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Kentucky River Basin: Unified Long-Range Water Resources Plan. County Water Management Planning for the Kentucky River Basin

Lindell E. Ormsbee

University of Kentucky, lindell.ormsbee@uky.edu

Malissa McAlister

University of Kentucky, mmlcal2@uky.edu

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Kentucky River Basin:

Unified Long-Range Water Resources Plan

County Water Management Planning for the Kentucky River Basin

L. Ormsbee
M. McAlister

Prepared for:
The Kentucky River Authority

Prepared by:
The Kentucky Water Resources Research Institute
University of Kentucky
Lexington, KY 40506

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DRAFT

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1.0 Summary of County Water Management Plans

1.1 Introduction

During the drought of 1988, several communities throughout Kentucky experienced difficulties in providing adequate supplies of potable water to their citizens. In response to this emergency situation, Governor Wallace Wilkinson issued an Executive Order to create a Water Supply Task Force. In 1989, the task force released its recommendations, one of which was a requirement for water suppliers to develop Water Supply Plans.

In 1990, the General Assembly passed KRS151.114-.118, mandating that long-range County Water Supply Plans be developed by July 15, 1998. Kentucky Administrative Regulations (401 KAR 4:220) outlined the content of the long-range plans. County Water Supply Plans were subsequently developed for every county in the state by the Area Development Districts, members of the different Water Supply Planning Councils, and the elected and appointed officials of each county.

In 2000, KRS 151:601 directed the formation of county or planning area *water management councils*, superseding the former water supply planning councils. In KRS 151:603, the management councils were charged with developing and implementing plans for reliable potable water and wastewater treatment services for un-served or under-served areas of the state. The newly formed councils identified *water management areas* where water and wastewater services could be most effectively addressed through coordinated efforts, such as through merged facilities or shared resources.

The water coordinator for each planning area is responsible for compiling the council's findings into a *water management plan*. These plans are to be updated annually, and are due by July 1 of each year according to KRS 151:607. The first such management plan was to have been submitted electronically to the Kentucky Division of Water as of December 31, 2002. For this initial year, each plan was to contain an identification of priority projects which could be implemented between 2001 and 2003. It is hoped that the new planning format will enable continuous updates to the plans, thereby maintaining functional documents that will assist in ongoing water supply improvements.

In Kentucky's regulatory statute 420 KAR 1:030, Section 4, the Kentucky River Authority was mandated to develop a Unified Long-Range Water Resources Plan (ULRWRP) for the Kentucky River Basin. One of the required components of the ULRWRP is that of "county water resource plans." This summary document addresses this planning component and was written by the Kentucky Water Resources Research Institute under a contractual agreement with the Kentucky River Authority.

1.2 Overview

Twenty-nine public water suppliers in 25 counties utilize water supply sources in the Kentucky River basin. (See Figure 1.) Currently, 11 suppliers use the main stem of the Kentucky River as

their source, 11 suppliers withdraw from tributaries of the Kentucky River, 9 utilize reservoirs in the basin and four suppliers withdraw from groundwater wells. (See Table 1 and Figures 2, 3 and 4.)

1.3 Growth Projections

According to the most recent population projections by the University of Louisville's Kentucky State Data Center, county populations in the basin range from an expected 24% decrease by 2020 in Leslie County to an expected 109% increase by 2020 in Boone County. (See Table 2.) The average predicted change in population for these counties is a 24.8% increase.

In addition to increased water demand brought about by population growth, many counties are making an effort to greatly increase the percentage of county residents served by a public water supplier. Water demand predictions through 2020 range from an 8% increase in demand in Estill County to a 217% increase in Letcher County. (See Table 3.) The dramatic increase in demand in Letcher County is due to public water line extensions into previously unserved rural areas of the county. The predicted average increase in water demand between 2000 and 2020 is 49% for counties utilizing Kentucky River Basin supplies.

1.4 Summary of Infrastructure Needs

According to the 1998 Kentucky Infrastructure Authority's report, *Water Resource Development: A Strategic Plan*, publicly owned water suppliers in the Kentucky River Basin are predicted to require an estimated \$182 million in infrastructure funding between 2000 and 2005. Between 2006 and 2020, funding needs are expected to be approximately \$254.5 million. (See Table 4.) These estimates are based on locally identified needs to expand, upgrade and replace infrastructure, as well as estimates of funding needed to meet the requirements of the Safe Drinking Water Act. It should be noted that infrastructure funding needs for privately owned suppliers are not included in this table, i.e., Kentucky-American Water Company in Fayette County.

Clay, Letcher and Madison Counties have the highest estimated infrastructure expenses. (See Table 4.) The bulk of Clay County's expenses are predicted to be spent in developing new sources and installing new water lines. Letcher County has plans for a new treatment plant, and also plans to install new water lines to serve many additional customers. Madison County's expenses are predominantly targeted toward its treatment plant, tanks and pumps and water line rehabilitation.

1.5 Drought Vulnerability

The Kentucky Division of Water developed a program to evaluate water system vulnerability to shortages caused by drought. Water systems are grouped into three classes of susceptibility by comparing average withdrawal rates to water availability at the point of withdrawal during drought conditions. (See Appendix A for further explanation.) The drought susceptibility classes are:

A – Systems unlikely to experience water shortage during drought conditions.

B – Systems that should be examined for susceptibility to water shortage during drought. Plans need to be made for response to possible shortage.

C – Systems that are likely to have water shortage during drought conditions. Plans for response to shortage are necessary.

Thirteen of the basin suppliers in 12 different counties are classified as drought-vulnerable systems (Classes B and C), implying that alternative supply sources must be sought for these systems. (See Figure 5.) A summary of water supply alternatives for these drought-vulnerable systems is presented in Table 5.

1.6 Water Supply Issues

The inadequacy of Kentucky River Basin supplies during drought conditions is a major concern throughout the basin. Water suppliers are examining several options to counter potential shortages, including alternative supply sources, regionalization of systems, and the continued maintenance and improvement of the existing lock and dam storage on the Kentucky River.

1.6.1 *Drought-vulnerable suppliers still in need of an alternative water supply source*

Most communities that have been identified as drought-vulnerable have identified a preferred alternative for water supply. However, few have actually begun the process of implementing these alternatives. Drought vulnerable suppliers in Clay, Fayette, Leslie, Letcher, Lincoln, Madison, Owen, Owsley, Perry, Powell and Scott Counties are in the process of determining and developing alternative supply sources. The following is a description of their proposed alternative supplies.

Clay County: Manchester Water Works is pursuing funding for a new low-flow dam on Goose Creek, as well as a new 2.5 mgd raw water intake structure and 16,000 feet of raw water lines. Both the Economic Development Administration and Rural Development have contributed funding for this project, which is proposed for completion in 2003. Additionally, Manchester and the Barbourville Utility Commission are proposing an interconnection between their two systems for long-term supply reliability.

Fayette County: The Kentucky American Water Company, the sole supplier in Fayette County, has joined the Bluegrass Water Supply Consortium to work with others in the region to find an adequate long-range water source to supplement its Kentucky River supply. (See Section 1.6.2 for additional details.) Potential alternative sources include the construction of a new reservoir, a raw or treated water pipeline to the Ohio River and increased storage in the Kentucky River.

Leslie County: The Hyden-Leslie County Water District has determined that the installation of wells in abandoned deep mines would create the best and most feasible alternative for additional water supply. Further study is needed to determine the location, quality and quantity of water available.

Letcher County: In order to supplement their current water supply, the Fleming-Neon Water Company has proposed the development of a new well into a deeper pool of water near the existing well and the catchment basin near the community of McRoberts.

The primary short-term alternative for Whitesburg Municipal Water Works is an existing well that once served the City of Whitesburg. An interconnection with the Letcher County Water and Sewer District will serve as the primary alternative later in the planning period.

Lincoln County: The city of Stanford in Lincoln County has purchased Buck Creek Lake to augment its supplies from Rice and Harris Reservoirs. However, it has not yet begun construction of the raw water lines connecting it to the water treatment plant.

Madison County: The Berea College Water Department is investigating sites for a fifth supply reservoir. In order to be prepared for the next drought situation, Berea needs to determine the reservoir site and construct and connect the reservoir to its drinking water treatment plant. Berea is also a member of the Bluegrass Water Supply Consortium, a regional potable water supply effort. (See Section 1.6.2 for additional details.)

Owen County: Owenton Water Works must complete the installation of its proposed raw water intake at Pool 2 of the Kentucky River, as well as a raw water line connecting the intake to its treatment plant.

Owsley County: Booneville Water and Sewer has proposed a new raw water line to Pool 14 of the Kentucky River, but has not yet begun construction.

Perry County: The Hazard Water Department has proposed the construction of a 400,000 gpd water treatment plant in southern Perry County, which would treat water from abandoned mines. This new Hazard-owned plant would serve residents of the surrounding area, as well as serve as an alternative supplemental source for the rest of the county. The project is already partially funded and could potentially be in operation early in the 2000 – 2020 planning period.

Powell County: Beech Fork Water Commission has proposed a connection to Irvine Municipal, whose supply source is Pool 11 of the Kentucky River. This project has not yet been implemented.

Scott County: Georgetown Municipal is pursuing the development of a new reservoir in northwestern Scott County for its alternative source, construction of which has not yet begun. Georgetown is also a member of the Bluegrass Water Supply Consortium, a regional potable water supply effort. (See Section 1.6.2 for additional details.)

Wolfe County: Campton Water Works plans to connect with the Beattyville water system and begin purchasing 100,000 gpd of treated water from them in 2005. Additionally, Campton is participating in the Cave Run Lake Water Commission, which is pursuing a regional treatment plant on Cave Run Lake.

In addition to these suppliers that are classified as drought vulnerable by the Division of Water's criteria, several other suppliers in the Kentucky River Basin are independently pursuing supplemental water supply sources (see below).

1.6.2 Cooperation in setting up regional systems

In order to ensure greater reliability of public water supplies, the concept of regionalization is being encouraged throughout Kentucky. By linking neighboring water supply systems, individual suppliers are better able to cope with shortages that may result from droughts or contamination events. Multiple system-to-system interconnections are recommended within the county water supply plans. In addition, broader system linkages involving multiple systems are being pursued. These include efforts of the Bluegrass Water Supply Consortium, Carr Creek Water Commission and Cave Run Lake Water Commission.

Bluegrass Water Supply Consortium (Anderson, Boyle, Clark, Fayette, Franklin, Garrard, Jessamine, Madison, Mercer, Scott and Woodford Counties)

The Bluegrass Water Supply Consortium is an alliance of water utilities and government agencies that are working to address the potable water needs of central Kentucky. The regionalization offered by the BWSC will provide system reliability that is not possible for individual suppliers. The BWSC's goal is to construct a transmission grid connecting the participating water utilities. This grid will enable the movement of treated water from points of availability to points of need throughout the system. The BWSC is also endeavoring to identify a supply source that will augment that of the Kentucky River and other supplier sources in order to ensure water availability during a shortage. Thus, existing treatment facilities and distribution systems will remain in operation.

The Consortium is currently conducting a study of various water supply alternatives. The intent of the study is to define the best, most cost effective, implementable, and environmentally acceptable capital plan to make additional potable water available to the participating water utilities. The additional supply could come from the purchase of water from a major supplier located outside the region, or the transfer of raw water to a treatment plant located within the basin. It could also be developed through the addition of one or more water treatment plants at a point or points in the downstream reaches of the Kentucky River where added stream flow from major tributaries should make more water available for withdrawal from the river. Other alternatives, such as the development of new reservoirs, are also being considered.

Participants in the Consortium include the Lexington-Fayette Urban County Government; Kentucky-American Water Company; Nicholasville Utilities; Winchester Municipal Utilities; Georgetown Municipal Water and Sewer Service; Frankfort Electric and Water Plant Board; Shelbyville Municipal Water and Sewer Commission; Mount Sterling Water and Sewer Commission; Berea College Utilities; and the cities of Cynthiana, Danville, Harrodsburg, Lancaster, Lawrenceburg, Paris, Versailles and Wilmore. BWSC participants expect to reach a consensus on a supply alternative by late spring to summer of 2003. Relief from the region's drought supply deficit should then begin to occur within three years in the form of system interconnections through the "grid" and/or access to an additional water supply source.

Carr Creek Water Commission (Knott, Letcher and Perry Counties)

The goal of the Carr Creek Water Commission is to construct a regional water treatment plant at Carr Creek Lake in Knott County. Members of the Commission include Hindman Municipal Water Works, Knott County Water and Sewer District, Letcher County Water and Sewer District, Southern Floyd Water District, and the City of Vicco. The Commission would have the authority to wholesale treated water from the proposed Carr Creek Lake water treatment plant. The Corps of Engineers has estimated that approximately 2 mgd could be withdrawn for each of the three participating counties.

The Knott County Water and Sewer District has become the lead applicant for the proposed plant. An engineer has been retained, and both an Appalachian Regional Commission (ARC) pre-application and rural development (RD) application have been submitted.

Cave Run Water Commission (Wolfe County)

The Cave Run Water Commission was formed by executive order of the Menifee County Judge Executive in March 2001. The Commission has proposed the construction of a water treatment plant at Cave Run Lake, an impoundment of the Licking River located in Bath, Menifee, Morgan and Rowan counties. Of these participating suppliers, Campton currently utilizes a Kentucky River Basin source, Campton Lake. In addition to serving as a supplemental water source for Campton, Jeffersonville and Morgan County, the regional treatment plant would serve as the main water source for Menifee County.

The Cave Run Water Commission has been able to secure funding in the amount of \$4.5 million toward the cost of the \$12 million project. Additional funds are being sought from the Community Development Block Grant, or CDBG, program (\$2 million); the Economic Development Administration, or EDA, program (\$1.5 million); and Rural Development, or RD, program (\$4 million). Required capital improvements will include the construction of a new raw water intake, water treatment plant, main distribution system, 300,000 gallon water tank and pump station.

1.6.3 *Maintenance of Kentucky River locks and dams*

The prevailing sentiment of public water suppliers using the mainstem of the Kentucky River for their raw water supply is to maintain the river as their major supply source. The continued use of the Kentucky River for water storage will require ongoing maintenance and improvements to the existing lock and dam system. Necessary maintenance activities may include stabilization measures, maintenance or installation of low-level release valves, repair of leakage through the locks and dams, and height increases at some of the dams to increase storage.

In December 2002, the KRA decided to move forward with increasing the height of Kentucky River dam #10 by either four or six feet, thereby creating an additional 1.1 to 1.6 billion gallons of water storage capacity in Pool 10. The U.S. Corps of Engineers will perform detailed analyses of both of these options and present their findings to the KRA for a determination of

which height increase to pursue. Federal funding in the amount of \$24 million has been allocated for the completion of this project.

In the meantime, maintenance needs are being examined at Lock and Dam 10. The Louisville District of the Army Corps of Engineers is performing a detailed evaluation that will result in recommendations for the near-term stabilization of the existing structure. The proposed project includes actions to stabilize the main dam, the land lock wall and the miter gates at Lock and Dam 10. The repairs are expected to cost approximately \$1 million and will not substantially alter the function of the existing lock and dam.

Additionally, the Corps of Engineers is conducting a preliminary study of options to stabilize, and possibly raise the height of, Lock and Dam 9. By raising Lock and Dam 9 by four feet, it is estimated that an additional 0.8 billion gallons of water storage can be created on the mainstem of the river. Future possible plans under consideration also include building a new Dam 8 that increases its height by 22 feet in order to add a storage volume of approximately 4.5 billion gallons. Further, a proposed increase in the height of Dam 11 by four feet is predicted to add approximately 0.65 billion gallons of storage.

2.0 County Plan Summaries

The following sections (3.0 – 27.0) contain summaries of the water management plans for individual counties that have water suppliers utilizing supply sources within the Kentucky River Basin. Each plan summary includes the following sections.

2.1 County Water Suppliers: Current Sources & Treatment Capability: This section lists individual suppliers and distributors for each county. It also provides information about the supply source(s) and water treatment plant capacities. If water is purchased from or sold to other suppliers, these arrangements are also described. County suppliers utilizing sources outside of the Kentucky River Basin are listed, but are not assessed in further detail in the summaries.

2.2 Water Demand: This section provides projections for county population increases or decreases for the planning period of 2000 to 2020. It also presents water demand projections through 2020. A comparison of projected average and peak demands is made with existing water withdrawal permit amounts and water treatment plant capacities.

2.3 Supply Assessment & Drought Susceptibility: This section provides statistics relevant to source water availability for the county's water supply source(s). It also explains the drought susceptibility classification for these supplies according to the criteria developed by the Kentucky Division of Water.

2.4 Water Supply Alternatives: Specific water supply alternatives are described for those county suppliers determined as having inadequate supply sources during normal and/or drought conditions. A preferred water supply alternative is noted, as well as any progress being made toward implementing this alternative. This section also provides a description of recommended interconnections between water suppliers and any other regional efforts to provide treated water.

2.5 Narrative Summary

2.5.1 *General assessment of system:* This assessment of the county's water providers describes the overall status of the county's water supply. It makes note of any county needs for supplemental raw water supply sources, amendments to water withdrawal permits or increases to water treatment plant capacity. Where relevant, the status of efforts to develop alternative water supplies is also described.

2.5.2 *Water shortage response plans / Contamination response plans:* This section details county plans for responding to water shortages resulting from a drought or a contamination event. In some instances, counties have developed individualized response plans. Other counties plan to adapt generalized specifications provided in the Kentucky Division of Water's Water Shortage Response Plan.

2.5.3 *Proposed projects and estimated costs:* Infrastructure needs and funding projections are separated into short-term (2000-2005) and long-term needs (2006-2020). In addition to providing general estimates of the number of additional customers expected to be served and the number of new miles of water line to be installed in the county, a summary table lists projected costs of new lines, line rehabilitation, source improvement/development, water treatment and tanks and pumps. Details provided in this section are based on projections included in the 1999 Kentucky Infrastructure Authority report, *Water Resource Development: A Strategic Plan*. They include estimates for publicly-owned water supply systems only.

2.5.4 *Other major issues:* This final section describes any water supply issues not previously addressed in the county plan summary. Examples of such issues include the presence of competing water withdrawers, water quality concerns and further details about water supply regionalization efforts.

2.6 Appendix A – County Water System Maps: These maps show the existing and proposed service areas for individual public water suppliers in each county. They were prepared by the Water Resource Development Commission and are available on the Kentucky Infrastructure Authority's website at <http://wris.state.ky.us/website/wmp/viewer.htm>.

2.7 Appendix B – Water Withdrawal Permits: These permits are the most recent water withdrawal permits for public water suppliers in the Kentucky River Basin, as issued by the Kentucky Division of Water.

2.8 Appendix C – Drought Susceptibility Classification: This appendix provides details about the Kentucky Division of Water's standards for classifying the vulnerability of water suppliers to shortages during drought conditions.

