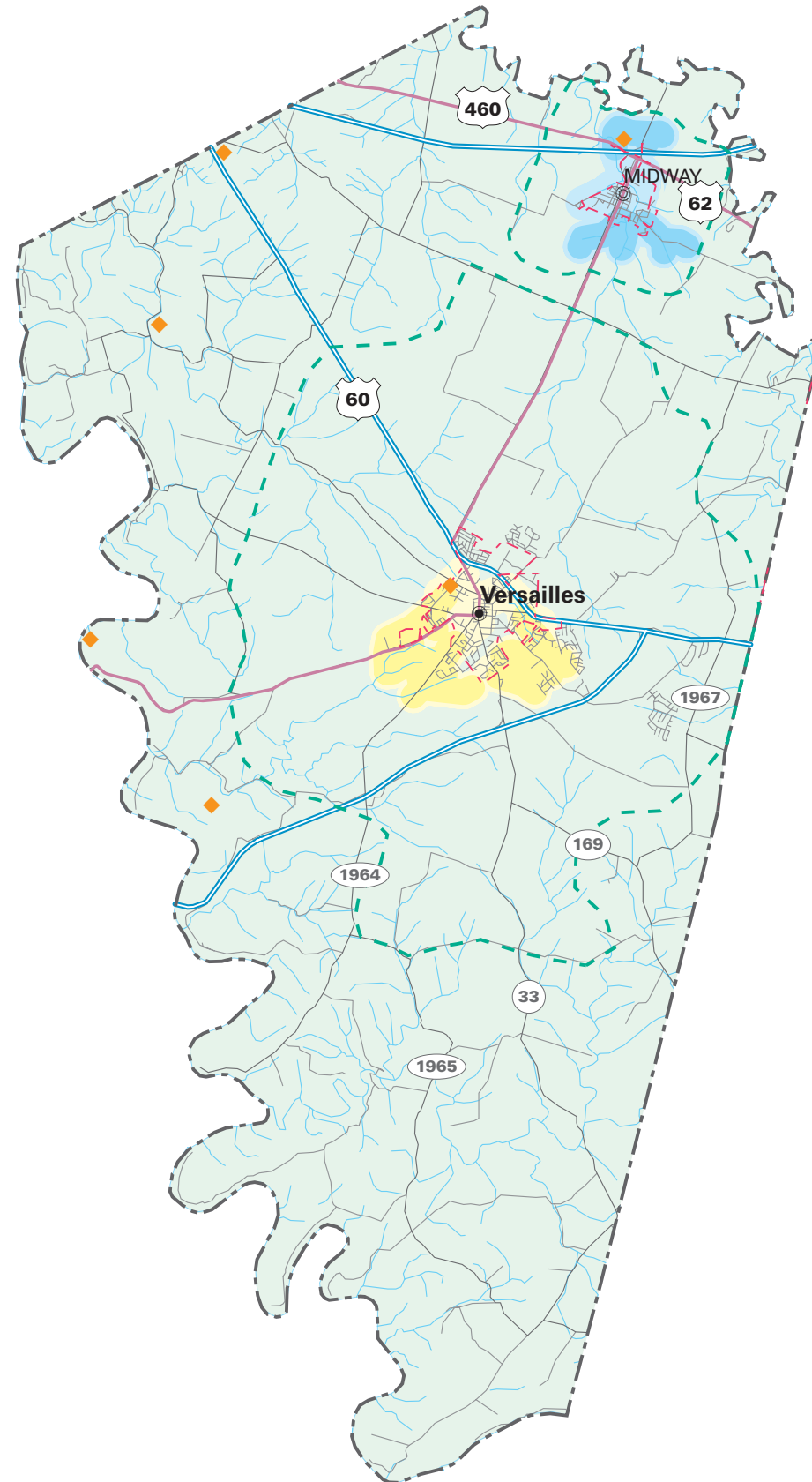
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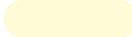
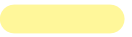
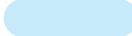





