Chapter VI
Recommended Alternatives

I. Purpose:

The purpose of this chapter is to define and describe the recommended alternatives for the purpose of determining the most environmentally sound, cost-effective and implementable wastewater collection and treatment systems which will meet all applicable federal, state and local requirements for the Hodgenville, Kentucky Planning Area.

II. Description of Wastewater Treatment Plant Alternative

A. Provisions for Expansion of the Existing Plant

The planning and construction of the 1988 plant improvements included provisions to expand the plant to provide additional capacity beyond its 0.431 MGD design average capacity. For example, space was reserved for the future construction of two screening channels, a centrifugal grit collection chamber, two oxidation ditches, two secondary clarifiers, an effluent flow monitoring, disinfection and post-aeration facility, and a sludge storage tank. These additional treatment facilities were sized to match the facilities built in 1988, thereby allowing for a duplication of the plant's major treatment components.

B. Actual Treatment Capacity of Hodgenville WWTP

The 1985 Facility Plan Update included forecasts of equivalent population and wastewater loads to the Hodgenville WWTP for the period of 1990 to 2010 that have been shown to be very conservative. Historic operating data for the plant indicate that BOD and TSS loads to the plant are significantly lower than projected, primarily because the concentrations of these parameters have been lower than anticipated in 1985.

For example, the influent BOD to the oxidation ditches has been on the order of 220 mg/l. Based on the actual capacity of these units to handle 1,434 pounds of BOD per day, this portion of the plant can actually handle an average daily flow of 0.78 MGD.

However, the KDOW's recently released reliability and redundancy criteria for wastewater treatment plants have significantly altered the manner in which the actual capacity of plants are determined. These criteria expand the previously used regulations (10 - States Standards) and call for spare equipment and tankage at plants under the entire range of flow and loading conditions during the planning period. Plants undergoing new or expanded construction are required to comply with these criteria, which are summarized in Table VI-1.

Table VI-1 Capacity Requirements For WWTP's in Kentucky	
Plant Component	**Capacity Requirement**
Influent Pumping	Capable of pumping the design peak hourly flow to the plant with the largest pump out of service.
Screening Facilities	Provide manually cleaned or mechanically cleaned screen as back-up, with capacity to handle the design peak instantaneous flow with the largest unit out of service.
Grit Removal for Plant Serving a Separate Sewer System	Provide at least two mechanically cleaned grit removal units, with provisions for bypassing, each capable of handling the design peak
Biological Treatment (Oxidation Ditches)	Provide at least two half size basins, with provisions for bypassing, with a total volume based on the design daily average organic load.
Aeration Equipment	Provide sufficient equipment for each basin to allow full design aeration demand with the largest unit out of service.
Final Clarifiers	Provide an adequate number of clarifiers to handle the design peak hourly flow and/or peak solids loading rate with the largest unit out of service.
Disinfection (Chlorine)	Provide for solids removal from the chlorine contact tank, or provide duplicate tanks, each with a detention time based on peak hourly flow.
Disinfection Equipment (Chlorination and De-chlorination)	Provide an adequate number of chlorinators and de-chlorinators to allow for the peak disinfection demand with the largest unit out of service.
Effluent Pumping	Capable of pumping the design peak hourly flow from the plant with the largest pumps out of service.
Sludge Digestion/Holding	Provide at least two half-size tanks, with provisions for bypassing. Provide aeration equipment in each tank capable of full backup at design loading.

Based on the criteria listed in Table VI-1, the capacity of each treatment component in the existing Hodgenville WWTP is provided in Table VI-2. This table indicates that when the KDOW's reliability and redundancy criteria are taken into account, many of the existing plant components do not provide the required firm treatment capacity (the capacity with the largest unit out of service). The capacity of these plant components needs to be considered as part of the required capacity to meet future treatment needs.

C. Current and Projected Wastewater Flows and Loads

Based on a review of historic plant operating records, projections of flows (see Exhibit V-1) and loads were made to determine the needs for future treatment improvements to the plant.