TABLE 1: Summary of Kentucky River Basin Suppliers

County/Supplier	Water Source Type ¹	Water Source	Permitted Withdrawal	Combined Plant Capacity	Projected 2020 Average/Max Demand	Drought Vulnerability ²
Anderson						
Lawrenceburg Water & Sewer	M	Ky. River Pool 5	2.5 mgd	2.488 mgd	2.768 mgd/ 3.852 mgd	A
Boone						
Bullock Pen Water District	R	Bullock Pen Lake	0.550 – 0.850 mgd	1.0 mgd	1.340 mgd/ 1.693 mgd	A
Boyle						
Danville City Water Works	R	Herrington Lake	5.0 mgd	10.0 mgd	4.959 mgd/ 6.908 mgd	A
Northpoint Training Center	R	Herrington Lake	0.300 gpd	0.806 mgd	0.298 mgd/ 0.524 mgd	A
Breathitt						
Jackson Municipal Water Works	T	N. Fork Ky. River	1.5 mgd	1.5 mgd	1.281 mgd/ 2.097 mgd	A
Clark						
Winchester Municipal Utilities	M	Ky. River Pool 10	15.0 mgd	5.32 mgd	5.02 mgd/ 6.646 mgd	A
	R	Ecton Reservoir	5.3 mgd			
Clay						
Manchester Water Works *withdrawals from 3 sources combined can't exceed 2 mgd*	R	Bert Combs Lake	2.0 mgd	2.3 mgd	2.132 mgd/ 4.54 mgd	C
	G	Well	0.12 mgd			
	T	Goose Creek	2.5 mgd			
Estill						
Irvine Municipal	M	Ky. River Pool 11	2.0 mgd	2.0 mgd	1.128 mgd/ 1.624 mgd	A
Fayette						
Kentucky-American	M	Ky. River Pool 9	60.0 – 63.0 mgd	65 mgd	51.86 mgd/ 87.67 mgd	C
	R	Jacobson Reservoir	16.0 mgd			

County/Supplier	Water Source Type ¹	Water Source	Permitted Withdrawal	Combined Plant Capacity	Projected 2020 Average/Max Demand	Drought Vulnerability ²
Franklin						
Frankfort Electric & Water Plant	M	Ky. River Pool 4	14-15 mgd	18.0 mgd	8.711 mgd/ 14.565 mgd	A
Garrard						
Lancaster Municipal	M	Ky. River Pool 8	1.2 – 1.7 mgd	2.1 mgd	1.899 mgd/ 2.679 mgd	A
Jessamine						
Nicholasville Municipal	M	Ky. River Pool 8	2.0 – 3.0 mgd	6.0 mgd	4.531 mgd/ 7.186 mgd	A
Wilmore Municipal	M	Ky. River Pool 6	1.0 mgd	0.684 mgd	0.787 mgd/ 1.286 mgd	A
Knott						
Hindman Water Department	G	3 wells along Right Fork of Troublesome Cr	0.18 – 0.22 mgd	0.465 mgd	0.268 mgd/ 0.364 mgd	A
Lee						
Beattyville Water Works	T	N. Fork of Ky. River	0.605 – 0.75 mgd	1.0 mgd	0.698 mgd/ 1.048 mgd	A
Leslie						
Hyden-Leslie County W.D.	T	Middle Fork of Ky. River	0.792 mgd	1.0 mgd	0.841 mgd/ 1.261 mgd	B
Letcher						
Blackey Water System	T	N. Fork of Ky. River	0.150 mgd	0.300 mgd	0.260 mgd/ 0.390 mgd	A
Fleming-Neon Water Company	G	Deep mine wells	0.360 mgd	0.430 mgd	0.248 mgd/ 0.373 mgd	Unknown
	G	Wells on Tom Biggs Branch	0.100 mgd			
Whitesburg Municipal	T	N. Fork of Ky. River	0.412 mgd	0.864 mgd	0.412 mgd/ 0.618 mgd	B

County/Supplier	Water Source Type ¹	Water Source	Permitted Withdrawal	Combined Plant Capacity	Projected 2020 Average/Max Demand	Drought Vulnerability ²
Lincoln						
Stanford Municipal	R	Rice Reservoir	1.5 mgd	2.0 mgd	1.309 mgd/ 1.605 mgd	B
	R	Harris Reservoir (Green R. Basin)	1.0 mgd			
Madison						
Richmond Water, Gas & Sewer	M	Ky. River Pool 11	9.0 mgd	9.0 mgd	8.051 mgd/ 11.794 mgd	A
Berea College Water Dept.	R	Kales Lake	2.0 mgd	4.0 mgd	3.250 mgd/ 4.385 mgd	B
	R	Lower Silver Creek (B) Lake	2.5 mgd			
	R	Cowbell Lake	2.5 mgd			
	R	Owsley Fork Lake	2.5 mgd			
Bluegrass Army Depot	R	Lake Vega	0.5 mgd	0.750 mgd	0.112 mgd	B
Mercer						
Harrodsburg Municipal	M	Ky. River Pool 7	3.2 mgd	4.0 mgd	3.133 mgd/ 4.448 mgd	A
Owen						
Owenton Water Works	R	Lower Thomas Lake	0.800 – 0.900 mgd	1.44 mgd	1.411 mgd/ 1.608 mgd	B
	T	Severn Creek	0.800 – 0.900 mgd			
Owsley						
Booneville Water & Sewer	T	South Fork of Ky. River	0.355 mgd	0.864 mgd	0.374 mgd/ 0.561 mgd	C
Perry						
Hazard Water Dept.	T	North Fork of Ky. River	3.75 mgd	5.0 mgd	3.423 mgd/ 4.654 mgd	C

County/Supplier	Water Source Type ¹	Water Source	Permitted Withdrawal	Combined Plant Capacity	Projected 2020 Average/Max Demand	Drought Vulnerability ²
Powell						
Beech Fork Water Commission	R	Beech Fork Reservoir	1.5 mgd	1.944 mgd	1.450 mgd/ 2.054 mgd	B
	T	Red River	0 – 4.0 mgd			
Natural Bridge State Park	R	Mill Creek Lake	0.030 – 0.070 mgd	0.144 mgd	0.034 mgd/ 0.082 mgd	A
Scott						
Georgetown Municipal	G	Royal Spring Creek	4.0 mgd	4.0 mgd	3.153 mgd/ 4.928 mgd	C
	T	N. Elkhorn Creek	1.1 mgd			
Wolfe						
Campton Water Works	R	Campton Lake	0.350 – 0.375 mgd	0.430 mgd	0.387 mgd/ 0.430 mgd	C
Woodford						
Versailles Municipal Water	M	Ky. River Pool 5	3.0 -4.0 mgd	4.0 mgd	4.016 mgd/ 5.129 mgd	A

¹Water Source Type:

G = groundwater

M = mainstem of Kentucky River

R = reservoir

T = tributary to Kentucky River

²Drought Vulnerability Classification

A = Systems unlikely to experience water shortage during drought conditions

B = Systems that should be examined for susceptibility to water shortage during drought. Plans need to be made for response to possible shortage.

C = Systems that are likely to have water shortage during drought conditions. Plans for response to shortage are necessary.

See Appendix A for further details on drought classification criteria.

TABLE 2: Predicted Percent Change in County Population between 2000 and 2020

County	Percentage Change in Population 2000-2030
Anderson	+ 69%
Boone	+ 109 %
Boyle	+ 11.5%
Breathitt	+ 4%
Clark	+ 21%
Clay	+ 22%
Estill	+ 7%
Fayette	+ 25%
Franklin	+ 10%
Garrard	+ 67%
Jessamine	+ 50%
Knott	- 8%
Lee	+ 11.5%
Leslie	- 24%
Letcher	- 15%
Lincoln	+ 37%
Madison	+ 36%
Mercer	+ 16%
Owen	+ 41%
Owsley	- 7.5%
Perry	- 12%
Powell	+ 25%
Scott	+ 82%
Wolfe	+ 16%
Woodford	+ 26%

Based on estimates provided by the University of Louisville Kentucky State Data Center at <http://cbpa.louisville.edu/ksdc/>. (2003)

TABLE 3: Demand Estimates for Kentucky River Basin Suppliers (by County)

County	Avg. Daily Production 2000	Avg. Daily Production 2005	Avg. Daily Production 2010	Avg. Daily Production 2015	Avg. Daily Production 2020	Percent Change in Demand
Anderson	1.708 mgd	1.973 mgd	2.238 mgd	2.503 mgd	2.768 mgd	+ 62%
Boone	0.878 mgd	1.036 mgd	1.160 mgd	1.297 mgd	1.340 mgd	+ 53%
Boyle	4.35 mgd	4.502 mgd	4.654 mgd	4.807 mgd	4.959 mgd	+ 14%
Breathitt	0.594 mgd	0.892 mgd	1.204 mgd	1.297 mgd	1.398 mgd	+ 135%
Clark	3.998 mgd	4.253 mgd	4.505 mgd	4.764 mgd	5.020 mgd	+ 26%
Clay	1.644 mgd	1.913 mgd	2.005 mgd	2.076 mgd	2.132 mgd	+ 30%
Estill	1.041 mgd	1.070 mgd	1.091 mgd	1.111 mgd	1.128 mgd	+ 8%
Fayette	41.02 mgd	44.86 mgd	47.09 mgd	49.33 mgd	51.86 mgd	+ 26%
Franklin	7.950 mgd	8.201 mgd	8.409 mgd	8.580 mgd	8.711 mgd	+ 10%
Garrard	1.197 mgd	1.358 mgd	1.522 mgd	1.703 mgd	1.899 mgd	+ 59%
Jessamine	3.503 mgd	3.95 mgd	4.399 mgd	4.856 mgd	5.318 mgd	+ 52%
Knott	0.140 mgd	0.240 mgd	0.246 mgd	0.253 mgd	0.258 mgd	+ 85%
Lee	0.540 mgd	0.692 mgd	0.698 mgd	0.698 mgd	0.698 mgd	+ 30%
Leslie	0.575 mgd	0.745 mgd	0.767 mgd	0.841 mgd	0.841 mgd	+ 46%
Letcher	0.584 mgd	0.834 mgd	1.126 mgd	1.391 mgd	1.649 mgd	+ 182%
Lincoln	0.963 mgd	1.049 mgd	1.135 mgd	1.222 mgd	1.309 mgd	+ 36%
Madison	8.347 mgd	9.099 mgd	9.834 mgd	10.553 mgd	11.301 mgd	+ 35%
Mercer	2.724 mgd	2.826 mgd	2.928 mgd	3.03 mgd	3.133 mgd	+ 15%
Owen	0.989 mgd	1.112 mgd	1,243 mgd	1.329 mgd	1.411 mgd	+ 43%
Owsley	0.315 mgd	0.374 mgd	0.374 mgd	0.374 mgd	0.374 mgd	+ 19%
Perry	2.752 mgd	3.017 mgd	3.348 mgd	3.384 mgd	3.423 mgd	+ 24%
Powell	1.124 mgd	1.206 mgd	1.287 mgd	1.369 mgd	1.450 mgd	+ 29%
Scott	1.733 mgd	2.028 mgd	2.351 mgd	2.725 mgd	3.153 mgd	+ 82%
Wolfe	0.305 mgd	0.328 mgd	0.430 mgd	0.465 mgd	0.465 mgd	+ 52%
Woodford	2.967 mgd	3.148 mgd	3.345 mgd	3.642 mgd	4.016 mgd	+ 35%

Demand estimates provided in individual County Water Management Plans.

TABLE 4: Public Water Supply Infrastructure Funding Needs by County

County	New Customers Served (2000-2020)	New Miles of Line (2000-2020)	2000-2005 Needs (in \$1,000)	2006-2020 Needs (in \$1,000)
Anderson	607	154.5	\$9,304	\$2,584
Boone	--	--	\$4,000	\$0
Boyle	374	68	\$3,393	\$7,590
Breathitt	2,720	243.9	\$10,000	\$22,655
Clark	362	66.2	\$8,820	\$2,030
Clay	2,033	351.7	\$35,645	\$13,941
Estill	183	77.5	\$1,933	\$6,698
Fayette	50,000	--	\$92,500	\$262,500
Franklin	84	30.5	\$7,741	\$11,999
Garrard	261	40.5	\$2,246	\$3,167
Jessamine	304	56	\$7,798	\$9,707
Knott	3,155	294.1	\$18,488	\$16,300
Lee	320	51.7	\$2,441	\$9,250
Leslie	1,694	147.2	\$6,350	\$10,000
Letcher	5,256	301.6	\$18,575	\$30,800
Lincoln	351	90	\$6,155	\$3,935
Madison	459	95.5	\$6,650	\$43,605
Mercer	262	90	\$7,650	\$7,465
Owen	1,328	318.8	\$3,160	\$10,400
Owsley	267	43	\$2,500	\$4,000
Perry	3,429	215.6	\$11,700	\$7,150
Powell	82	29.5	\$3,069	\$1,749
Scott	269	27	\$2,823	\$3,004
Wolfe	700	95	\$0	\$19,500
Woodford	228	47.5	\$1,990	\$7,004
TOTALS	74,728	2,968.5	\$274,931	\$517,033

Estimates taken from *Water Resource Development: A Strategic Plan* (KIA, 2000)

NOTE: In its report, the Kentucky Infrastructure Authority provided estimates for publicly owned water suppliers only. Estimates for the privately-owned water supply system in Fayette County were provided by its owner, the Kentucky-American Water Company.

TABLE 5: Kentucky River Basin Drought-Vulnerable Systems

Public Water Supplier	Current Water Supply Source	Class*	Discussion of Water Supply Alternatives
Manchester Water Works (Clay)	Bert Combs Lake, Well and Goose Creek	C	Manchester Water Works has requested funding to construct a low flow dam and new raw water intake structure on Goose Creek. Raw water would be pumped directly to Manchester's water treatment plant. In addition, interconnections are proposed between Manchester Water Works and the Knox County Utility System for the summer of 2003 and with the Leslie County Water System in the summer of 2004.
Kentucky-American (Fayette)	Ky. River Pool 9	C	The outcome of the Bluegrass Water Supply consortium's 2002-2003 study will likely determine KAWC's water supply future. Although water conservation could alleviate some of the supply shortage, additional potable water supply is a serious need of the Kentucky-American Water Company. Some of the water supply alternatives to be considered by the Consortium include a potable water supply connection to Louisville or Cincinnati, a potable water supply connection to the Greater Fleming Regional Water Commission's Lewis County well field, a treatment plant at a downstream point on the Kentucky River, and supplemental storage provided by raising dams on the Kentucky River.
Hyden-Leslie Water District (Leslie)	Middle Fork	B	Considered alternatives include abandoned deep mines, raising the dam in the Middle Fork, a new reservoir on Rockhouse Creek, Buckhorn Lake and water conservation. Final consideration was given to conservation, a new reservoir and deep mines. An average water use reduction of 31 percent was projected through the use of conservation measures. However, this measure alone cannot assure an adequate supply. A new reservoir with a volume of at least 640 acre-feet would be required to meet projected water supply needs (with additional volume for sedimentation, aquatic life and other uses). The estimated cost of the reservoir, intake and raw water line is \$4.34 million. Several abandoned mines are located in the Leslie County area, with potential flooding volumes of 6,000 to 9,000 acre-feet. The estimated cost of drilling a well and installing a raw water line to access water from the mines is \$944,000. <i>The use of flooded abandoned deep mines is the recommended alternative.</i>
Fleming-Neon Water Company (Letcher)	Deep mine wells, Wells on Tom Biggs Branch	Unknown/B	A project has been proposed to drill a new well into a deeper pool of water near the existing well and the catchment basin near the community of McRoberts. The completion of planned interconnections with surrounding water suppliers would further ensure a dependable water supply.

Public Water Supplier	Current Water Supply Source	Class*	Discussion of Water Supply Alternatives
Whitesburg Municipal (Letcher)	North Fork Ky. River	B	<p>Considered alternatives include abandoned deep mines, a new reservoir and water conservation. An average water use reduction of 29 percent was projected through the use of conservation measures. However, this measure alone cannot assure an adequate supply. A new reservoir with a volume of at least 420 acre-feet would be required to meet projected water supply needs (with additional volume for sedimentation, aquatic life and other uses). The estimated cost of the reservoir, intake and raw water line is \$2.3 million. Several abandoned mines are reportedly located in Whitesburg area. The estimated cost of drilling a well and installing a raw water line to access water from the mines is \$797,000. <i>The use of flooded abandoned deep mines is the recommended alternative.</i> This option will require further study to determine the location, quality and quantity of available water.</p>
Stanford Municipal (Lincoln)	Rice Reservoir / Harris Reservoir	B	<p>Stanford has recently purchased an existing small dam and reservoir on Buck Creek in southern Lincoln County in the Cumberland River Basin. Stanford plans to supplement their existing water supply by linking newly purchased Buck Creek Lake with its treatment plant by means of a pump and transmission pipeline.</p>
Berea College Water (Madison)	4 lakes (Kales, Lower Silver, Cowbell, Owsley Fork)	B	<p>Expected to develop a fifth water supply reservoir. Would likely be constructed in southeastern Madison County. Officials have been evaluating new reservoir options for more than five years, and it seems likely that a specific project will be initiated by 2010. A connection to the proposed Bluegrass Water Supply Consortium grid may be difficult due to distance from the region.</p>
Owenton Water Works (Owen)	Lower Thomas Lake / Severn Creek	B	<p>Owenton is currently extending its Severn Creek intake to a lower elevation within the Kentucky River. This new intake will provide access to a water source that is adequate, even during drought conditions, and is superior in water quality.</p>
Booneville Water & Sewer (Owsley)	South Fork Ky. River	C	<p>Considered alternatives include a connection to the Beattyville system, a new raw water line to Pool 14 of the Kentucky River and water conservation. An average water use reduction of 20 percent was projected through the use of conservation measures. However, this measure alone cannot assure an adequate supply from the South Fork. A connection to the Beattyville system was considered too costly for further evaluation. <i>The construction of a raw water line to Pool 14 was the chosen alternative.</i> It would provide enough water to meet projected demands and have long-term reliability. Requires construction of intake structure and a raw water line of approximately 11 miles in length. Expected to cost approximately \$1.4 million.</p>

Public Water Supplier	Current Water Supply Source	Class*	Discussion of Water Supply Alternatives
Hazard Water Department (Perry)	North Fork Ky. River	C	<p>Considered alternatives include releases from Carr Fork Reservoir, a new reservoir, wells in flooded abandoned mines and water conservation. An average water use reduction of 28 percent was projected through the use of conservation measures. However, this measure alone cannot assure an adequate supply from the North Fork. The use of Carr Fork Reservoir requires an agreement with the U.S. Army Corps of Engineers to release water as needed during a drought. Also requires purchase of storage space, which is projected to cost approximately \$2.5 million. A new reservoir would require construction of a dam, intake structure and raw water line to the treatment plant, with expected costs of approximately \$6.4 million. <i>The use of wells in abandoned mines was the chosen alternative.</i> Requires construction of wells and a raw water line of approximately 5 miles in length. Expected to cost approximately \$2.27 million. This option will require further study to determine the location, quality and quantity of available water.</p>
Beech Fork Water Commission (Powell)	Beech Fork Reservoir / Red River	B	<p>A connection with Irvine Municipal, whose supply is from Pool 11 of the Kentucky River, would alleviate the drought susceptibility of the Beech Fork system.</p>
Georgetown Municipal (Scott)	Royal Spring Cr. / North Elkhorn Cr.	C	<p>Georgetown is expected to begin construction of a new reservoir in northwestern Scott County, and intends to install a raw water pipeline to connect the reservoir to the municipal water treatment plant in the city center. Georgetown is also a member of the Bluegrass Water Supply Consortium, a regional potable water supply effort with a water line grid that is capable of conveying large quantities of potable water from the point(s) of availability to the point(s) of need.</p>
Campton Water Works (Wolfe)	Campton Lake	C	<p>A planned interconnection with Beattyville will enable Campton to begin purchasing 100,000 gpd from Beattyville in 2005. Additionally, Campton is participating in the Cave Run Lake Water Commission, which is pursuing a regional treatment plant on Cave Run Lake. This source would ensure the long-term adequacy of Campton's water supply.</p>

* Class refers to the Kentucky Division of Water's Drought Susceptibility Classification:

A - Systems unlikely to experience water shortage during drought conditions.

B - Systems that should be examined for susceptibility to water shortage during drought. Plans need to be made for response to possible shortage.

C - Systems that are likely to have water shortage during drought conditions. Plans for response to shortage are necessary.