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-  201k Facility Planning Area
-  Incorporated City Boundary
-  Sewage Treatment Plant



## SEWER SERVICE STATUS BY OWNER

EXISTING SERVICE AREA	PROPOSED SERVICE AREA	OWNER
		VERSAILLES MUNICIPAL SEWER
		MIDWAY MUNICIPAL SEWER
		FAYETTE URBAN COUNTY GOVERNMENT

Street and Douglas Street to the Bypass and then with the Bypass to Lexington Road and McDavid Drive. As this primary interceptor sewer extends upstream, it continuously downsizes—from a 24-inch diameter sewer to a 21-inch sewer, then to an 18-inch sewer, and finally to a 15-inch sewer at McDavid Drive.

A significant branch interceptor extends south from the 24-inch interceptor beginning at a point less than one half mile from the wastewater treatment plant and finally continues as a 12-inch diameter sewer generally parallel to but south of High Street. This 12-inch diameter sewer ends at the intersection of High Street and Highland Avenue. Also a part of the interceptor sewer system is a 12-inch diameter line that extends from the wastewater treatment plant northeast with Kentucky Avenue and Camden Avenue to the Woodford County High School. The basic sewer network is a separate one and has served to accommodate the infill and suburban growth that has occurred since the *Woodford County Water and Sewer Plan* was first developed in 1973.

There are 24 sewage pumping stations. According to utility personnel, the Merewood pumping station may have to be replaced and upgraded because of current problems with inflow and infiltration. The direction of much of the growth in the sewer system has been southward and northeastward. The large number of sewage pumping stations in the sewer system is indicative of an interceptor sewer system that has not been extensively developed. As recent subdivisions or other urban areas have been developed, many have required the installation of a sewage pumping station at the low point and a force main back to a nearby sanitary sewer. This type of incremental sewer system development can result in situations in which sewage is pumped and re-pumped. Eventually, such situations give rise to questions of sewer line conveyance capacity. An extraordinarily high number of pumping stations for the city's size also can result in operation and maintenance costs that exceed the norm.

The City has not been aggressive in its annexation policies as subdivision growth has occurred both inside and outside the city with municipal sewer service availability. Inflow and infiltration are reported to be serious problems in the Versailles sewer system just as they are in most sewer systems across Kentucky. Older sewers seem to be the most seriously affected. Sewage flows rise markedly following heavy rainfall and as a result of prolonged wet

weather periods. As of mid-1998, Versailles utility personnel reported 5,000 connections to the city sewer system.

Versailles has two state-certified wastewater treatment plant operators who hold Class IV and a Class III certificates, respectively. The city does have a pre-treatment ordinance and a number of industries are required to pretreat their wastewaters before discharge to the city sewer. Pretreating industries include Osram-Sylvania (at two locations), World Color, United LN, YA America, Kuhlman, and Texas Instruments. These industries are required to self-monitor their pre-treatment effectiveness, but the city does occasionally double-check the industrial self-monitoring efforts.

Versailles sewage treatment plant was expanded and upgraded in 1991-92. The oxidation ditch-type treatment plant consists of the following components: influent odor control, influent screening, oxidation ditches, final clarification, return waste activated sludge, scum pumping, post-aeration, flow measurement, sludge thickening, diffused aeration sludge storage, three lagoons, chlorination and dechlorination.

The treatment plant has a rated capacity of 3.0 million gallons per day (MGD) and a hydraulic maximum capacity of 9.0 MGD. The average daily flow during 1995 was 2.01 million gallons, 2.22 MGD in 1996, and 2.307 MGD in 1997.