These projections take into account the planned additional customers to be served in the planning area from 2000 to 2020. It is projected that Expansion Areas 1, 2 and 3 will be added to the Hodgenville system in the years 2000, 2002 and 2010, respectively. The average daily flow treated in the Hodgenville plant is projected to be 0.50 MGD in 2000, 0.70 MGD in 2002, 0.80 MGD in 2010 and 1.17 MGD in 2020.

Maximum daily flow projections were made assuming the City reduces a portion of the wet weather infiltration and inflow by a program of sewer rehabilitation, repair or replacement. On that basis, it is projected that the maximum daily flow (the single 24-hour period of maximum flow during the year) will be 2.73 MGD in 2000, 2.93 MGD in 2002, 3.03 MGD in 2010 and 3.43 MGD in 2020. Peak hourly flow data is not available for the plant. However, since the maximum capacity of the influent pump station is the maximum daily flow to the plant, the peak hourly flow is the same as the maximum daily flow rate.

Loads for 2000 were based on the current daily average and wet weather average influent BOD, TSS and estimated TKN and P concentrations. Load projections for future years were based on slight increases in BOD and TSS concentrations assuming the City rehabilitates some of the high I/I areas of its collection system in the years between 2000 and 2010. The BOD, TSS, TKN and P concentrations in the wastewater received from the expansion areas were assumed to be the same as for Hodgenville. Since influent TKN data are not available, load projections for TKN were based on an assumed daily average influent concentration of 25 mg/l, and a maximum daily and peak hourly concentrations of 15 mg/l during the planning period. Similarly, loadings for P were based on an assumed daily average concentration of 7 mg/l, and maximum daily and peak hourly concentrations of 5 mg/l during the planning period.

These projections are summarized in Table VI-3.

D. Future Wastewater Treatment Plant Capital Improvements

1. Wastewater Treatment Modifications

When the information in Tables VI-1 and VI-2 are compared, it is apparent that many existing treatment components of the plant do not have sufficient capacity to reliably treat the projected wastewater loads to the levels required under its discharge permit.

Table VI-2 Capacity of Plant Components Existing Hodgenville WWTP	
Plant Component	**Existing Capacity**
Influent Pump Station (4 Pumps)	Total Pump Capacity = 2130 gpm (3.06 MGD) Firm Pump Capacity = 1200 gpm (1.73 MGD)
Screening Facilities (2 Screens)	Total Screening Capacity = 4260 gpm (6.12 MGD) Firm Screening Capacity = 2130 gpm (3.06 MGD)
Grit Removal Facilities (1 Grit Chamber)	Total Grit Rem. Capacity = 2780 gpm (4.0 MGD) Firm Grit Rem. Capacity = 0 gpm
Biological Treatment (2 Oxidation Ditches)	Total Volume = 95,588 cu. ft. Organic Load Capacity = 1,434 lb. BOD/day
Aeration Equipment (4 Brush Aerators)	Total Capacity = 5,088 lb. O_2/day Firm Capacity = 3,816 lb. O_2/day
Final Clarifiers (2 Clarifiers)	Total Overflow Capacity = 3.18 MGD (Peak Hr. Flow) Firm Overflow Capacity= 1.59 MGD (Peak Hr. Flow) Total Solids Capacity = 3.00 MGD (Peak Hr. Flow) Firm Solids Capacity = 1.50 MGD (Peak Hr. Flow)
Disinfection (2 Cl_2 Contact Tanks)	Total Capacity = 3.31 MGD (Peak Hr. Flow) Firm Capacity = 1.65 MGD (Peak Hr. Flow)
Disinfection Equipment (Chlorination and De-chlorination)	Total Capacity = 175 lb/day chlorine solution, 60 lb/day sulfur dioxide Firm Capacity = 100 lb/day chlorine solution, 30 lb/day sulfur dioxide
Effluent Pumping	Total Capacity = 2100 gpm (3.0 MGD) Firm Capacity = 1050 gpm (1.5 MGD)
Sludge Digestion/Holding	Total Capacity = 264,000 gal. Total Storage = 70 days Firm Capacity = 95,000 gal. Firm Storage = 10 days

Firm Capapcity = Capaicty of plant componenent with largest unit out of service.