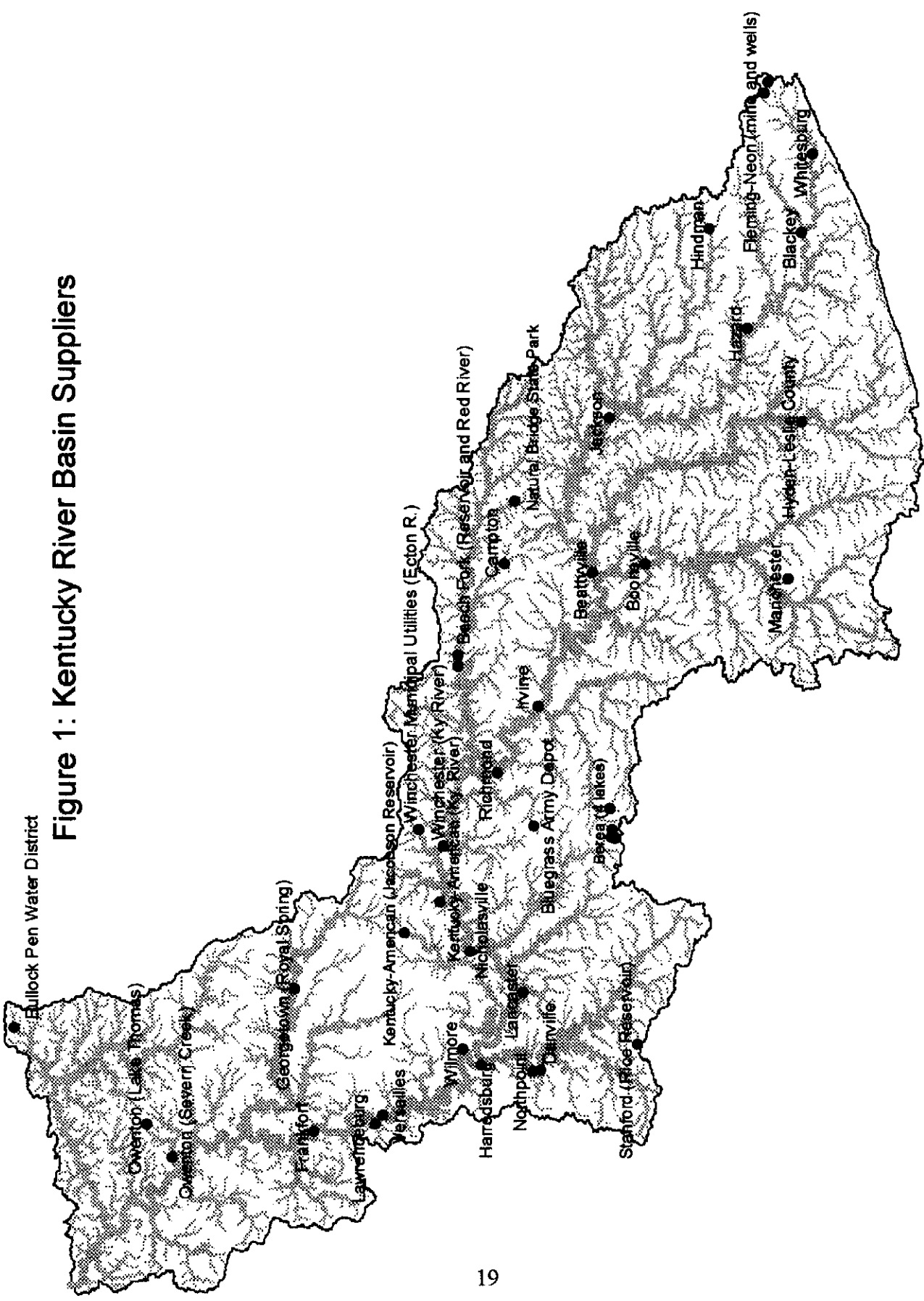


Figure 1: Kentucky River Basin Suppliers

Figure 2: Kentucky River Basin Suppliers – Drought Classification

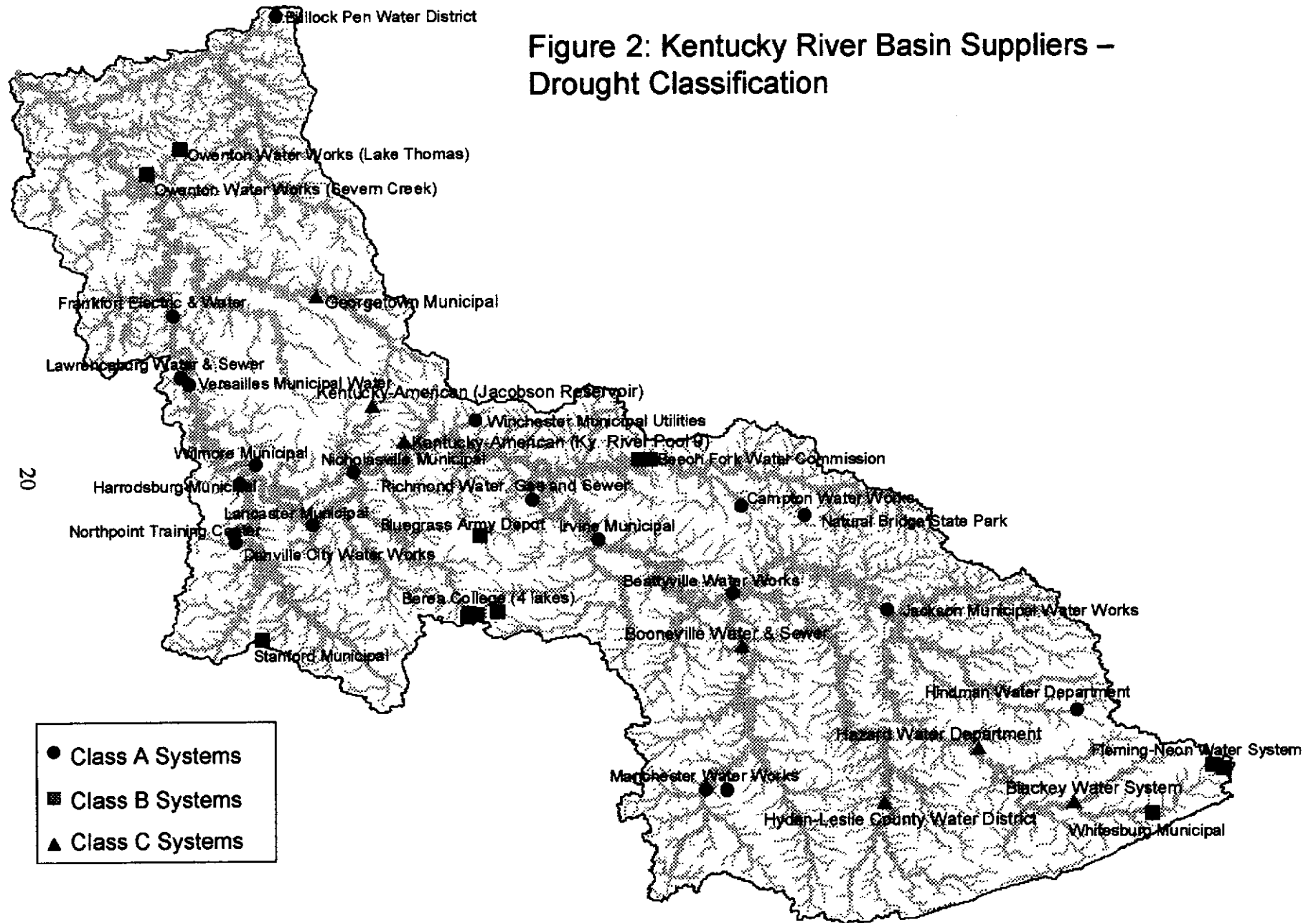
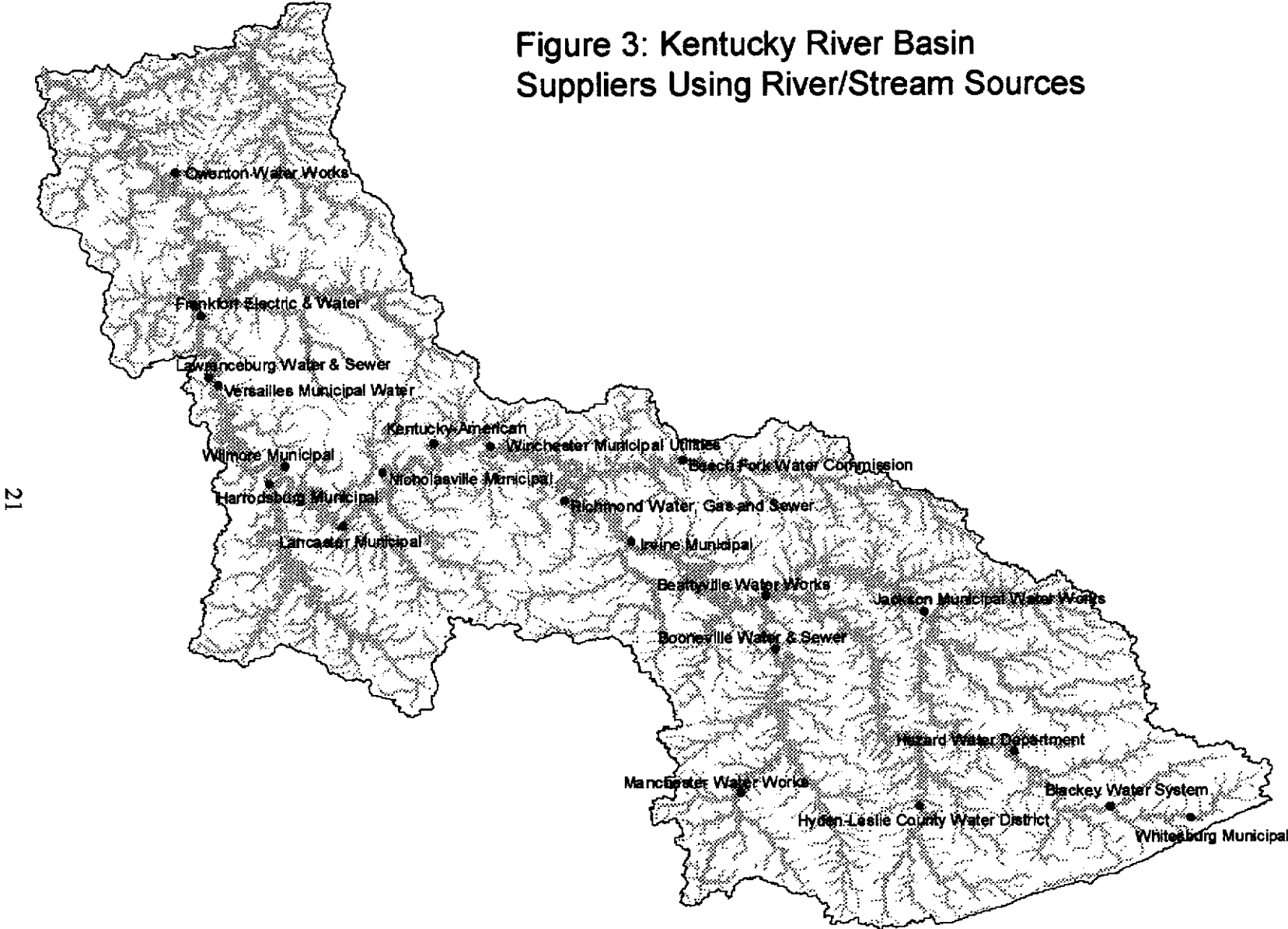


Figure 3: Kentucky River Basin
Suppliers Using River/Stream Sources



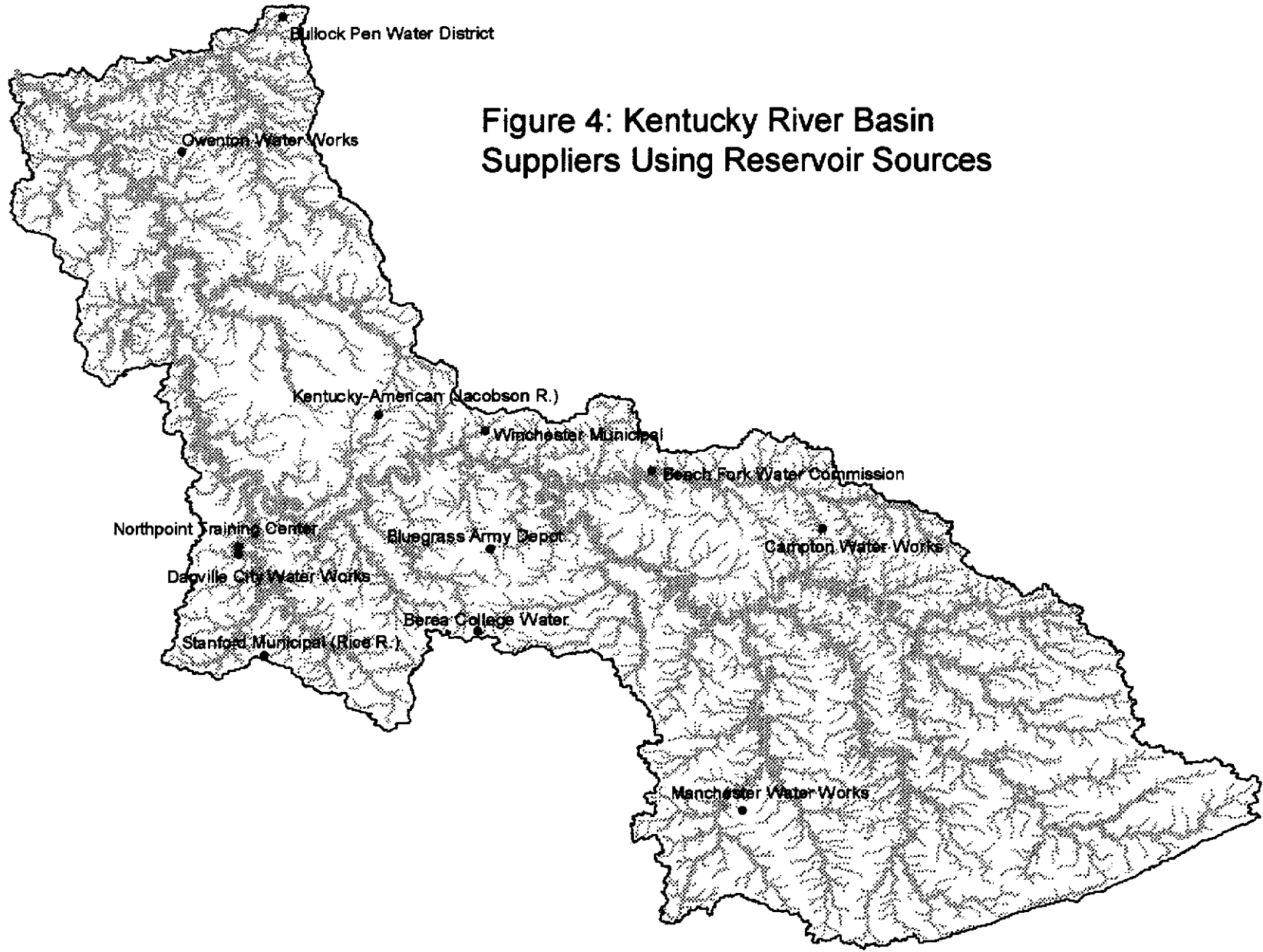
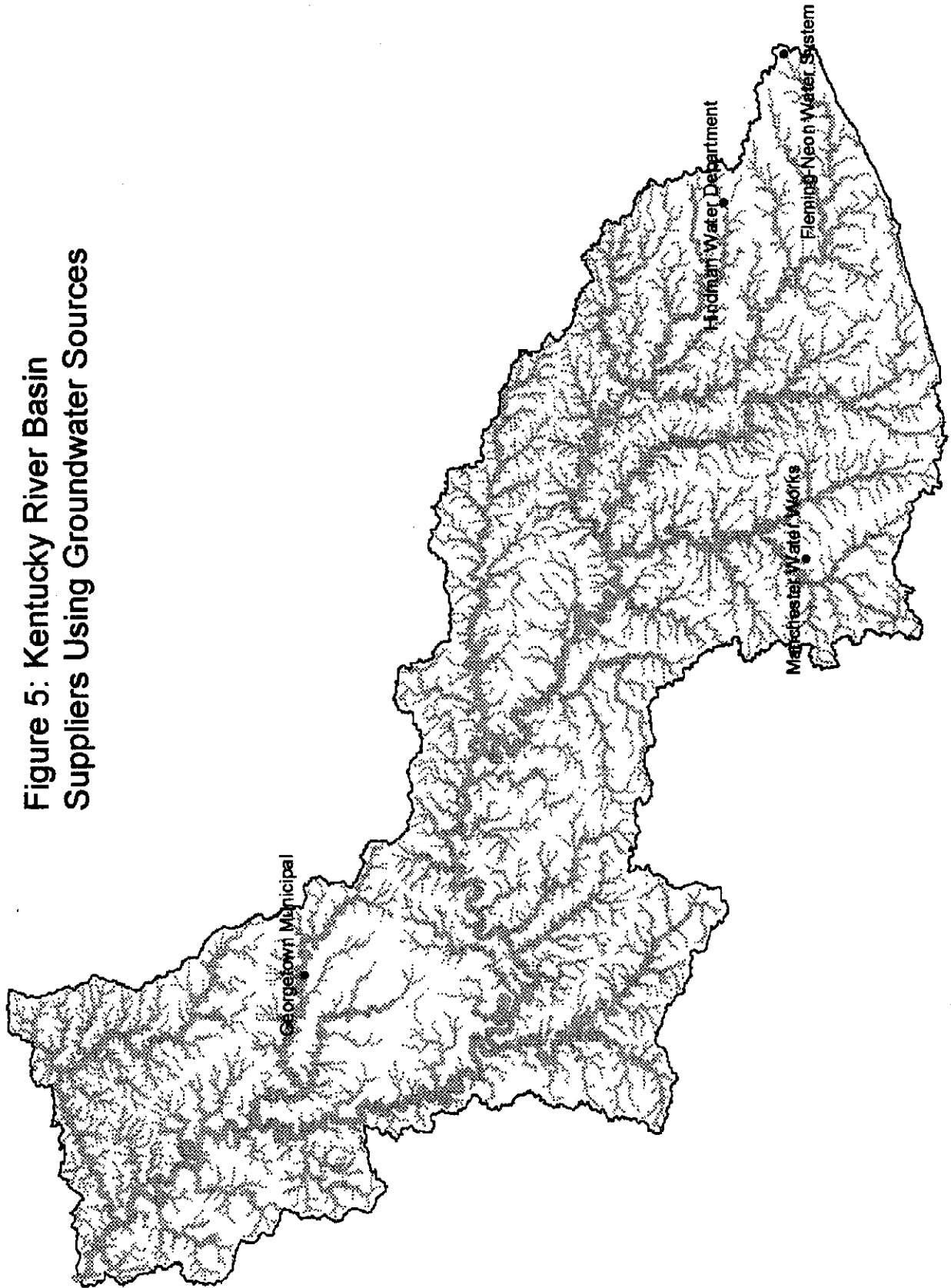
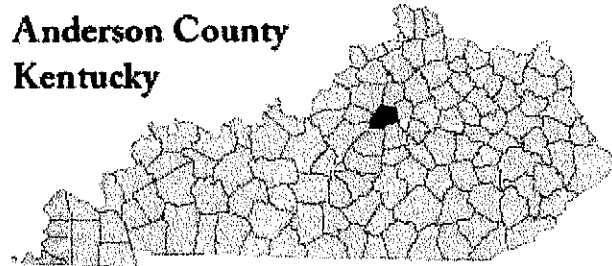


Figure 4: Kentucky River Basin Suppliers Using Reservoir Sources

**Figure 5: Kentucky River Basin
Suppliers Using Groundwater Sources**



3.0 ANDERSON COUNTY



Anderson County is located in central Kentucky in the middle to lower regions of the Kentucky River Basin. Kentucky River Lock and Dam 5 is located in Anderson County, creating Pool 5 of the river, which serves as Lawrenceburg’s water supply source.

3.1 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute their finished, potable water to their customers or sell the water to other distributors. Table 3.1 lists the water suppliers for Anderson County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier’s overall water treatment plant capacity.

Table 3.1 – Summary of Anderson County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity*	Treatment Plant Capacity
Lawrenceburg Water & Sewer Department	Kentucky River Pool 5	Kentucky River	2.5 mgd	2.488 mgd

*Permitted water withdrawal amount, per Kentucky Division of Water.

In addition to supplying its own customers, Lawrenceburg sells water to two other distributors for Anderson County; the South Anderson Water District and the Alton Water District. The South Anderson Water District was set to commence a wholesale water purchase arrangement with the Frankfort Water Plant Board late in 2002. Thus, it will no longer be served by Lawrenceburg. See Figure 3.1 in Appendix A for a map of the Anderson County water system. In addition, Lawrenceburg’s water withdrawal permit can be found in Appendix B.

3.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water

supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised population projections for the water management planning period of 2000 to 2020. These new figures for Anderson County, shown in Table 3.2, are based on results from the 2000 census data.

Table 3.2 – Anderson County Population Projections

2000 Census	2005	2010	2015	2020
19,111	21,977	25,036	28,495	32,347

* Taken from University of Louisville Kentucky State Data Center.

Between 2000 and 2020, the Anderson County population is expected to increase by approximately 69%, or 13,236 people. In 2000, 95.1% of the county population was served by a public water supplier. It is projected that 99.7% of the population will be served by a public water supply by 2020, for an overall increase of 13,236 individuals. The associated projected water demands for the Lawrenceburg Water and Sewer Department are shown in Table 3.3 and illustrated in Figure 3.2.