Treatment plant performance in 1995, 1996, and 1997 compared very favorably to the limits established by the city's state-issued wastewater treatment plant discharge permit. In 1997, the treatment plant had one monthly exceedence of the summer ammonia limit. Laboratory results of the treatment plant effluent for these three years as compared to the city's effluent limits are as follows:

Parameter	KPDES Limits	Average Annual Value		
		1995	1996	1997
Dissolved Oxygen	7 mg/l minimum	7.6 mg/l	7.6 mg/l	7.2 mg/l
Total Suspended Solids	30 mg/l maximum	3.5 mg/l	3.2 mg/l	2.8 mg/l
Ammonia – Summer	4 mg/l maximum	0.12 mg/l	0.43 mg/l	1.62 mg/l
Ammonia –	10 mg/l	0.57 mg/l	0.73 mg/l	1.56 mg/l

Winter	maximum			
Coliform	200/100 ml maximum	33/100 ml	36/100 ml	21/100 ml
BOD	20 mg/l maximum	3.2 mg/l	2.5 mg/l	2.6 mg/l
Flow	3.0 MGD	2.01 MGD	2.22 MGD	2.307 MGD

Accordingly, it is concluded that Versailles is consistently meeting the terms of its KPDES permit. The city is not involved in enforcement proceedings with the Kentucky Division of Water.

Treatment plant effluent is chlorinated for disinfection purposes and is then dechlorinated prior to its discharge to Glenss Creek. Sludge is landfarmed by the city on land that is municipally owned. The landfarming site is adjacent to the treatment plant. The city is not experiencing problems with its current sludge disposal method.

Sewer rates currently in effect are these:

Inside City Customers:

First 1,000 gallons per month \$2.10 minimum bill  
 Next 10,000 gallons \$ .903/1,000 gallons  
 All over 11,000 gallons \$ .808/1,000 gallons

Outside City Customers

First 1,000 gallons per month \$4.75 minimum bill  
 Next 9,000 gallons \$1.94/1,000 gallons  
 Next 15,000 gallons \$1.83/1,000 gallons  
 All over 25,000 gallons \$1.74/1,000 gallons

In fiscal year 1997, Versailles reported gross revenues from sewer sales of \$717,000.

Operating and maintenance costs exclusive of depreciation were \$256,000. Net revenues before debt service were \$461,000. The combined water, sewer, and sanitation system debt service payment for fiscal year 1997 was \$364,000.

It should be in Versailles' financial self-interest to rehabilitate its sewer system to such an extent as is cost effective. Successful rehabilitation efforts can accomplish several objectives:

1. It can delay or circumvent the need for relief sewer construction.
2. It can extend the life of wastewater treatment facilities and can reduce the size and cost of expanded wastewater treatment facilities.

**Proposed Projects 2000-2005**

**SX21239001**

1. Even though measured sewage flows have increased by 15 percent at the wastewater treatment plant during the two year span from 1995 to 1997, Versailles should still be able to continue to operate its wastewater treatment plant without hydraulic expansion through the period of the Immediate Plan. Certain capital improvements may be required to the treatment plant's solids handling facilities during the five year planning period, but the 1997 estimated project cost should not exceed \$200,000.
2. Suggested is that certain relief sewers and interceptors be installed during the period of the Immediate Plan. Suggested are the following:
  - a. a combination of 8-, 10-, and 12-inch diameter sewers, which would essentially be an extension of an existing 18-inch diameter sewer at Lexington Road and Wilson Avenue. The proposed sewer would have several small branches and would offer sewer capacity relief especially to the Hunter Ridge and Charmill Estates subdivision. As many as four existing sewage pumping stations could be abandoned. One branch of the sewer could open for urban development vacant land north of Huntertown School and south of Huntertown Road.
  - b. a combination of 12- and 15-inch diameter sewers beginning near the wastewater treatment plant and extending generally in a southerly direction to offer sewer capacity relief on both sides of Clifton Road.
3. Sewers suggested for installation during the period of the Immediate Plan have a 1997 estimated project cost of \$ 460,000. Sewer line extensions will serve approximately 52 households.
4. In the Charmil area and in other non-specific areas of the sewer system, sewer rehabilitation is suggested during the period of the Immediate Plan. A total estimated project cost of \$750,000 is suggested for the period of the Immediate Plan. The need to reduce extraneous flows to the sewer system is continuous in nature.