Table VI-3
Flow and Load Forecast
Hodgenville WWTP
(2000 to 2020)

Year	Avg Daily Flow MGD	Max. Daily Flow MGD	Peak Hourly Flow MGD	BOD (Mg/l)	BOD (lb/Day)	TSS (Mg/l)	TSS (lb/Day)	TKN (Mg/l)	TKN (lb/Day)	P (Mg/l)	P (lb/Day)
2000	0.50			220	917	190	792	25	104	7	29
		2.73		120	2732	100	2276	15	342	5	114
			2.73	120	2732	100	2276	15	342	5	114
2002	0.70			222	1296	192	1121	25	146	7	41
		2.93		122	2981	102	2492	15	366	5	122
			2.93	122	2981	102	2492	15	366	5	122
2010	0.80			225	1501	195	1301	25	167	7	47
		3.03		125	3159	105	2653	15	379	5	126
			3.03	125	3159	105	2653	15	379	5	126
2015	0.98			227	1855	197	1610	25	204	7	57
		3.23		127	3421	107	2882	15	404	5	135
			3.23	127	3421	107	2882	15	404	5	135
2020	1.17			230	2244	200	1952	25	244	7	68
		3.43		130	3719	110	3174	15	458	5	143
			3.43	130	3719	110	3174	15	458	5	143

Accordingly, it is anticipated that expansions of the plant will be needed in 2002 and again by 2010, to provide the required capacities described in Table VI-3. These capacities are summarized in Table VI-4 and the required plant modifications include the following:

- Increase the influent pump station capacity by 2002. Replace the largest pumps so that the entire range of peak pumping requirements can be met with the largest pump out of service. It is estimated that the peak hourly flow to the plant will be on the order of 2.73 MGD to 3.03 MGD during the period of 2000 to 2010. The 25-gpm and 580-gpm pumps will be needed for diurnal flow pumping until well after 2002. On that basis, the 900-gpm pumps should be replaced so that the firm pumping capacity of this pump station is increased to 2,100 gpm.

- By 2002, add a second mechanically grit removal unit so that either the new or existing unit can handle the peak hourly flow rate of 3.43 MGD.

- Add a phosphorus removal system to the plant by 2002. For this plant, a system that uses the addition of alum to the secondary clarifiers is recommended. The alum will be mixed with the influent to the clarifiers so that sufficient contact time is provided to achieve flocculation and settling of the phosphoruscontaining sludge in conjunction with the biological sludge in the clarifiers.

- Add a third 45' diameter final clarifier by 2002. The existing clarifiers will not meet the KDOW's reliability and redundancy criteria for capacity at peak hourly flow conditions and/or peak solids loading rate with the largest clarifier out of service. With three final clarifiers of equal size (two always available for operation) the peak hourly surface overflow rate will remain under 1,000 gpd/square foot until 2014, and the solids loading rate under maximum daily conditions and 150% return sludge will also remain under 35 pounds/day/square foot until 2012.

- Increase the chlorination capacity to 250 pounds per day by 2002. This will provide a firm capacity, with the largest unit out of service, of 175 pounds per day. Also, add a third chlorine contact basin by 2002, to ensure that two basins are always in operation, providing a firm capacity for a minimum detention time of 15 minutes at peak hourly flow conditions for the balance of the planning period. Also, add additional sulfur dioxide de-chlorination capacity to provide a firm dosage capability of 155 pounds per day.

- Increase the high water effluent pump station capacity by 2002. Provide additional pumping capacity to provide a firm capacity of 3.43 MGD (2,400 gpm) with the largest pump out of service. The two existing 1.5 MGD (1,050-gpm each) pumps should remain in service and a third pump of equal capacity should be provided so that any combination of two of these pumps can be used to discharge treated wastewater to the river during peak hourly flow periods at high river level.

- Increase the influent pump station capacity again by 2010. To provide a firm pumping capacity for the period from 2010 to 2020, when peak hourly flows are projected to increase from 3.03 MGD to 3.43 MGD, replace the 250-gpm pump with a larger unit. The firm capacity of the pumps will need to be increased to 2,400 gpm.