**Table 3.3 – Summary of Current and Projected Anderson County Water Demand:
Lawrenceburg Water and Sewer Department**

	Average Annual Water Use (million gals)	Projected Annual Water Use (million gals)			
		2000	2005	2010	2015
Residential	345.36	398.89	452.42	505.95	559.48
Commercial/Institutional	61.37	70.89	80.40	89.91	99.43
Industrial	111.30	128.56	145.81	163.06	180.31
Public/Unaccounted For	105.51	121.87	138.22	154.57	170.93
Other	0.00	0.00	0.00	0.00	0.00
Total	623.55	720.20	816.85	913.50	1,010.15
Avg. Daily Production (mgd)	1.708	1.973	2.238	2.503	2.768
Peak Day (mgd)	2.442	2.747	3.115	3.484	3.852

(Taken from Bluegrass Area Water Management Plan, 2002)

Anderson County’s average daily water use demand from Pool 5 of the Kentucky River is expected to increase by approximately 62% between 2000 and 2020. In 2001, Lawrenceburg reported withdrawing an average daily amount of 1.72 mgd, which is slightly greater than predictions for 2000 and less than the predicted average demand for 2005.

Lawrenceburg’s projected peak demand for 2020 of 3.852 mgd is greater than its current permitted water withdrawal amount of 2.5 mgd, as well as its treatment plant capacity of 2.59 mgd.

According to the Bluegrass Area Water Management Plan, demand management through water conservation measures is predicted to have the potential to reduce Lawrenceburg’s annual average demand by approximately 6.5% and its maximum day demand by approximately 6.7%.

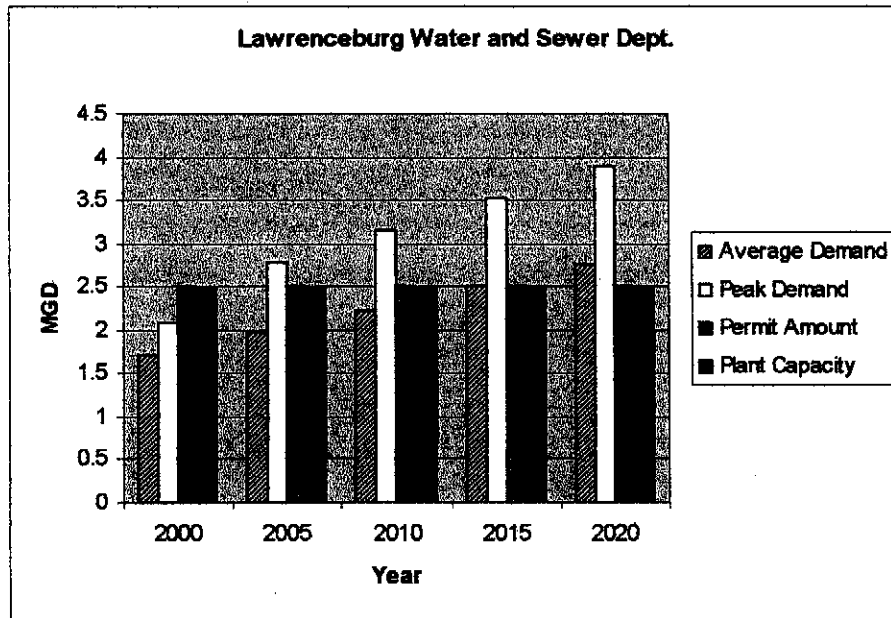


Figure 3.2 – Comparison of Lawrenceburg’s Predicted Average Demand/Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Lawrenceburg’s predicted average demand is expected to exceed its permitted water withdrawal amount and its treatment plant capacity by 2015. The system’s peak demand is predicted to surpass the permitted water withdrawal amount and plant capacity by 2005.

3.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors.

Critical to the determination of supply adequacy is the relationship between the permitted withdrawal amount, and statistical measures of flow measured at the point of withdrawal such as 1) the normal flow, 2) the 7Q10 flow and 3) the 7Q20 flow. Values for each of these statistics for Pool 5 are provided in Table 3.4.

Table 3.4 – Anderson County Supply Sources and Capacities

Supply Source	Normal Flow ¹	7Q10 ²	7Q20 ³
Kentucky River Pool 5	106.9 mgd	96.9 mgd	80.1 mgd

¹Normal flow = 10% of lowest monthly mean flow; maximum amount that any single user can be permitted to withdraw

²7Q10 = lowest consecutive 7 day streamflow that is likely to occur in a ten year period; for planning purposes, represents “minimum flow”

³7Q20 = lowest consecutive 7 day streamflow that is likely to occur in a twenty year period; for planning purposes, represents “drought conditions”

The Kentucky Division of Water has established the “normal flow” as the basis for determining the maximum amount that any one permittee may be allowed to withdraw. Thus, Lawrenceburg’s current and projected demands are well within this available allotment.

The Kentucky Division of Water considers a regulated stream source adequate if the average daily water use is less than 20 percent of the stream’s 7Q10 flow value. Lawrenceburg’s predicted 2020 average daily water use, 2.768 mgd, is only 3% of the 7Q10 for Kentucky River Pool 5. As a result, Lawrenceburg’s water supply has been assigned a drought susceptibility classification of A, as shown in Table 3.5.

Table 3.5 – Anderson County Water Supply Drought Susceptibility

Supplier	Drought Susceptibility Class
Lawrenceburg Water and Sewer Department	A

The drought susceptibility classification of “A” indicates that the system is unlikely to experience a water shortage during drought conditions. See Appendix C for further explanation of the Kentucky Division of Water’s drought susceptibility classification.

3.4 Water Supply Alternatives

Anderson County’s water supply from the Kentucky River was found to be adequate through 2020. Therefore, no supply alternatives were considered.

3.5 Narrative Summary

3.5.1 General assessment of system

Lawrenceburg’s supply source of Kentucky River Pool 5 has an adequate capacity to meet both projected average and peak demands through 2020. However, Lawrenceburg’s predicted average demand is expected to exceed its permitted water withdrawal amount by 2015 and its treatment plant capacity by 2020. Peak demands are predicted to exceed both permit and treatment plant capacities by 2005. This suggests that Lawrenceburg may need to upgrade its water treatment plant capacity and withdrawal permit amount during the 20-year planning period. In 2001, Lawrenceburg reported an average monthly withdrawal rate of 1.720 mgd and a maximum monthly average of 1.974 mgd. Each of these values is within the maximum withdrawal (2.5 mgd) and plant capacities (2.488 mgd).

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss rate for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap between water purchased for resale and cumulative sales to water customers. Year 2000 unaccounted-for loss estimates for systems in Anderson County resulted in the following:

Lawrenceburg Water & Sewer Department	8.6%,
South Anderson Water District	15.4%
Alton Water District	11.9%

According to the county water management plan, it is expected that South Anderson’s water loss rate will be reduced to 15% by 2005.

3.5.2 Water shortage response plans / Contamination response plans

Water Shortage Response Plan:

Anderson County’s local officials and water system managers follow the specifications of the Kentucky Division of Water’s *1988 Kentucky Water Shortage Response Plan*.

Water Supply Contamination Response Plan:

The Anderson County Disaster and Emergency Management Agency has a state-approved Emergency Response Plan that addresses the ways that accidental contaminant releases will be handled. Among the topics included in this plan are: the identification of the appropriate response agencies, the methods of protecting citizens from the contaminants, mitigation measures and hazard alleviation.

3.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning

period. These funding need estimates are listed below for the short-term period of 2000 to 2005 (Table 3.6a) and the longer term period of 2006 to 2020 (Table 3.6b).

Table 3.6a: Short-Term Infrastructure Funding Needs (2000-2005) – Anderson County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Anderson Co.	100.0	393	4,352	1,452	--	2,150	1,350	9,304

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

Table 3.6b: Long-Term Infrastructure Funding Needs (2006-2020) – Anderson County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Anderson Co.	54.5	214	2,344	--	--	--	240	2,584

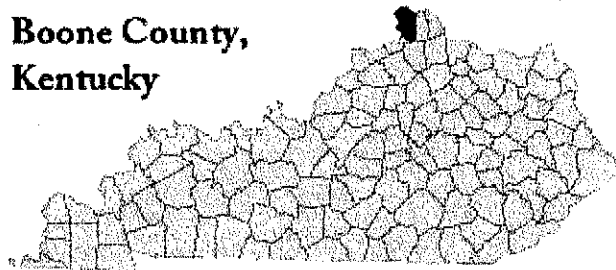
* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

Anderson County’s immediate infrastructure needs account for 393 new customers between 2000 and 2005 and requisite system upgrade costs of approximately \$9.3 million. Between 2006 and 2020, 214 additional customers are expected, necessitating an additional long-term system upgrade cost of approximately \$2.6 million.

3.5.4 Other major issues

Lawrenceburg is a participant in the Bluegrass Water Supply Consortium, an alliance of water utilities and government agencies that are working to address the potable water needs of central Kentucky. The BWSC’s goal is to construct a transmission grid connecting the participating water utilities. This grid will enable the movement of treated water from points of availability to points of need throughout the system. The BWSC is also endeavoring to identify a supply source that will augment that of the Kentucky River and other existing supply sources in order to ensure water availability during a drought. Existing treatment facilities and distribution systems will remain in operation. The regionalization offered by the BWSC will provide system reliability that is not possible for individual suppliers.

4.0 BOONE COUNTY



Boone County is located in north central Kentucky in the lower region of the Kentucky River Basin. Only the southern tip of the county lies within the Kentucky River Basin. However, the basin encompasses the watershed of Bullock Pen Lake, the water supply source for Boone County’s Bullock Pen Water District.

4.1 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute their finished, potable water to their customers or sell the water to other distributors. Table 4.1 lists the water suppliers for Boone County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier’s overall water treatment plant capacity.

Table 4.1 – Summary of Boone County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity*	Treatment Plant Capacity
Bullock Pen Water District	Bullock Pen Lake	Kentucky River	550,000 – 850,000 gpd	1.0 mgd
Northern Kentucky Water District	Ohio River	Ohio River	37.0 mgd	44.0 mgd
	Licking River	Licking River	11.0 mgd	12.0 mgd

*Permitted water withdrawal amount, per Kentucky Division of Water.

In addition to treating water from Bullock Pen Lake, the Bullock Pen Water District purchases treated water from Williamstown and Walton Waterworks Department. See Figure 4.1 in Appendix A for a map of the Boone County water system. In addition, Bullock Pen’s water withdrawal permit can be found in Appendix B.

The Northern Kentucky Water District is not discussed further in this summary because it utilizes Ohio River and Licking River sources, rather than a Kentucky River Basin source.

4.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised population projections for the water management planning period of 2000 to 2020. These new figures for Boone County, shown in Table 4.2, are based on results from the 2000 census data.

Table 4.2 – Boone County Population Projections

2000 Census	2005	2010	2015	2020
85,991	104,982	126,036	150,709	179,528

* Taken from University of Louisville Kentucky State Data Center.

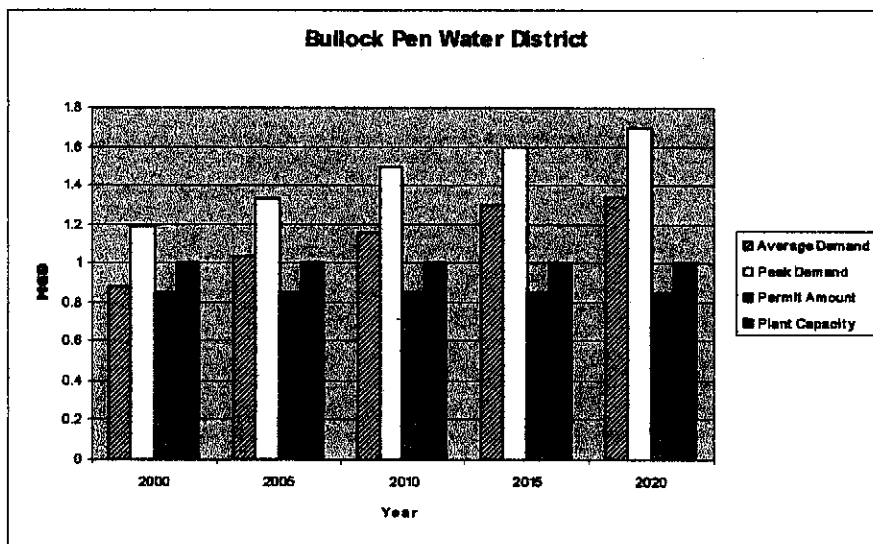
Between 2000 and 2020, the Boone County population is expected to increase by approximately 109%, or 93,537 people. In 2000, 79% of the county population was served by a public water supplier. It is projected that 80% of the population will be served by a public water supply by 2020, for an overall increase of 37,900 individuals. The associated projected water demands for the Bullock Pen Water District are shown in Table 4.3 and illustrated in Figure 4.2.

**Table 4.3 – Summary of Current and Projected Boone County Water Demand:
Bullock Pen Water District**

	Average Water Use (mgd)	Projected Annual Water Use (mgd)			
	2000	2005	2010	2015	2020
Residential	0.773	0.920	1.03	1.154	1.193
Non-Residential	0.058	0.062	0.070	0.076	0.0775
Other (City, etc.)	0.047	0.054	0.060	0.067	0.0695
Avg. Daily Demand	0.878	1.036	1.160	1.297	1.340
Peak Day Demand (mgd)	1.187	1.334	1.492	1.595	1.693

(Taken from Kentucky River Area Water Management Plan, 2002)

Bullock Pen’s average daily water use demand from Bullock Pen Lake is expected to increase by approximately 53% between 2000 and 2020. In 2001, Bullock Pen reported withdrawing an average daily amount of 0.656 mgd, which is less than the predicted average demand for 2000.



Permit amount is maximum withdrawal amount of 0.85 mgd.

Figure 4.2 – Comparison of Bullock Pen’s Predicted Average Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Bullock Pen’s predicted average demand was expected to exceed its permitted water withdrawal amount by 2000 and is expected to surpass its treatment plant capacity by 2005. Peak demands were expected to surpass both the permit amount and plant capacity beginning in 2000.

4.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors.

Critical to the determination of supply adequacy is the relationship between the permitted withdrawal amount and a reservoir’s drainage area and storage volume. Values for each of these statistics for Bullock Pen Lake are provided in Table 4.4.

Table 4.4 – Boone County Supply Sources and Capacities

Supply Source	Reservoir Drainage Area	Reservoir Capacity ¹
Bullock Pen Lake	8 sq. mi.	803,264,000 gals.

¹ Normal pool volume

Assuming the 7Q10 and 7Q20 inflows to Bullock Pen Lake are both 0 mgd and it has a drainage area of between five and ten square miles (8 square miles), the DOW’s classification criteria require at least 351 days of reservoir storage at average demand rates to be considered adequate during normal and drought conditions (i.e., an “A” drought vulnerability classification). Table 4.5 shows estimates of Bullock Pen’s 351-day demand through 2020.

Table 4.5 – Supply Assessment – Bullock Pen Reservoir

Year	Projected Demand (MGD)	351-Day Average Demand
2000	0.878	308.2 MG
2005	1.036	363.6 MG
2010	1.160	407.2 MG
2015	1.297	455.2 MG
2020	1.340	470.3 MG

The estimated normal capacity of the reservoir (803.26 MG) is greater than the 351-day average demand through 2020, resulting in the “A” classification shown in Table 4.6. However, it should be noted that this source assessment assumes the availability of the full volume of the reservoir. This assumption is problematic because the reservoir is unlikely to be at full pool when a drought situation is declared. Additionally, a portion of the volume will not be accessible for drinking water treatment due to the height of the raw water intake and the poor quality of water at lower levels within the reservoir.

Table 4.6 – Boone County Water Supply Drought Susceptibility

Water Supplier / Supply Source	Drought Susceptibility Class
Bullock Pen Water District / Bullock Pen Lake	A

The drought susceptibility classification of “A” indicates that the system is unlikely to experience a water shortage during drought conditions. See Appendix C for further explanation of the drought susceptibility classification.

4.4 Water Supply Alternatives

The Bullock Pen Water District’s supply from Bullock Pen Lake was found to be adequate through 2020. Therefore, no supply alternatives were considered.

4.5 Narrative Summary

4.5.1 General assessment of system

Bullock Pen’s supply source of Bullock Pen Lake is considered adequate to meet water demands through 2020. In addition, the water district reduces its drought-vulnerability by purchasing treated water from both Williamstown Municipal Water and Walton Waterworks Department.

The predicted average demand for Bullock Pen was expected to exceed the maximum permitted water withdrawal amount of 850,000 gpd in 2000 and is expected to surpass its treatment plant capacity of 1.0 mgd by 2005. Thus, it would seem that both the withdrawal permit and plant capacity will need to be upgraded in the near future. However, in 2001, Bullock Pen reported withdrawing an average of only 0.656 mgd, which remains well below both permit and plant capacity levels.

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss rate for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap between water purchased for resale and cumulative sales to water customers. In 2000, unaccounted-for loss estimates for systems in Boone County resulted in the following:

Bullock Pen Water District	5.5%
City of Florence	6%
City of Walton	not available

4.5.2 Water shortage response plans / Contamination response plans

Water Shortage Response Plan

A water shortage response plan was not prepared for Boone County due to the current adequacy of its supply sources.

Water Supply Contamination Response Plan

In a short-term emergency involving contamination of Bullock Pen Lake, the Bullock Pen Water District could shut down the water treatment plant and rely on stored water for one to two days. Also, additional water could be purchased from the City of Williamstown.

In a long-term emergency, demand would need to be met through purchased water from Williamstown, Walton and the Northern Kentucky Water District. The Northern Kentucky Water District works with ORSANCO and generally has sufficient notice to maximize its stored water volume. If a spill or discharge is reported, the water district will close its intakes and rely on stored water until the pollutants have passed. Since the Northern Kentucky Water District relies on both the Licking River and Ohio River as sources, it is possible that one source could be closed while the other remained open.

4.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning period. These funding need estimates are listed below for the short-term period of 2000 to 2005 (Table 4.7a) and the longer term period of 2006 to 2020 (Table 4.7b).

Table 4.7a: Short-Term Infrastructure Funding Needs (2000-2005) – Boone County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Boone Co.	--	--	--	4,000	--	--	--	4,000

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

Table 4.7b: Long-Term Infrastructure Funding Needs (2006-2020) – Boone County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Boone Co.	--	--	--	--	--	--	--	--

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

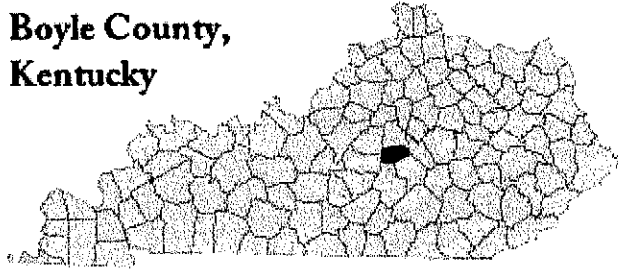
Boone County’s immediate infrastructure needs planned for 2000 to 2005 include line rehabilitation, estimated to cost \$4 million. Between 2006 and 2020, no additional customers or additional infrastructure expenses are expected.

4.5.4 Other major issues

None.

5.0 BOYLE COUNTY

**Boyle County,
Kentucky**



Boyle County is located in central Kentucky in the middle region of the Kentucky River Basin. The Dix River Dam creates Herrington Lake, which is located on the eastern border of Boyle County and serves as Danville’s water supply source. Portions of the lake extend into Garrard, Lincoln and Mercer counties.

5.1 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute their finished, potable water to their customers or sell the water to other distributors. Table 5.1 lists the water suppliers for Boyle County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier’s overall water treatment plant capacity.

Table 5.1 – Summary of Boyle County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity*	Treatment Plant Capacity
Danville City Water Works	Herrington Lake	Kentucky River	5.0 mgd	10.0 mgd
North Point Training Center	Herrington Lake	Kentucky River	300,000 gpd	806,400 gpd

*Permitted water withdrawal amount, per Kentucky Division of Water.

In addition to supplying its own customers, Danville City Water Works sells water to five other distributors for Boyle County; Hustonville, Junction City Utilities, Lake Village Water District, Parksville Water District and Perryville Utilities. See Figure 5.1 in Appendix A for a map of the Boyle County water system. In addition, Danville’s and Northpoint’s water withdrawal permits can be found in Appendix B.

5.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised population projections for the water management planning period of 2000 to 2020. These new figures for Boyle County, shown in Table 5.2, are based on results from the 2000 census data.

Table 5.2 – Boyle County Population Projections

2000 Census	2005	2010	2015	2020
27,697	28,503	29,273	30,085	30,888

* Taken from University of Louisville Kentucky State Data Center.