**Proposed Projects 2006-2020**

**SX21239002**

1. During the period of the Long Term Plan, the expansion of the wastewater treatment plant at the existing site will likely be necessary. An expansion to 4.5 MGD is suggested utilizing the same technology as is employed with the present treatment facilities. The 1997 estimated project cost of the wastewater treatment plant expansion is \$3.9 million.
2. During the period of the Long Term Plan, additional sewers are proposed for installation. Suggested are:
  - a. a two pronged 10-inch interceptor sewer to be installed between McCowan's Ferry Road and Tyrone Road. The two sewers would follow minor drainage ways that flow away from the city center. At the conveyance of the two minor drainage ways, the two proposed sewers would join at a proposed sewage pumping station which would convey the wastewater back toward to



- join the gravity sewer (proposed for installation during the period of the Immediate Plan) near the intersection of Beech Street and Clifton Avenue.
- b. several 10-inch diameter sewers that would drain areas on both sides of McCowan's Ferry Road in an area generally described as being southeast of The Colony subdivision. All the sewers would drain to a low area on McCowan's Ferry Road at which point a proposed sewage pumping station would redirect the wastewater through a force main to the existing 12-inch diameter sewer at Highland Avenue and High Street.
  - c. several sewers—for the most part, 8-inches in diameter—that would drain presently vacant land that lies primarily between KY 33 and Hunteertown Road. Two new sewage pumping stations would be required with the final pumping stations discharge directed back toward the city center to tie to the existing 12-inch diameter sewer on South Main Street near the cemetery.
3. The 1997 estimated project cost of relief and interceptor sewers together with some small amount of 8-inch sewers to serve developing areas is \$ 300,000. Sewer line extensions will serve approximately 20 households.
  4. During the period of the Long Term Plan, expenditures of another \$1.4 million is suggested for sewer rehabilitation efforts.

#### CITY OF MIDWAY SANITARY SEWER SYSTEM

Developed areas inside the city are fully sewerred. The system is primarily a gravity one as the 10-inch interceptor sewer, which lies in Brand Street and then follows Lee's Branch to the sewage treatment plant, intercepts all of the lateral sewers and conveys by gravity the collected sewage to the treatment plant. Midway presently has 560 sewer customers. Infiltration of ground water and intrusion of storm water continue to be a major concern in the sewer system. A sanitary sewer rehabilitation effort in 1992 reduced, but failed to eliminate, sewage conveyance and sewage treatment capacity problems associated with excess flows which are attributed to inflow and infiltration. The sewer system contains only two pumping stations apart from the major pumping station at the sewage treatment plant. The two pumping stations are located on Stephens Street west of the cemetery at the extension of Dudley Street.

After years of planning and delays, Midway constructed major improvements to its wastewater treatment plant in 1981. The modified treatment plant includes raw screening, grit removal, a primary screen, two rotating biological contactors (RBC's), secondary clarifiers, chlorine contact chamber, post-aeration, and dechlorination. The former trickling filter was converted in 1981 to a flow equalization basin. Solids are treated by aerobic sludge

digestion and, subsequently, sludge drying beds. Ultimate sludge disposal is at the privately owned landfill in Franklin County. One of the two RBC units is reported to be troublesome. A Sewer System Evaluation Study was recently completed as was the preparation of a Regional Wastewater Facilities Plan Update for Midway.

The treatment plant has a rated capacity of 253,000 gallons per day. An inspection of monthly discharge monitoring reports for 1995 revealed that average daily flow at the treatment plant was 203,000 gallons. Measured flows at the wastewater treatment plant ranged as high as 806,000 gallons per day during and as a result of the year's most severe storm event. City officials suspect that inflow is a more serious problem than infiltration. Subsequent to 1995, average daily sewage flows were first up (in 1996) and then down (in 1997).