- Increase the aeration capacity of the oxidation ditches by 2010. The existing brush aerators (two per basin) have a combined capacity to provide a maximum of 5,088 pounds of oxygen per day. The projected 2010 peak hourly BOD and NH_3-N loads equate to a combined oxygen requirement of 5,218 pounds of oxygen per day. Since this exceeds the available capacity of the existing brush aerators, additional aeration capacity will be needed to meet the oxygen demand anticipated by 2010. This could be achieved by providing supplemental mixers in each basin, thus allowing the existing brushes to be more efficiently used to transfer oxygen to the mixed liquor. Alternatively, supplemental brush aerators could be installed to increase the oxygenation rate for each basin.

- Add a third oxidation ditch and a fourth secondary clarifier by 2010, equal in size to the existing units. By 2010, the organic loading capacity of the two existing oxidation ditches (1,434 pounds of BOD per day) will be exceeded by the average daily BOD load. A third oxidation ditch of the same size as the two existing ditches should be provided by that time. A fourth secondary clarifier, identical to the two existing clarifiers, and the third one added in 2002, will meet the KDOW's reliability and redundancy criteria for the balance of the planning period. Additional return and waste sludge pumping capacity will also need to be provided at the same time.

The above-recommended addition of a third oxidation ditch is based on the 1985 Facility Plan Update, in which four alternatives were evaluated for treatment for Hodgenville. These alternatives were oxidation ditches, rotating biological contactors, trickling filter/solids

Table VI-4 Modifications to Hodgenville WWTP	
<u>Plant Component</u>	**<u>Required Firm Capacity</u>**
Influent Pumping	2002 - 2010: 2.93 MGD to 3.03 MGD 2010 - 2020: 3.03 MGD to 3.43 MGD
Screening Facilities	2002 - 2020: 3.43 MGD
Grit Removal	2002 - 2020: 3.43 MGD
Biological Treatment	2002 - 2010: 917 lb BOD/day to 1501 lb BOD/day 2010 - 2020: 1501 lb BOD/day to 2244 lb BOD/day
Aeration Equipment	2002 - 2010: 4963 lb O_2/day to 5218 lb O_2/day 2010 - 2020: 5218 lb O_2/day to 6198 lb O_2/day
Final Clarifiers	2002 - 2010: 2.93 MGD to 3.03 MGD 2010 - 2020: 3.03 MGD to 3.43 MGD
Disinfection	2002 - 2020: 2.93 MGD to 3.03 MGD
Disinfection Equipment	2002 - 2010: 147 lb Cl_2/day to 172 lb Cl_2/day 2010 - 2020: 132 lb So_2/day to 155 lb So_2/day
Effluent Pumping	2002 - 2020: 2.93 MGD to 3.03 MGD
Sludge Digestion/Holding	2002 - 2010: 357,600 gal. 2010 - 2020: 484,500 gal.

contact, and land application. Of these alternatives, the oxidation ditch was determined to be the most cost effective, environmentally sound and implementable alternative, and the plant was expanded on that basis. Land was also acquired for the construction of additional oxidation ditches and other plant components and the hydraulic design of the plant was based on oxidation ditches, for the 1988 expansion and for future expansions. Accordingly, there is no reason to evaluate other secondary treatment alternatives at this time. If significant changes occur in the planning area, indicating the need to re-consider other secondary treatment alternatives, this Plan will then be updated or amended to consider the impacts of such changes. The projected cost estimates included in this Plan, therefore, are based on the addition of an oxidation ditch and secondary clarifier by 2010.

2. *Sludge Treatment and Disposal Modifications*

Recent improvements have been made to the City's water treatment plant (WTP) to increase the capacity of the plant to 1 MGD. As part of the WTP improvements, a new basin has been built to store filter backwash wastewater and sludge from the sedimentation basin. This basin will allow these wastes to settle during storage, with decanted water either returned to the WTP or discharged to the river in accordance with the KPDES permit requirements for the WTP. Projections of the WTP indicate that approximately 1,000 gallons of sludge will be produced daily at a water treatment rate of 1 MGD. This sludge is expected to have a solids content of 5 percent. Assuming the sludge is hauled to the wastewater treatment plant five days a week, approximately 1,400 gallons or 580 pounds of WTP sludge will be received daily.