Between 2000 and 2020, the Boyle County population is expected to increase by approximately 11.5%, or 3,191 people. In 2000, 99.4% of the county population was served by a public water supplier. It is projected that 99.9% of the population will be served by a public water supply by 2020, for an overall increase of 3,191 individuals. The associated projected water demands for Danville City Water Works are shown in Table 5.3a and illustrated in Figure 5.2. Projected water demands for the Northpoint Training Center are shown in Table 5.3b.

Table 5.3a – Summary of Current and Projected Boyle County Water Demand: Danville City Water Works*

	Average Annual Water Use (million gals)	Projected Water Use, million gals				
	2000	2005	2010	2015	2020	
Residential	1,124.96	1,164.33	1,203.70	1,243.08	1,282.45	
Commercial/Institutional	155.91	161.37	166.83	172.28	177.74	
Industrial	111.01	114.90	118.78	122.67	126.56	
Public/Unaccounted For	195.87	202.72	209.58	216.43	223.29	
Other	0.00	0.00	0.00	0.00	0.00	
Total Production	1,587.75	1,643.32	1,698.89	1,754.46	1,810.04	
Average Daily Production (mgd)	4.35	4.502	4.654	4.807	4.959	
Peak Day (mgd)	5.712	6.272	6.484	6.696	6.908	

(Taken from Bluegrass Area Water Management Plan, 2002)

*also includes demand for Perryville, Junction City, Hustonville, Parksville WD, Lake Village WA, and Garrard County WA

Danville’s average daily water use demand is expected to increase by approximately 14% between 2000 and 2020. In 2001, Danville reported withdrawing an average daily amount of 4.492 mgd, which is slightly less than demand predictions for 2005.

Danville’s projected peak demand for 2020 of 6.908 mgd is greater than its current permitted water withdrawal amount of 5 mgd, but is well below its treatment plant capacity of 10 mgd.

Demand management through water conservation measures is predicted to have the potential to reduce Danville’s annual average demand by approximately 6% and its maximum day demand by approximately 6.4%.

**Table 5.3b – Summary of Current and Projected Boyle County Water Demand:
Northpoint Training Center**

	Average Water Use, million gals	Projected Water Use, million gals			
	2000	2005	2010	2015	2020
Residential	0	0	0	0	0
Commercial/Institutional	84.75	87.68	89.87	94.01	97.77
Industrial	0	0	0	0	0
Public/Unaccounted For	9.42	9.74	9.99	10.45	10.86
Other	0.00	0.00	0.00	0.00	0.00
Total Production	94.17	97.42	99.86	104.45	108.63
Average Daily Production (mgd)	0.258	0.267	0.274	0.286	0.298
Peak Day (mgd)	0.648	0.470	0.482	0.504	0.524

* Taken from Bluegrass Area Water Management Plan, 2002

Northpoint’s demand is expected to increase by 15.5% between 2000 and 2020. In 2001, Northpoint reported withdrawing an average daily amount of 0.269 mgd, which is just greater than the predicted average withdrawal for 2005.

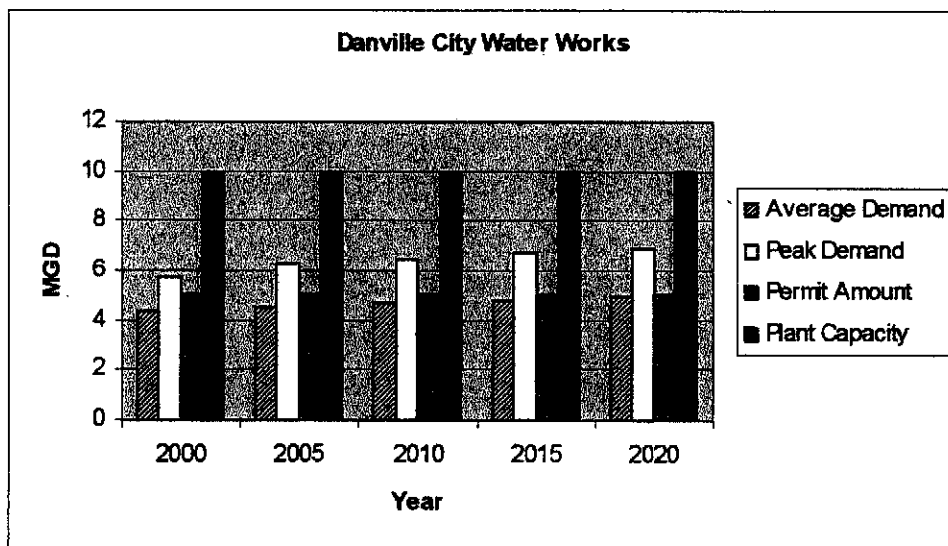


Figure 5.2 – Comparison of Danville’s Predicted Average Demand/Predicted Peak Demand/Current Current Water Withdrawal Permit Amount/Current WTP Capacity

Danville’s predicted average demand is expected to remain less than its permitted water withdrawal amount and its treatment plant capacity through 2020. The system’s peak demand was predicted to surpass the withdrawal permit amount in 2000, but remain less than the plant capacity through 2020.

5.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors.

Critical to the determination of supply adequacy is the relationship between the permitted withdrawal amount and a reservoir’s drainage area and storage volume. Values for each of these statistics for Herrington Lake are provided in Table 5.4.

Table 5.4 – Boyle County Supply Sources and Capacities

Supply Source	Drainage Area	Full Capacity ¹
Herrington Lake	439 sq. mi.	75,140 million gals.

¹ Full reservoir capacity

Assuming the 7Q10 and 7Q20 inflows to Herrington Lake are both 0 mgd and it has a drainage area of greater than ten square miles, the DOW’s classification criteria require at least 201 days

of reservoir storage at average demand rates to be considered adequate during normal and drought conditions (i.e., an “A” drought vulnerability classification).

The 2020 average demand is predicted to be 4.959 mgd. Thus, the normal volume of Herrington Lake would provide approximately 75 times the volume considered adequate to meet Danville’s average 2020 demand.

$$4.959 \text{ mgd} \times 201 \text{ days} = 996.76 \text{ MG}$$

$$75,140 \text{ MG} / 996.76 \text{ MG} = 75.4$$

According to this analysis, Danville and Northpoint have been determined to have the drought susceptibility classifications shown in Table 5.5.

Table 5.5 – Boyle County Water Supply Adequacy Assessment

Water Supplier/ Supply Source	Drought Susceptibility Class
Danville City Water Works/ Herrington Lake	A
Northpoint Training Center/ Herrington Lake	A

The drought susceptibility classification of “A” indicates that the system is unlikely to experience a water shortage during drought conditions. Thus, water supplies of both Danville and Northpoint are considered adequate even during drought conditions. See Appendix C for further explanation of the Kentucky Division of Water’s drought susceptibility classification.

5.4 Water Supply Alternatives

Boyle County’s water supply from Herrington Lake was found to be adequate through 2020. Therefore, no supply alternatives were considered.

5.5 Narrative Summary

5.5.1 General assessment of system

Danville’s water supply source of Herrington Lake is adequate to accommodate projected average demands, as are its water withdrawal permit amount and its treatment plant capacity. Additionally, its two intakes on Herrington Lake are sufficiently low to withdraw water during drought conditions. Likewise, Northpoint’s supply, permit amount and treatment plant capacity seem to be adequate to meet average demands through 2020.

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss rates for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap between water purchased for resale and cumulative sales to water customers. Year 2000 unaccounted-for loss estimates for systems in Boyle County resulted in the following:

Danville	12.7%
Junction City	18.4%
Perryville	13.2%

According to the county water management plan, Junction City’s water losses are expected to be reduced to 15% by 2005.

5.5.2 Water shortage response plans / Contamination response plans

Water Shortage Response Plan:

In 19986, Danville formally adopted a water shortage plan, which was codified by the City of Danville in Ordinance 1365. The purpose of the ordinance is to provide for the declaration of a water shortage or emergency and to provide for the implementation of voluntary and mandatory water conservation measures throughout the city and those areas served by the city water utility in the event a water shortage is declared. The plan addresses issues of voluntary conservation, as well as mandatory conservation. Moreover, it establishes prohibitions for non-essential uses, uses of water from fire hydrants and health protection.

Danville’s plan also addresses issues relative to temporary water service interruptions, such as water rationing, identifies procedures for providing enforcement of the ordinance and establishes penalties for failure to comply with the ordinance.

Water Supply Contamination Response Plan:

The Boyle County Emergency Management Agency has prepared Emergency Response Plans which address the ways in which accidental contaminant releases will be handled—appropriate response agencies, protection of civilians, mitigation and alleviation of the hazard.

In the event of an occurrence that may contaminate the source of water supply, the City of Danville could shut down its water intake until the threat presented by the hazard has passed, provided the threat is less than the 24-hour period mandated by the KDOW. To this end, management personnel at the Danville system have indicated that the system maintains, on average, a reserve of potable water equal to approximately 30 hours of use.

5.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning period. These funding need estimates are listed below for the short-term period of 2000 to 2005 (Table 5.6a) and the longer term period of 2006 to 2020 (Table 5.6b).

Table 5.6a: Short-Term Infrastructure Funding Needs (2000-2005) – Boyle County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Boyle Co.	33.0	166	1,060	1,558	--	500	275	3,393

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

Table 5.6b: Long-Term Infrastructure Funding Needs (2006-2020) – Boyle County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Boyle Co.	35.0	208	1,540	2,000	--	1,500	2,550	7,590

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

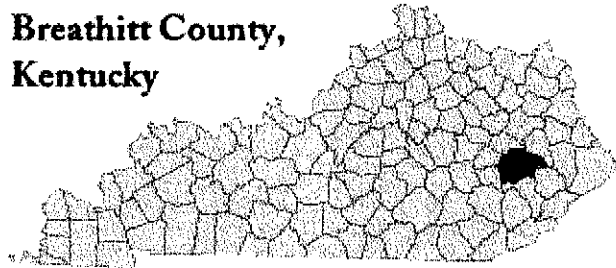
Boyle County’s immediate infrastructure needs account for 166 new customers between 2000 and 2005 and requisite system upgrade costs of approximately \$3.4 million. Between 2006 and 2020, service to 208 additional customers, as well as improvements to the treatment plant and tanks and pumps, are expected to necessitate a long-term system upgrade cost of approximately \$7.6 million.

5.5.4 Other major issues

In 1999, the U.S. Environmental Protection Agency selected the Dix River and Herrington Lake as a Clean Water Action Plan project area. While a few subwatershed projects have been supported with 319(h) funds, the Kentucky Division of Water is currently securing funding to develop a detailed Watershed Implementation Plan (WIP). The WIP will enable the agency to better target best management practices (BMPs) and improve water quality in the Dix River and Herrington Lake.

Danville is a participant in the Bluegrass Water Supply Consortium, an alliance of water utilities and government agencies that are working to address the potable water needs of central Kentucky. The BWSC’s goal is to construct a transmission grid connecting the participating water utilities. This grid will enable the movement of treated water from points of availability to points of need throughout the system. The BWSC is also endeavoring to identify a supply source that will augment that of the Kentucky River and other supplier sources in order to ensure water availability during a drought. Existing treatment facilities and distribution systems will remain in operation. The regionalization offered by the BWSC will provide system reliability that is not possible for individual suppliers.

6.0 BREATHITT COUNTY



Breathitt County is located in southeastern Kentucky in the upper reaches of the Kentucky River Basin. The North Fork of the Kentucky River runs through Breathitt County and serves as the water supply source for the city of Jackson. The North Fork watershed lies within the Eastern Kentucky Coal Field physiographic region, which is characterized by mountainous terrain, rapid surface runoff and moderate rates of groundwater drainage.

6.1 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute their finished, potable water to their customers or sell the water to other distributors. Table 6.1 lists the water suppliers for Breathitt County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier’s overall water treatment plant capacity.

Table 6.1 – Summary of Breathitt County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity*	Treatment Plant Capacity
Jackson Municipal Water Works	North Fork of Kentucky River	Kentucky River	1.5 mgd	1.5 mgd

*Permitted water withdrawal amount, per Kentucky Division of Water.

In addition to distributing treated water to its own customers, Jackson Municipal Water Works sells water to the Breathitt County Water District. See Figure 6.1 in Appendix A for a map of the Breathitt County water system. In addition, Jackson’s water withdrawal permit can be found in Appendix B.

6.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water

supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised population projections for the water management planning period of 2000 to 2020. These new figures for Breathitt County, shown in Table 6.2, are based on results from the 2000 census data.

Table 6.2 – Breathitt County Population Projections

2000 Census	2005	2010	2015	2020
16,100	16,414	16,627	16,734	16,702

* Taken from University of Louisville Kentucky State Data Center.

Between 2000 and 2020, the Breathitt County population is expected to increase by approximately 3.7%, or 602 people. In 2000, only 34% of the county population was served by a public water supplier. It is projected that 73% of the population will be served by a public water supply by 2020, for an overall increase of 6,720 individuals. The associated projected water demands for Jackson Municipal Water Works are shown in Table 6.3 and illustrated in Figure 6.2.

Table 6.3 – Summary of Current and Projected Breathitt County Water Demand: Jackson Municipal Water Works

	Average Water Use gpd	Projected Daily Water Use, gpd			
	2000	2005	2010	2015	2020
Residential	360,000	390,271	390,271	390,271	390,271
Commercial	124,400	164,384	164,384	164,384	164,384
Wholesale	0	75,000	189,908	454,859	533,856
Subtotal - Water Sold	484,400	629,655	744,563	1,009,514	1,088,511
Unaccounted	165,000	111,116	131,393	178,150	192,090
Total Avg. Daily Production	649,400	740,771	875,956	1,187,664	1,280,601
Peak Day (mgd)	891,288	1,339,000	1,805,580	1,945,100	2,096,800

(Taken from Kentucky River Area Water Management Plan, 2002)

Breathitt County’s average daily water use demand is expected to increase by approximately 97% between 2000 and 2020. Most of the increase in water demand will be due to water line extensions into rural Breathitt County and will be distributed by the Breathitt County Water District. The District plans to purchase water from the Jackson Municipal Water Works (see wholesale demand above).

The projected peak demand is expected to exceed 2 million gallons per day by 2020, which is greater than both the currently permitted water withdrawal amount and treatment plant capacity of 1.5 mgd.

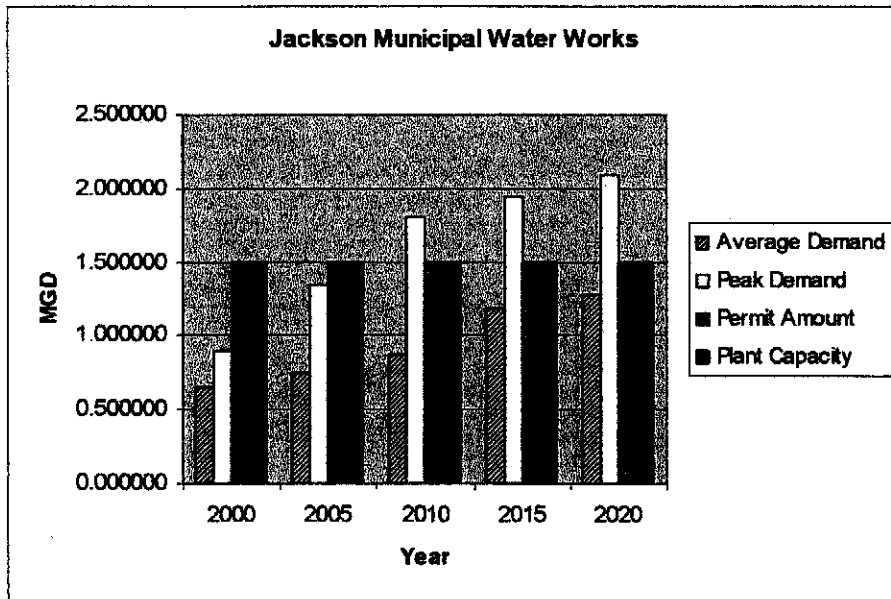


Figure 6.2 – Comparison of Jackson’s Predicted Average Demand/Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Jackson’s estimated average demand is not expected to exceed its permitted water withdrawal amount or treatment plant capacity through 2020. The peak demand is predicted to surpass both the permit amount and plant capacity in 2010.

6.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors.

Critical to the determination of supply adequacy is the relationship between the permitted withdrawal amount, and statistical measures of flow measured at the point of withdrawal such as 1) the normal flow, 2) the 7Q10 flow and 3) the 7Q20 flow. Values for each of these statistics for the North Fork Kentucky River are provided in Table 6.4.

Table 6.4 – Breathitt County Supply Sources and Capacities

Supply Source	Normal Flow ¹	7Q10 ²	7Q20 ³
N. Fork Kentucky River	18.7 MGD (29 cfs)	16.16 MGD (25 cfs)	12.93 MGD (20 cfs)

¹Normal flow = 10% of lowest monthly mean flow; maximum amount that any single user can be permitted to withdraw

²7Q10 = lowest consecutive 7 day streamflow that is likely to occur in a ten year period; for planning purposes, represents “minimum flow”

³7Q20 = lowest consecutive 7 day streamflow that is likely to occur in a twenty year period; for planning purposes, represents “drought conditions”

The Kentucky Division of Water has established the “normal flow” as the basis for determining the maximum amount that any one permittee may be allowed to withdraw. Thus, Jackson’s current and projected demands are well within this available allotment.

The Kentucky Division of Water considers a regulated stream source adequate if the average rate of water use is less than 20 percent of the stream’s 7Q10 flow value. Jackson’s predicted 2020 average water demand (1.28 mgd) is 8% of the estimated 7Q10 at the North Fork intake. As a result, Jackson’s water supply has been given the drought susceptibility classification shown in Table 6.5.

Table 6.5 – Breathitt County Water Supply Adequacy Assessment

Water Supplier / Supply Source	Drought Susceptibility Class
Jackson Water Works / N. Fork Kentucky River	A

The drought susceptibility classification of “A” indicates that the system is unlikely to experience a water shortage during drought conditions. See Appendix C for further explanation of the Kentucky Division of Water’s drought susceptibility classification.

6.4 Water Supply Alternatives

Breathitt County’s water supply from the North Fork of the Kentucky River was found to be adequate through 2020. Therefore, no supply alternatives were considered.

6.5 Narrative Summary

6.5.1 General assessment of system

Jackson’s water supply source of the North Fork of the Kentucky River was found to be adequate to meet water demands through 2020. Additionally, the 2020 average daily demand of 1.28 mgd is within the city’s water withdrawal permit limit, as well as its treatment plant capacity.

The Breathitt County Water District will distribute treated water to new customers in rural areas of the county. It is expected that Jackson Municipal Water Works will provide all treated water to the Breathitt County Water District throughout the planning period. However, other potential water suppliers include the Booneville Water District, Beattyville Water Works and Campton Water Works.

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap between water purchased for resale and cumulative sales to water customers. In 2000, the unaccounted-for water loss rate for Jackson Municipal Water Works was estimated to be 25%. It is expected that the Jackson system’s leakage rate will be decreased to at least 15% by 2005.

6.5.2 Water shortage response plans / Contamination response plans

A general, combined water shortage and contamination response plan was developed for the entire Kentucky River Area Development District and can be found in Chapter 12 of its 2002 Water Management Plan.

6.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning period. These funding need estimates are listed below for the short-term period of 2000 to 2005 (Table 6.6a) and the longer term period of 2006 to 2020 (Table 6.6b).

Table 6.6a: Short-Term Infrastructure Funding Needs (2000-2005) – Breathitt County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Breathitt Co.	52.1	793	2,900	500	--	5,700	900	10,000

* Taken from *Water Resource Development: A Strategic Plan (KIA, 1999)*

Table 6.6b: Long-Term Infrastructure Funding Needs (2006-2020) – Breathitt County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Breathitt Co.	191.8	1,927	9,855	--	5,000	6,000	1,800	22,655

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

Breathitt County’s immediate infrastructure needs planned for 2000 to 2005 include new water distribution lines to 793 new customers, treatment capacity, and tanks and pumps, and are estimated to cost \$10 million. Between 2006 and 2020, total system upgrades, including service to 1,927 new customers, are expected to cost approximately \$22.6 million.