Treatment plant performance in 1995, 1996 and 1997 must be considered to be variable as compared to the limits established by the city's state-issued wastewater treatment plant discharge permit. In 1997, the plant had three monthly exceedences of the BOD limit, one monthly exceedence of the dissolved oxygen limit, and four monthly exceedences of the coliform limit. Laboratory results of the treatment plant effluent over the period of the past three years as compared to the city's effluent limits are as follows:

Average Annual Value

Parameter	KPDES Limits	1995	1996	1997
Dissolved Oxygen <sup>1</sup>	7 mg/l minimum	8.0 mg/l	9.4 mg/l	9.2 mg/l
Total Suspended Solids <sup>1</sup>	30 mg/l maximum	10 mg/l	10.3 mg/l	12.6 mg/l
Ammonia – Summer	4 mg/l maximum	0.9 mg/l	1.7 mg/l	2.11 mg/l
Ammonia – Winter	10 mg/l maximum	2.9 mg/l	1.8 mg/l	2.10 mg/l
Coliform <sup>3</sup>	200/100 ml maximum	14/100 ml	67/100 ml	197/100 ml
BOD <sup>2</sup>	15 mg/l maximum	12 mg/l	7.2 mg/l	11.7 mg/l
Flow	0.253 MGD	0.203 MGD	0.258 MGD	0.186 MGD

<sup>1</sup>Exceedences noted in August, 1995

<sup>2</sup>Exceedences noted in January, March and April, 1995

<sup>3</sup>Exceedences noted in December, 1996

Sewage bypassing is somewhat less frequent since the sewer rehabilitation effort of 1992. As sewage flows begin to increase at the wastewater treatment plant, incoming sewage receives at least minimal treatment with chlorination. As incoming flows increase further, bypassing can occur at the head of the treatment plant. Sewage bypassing within the sewer system itself is presently uncommon. Discharge of the treated effluent is to mile point 0.93 of Lee's Branch. Lee's Branch is a tributary of South Elkhorn Creek.

Midway has three state-certified wastewater treatment plant operators, all of whom are Class II. The city does have a pretreatment ordinance to protect the treatment plant from the entry of strong or toxic wastewaters which could upset the biological treatment processes. Pre-treatment is to be required if a contributing sewage discharger has wastewater which exceeds the following limits:

BOD	300 mg/1	
Total Suspended Solids		300 mg/1
Ammonia	25 mg/1	
Fats, oils, grease		100 mg/1

At present, no sewer customers exceed the limits. As a result, pre-treatment is not required of any customer.

Sewer user charges presently in effect are these:

First 1,000 gallons/month	\$7.23 (minimum)
All Over 1,000 gallons	\$5.10/1,000 gallons

Pertinent financial data for fiscal year 1997 audit are as follows:

Gross Revenues from Sales of Sewer Service	\$214,500
Maintenance and Operating Costs	\$153,600
Net Annual Sewer Revenues	\$ 60,900

The FY 1997 debt service payment for the combined water/sewer utility was \$27,000.

Midway and its consulting engineer concluded a Regional Wastewater Facilities Planning Update in mid-1997. Relocation of the wastewater treatment plant to a site on high ground north of I-64 and east of KY 341 was proposed as a part of that planning effort. Such a relocation would require that sewage presently collected at the existing treatment plant be

pumped to the new treatment plant site. Sewage conveyance costs are included in a subsequent section with the projected cost of new treatment facilities.

A Regional Wastewater Facilities Plan Update was prepared for Midway and was submitted to the KY Division of Water in 1997. The planning conclusion called for the abandonment of Rotating Biological Contactor (RBC) technology in favor of a larger treatment plant utilizing more appropriate technology. With only a small existing treatment plant site, and with significant urban growth expected on the north side of I-64, the Plan concluded that the existing 0.253 MGD plant should be abandoned in favor of a new 0.75 MGD wastewater treatment plant on high ground north of I-64 and east of KY 341. A peak flow capability of 2.0 MGD was specified in that 1997 planning effort. An oxidation ditch type treatment plant was the Plan's selected alternative.