The City is currently planning to haul the WTP sludge by truck to the wastewater treatment plant for further treatment and storage prior to disposal. The WTP sludge will be discharged to the existing sludge basin, where the combined sludge will be aerated and stored prior to off-site disposal on the land farm site.

Table VI-5 summarizes the projected combined sludge loads to the sludge treatment facilities at the wastewater treatment plant.

The existing sludge concentration (thickening) and storage (aerobic digestion) basins can provide a combined 80 days storage for the waste sludge produced from a 0.431 MGD treatment plant (the year 2010 average flow in the 1985 update of the Facilities Plan). This storage time was based on an average sludge yield of 1,500 pounds at 7,500 mg/l per MGD treated, and the thickening of the sludge in the concentration basin to 3% solids. This equates to 646.5 pounds per day or 10,335 gallons per day of waste sludge. This estimate is similar to projecting the sludge yield for an extended aeration plant that acheives nitrification using 0.8 pounds of waste sludge production per pound of BOD applied to the plant. Under these conditions, the concentration basin will provide 10 days detention time and the storage basin will provide 70 days detention time.

It should be noted that KDOW requirements call for 60 days of storage for sludge prior to land application.

For the alternative described above, the sludge concentration basin would continue to be used to thicken the wastewater treatment plant sludge. At the projected 2020 waste sludge production level of 28,060 gallons per day and 1,755 pounds per day, this basin would provide a detention time of 3.2 days. Assuming 95 percent capture of solids in this basin, the storage basin would then receive an average of 6,675 gallons per day (1,670 pounds per day) of 3 percent sludge. When the 1,400 gallons per day of WTP sludge is added, the combined daily load is 8,075 gallons per day (2,250 pounds per day). To provide a storage volume of 60 days, a total storage basin volume of 484,500 gallons is needed. Therefore, in addition to storing sludge in the existing 169,100-gallon storage basin, sludge would also be stored in a new 315,400-gallon basin.

This could be provided in one (1) 315,400-gallon basin or in two (2) 160,000-gallon basins.

- Add a 160,000 gallon aerated waste activated sludge storage basin by 2002. This basin is needed to provide 60 days sludge storage prior to land application of the sludge. Aeration and mixing will be provided to maintain aerobic condition and prevent settling of the stored sludge.

- Add a second 160,000 gallon aerated sludge waste activated sludge storage basin by 2010. By 2010, the waste activated sludge produced will exceed the capacity of the existing storage basin and the basin added in 2002.

Table VI-5 WWTP Waste Sludge and WTP Sludge Load Projections Hodgenville WWTP								
Year	WWTP Waste Sludge Load				WTP Sludge Load To Storage Basin		Total Load To Storage Basin	
	To Concrete Basin		To Storage Basin					
	Gal/day	Lb/day	Gal/day	Lb/day	Gal/day	Lb/day	Gal/day	Lb/day
2000	11,990	750	2,860	715	1,400	580	4,260	1,295
2002	16,785	1,050	4,000	1,000	1,400	580	5,400	1,580
2010	19,185	1,200	4,560	1,140	1,400	580	5,960	1,720
2015	23,500	1,470	5,600	1,400	1,400	580	7,000	1,980
2020	28,060	1,755	6,675	1,670	1,400	580	8,075	2,250

This basin will increase the storage capacity to 489,100 gallons. Each of the newer basins will, in conjunction with the existing 169,100-gallon basin, meet the reliability and redundancy criteria for the design year.

The initial (2002) wastewater treatment plant improvements will increase the plant's capacity to handle an average daily flow of 0.78 MGD, as indicated in Table VI-7. The second phase of improvements (2010) will increase the plant's capacity to 1.17 MGD.

3. Estimated Costs (Year 2000 Dollars) for Recommended Wastewater Treatment Plant Improvements

Table VI-6 summarizes the estimated construction costs for the wastewater and sludge treatment system improvements recommended in the preceding paragraphs. These estimates include the basic construction costs (structures, equipment, etc.), and an allowance of 10% for construction contingencies.