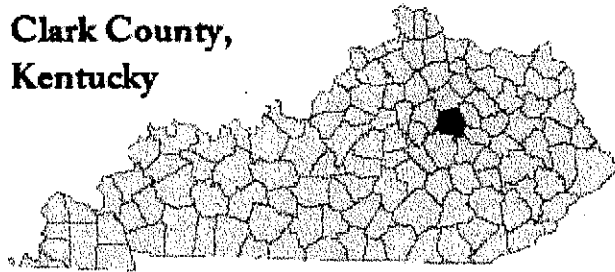
6.5.4 Other major issues

Numerous other withdrawals from the North Fork of the Kentucky have the potential to influence Jackson’s supply source. These include withdrawals of several coal companies, the community of Blackey and a proposed power plant. The following water withdrawals are permitted from the North Fork, upstream of Jackson’s intake located at mile 305.45.

Company Name	Withdrawal Location on North Fork	Water Withdrawal Permit Amount
Coastal Coal	Mile 393.5	0.075 mgd
Coastal Coal	Mile 391.45	0.070 mgd
Blackey Intake	Mile 387.43	0.300 mgd
Coastal Coal	Mile 383.85	0.144 mgd
Whitaker Coal	Mile 363.3	1.0 mgd
Kentucky Mountain Power	Mile 310.4	2.4 – 14.4 mgd

Kentucky Mountain Power has a water withdrawal permit enabling withdrawals of 2.4 to 14.4 mgd at mile 310.4 of the North Fork of the Kentucky River, which is approximately five miles upstream of Jackson’s intake point. The power plant associated with these withdrawals is expected to withdraw an average of 12 million gallons per day. There is concern that, during times of drought, this withdrawal could negatively impact the supply available to Jackson.

7.0 CLARK COUNTY



Clark County is located in central Kentucky in the middle region of the Kentucky River Basin. Lock and Dam 10 is situated on the mainstem of the river on the southwestern border of Clark County with Madison County. This structure creates Pool 10 of the Kentucky River, which serves as Winchester’s main water supply source.

7.0 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute their finished, potable water to their customers or sell the water to other distributors. Table 7.1 lists the water suppliers for Clark County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier’s overall water treatment plant capacity.

Table 7.1 – Summary of Clark County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity ¹	Treatment Plant Capacity
Winchester Municipal Utilities	Kentucky River Pool 10	Kentucky River	15.00 mgd ²	5.32 mgd
	Carroll Ecton Reservoir	Kentucky River	5.3 mgd	

¹ Permitted water withdrawal amount, per Kentucky Division of Water.

² When flows measured at Lock 10 are 190 cfs or less for four consecutive days, Winchester Municipal Utilities shall reduce withdrawals according to a pre-arranged withdrawal schedule:

<u>Lock 10 Flows (cfs)</u>	<u>Available Withdrawals</u>
157.0-189.9	10.8 mgd
124.0-156.9	5.2 mgd
90.0-123.9	4.0 mgd
below 90.0	2.8 mgd

Winchester’s water is usually withdrawn from the Ecton Reservoir, an impoundment of Lower Howard’s Creek, for the first five months of the year. Due to the characteristics of the reservoir’s drainage area, its water may contain high levels of manganese which can cause taste and odor problems in the city’s drinking water. Thus, as raw water quality begins to decline in the mid- to late spring, Winchester switches to Kentucky River Pool 10 as its primary supply source.

In addition to Winchester Municipal Utilities, three other distributors provide water in Clark County; the East Clark County Water District, Judy Water Association and Reid Village Water. The East Clark County Water District purchases treated water from Winchester, and the Judy Water Association and Reid Village purchase from Mt. Sterling. See Figure 7.1 in Appendix A for a map of the Clark County water system. In addition, Winchester’s water withdrawal permit can be found in Appendix B.

7.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised population projections for the water management planning period of 2000 to 2020. These new figures for Clark County, shown in Table 7.2, are based on results from the 2000 census data.

Table 7.2 – Clark County Population Projections

2000 Census	2005	2010	2015	2020
33,144	35,135	36,932	38,631	40,226

* Taken from University of Louisville Kentucky State Data Center.

Between 2000 and 2020, the Clark County population is expected to increase by approximately 21%, or 7,082 people. In 2000, 99.3% of the county population was served by a public water supplier. It is projected that 99.9% of the population will be served by a public water supply by 2020, an overall increase of 7,082 individuals. The associated projected water demands for Winchester Municipal Utilities are shown in Table 7.3 and illustrated in Figure 7.2.

Table 7.3 – Summary of Current and Projected Clark County Water Demand: Winchester Municipal Utilities*

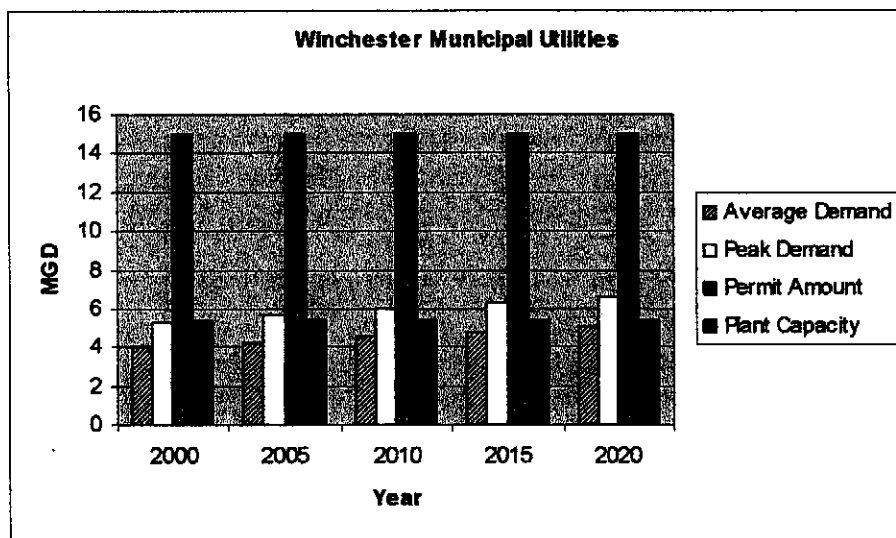
	Average Annual Water Use (million gals)	Projected Annual Water Use (million gals)			
	2000	2005	2010	2015	2020
Residential	793.98	844.72	895.46	946.20	996.94
Commercial/Institutional	158.92	169.07	179.23	189.38	199.54
Industrial	264.95	281.88	298.81	315.74	332.68
Public/Unaccounted For	230.02	244.72	259.43	274.13	288.83
Other	11.36	11.93	11.24	13.41	14.27
Total Production	1,459.23	1,552.33	1,644.16	1,738.86	1,832.25
Average Daily Production (mgd)	3.998	4.253	4.505	4.764	5.020
Peak Day (mgd)	5.311	5.631	5.964	6.308	6.646

(Taken from Bluegrass Area Water Management Plan, 2002)

* Also includes demand for East Clark County Water District

Winchester’s average daily water use demand is expected to increase by approximately 26% between 2000 and 2020. In 2001, Winchester reported withdrawing an average daily amount of 4.887 mgd from the Kentucky River, which is slightly greater than average demand predictions for 2015. It also withdrew an average of 3.6 mgd from Ecton Reservoir in January – March.

Demand management through water conservation measures is predicted to have the potential reduce Winchester’s annual average demand by approximately 5.2% and its maximum day demand by approximately 5.4%.



Used maximum permit withdrawal amount from Kentucky River source, since it can be used to replenish Ecton Reservoir when necessary.

Figure 7.2 – Comparison of Winchester’s Predicted Average Demand/Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Winchester’s predicted average demand is not expected to exceed its permitted water withdrawal amount or treatment plant capacity through 2020. The system’s peak demand is not predicted to surpass the permitted water withdrawal amount but is expected to exceed its treatment plant capacity by 2005.

7.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors.

Critical to the determination of supply adequacy is the relationship between the permitted withdrawal amount, and statistical measures of flow measured at the point of withdrawal such as 1) the normal flow, 2) the 7Q10 flow and 3) the 7Q20 flow. Values for each of these statistics for Pool 10 are provided in Table 7.4, in addition to the estimated full capacity of Winchester’s Ecton Reservoir.

Table 7.4 – Clark County Supply Sources and Capacities

Supply Source	Normal Flow ¹	7Q10 ²	7Q20 ³	Full Reservoir Capacity
Kentucky River Pool 10	73.1 mgd	77.5 mgd	46.5 mgd	N/A
Carroll Ecton Reservoir	N/A	N/A	N/A	242.6 million gallons

¹Normal flow = 10% of lowest monthly mean flow; maximum amount that any single user can be permitted to withdraw

²7Q10 = lowest consecutive 7 day streamflow that is likely to occur in a ten year period; for planning purposes, represents “minimum flow”

³7Q20 = lowest consecutive 7 day streamflow that is likely to occur in a twenty year period; for planning purposes, represents “drought conditions”

The Kentucky Division of Water has established the “normal flow” as the basis for determining the maximum amount that any one permittee may be allowed to withdraw. Thus, Winchester’s current and projected demands are well within this available allotment.

The Kentucky Division of Water considers a regulated stream source adequate if the average rate of water use is less than 20 percent of the stream’s 7Q10 flow value. Winchester’s predicted 2020 average rate of water use, 5.02 mgd, is only 6.5% of the 7Q10 for Kentucky River Pool 10. Thus, Winchester’s Kentucky River source is considered adequate.

Assuming the 7Q10 and 7Q20 inflows to Ecton Reservoir are both 0 mgd and it has a drainage area of between one and five square miles (4.9 square miles), the DOW’s classification criteria require at least 201 days of reservoir storage at average demand rates to be considered adequate during normal and drought conditions (i.e., a “B” drought vulnerability classification). Table 7.5 shows estimates of Winchester’s 201-day demand through 2020.

Table 7.5 – Supply Assessment – Ecton Reservoir

Year	Projected Demand (MGD)	201-Day Average Demand
2000	3.998	803.6 MG
2005	4.253	854.8 MG
2010	4.505	905.5 MG
2015	4.764	957.6 MG
2020	5.02	1,009.0 MG

The estimated normal capacity of Ecton Reservoir (242.6 MG) is less than the 201-day average demands for 2000 through 2020, resulting in a “C” classification. Additionally, this source assessment assumes the availability of the full volume of the reservoir. This assumption is problematic because the reservoir is unlikely to be at full pool when a drought situation is declared, and a portion of the volume will not be accessible for drinking water treatment due to

the height of the raw water intake and the poor quality of water at lower levels within the reservoir.

Winchester Municipal Utilities would be rated a “C” drought susceptibility classification if Ecton Reservoir served as its sole supply source. However, the Kentucky River serves as the main source of water, and the reservoir acts as a supply buffer. Thus, Winchester was given the overall classification shown in Table 7.6

Table 7.6 – Clark County Water Supply Adequacy Assessment

Supply Source	Drought Susceptibility Class
Winchester Municipal/ Kentucky River Pool 10 and Ecton Reservoir	A

The drought susceptibility classification of “A” indicates that the system is unlikely to experience a water shortage during drought conditions. See Appendix C for further explanation of the Kentucky Division of Water’s drought susceptibility classification.

Winchester’s water supply from Pool 10 of the Kentucky River is dependent on the condition of Lock and Dam 10. Since 1993, significant renovations have occurred at Dam 10. These include the installation of sheet piling on the upstream face of the auxiliary dam, the placement of derrick stone on the dam apron and the reinforcement of the lock gates. In addition, in December 2002, the KRA voted to raise the dam by 4-6 feet, creating an additional 1.0 to 1.6 billion gallons of storage capacity. The target date for completion of the dam is 2008.

7.4 Water Supply Alternatives

Clark County’s water supplies from the Kentucky River and Ecton Reservoir were found to be adequate through 2020. Therefore, no supply alternatives were considered.

7.5 Narrative Summary

7.5.1 General assessment of system

Winchester’s supply source of the Kentucky River Pool 10 has an adequate supply capacity to meet both projected average and peak demands. However, peak demands are predicted to exceed Winchester’s treatment plant capacity by 2005. This suggests that Winchester will need to upgrade its plant capacity in the near future.

In 2001, Winchester reported an average monthly withdrawal rate of 4.887 mgd and a maximum monthly average of 5.199 mgd from its Kentucky River source. These withdrawal demands are

greater than the projected 2015 average demand of 4.764 mgd for Winchester, indicating that demand estimates may need to be revised to reflect actual usage. The 2001 average monthly withdrawal rate is within the current maximum withdrawal and plant capacities, although the maximum monthly average of 5.199 mgd is nearing the plant capacity of 5.32 mgd.

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap between water purchased for resale and cumulative sales to water customers. Year 2000 unaccounted-for loss estimates for systems in Clark County resulted in the following:

Winchester Utilities	8.5%
East Clark County Water District	8.4%

7.5.2 Water shortage response plans / Contamination response plans

Water Shortage Response Plan:

The Clark County Emergency Management Agency (EMA) does not have a separate water shortage response plan. Response measures to a water shortage are contained in its Emergency Water Conservation Program (see below).

Water Supply Contamination Response Plan:

Winchester Municipal has an adopted policy and procedure to deal with unforeseen circumstances such as water system mechanical failure, water main breaks, extreme weather conditions, reduction of Kentucky River withdrawal limits, or an extended period of high water demand. WMU calls this policy and procedure its Emergency Water Conservation Program (EWCP). The program is a written document and became effective in June of 1997. The EWCP is intended to be activated in three phases which are: Phase I – Water Shortage Advisory; Phase 2 – Water Shortage Alert; and Phase 3 – Water Shortage Emergency. WMU’s EWCP spells out specific triggers which would activate each of the three phases of the Program.

Winchester Municipal Utilities has a written Emergency Notification Plan (ENP) which it can and will put into effect for either of the following reasons:

- a water system outage for whatever reason; or
- a threatened or a claimed contamination of the municipal potable water supply.

For whichever reason the ENP is activated, there is a well-defined ranked order list of who will receive notification. WMU’s ENP was most recently updated in January of 1999.

In a more general context, the Clark County Emergency Management Agency has a State-approved Emergency Response Plan that addresses the ways that accidental contaminant releases will be handled.

7.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning period. These funding need estimates are listed below for the short-term period of 2000 to 2005 (Table 7.7a) and the longer term period of 2006 to 2020 (Table 7.7b).

Table 7.7a: Short-Term Infrastructure Funding Needs (2000-2005) – Clark County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Clark Co.	42.7	251	1,920	--	1,700	4,000	1,200	8,820

* Taken from *Water Resource Development: A Strategic Plan* (KIA, 1999)

Table 7.7b: Long-Term Infrastructure Funding Needs (2006-2020) – Clark County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Clark Co.	23.5	111	1,050	980	--	--	--	2,030

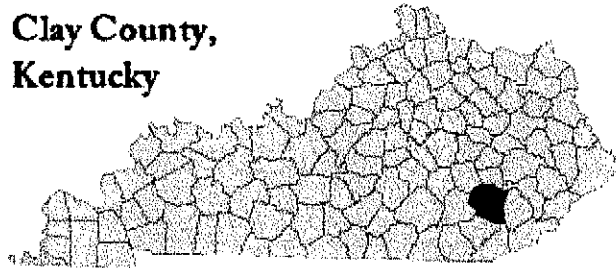
* Taken from *Water Resource Development: A Strategic Plan* (KIA, 1999)

Clark County’s immediate infrastructure needs account for 251 new customers between 2000 and 2005 and requisite system upgrade costs of approximately \$8.8 million. Between 2006 and 2020, 111 additional customers are expected, and new and rehabilitated water lines are expected to result in a long-term system upgrade cost of \$2.03 million.

7.5.4 Other major issues

Winchester is a participant in the Bluegrass Water Supply Consortium, an alliance of water utilities and government agencies that are working to address the potable water needs of central Kentucky. The BWSC’s goal is to construct a transmission grid connecting the participating water utilities. This grid will enable the movement of treated water from points of availability to points of need throughout the system. The BWSC is also endeavoring to identify a supply source that will augment that of the Kentucky River and other supplier sources in order to ensure water availability during a drought. Existing treatment facilities and distribution systems will remain in operation. The regionalization offered by the BWSC will provide system reliability that is not possible for individual suppliers.

8.0 CLAY COUNTY



Clay County is located in southeastern Kentucky in the upper region of the Kentucky River Basin. The South Fork of the Kentucky River flows through Clay County in a northwesterly direction. The South Fork watershed falls within the Eastern Kentucky Coal Field physiographic region, which is characterized by mountainous terrain, rapid surface runoff and moderate rates of groundwater drainage.

8.1 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute their finished, potable water to their customers or sell the water to other distributors. Table 8.1 lists the water suppliers for Clay County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier’s overall water treatment plant capacity.

Table 8.1 – Summary of Clay County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity*	Treatment Plant Capacity
Manchester Water Works	Bert Combs Lake	Kentucky River	2.0 mgd	2.3 mgd
	Well	Kentucky River	0.12 mgd	
	Goose Creek	Kentucky River	2.5 mgd	

*Permitted water withdrawal amount, per Kentucky Division of Water.

Manchester Water Works recently incorporated the Clay County distributor, the Hima-Sibert Water District. Manchester also sells water to the North Manchester Water Association for distribution within the county. See Figure 8.1 in Appendix A for a map of the Clay County water system. In addition, Manchester’s water withdrawal permit can be found in Appendix B.

8.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water

supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised population projections for the water management planning period of 2000 to 2020. These new figures for Clay County, shown in Table 8.2, are based on results from the 2000 census data.

Table 8.2 – Clay County Population Projections

2000 Census	2005	2010	2015	2020
24,556	26,152	27,615	28,938	30,020

* Taken from University of Louisville Kentucky State Data Center.

Between 2000 and 2020, the Clay County population is expected to increase by approximately 22%, or 5,464 people. In 1999, 52% of the county population was served by a public water supplier. It is projected that 70% of the population will be served by a public water supply by 2020, for an overall increase of 8,391 individuals. The associated projected water demands for Manchester Water Works are shown in Table 8.3a and illustrated in Figure 8.2. The demand for the North Manchester Water Association is also shown separately in Table 8.3b.

Table 8.3a – Summary of Current and Projected Clay County Water Demand: Manchester Water Works*

	Average Water Use (gpd)	Projected Water Use (gpd)			
	2000	2005	2010	2015	2020
Residential	534,247	639,001	691,378	743,755	796,132
Commercial	205,479	206,164	206,849	207,534	208,219
Industrial	136,986	150,685	164,384	178,082	178,082
Other Uses	410,959	410,959	410,959	410,959	410,959
Resale	273,973	410,959	410,959	410,959	410,959
Unmetered/Unaccounted For	82,192	95,672	120,289	124,550	127,937
Avg. Daily Demand (gpd)	1,643,836	1,913,440	2,004,818	2,075,840	2,132,289
Peak Day (gpd)	3,500,000	4,074,032	4,268,591	4,419,809	4,539,998

(Taken from Cumberland Valley ADD Water Management Plan, 2002)

* Also includes demand for North Manchester Water Association

Table 8.3b – Summary of Current and Projected Clay County Water Demand: North Manchester Water Association

	Average Water Use (gpd)	Projected Water Use (gpd)			
	2000	2005	2010	2015	2020
Residential	325,466	344,682	363,899	383,115	402,331
Commercial	28,301	28,301	28,301	28,301	28,301
Unmetered/Unaccounted for	30,762	23,807	16,342	8,396	8,788
Avg. Daily Demand (gpd)	384,529	396,791	408,542	419,813	439,421
Peak Day (gpd)	453,613	468,077	481,939	495,235	518,367

(Taken from Cumberland Valley ADD Water Management Plan, 2002)

Manchester’s average daily water demand (including that of the North Manchester Water Association) is expected to increase by approximately 30% between 2000 and 2020. In 2001, Manchester Water Works reported withdrawing an average daily amount of 1.699 mgd from Bert Combs Lake, 0.075 mgd from its well and 0.961 mgd from Goose Creek, for a combined average withdrawal of 2.735 mgd. Water withdrawn from Goose Creek and the well is pumped to the lake, and withdrawals from the lake are pumped directly to the water treatment plant. Thus, the average daily amount of water treated in 2001 was 1.699 mgd, an amount greater than that predicted for 2000 and less than predictions for 2005.

Manchester’s projected peak demand for 2020 of 4.54 mgd is greater than its current permitted water withdrawal amount of 2.0 mgd from Bert Combs Lake, as well as its treatment plant capacity of 2.3 mgd.