The proposed treatment plant would have a mechanical bar screen, a grit removal system, parallel oxidation ditches, parallel secondary clarifiers, ultra-violet light disinfection, and post-aeration before discharge to South Elkhorn Creek about one mile upstream of the confluence of South Elkhorn Creek with Lees Branch. Lees Branch presently receives Midway's treated sewage treatment plant effluent. The proposed sewage sludge treatment system would include a sludge thickener/aerobic digester, a belt filter press with ultimate disposal at an approved contained landfill.

**Proposed Projects 2000-2005**  
**SX21239003**

1. Total estimated project cost of proposed treatment facilities together with the conveyance of sewage from the existing treatment site is pegged at \$4.0 million. Implementation is proposed for the period of the Immediate Plan.
2. During the period of the Immediate Plan, significant commercial and industrial development are considered to be likely in the area north of I-64 and both east and west of KY 341. That development is predicated upon the availability of municipal wastewater treatment capacity that would permit and encourage growth. The estimated 1997 project cost of these sewers proposed for the period of the Immediate Plan is \$140,000. Sewer line extensions will serve approximately 4 households.
3. An extensive sewer system evaluation was undertaken as a part of the 1997 Wastewater Facilities Plan Update effort. Recommended was that a \$262,000 manhole and sewer line rehabilitation effort be undertaken as a means of reducing inflow and infiltration in areas where such flow reduction is cost effective. Proposed is that an outlay of \$150,000 be targeted for the period of the Immediate Plan.

**Proposed Projects 2006-2020**

**SX21239004**

1. During the period of the Long Term Plan, additional sewers are recommended to be installed. Proposed are the following sewer line extensions, which will serve approximately 5 households:
  - a. two 8-inch diameter sewers south of the city along Lee Branch and a tributary
  - b. an 8-inch diameter sewer southeast of the city following Craigs Mill Road and a Lee Branch tributary.
2. Long Term Plan improvements recommended herein have an estimated 1997 project cost of \$300,000.
3. An extensive sewer system evaluation was undertaken as a part of the 1997 Wastewater Facilities Plan Update effort. Recommended was that a \$262,000 manhole and sewer line rehabilitation effort be undertaken as a means of reducing inflow and infiltration in areas where such flow reduction is cost effective. Proposed is that an outlay of another \$112,000 be expended during the period of the Long Term Plan.
4. During the period of the Long Term Plan, it is proposed that the proposed wastewater treatment plant capacity will be further increased. An expansion to 1.125 MGD is proposed by the 1997 HMB Engineers Wastewater Facilities Plan Update. Since several components of the 0.75 MGD wastewater treatment plant would be initially sized to accommodate the larger 1.125 MGD flow rate, actual expansion to the higher 1.125 MGD rate would be relatively inexpensive as compared to the initial investment in the 0.75 MGD facility. An incremental estimated project cost of \$300,000 is suggested to expand the treatment plant to 1.125 MGD during the period of the Long Term Plan.

**ON-SITE TREATMENT SYSTEMS**

**SI21239001**

This area consists of rural Woodford County beyond the service areas of the sanitary sewer systems of the Cities of Versailles and Midway. It is unlikely that public sewer line extensions will reach this area of Woodford County by 2020. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. It appears to be impractical to extend sewer service to this area because of the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. Reasons for the high cost are the number of households (5,000), a low customer per mile ratio, rugged terrain, and the long distance from these houses to treatment facilities and existing sewer systems. Suggested instead is that a Revolving Loan Fund

Program be established or that the U.S. Army Corps of Engineers 531 program be extended for the installation of a septic tank for each house that does not presently have sanitary sewer service, or could currently have a failing septic system. The generalized proposed cost of this option is \$25,000,000, or \$5,000 per household.