III. Description of Collection System Alternative:

The immediate needs for the wastewater collection system are to comply with the requirements of the Agreed Order.

Other needs in the system relate to present and future capacities and potential expansion of the service area.

The alternatives which are being considered to meet the requirements of the Agreed Order and the City's other needs are described hereinafter.

A. Collection System Rehabilitation

The City of Hodgenville began a Sewer System Evaluation Survey (SSES) in the summer of 1999. The SSES will result in a rehabilitation program to remove part of the inflow and infiltration which currently exists during wet weather events. The draft SSES was submitted to the Kentucky Division of Water for review on February 21, 2000.

The SSES project included flow monitoring, manhole inspections, smoke testing, and dye testing. In addition to the tasks performed, television inspections were recommended for the most questionable sewer lines. The conclusions of the survey are as follows:

- Several sources of inflow were found in the system such as direct connections from downspouts, missing cleanout caps, stormwater drains and catch basins.

Table VI-6
Estimated Project Costs for
Hodgenville WWTP Improvements
(Year 2000 Dollars)

For planning purposes, these project costs are grouped into two phased periods as follows:

	First Phase (years 0 to 2, or 2000 to 2002):		
1.	Increase Influent Pump Station Capacity		$75,000
2.	Add Second Grit Removal Unit		100,000
3.	Add Phosphorus Treatment System		75,000
4.	Increase Effluent Pump Station Capacity		50,000
5.	Add a 45' diameter Final Clarifier		250,000
6.	Add third Chlorine Contact Basin and increase dosage capacity		75,000
7.	Add 160,000 Gallon Sludge Storage Basin		375,000
		Total	**$1,000,000**
	Second Phase (years 3 to 10, or 2003 to 2010):		
8.	Increase Influent Pump Station Capacity		$50,000
9.	Add Second 160,000 Gallon Sludge Storage Basin		375,000
10.	Add Brush Aerators to Exisitng Oxidation Ditches		170,000
11.	Add Third Oxidation and Fourth Secondary Clarifier		1,100,000
		Total	**$1,695,000**

Table VI-7 Hodgenville WWTP Capacity after Phase 1 Improvements	
Plant Component	**Firm Capacity***
Influent Pump Station	3.03 MGD (Peak hourly flow)
Screening Facilities	3.06 MGD (Peak hourly flow)
Grit Removal Facilities	4.0 MGD (Peak hourly flow)
Biological Treatment	0.78 MGD (Average daily flow at 220 mg/l BOD)
Aeration Equipment	2.28 MGD (Peak hourly flow at 120 mg/l BOD and 15 mg/l TKN
Final Clarifiers	2.25 MGD (Peak hourly flow at peak solids loading rate)
Disinfection	3.31 MGD (Peak hourly flow)
Disinfection Equipment	3.43 MGD (Peak hourly flow)
Effluent Pumping	3.43 MGD (Peak hourly flow)
Sludge Digestion/Holding	0.89 MGD (Avg. hourly flow with water plant sludge also stored at WWTP)
Plant Capacity = Capacity base on plant component with lowest firm capacity = 0.78 MGD	

* Firm Capacity = Capacity of Plant Component with largest unit out of service.

- A review of plant records from December 1998 to December 1999 revealed signs of a seasonal infiltration problem due to a high or perched groundwater table. Based on this pattern, it appears that the elevated dry and wet weather flows (cited by the Division of Water from 1996-1998) were most attributed to a prolonged period of infiltration.

- It was determined that since infiltration tends to migrate to the next sewer defect, it is often difficult to remove. Keeping in mind that the problems found in Hodgenville appear to be created by infiltration and compounded by inflow, it was GRW's recommendation that all known sources of inflow be eliminated and that the infiltration be addressed by plant improvements and not with major improvements to the system.

Cost estimates for necessary rehabilitation to these sewers are included as Table VI-3.

As a result of several leaks due to smoke testing, it was determined that problems also exist on private property. These included leaks associated with smoke emanating from crawl spaces, service lines, and water meters.