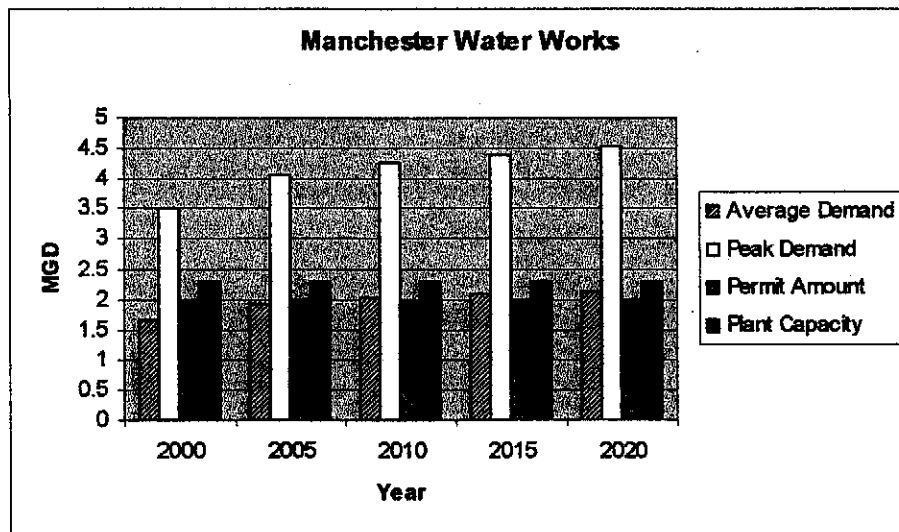


Figure 8.2 – Comparison of Manchester’s Predicted Average Demand/Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Manchester’s predicted average demand is expected to narrowly exceed its permitted water withdrawal amount by 2010, but remain less than the treatment plant capacity through 2020. The system’s peak demand was predicted to surpass the permitted water withdrawal amount and plant capacity by 2000.

8.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors. Critical to the determination of supply adequacy is the relationship between the permitted withdrawal amount, and statistical measures of flow measured at the point of withdrawal such as 1) the normal flow, 2) the 7Q10 flow and 3) the 7Q20 flow. Values for each of these statistics for Goose Creek are provided in Table 8.4, in addition to the estimated full capacity of Manchester’s Bert Combs Lake.

Table 8.4 – Clay County Supply Sources and Capacities

Supply Source	Normal Flow ¹	7Q10 ²	7Q20 ³	Reservoir Volume
Goose Creek	2.7 mgd	0.17 mgd	0.1 mgd	N/A
Bert Combs Lake	N/A	N/A	N/A	304,650,000 gals
Well	N/A	N/A	N/A	N/A

¹Normal flow = 10% of lowest monthly mean flow; maximum amount that any single user can be permitted to withdraw

²7Q10 = lowest consecutive 7 day streamflow that is likely to occur in a ten year period; for planning purposes, represents “minimum flow”

³7Q20 = lowest consecutive 7 day streamflow that is likely to occur in a twenty year period; for planning purposes, represents “drought conditions”

The Kentucky Division of Water has established the “normal flow” as the basis for determining the maximum amount that any one permittee may be allowed to withdraw. Although Manchester’s current and projected average demands through 2020 are within this available allotment, peak demand projections exceed it.

The Kentucky Division of Water considers an unregulated stream source inadequate if average withdrawal rates are greater than 50 percent of the 7Q10. Manchester’s predicted 2020 average rate of water use (2.132 mgd) is greater than the entire 7Q10 flow value for Goose Creek (0.17 mgd). Thus, Goose Creek is not considered adequate as Manchester’s sole supply source.

Assuming the 7Q10 and 7Q20 inflows to Bert Combs Lake are both 0 mgd and a drainage area of less than five square miles (2 square miles), the DOW’s classification criteria require at least

201 days of storage at average demand rates to be considered adequate (“B” classification). An “A” classification is not possible for reservoirs with a drainage area of less than five square miles and a 7Q10 inflow of zero. Table 8.5 shows estimates of Manchester’s 201-day demand through 2020.

Table 8.5 – 201-Day Supply Demand – Bert Combs Lake

Year	Projected Demand (MGD)	201-Day Average Demand
2000	1.644	330.4 MG
2005	1.913	384.5 MG
2010	2.005	403 MG
2015	2.076	417.3 MG
2020	2.132	428.5 MG

The estimated full capacity of the reservoir (304.65 million gallons) is less than the 201-day average demand for 2000 through 2020 that is necessary to be considered an adequate supply source.

In addition, it should be noted that this source assessment assumes that the full volume of the reservoir will be available for withdrawals during a drought. This assumption is problematic because the reservoir is unlikely to be at full pool during a drought situation. Additionally, a portion of the volume will not be accessible for drinking water treatment due to the height of the intake and the quality of water at lower levels within the reservoir.

No information is available about the productivity of Manchester’s well source. Thus, its adequacy as a supply source is unknown. According to this analysis of Manchester’s supply sources, it has been determined to have the drought susceptibility classification shown in Table 8.6.

Table 8.6 – Clay County Water Supply Adequacy Assessment

Water Supplier/ Supply Source	Drought Susceptibility Class
Manchester Water Works / Bert Combs Lake, Well, Goose Creek	C

The drought susceptibility classification of “C” indicates that the system is likely to experience a water shortage during drought conditions. Plans for a response to a shortage are necessary. See Appendix C for further explanation of the Kentucky Division of Water’s drought susceptibility classification system.

8.4 Water Supply Alternatives

Clay County’s water supply from its three sources was found to be inadequate through 2020. Table 8.7 lists the supply alternatives that Manchester is considering.

Table 8.7 – Clay County Water Supply Alternatives

Manchester Water Works

Alternatives	Comments
Low flow dam on Goose Creek	Would also construct a 2.5 mgd raw water intake structure and 16,000 feet of raw water lines, which would enable pumping directly from Goose Creek to the existing treatment plant.
Additional temporary intake on Goose Creek	Short-term alternative until a new source is developed.
Connection with Barbourville Utility System	Only entails a short-distance water line connection. Barbourville’s supply source is Laurel River Lake.
Interconnection with Knox County Utility System and Leslie County Water System	Proposed interconnections for 2003 with Knox County and 2004 with Leslie County
Purchase water from East Laurel Water District	Would relieve Manchester’s wholesale demand from North Manchester Water Association. East Laurel’s source is Wood Creek Lake via the Wood Creek Water District. There are some question as to the infrastructure obstacles for this connection.

Preferred alternative in bold text.

Manchester Water Works has requested funding to construct a low flow dam and new raw water intake structure on Goose Creek. Raw water will be pumped to the treatment plant located at Bert T. Combs Lake. The Economic Development Administration and Rural Development have already agreed to commit funding for this project.

In addition, interconnections are proposed between Manchester Water Works and the Knox County Utility System for the summer of 2003 and with the Leslie County Water System in the summer of 2004. Clay County has also considered the possibility of purchasing more water from East Laurel Water District, which purchases water from the Wood Creek Water District. (The Wood Creek Water District uses Wood Creek Lake as its supply source, which falls within the Cumberland River Basin in Laurel County.)

8.5 Narrative Summary

8.5.1 General assessment of system

In order to offset reservoir shortages in the past, Manchester set up a temporary pump and raw water line capable of pumping 1.0 mgd from Goose Creek into Combs Lake. This arrangement is not capable of maintaining adequate reservoir storage during periods of prolonged drought. Thus, Manchester is now pursuing funding for a low-flow dam on Goose Creek, as well as a new 2.5 mgd raw water intake structure and 16,000 feet of raw water lines. Both the Economic Development Administration and Rural Development have contributed funding for this project, which is proposed for completion in 2003.

A long-term alternative for Manchester Water Works is to connect with the Barbourville Utility Commission, whose water supply source is Laurel River Lake. The Barbourville Utility Commission proposed and submitted an application to construct a short-distance water line along route KY 11 to complete the gap between Manchester and Barbourville. This connection would allow Manchester Water Works to have an emergency source of treated water from Barbourville.

Another long-term alternative for Manchester Water Works is a close (approximately 50 feet) connection with the East Laurel Water District, which treats water from Laurel River Lake in the Cumberland River Basin. This source would be available to customers of the North Manchester Water Association, relieving Manchester Water Works from its treated water wholesale obligation to North Manchester.

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap between water purchased for resale and cumulative sales to water customers. In 2000, the unaccounted-for water loss rate for Manchester Water Works was estimated to be 15%. Manchester is planning to repair a leak in its intake structure at Bert Combs Lake, where significant water loss is known to occur. Additionally, the North Manchester Water Association is in need of replacing its leaking 500,000 gallon water storage tank. The replacement of the tank is estimated to cost \$375,000 and is currently being offered for bid.

8.5.2 Water shortage response plans / Contamination response plans

Water Shortage Response Plan:

Clay County's local officials and water system managers follow the specifications of the Kentucky Division of Water's *1988 Kentucky Water Shortage Response Plan*.

Water Supply Contamination Response Plan:

Manchester Water Works is capable of storing 2,030,000 gallons of treated water. In the event of a water shortage or contamination problem, Manchester Water Works has approximately 1.25 days of storage. In the event of an extreme emergency, a connection could be established with the Barbourville Utility Commission (if this connection does not already exist).

The North Manchester Water Association has a storage capacity of 788,000 gallons of treated water (purchased from Manchester Water Works). In the event North Manchester Water Association could no longer purchase water from Manchester Water Works, water could be purchased from the East Laurel Water District or the Jackson County Water Association.

8.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning period. These funding need estimates are listed below for the short-term period of 2000 to 2005 (Table 8.8a) and the longer term period of 2006 to 2020 (Table 8.8b).

Table 8.8a: Short-Term Infrastructure Funding Needs (2000-2005) – Clay County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Clay Co.	231.0	1,353	12,845	--	20,000	--	2,800	35,645

* Taken from *Water Resource Development: A Strategic Plan* (KIA, 1999)

Table 8.8b: Long-Term Infrastructure Funding Needs (2006-2020) – Clay County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Clay Co.	120.7	680	7,591	--	2,000	2,000	2,350	13,941

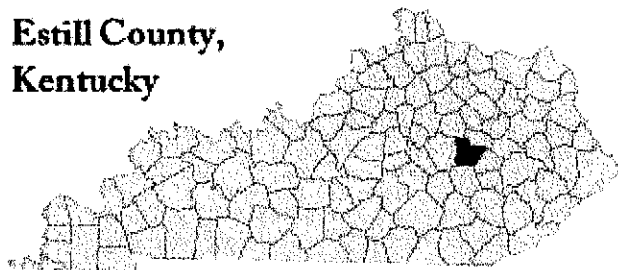
* Taken from *Water Resource Development: A Strategic Plan* (KIA, 1999)

Clay County’s immediate infrastructure needs account for 1,353 new customers between 2000 and 2005 and requisite system upgrade costs of approximately \$35.6 million. Between 2006 and 2020, 680 additional customers are expected. New water distribution lines, source development, treatment upgrades and tanks and pumps are expected to result in an additional long-term system upgrade cost of approximately \$13.9 million. Between 2006 and 2020, the majority of infrastructure funding will be targeted toward installing new water distribution lines and developing new water supply sources and treatment capacity.

8.5.4 Other major issues

None.

9.0 ESTILL COUNTY



Estill County is located in central Kentucky in the middle region of the Kentucky River Basin. Pools 11 and 12 of the Kentucky River flow through the county in a northwesterly direction, prior to the river’s confluence with the Red River tributary.

9.1 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute their finished, potable water to their customers or sell the water to other distributors. Table 9.1 lists the water suppliers for Estill County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier’s overall water treatment plant capacity.

Table 9.1 – Summary of Estill County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity*	Treatment Plant Capacity
Irvine Municipal Utilities	Kentucky River Pool 11	Kentucky River	2.0 mgd	2.0 mgd

*Permitted water withdrawal amount, per Kentucky Division of Water.

In addition to supplying its own customers, Irvine Municipal Utilities sells water to the Estill County Water District #1 for distribution within the county. The Powell’s Valley Water District also distributes water to some Estill County residents and purchases treated water from the Beech Fork Water Commission. See Figure 9.1 in Appendix A for a map of the Estill County water system. In addition, Irvine’s water withdrawal permit can be found in Appendix B.

9.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised

population projections for the water management planning period of 2000 to 2020. These new figures for Estill County, shown in Table 9.2, are based on results from the 2000 census data.

Table 9.2 – Estill County Population Projections

2000 Census	2005	2010	2015	2020
15,307	15,730	16,048	16,283	16,424

* Taken from University of Louisville Kentucky State Data Center.

Between 2000 and 2020, the Estill County population is expected to increase by approximately 7%, or 1,117 people. In 2000, 98.3% of the county population was served by a public water supplier. It is projected that 99.8% of the population will be served by a public water supply by 2020, an overall increase of 1,345 individuals. The associated projected water demands for Irvine Municipal Utilities are shown in Table 9.3 and illustrated in Figure 9.2.

Table 9.3 – Summary of Current and Projected Estill County Water Demand: Irvine Municipal Utilities*

	Average Annual Water Use (million gals)	Projected Annual Water Use (million gallons)			
	2000	2005	2010	2015	2020
Residential	245.88	252.71	257.75	262.90	267.85
Commercial/Institutional	21.57	22.17	22.61	22.94	23.14
Industrial	9.13	9.38	9.57	9.71	9.80
Public/Unaccounted For	103.41	106.26	108.40	110.00	110.95
Other	0.00	0.00	0.00	0.00	0.00
Total Production	379.99	390.51	398.34	405.55	411.74
Avg. Daily Production (mgd)	1.041	1.070	1.091	1.111	1.128
Peak Day (mgd)	1.328	1.541	1.572	1.600	1.624

(Taken from Bluegrass Area Water Management Plan, 2002)

* Also includes demand for Estill County Water District

Irvine’s average daily water use demand is expected to increase by approximately 8% between 2000 and 2020. In 2001, Irvine reported withdrawing an average daily amount of 1.077 mgd, which is slightly greater than predictions for 2005.

Irvine’s projected peak demand for 2020 of 1.624 mgd is less than its current permitted water withdrawal amount and its treatment plant capacity, both of which are 2.0 mgd. Demand management through water conservation measures is predicted to have the potential to reduce

Irvine’s annual average demand by approximately 5.3% and its maximum day demand by approximately 5.9%.

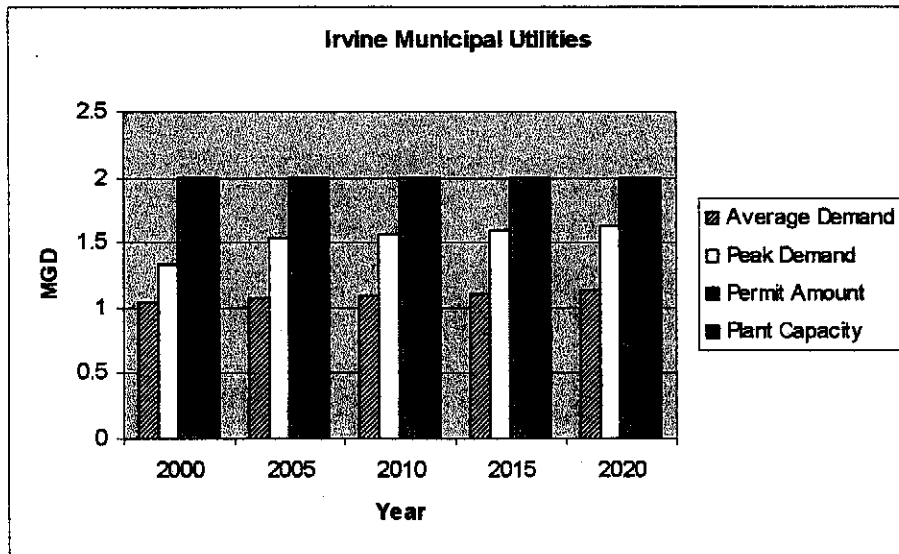


Figure 9.2 – Comparison of Irvine’s Predicted Average Demand/Predicted Peak Demand/Current Current Water Withdrawal Permit Amount/Current WTP Capacity

Neither Irvine’s predicted average or peak demands are expected to exceed its permitted water withdrawal amount or treatment plant capacity through 2020.

9.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors.

Critical to the determination of supply adequacy is the relationship between the permitted withdrawal amount, and statistical measures of flow measured at the point of withdrawal such as 1) the normal flow, 2) the 7Q10 flow and 3) the 7Q20 flow. Values for each of these statistics for Pool 11 are provided in Table 9.4.

Table 9.4 – Estill County Supply Sources and Capacities

Supply Source	Normal Flow ¹	7Q10 ²	7Q20 ³
Kentucky River Pool 11	59.5 mgd	64.6 mgd	38.8 mgd

¹Normal flow = 10% of lowest monthly mean flow; maximum amount that any single user can be permitted to withdraw

²7Q10 = lowest consecutive 7 day streamflow that is likely to occur in a ten year period; for planning purposes, represents “minimum flow”

³7Q20 = lowest consecutive 7 day streamflow that is likely to occur in a twenty year period; for planning purposes, represents “drought conditions”

Because there are no gaging stations in Kentucky River Pool 11, the above flows are estimated from measured flows at other stations on the river. The Kentucky Division of Water has established the “normal flow” as the basis for determining the maximum amount that any one permittee may be allowed to withdraw. Thus, Irvine’s current and projected demands are well within this available allotment.

The Kentucky Division of Water considers a regulated stream source adequate if the average rate of water use is less than 20 percent of the stream’s 7Q10 flow value. Irvine’s predicted 2020 average rate of water use (1.128 mgd) is only 2% of the 7Q10 flow value for Kentucky River Pool 11 (64.6 mgd). As a result, Irvine’s water supply has been assigned a drought susceptibility classification of A, as shown in Table 9.5.

Table 9.5 – Estill County Water Supply Adequacy Assessment

Water Supplier/ Supply Source	Drought Susceptibility Class
Irvine Municipal Utilities / Kentucky River Pool 11	A

The drought susceptibility classification of “A” indicates that the system is unlikely to experience a water shortage during drought conditions. See Appendix C for further explanation of the Kentucky Division of Water’s drought susceptibility classification.

9.4 Water Supply Alternatives

Irvine’s water supply from the Kentucky River was found to be adequate through 2020. Therefore, no supply alternatives were considered.

9.5 Narrative Summary

9.5.1 General assessment of system

Irvine’s supply source of the Kentucky River Pool 11 has an adequate capacity to meet both projected average and peak demands. In addition, the city’s current permitted withdrawal amount and its treatment capacity are adequate to meet current and peak demands through 2020. In 2001, Irvine reported an average monthly withdrawal rate of 1.077 mgd and a maximum monthly average of 1.130 mgd. This average demand is slightly greater than the projected 2005 demand rate, but is well within the maximum withdrawal and plant capacities of 2.0 mgd.

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap between water purchased for resale and cumulative sales to water customers. Year 2000 unaccounted-for loss estimates for systems in Estill County resulted in the following:

Estimated water loss:	
Irvine Municipal Utilities	7.4%
Estill County Water District	0%
U.S. 60 Water District	25.4%
North Shelby Water Company	17.9%

It is expected that leakage rates for both the U.S. 60 Water District and the North Shelby Water Company will be decreased to at least 15% by 2005.

9.5.2 Water shortage response plans / Contamination response plans

Water Shortage Response Plan:

Beyond the reserve capacity, Irvine has not adopted a municipal ordinance dealing with potential water shortages. This situation could be quickly and easily alleviated through passage of an emergency ordinance as needed for a water shortage situation. Further, Irvine Municipal Utilities management has indicated that, although it has not drafted a formal water shortage plan, it is aware of the plan guidelines established in the Kentucky Division of Water’s Water Shortage Response Plan. Management would follow these recommendations in the event of a water shortage.

Water Supply Contamination Response Plan:

The Estill County Emergency Management Agency has prepared Emergency Response Plans which address the ways in which accidental contaminant releases will be handled—defining appropriate response agencies, protection of civilians, and suggested strategies for mitigation and alleviation of the hazard.

All of the water utilities operating in Kentucky are required by regulations promulgated by the Kentucky Division of Water to have a volume of stored water which is equal to or greater than

the amount of water that the utility produces or sells in a 24-hour period. Both Irvine Municipal Utilities and the Estill County Water District meet this requirement. Subsequently, in the event of an occurrence that may contaminate the county’s source of water supply, Irvine Utilities could shut down its water intake until the threat presented by the hazard has passed, provided the duration of the threat is less than a 24-hour period.

9.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning period. These funding need estimates are listed below for the short-term period of 2000 to 2005 (Table 9.6a) and the longer-term period of 2006 to 2020 (Table 9.6b).