The City of Hodgenville elected to get the community involved by sending letters to private property owners identified as potential contributor's to the I/I problem. The standard form letter developed is included as Exhibit VI-1. The sample letter can be revised for each particular property owner and sewer system defect.

B. Collection System - Proposed Development

GRW Engineers, Inc. met with Hodgenville's Mayor and City Council during December 1999 to discuss the Planning Area boundary and phasing of future development. The phasing map for proposed sewer service is included as Exhibit II-2. The future sewer collection system map is included as Exhibit VI-2. Following is a description of extension to the service area for each Planning period:

0-2 Years:

Essentially three (3) separate areas are proposed for development during the 0-2 year planning phase. The total acreage lying within the 0-2 year service area is 347, and is designated for five (5) different land uses. Approximately 318 acres included in the 0-2 year service area is located to the east of Larue County High School. The projected flow from this area is 72,990 gpd. As shown on Exhibit VI-2, it appears that this particular area can be served by a gravity sewer collection system. Based upon the topography of the USGS map, it appears that construction of approximately 12,700 LF of gravity sewer is required to serve the area east of Larue County High School.

The second area included in the 0-2 year planning period is located along Lincoln Parkway beginning near the US 31E/Lincoln intersection and extending north/northwest along the corridor for approximately two (2) miles. Approximately 56 acres are included in the 0-2 year service area designated along the Lincoln Parkway corridor. The project flow from this area is 49,400 GPD. It is difficult to determine if the above described system can be served solely by a gravity sewer collection system. The available USGS mapping for this area appears to show the existing grade to be rather flat with sinkholes prevalent throughout. For the purpose of this study, it is assumed that this area can be served by approximately 11,600 LF of gravity collector sewers with final connection to the newly constructed Pamida Pump Station. The flow range for each submersible pump located in the Pamida Pump Station is 80-160 GPM. Therefore, little or no improvements to the station would be required.

The total preliminary construction cost estimate for the 0-2 year service area improvements is $1,312,127.

3 - 10 Years:

One (1) service area is designated in the 3-10 year plan. This area covers the residential development on US 31E to Ovesen Heights. Based upon the USGS mapping, it appears that the area can be served by approximately 10,000 LF of gravity collector sewers. The projected flow for the Ovesen Heights corridor is approximately 52,000 GPD. The proposed collection system is shown on Exhibit VI-2.

The total preliminary construction cost estimate for the 3-10 year service area improvements is $513,475.

11 - 20 Years:

Two (2) areas are proposed for 11-20 years planning area. First, an area of approximately 95 acres from the Industrial Park (north city limits) extending south/southwest along the Lincoln Parkway corridor and adjoining the 0-2 year service area described above at the Nolin River. The USGS mapping for the area indicates that the existing grade is flat with sinkholes prevalent. For the purpose of this study, it is assumed that the area can be served by 4,900 LF of gravity collector sewers, one (1) lift station and 1,000 LF of 4" force main. The projected flows for this service area is approximately 72,000 GPD.

The remaining service area is essentially the Buffalo Community and a +1-1.15 mile corridor along US 31-E from Abraham Lincoln's birthplace to South Fork. This area encompasses approximately 575 acres. Service for the above described area will be a combination of gravity collector sewers and pump stations, as shown on Exhibit VI-2.

The total preliminary construction cost estimate for the 11-20 year service area improvements is $1,598,661.

IV. Anticipated Capital Impact on Community

Total preliminary project cost estimates for the Wastewater Treatment Plant Expansion, Collection System Rehabilitation, and the proposed 0-2 year service area are included as Exhibits VI-4, VI-5, and VI-6, respectively.

The City of Hodgenville anticipates a Governor's office surplus grant of approximately $196,000 for the funding of the rehabilitation project.

For the purposes of this plan, a combination of a Kentucky Federally Assisted Revolving Fund Loan and a Community Development Block Grant (CDBG) are the assumed funding sources for the wastewater treatment plant expansion and the proposed 0-2 year service area improvements. A wastewater user charge study will be conducted to determine if there is a need to increase the current sewer revenues in order to amortize the projected debt. Existing user charges for a minimum bill are $12.00/3,000 gallon.