Table 9.6a: Short-Term Infrastructure Funding Needs (2000-2005) – Estill County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Estill Co.	18.0	51	823	300	--	--	810	1,933

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

Table 9.6b: Long-Term Infrastructure Funding Needs (2006-2020) – Estill County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Estill Co.	59.5	132	2,508	540	--	2,900	750	6,698

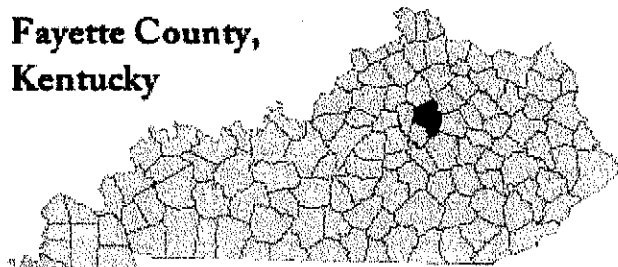
* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

Estill County’s immediate infrastructure needs account for 51 new customers between 2000 and 2005 and requisite system upgrade costs of approximately \$1.9 million. Between 2006 and 2020, 132 additional customers are expected. The installation of new distribution lines to serve these customers, along with treatment system and tank and pump upgrades, are expected to result in an additional long-term system upgrade cost of approximately \$6.7 million.

9.5.4 Other major issues

None.

10.0 FAYETTE COUNTY



Fayette County is located in central Kentucky in the middle region of the Kentucky River Basin. The Kentucky River flows along Fayette County's southern border with Madison County, where Lock and Dam 9 creates Pool 9 of the river. Pool 9 serves as Fayette County's major water supply source.

10.1 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute their finished, potable water to their customers or sell the water to other distributors. Table 10.1 lists the water suppliers for Fayette County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier's overall water treatment plant capacity.

Lexington's water is provided by the Kentucky American Water Company (KAWC). Lexington receives its treated water from two separate treatment plants. The first one is located on Richmond Road (RRWTP) while the second one is located south of the city on a bluff overlooking pool 9 of the Kentucky River (KRWTP). The Richmond Road plant was originally constructed in 1885, and was rebuilt in 1987. This plant is located within the city limits of Lexington and draws water from two separate reservoirs (No.1 and No. 4) both of which receive water from a raw water pumping station located at the Kentucky River Plant. The gross capacity of reservoir No.4 (Jacobson Reservoir) is 619 MG, while reservoir No.1, which has a capacity of 122 MG, is used only in the case of an operational emergency. The Kentucky River treatment plant was constructed in 1958 with an original capacity of 20 MGD. The plant was upgraded in 1984 to a capacity of 40 MGD. In 1988, Lexington experienced a drought which led to concerns about both water supply and treatment capacity deficiencies. In response, the RRWTP was upgraded from 20 million gallons per day (MGD) to 25 MGD bringing the total treatment capacity for the city up to 65 MGD in 1992. In 1999, Lexington experienced an even more severe drought which again raised concerns about water supply and treatment capacity. Demand estimates in 2000 identified a potential maximum day demand deficit of 11 MGD. In response, the Kentucky Drinking Water Branch (KDWB) granted an approval for the re-rating of the KRWTP to a reliable capacity of 45 MGD during the summer months, provided that water quality standards were maintained. On the basis of a demonstrated ability of the KRWTP to produce 50 MGD of good finished water quality, the KDWB moved to further allow a combined production of 75 MDG from both RRWTP and KRWTP to handle a maximum day

event. KAWC is currently pursuing improvements to the RRWTP which would provide the ability to temporarily increase the capacity of the plant up to 30 MGD thereby providing a total short term capacity of 80 MGD.

The Lexington-based Kentucky-American Water Company not only sells water to its own customers in Fayette, Woodford, Scott, Bourbon, Harrison and Clark Counties; it is also the sole water supplier to the City of Midway and to the City of North Middletown. Spears Water Company also distributes water purchased from KAWC and serves the southern portion of Fayette County. KAWC is a partial supplier to Georgetown Municipal Water and Sewer Service and to the Harrison County Water Association. A map of the Fayette County water system is provided in Figure 10.1 in Appendix A. In addition, KAWC’s water withdrawal permit can be found in Appendix B.

Table 10.1 – Summary of Fayette County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity*	Treatment Plant Capacity
Kentucky-American Water Company	Kentucky River Pool 9	Kentucky River	60.0 mgd (Jan-April, Nov-Dec) 63.0 mgd (May-Oct)	65 mgd***
	Jacobson Reservoir	Kentucky River	16.0 mgd	

*Permitted water withdrawal amount, per Kentucky Division of Water.

** As river flow diminishes during drought times, permitted withdrawals similarly are reduced. For further details, see Section C below.

*** Under normal conditions

10.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised population projections for the water management planning period of 2000 to 2020. These new figures for Fayette County, shown in Table 10.2, are based on results from the 2000 census data.

Table 10.2 – Fayette County Population Projections

2000 Census	2005	2010	2015	2020
260,512	279,005	295,664	311,436	326,446

* Taken from University of Louisville Kentucky State Data Center.

Between 2000 and 2020, the Fayette County population is expected to increase by approximately 25%, or 65,934 people. In 2000, 99.8% of the county population was served by a public water supplier. It is projected that 99.9% of the population will be served by a public water supply by 2020, an overall increase of 66,129 individuals. The associated projected water demands for the Kentucky American Water Company are shown in Table 10.3 and illustrated in Figure 10.2

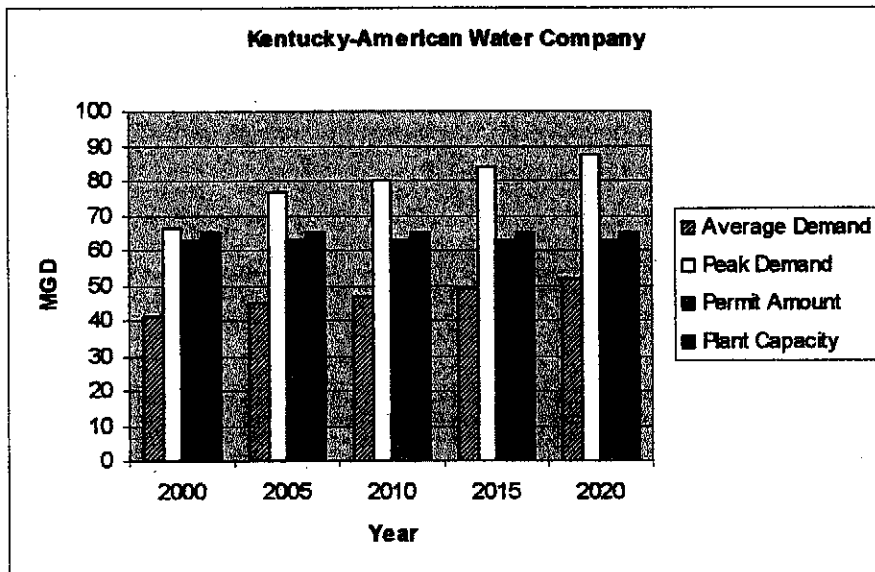
Table 10.3 – Summary of Current and Projected Fayette County Water Demand: Kentucky-American Water Company

	Average Annual Water Use (million gals)	Projected Annual Water Use (million gals)				
	2000	2005	2010	2015	2020	
Residential	7,347.45	7,998.43	8,560.94	9,015.57	9,477.95	
Commercial/Institutional	3,175.67	3,262.29	3,334.55	3,490.86	3,669.89	
Industrial	729.83	749.74	766.35	802.27	843.42	
Public/Unaccounted For	2,628.00	3,250.62	3,389.93	3,537.24	3,718.66	
Other	1,091.35	1,112.82	1,136.08	1,159.51	1,218.98	
Total Production	14,972.30	16,373.90	17,187.85	18,005.45	18,928.90	
Avg. Daily Production (mgd)	41.020	44.860	47.09	49.330	51.860	
Peak Day (mgd)	66.370	76.670	80.22	83.840	87.670	

(Taken from Bluegrass Area Water Management Plan)

The average daily water use demand in Fayette County is expected to increase by approximately 26% between 2000 and 2020. In 2001, Kentucky-American reported withdrawing an average daily amount of 41.262 mgd, which is greater than the 2000 average demand estimate but less than that for 2005. The projected peak demand is expected to exceed 89 million gallons per day by 2020, which is nearly 30 mgd greater than the currently permitted water withdrawal amount and 24 mgd greater than the current treatment capacity.

Kentucky-American’s predicted average demand is not expected to exceed its permitted water withdrawal or treatment plant capacity through 2020. However, the system’s peak demand was predicted to surpass the permit amount and treatment plant capacity by 2000.



Permit amount is for Kentucky River Pool 9 source only. (Jacobson Reservoir not included.)

Figure 10.2 – Comparison of Kentucky-American’s Predicted Average Demand/Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

10.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors. Critical to the determination of supply adequacy is the relationship between the permitted withdrawal amount, and statistical measures of flow measured at the point of withdrawal such as 1) the normal flow, 2) the 7Q10 flow and 3) the 7Q20 flow. Values for each of these statistics for pool 5 are provided in Table 10.5

Table 10.5 – Fayette County Supply Sources and Capacities

Supply Source	Normal Flow ¹	7Q10 ²	7Q20 ³	Full Reservoir
Kentucky River Pool 9	74.7 mgd	77.5 mgd	56.8 mgd	N/A
Jacobson Reservoir	N/A	N/A	N/A	781.8 million gals

¹Normal flow = 10% of lowest monthly mean flow; maximum amount that any single user can be permitted to withdraw

²7Q10 = lowest consecutive 7 day streamflow that is likely to occur in a ten year period; for planning purposes, represents “minimum flow”

³7Q20 = lowest consecutive 7 day streamflow that is likely to occur in a twenty year period; for planning purposes, represents “drought conditions”

The “normal flow” value is actually the maximum amount that any one user may be permitted to withdraw. Kentucky-American’s current and projected *average* demands are within this available allotment. However, projected *peak* demands are expected to begin to surpass this maximum possible withdrawal allotment in 2005, when the peak demand is predicted to be 76.67 mgd.

The Kentucky Division of Water considers a regulated stream source adequate if the average rate of water use is less than 20 percent of the stream’s 7Q10 flow value. A resulting percentage of 20 to 65% receives a “B” drought susceptibility classification, and a percentage greater than 65% receives a “C.” Kentucky-American’s predicted 2020 average rate of water use (51.86 mgd) is 67% of the 7Q10 flow value for Kentucky River Pool 9 (77.5 mgd). Thus, the Kentucky River is considered inadequate as Kentucky-American’s supply source, and as a result has been assigned a drought susceptibility classification of C as shown in Table 10.6

Table 10.6 – Fayette County Water Supply Adequacy Assessment

Water Supplier / Supply Source	Drought Susceptibility Class
Kentucky-American Water Company / Kentucky River Pool 9	C

Kentucky-American Water Company scores a “C” for both its Kentucky River and Jacobson Reservoir withdrawal points. Given the projected demand on the KAWC system, the reservoir was found to have only 15 days of supply, at full capacity. For that reason, the reservoir was judged incapable of improving the drought susceptibility of river withdrawals. Thus, KAWC’s overall susceptibility class is a “C”.

The drought susceptibility classification of “C” indicates that the system is likely to experience a water shortage during drought conditions. Plans for a response to shortage are necessary. (See Appendix C for further explanation of the Kentucky Division of Water’s drought susceptibility classification.)

In an attempt to provide additional water supply during drought conditions, the Kentucky River Authority has installed release valves in dams 10-14, that allow the release of water stored below the associated dam crests while still maintaining 7Q10 flows. Guidelines for use of these valves have been developed and documented by the River Authority in a Valve Operating Plan. The associated guidelines correlate the operation of the valves to different trigger events associated with flows in the Kentucky River and storages associated with pools 10-14.

As a result of the assessed inadequacy of KAWC’s supply to meet demands and in order to maintain some flows for instream uses, the water withdrawal permit for KAWC for Pool 9 contains specific directives for withdrawal reductions as flows in the river decrease below a certain level. The schedule of withdrawal reductions is outlined below. When flows measured at

Lock 10 are 140 cfs or less for four consecutive days, Kentucky-American’s withdrawals shall conform to the following schedule:

Lock 10 Flow	Allowable Withdrawals Under this Permit
> 140 cfs	Full permitted amount
139.99 – 120.00 cfs	58.0 mgd
119.99 – 90.00 cfs	54.0 mgd
89.99 – 60 cfs	50.0 mgd
59.99 – 30.00 cfs	48.0 mgd
29.99 – 0.00 cfs	45.0 mgd
Drought Phase 2	45.0 mgd
Drought Phase 3	42.0 mgd
Drought Phase 4	40.0 mgd
Drought Phase 5	35.0 mgd
Drought Phase 6	30.0 mgd

¹The full permitted amount is 60.0 mgd for the months of November through April and 63.0 mgd for the months May through October.

²Drought phase 2 shall exist between the time that Trigger 2 is met but before Trigger 3 is declared. Drought phase 3 shall exist between the time that Trigger 3 is met but before Trigger 4 is declared, and so on. [Conditions for “Triggers” outlined in the Kentucky River Authority’s Valve Operating Plan.]

“The revised Flow Schedule shall remain in effect under the condition that the valves and the valve operating plan are maintained by the Kentucky River Authority or some other entity approved by the Division of Water. If maintenance of the valves and valve operating plan is discontinued for any reason, the flow schedule will revert to that incorporated in permit #0200, as issued on December 14, 1992.”

10.4 Water Supply Alternatives

Fayette County’s water supply from the Kentucky River and Jacobson Reservoir was found to be inadequate through 2020. The outcome of the Bluegrass Water Supply Consortium’s 2002-2003 study will likely determine KAWC’s water supply future. The intent of the study is to define the most cost effective, implementable, and environmentally acceptable capital plan to make additional potable water available to the participating water utilities. A second part of the effort is to plan for a water system grid that would link participating water utilities to convey water from the point(s) of water availability to the point(s) of water need.

The additional potable water supply identified by the BWSC could come from the purchase of water from a major supplier outside the region or from the addition of one or more water treatment plants at a point or points in the downstream reaches of the Kentucky River where added stream flow from major tributaries should make more water available for withdrawal from the river. Possible alternatives include a treated water pipeline from a point on the Ohio River; a

raw water pipeline from a lower pool to Pool 9 of the Kentucky River; raising the height of Lock and Dam 9 on the Kentucky River; and the construction of a new reservoir.

The BWSC has hired a consultant to examine water supply alternatives and provide the findings in the spring or summer of 2003. Measures to begin providing relief from the existing water supply deficit are then expected to be in place within three years.

10.5 Narrative Summary

10.5.1 General assessment of system

Predicted average demands for the Kentucky-American Water Company through 2020 are less than the current withdrawal permit amount amounts and water treatment plant capacity. However, peak demands and water supply availability during drought conditions combine to pose shortage issues for the KAWC system. For this reason, the KAWC has joined the Bluegrass Water Supply Consortium to identify an alternative water source to supplement supplies during times of shortage.

Additionally, peak demands from 2000 through 2020 are greater than the KAWC's water combined treatment plant capacity of 65 mgd. Thus, an increase in treatment capacity or a source of potable water will be required to meet the supplier's peak demands.

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap between water purchased for resale and cumulative sales to water customers. The 2000 unaccounted-for loss estimate for the Kentucky-American Water Company was 10.5%. KAWC maintains an aggressive leak detection program, and any leaks detected in the distribution system are quickly repaired.

10.5.2 Water shortage response plans / Contamination response plans

Water Shortage Response Plan:

In 1993, the Kentucky-American Water Company created a Demand Management Plan in response to the 1988 drought. The "Demand Management Plan" has been filed with the proper local and state agencies. The plan has been approved and is in full force and effect at this time. The major sections in this Plan are: Conservation Public Education Program; Water Shortage Response Program; Preliminary Watch; Water Shortage Advisory Phase; Water Shortage Partial Alert; Water Shortage Full Alert Phase; Water Shortage Emergency Phase; Water Rationing Phase; and Return to Normal.

Water Supply Contamination Response Plan:

Fayette County currently withdraws water from two separate sources, with a third small reservoir as an emergency back up. The Kentucky River has been contaminated due to infrequent spills in the past. There is an interstate bridge that crosses the river just upstream of Kentucky-

American’s water intake, which makes it vulnerable to contamination. Fortunately, the spills have been due to traffic accidents and adequate warning was received. Jacobson Reservoir has a low risk of contamination, as the watershed is primarily residential and rural. No significant contamination event has occurred on the reservoir. Kentucky-American has adopted a Disaster/Emergency Operations Plan, which includes procedures for responses to contamination of the raw water supply and contamination of the distribution system.

Kentucky-American is in the process of completing an emergency connection with Georgetown Municipal Water and Sewer Service that will allow Kentucky-American to purchase water from GMWSS during an emergency. This will allow water service to be maintained in parts of Scott County during a temporary outage.

In the event of a short-term emergency, Kentucky-American can switch supplies and utilize its storage facilities to meet demands. If an extended shut down is required, then customers will be asked to reduce water usage as described in Kentucky-American’s Water Shortage Emergency Plan.

10.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning period for publicly-owned water suppliers only. Because the Kentucky-American Water Company is privately-owned, no figures were provided for Fayette County. However, independent funding estimates provided by KAWC are provided in Tables 10.8a and 10.8b below.

Table 10.8a: Short-Term Infrastructure Funding Needs (2000-2005) – Fayette County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Fayette Co.	--	12,500	--	--	--	--	--	\$92,500

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

Table 10.8b: Long-Term Infrastructure Funding Needs (2006-2020) – Fayette County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Fayette Co.	--	35,000	--	--	--	--	--	\$262,500

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

Approximately 12,500 new customers are expected to be served by the KAWC system between 2000 and 2005, and 35,000 customers are expected to be added between 2006 and 2020. Infrastructure expenditures average between \$13 million and \$15 million per year for

maintenance and expansion of the water system. In addition, KAWC anticipates an expense of \$70 to \$75 million to develop additional water supply.

10.5.4 Other major issues

Bluegrass Water Supply Consortium

The Kentucky-American Water Company is a participant in the Bluegrass Water Supply Consortium, an alliance of water utilities and government agencies that are working to address the potable water needs of central Kentucky. The BWSC's goal is to construct a transmission grid connecting the participating water utilities. This grid will enable the movement of treated water from points of availability to points of need throughout the system. The BWSC is also endeavoring to identify a supply source that will augment that of the Kentucky River and other supplier sources in order to ensure water availability during a drought. Thus, existing treatment facilities and distribution systems will remain in operation. The regionalization offered by the BWSC will provide system reliability that is not possible for individual suppliers.

Ownership of KAWC

A local controversy exists over the sale of the Kentucky-American Water Company, as Lexington residents consider public ownership versus ownership of the water company by the multinational Rheinisch-Westfälisches Elektrizitätswerk Aktiengesellschaft (RWE AG), which is based in Germany. RWE currently has a contract to purchase American Water Works, the parent company of Kentucky-American. This sale was approved by the Kentucky Public Service Commission on May 30, 2002.

Citizen groups have been created to support each side of the issue. The group called For Local Ownership of Water (FLOW) would like the Lexington-Fayette Urban County Government to purchase the water company. The Coalition Against a Government Takeover (CAGT) is arguing for continued ownership of the company by American Water Works, or its purchaser, RWE.

Pipeline Alternative

The *Fayette County 20-Year Comprehensive Water Supply Plan*, completed in 1999, offered the preferred water supply alternative of a treated water pipeline to the Louisville Water Company's system. Water from this pipeline would supplement the existing supply from the Kentucky River. Citizen concerns raised regarding construction, environmental impact and water quality were to be addressed in the pipeline design under development by the Kentucky-American Water Company. This proposed alternative was submitted to the Kentucky Public Service Commission for consideration. However, it was not pursued further due to public opposition.

11.0 FRANKLIN COUNTY



Franklin County is located in north central Kentucky in the lower region of the Kentucky River Basin. Kentucky River Lock and Dam 4 is located in Franklin County, creating Pool 4 of the river, which serves as Frankfort’s water supply source.

11.1 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute finished, potable water to their customers or sell the water to other distributors. Table 11.1 lists the water suppliers for Franklin County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier’s overall water treatment plant capacity.

Table 11.1 – Summary of Franklin County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity*	Treatment Plant Capacity
Frankfort Electric and Water Plant Board	Kentucky River Pool 4	Kentucky River	14.0 mgd (Jan-June, Nov-Dec) 15.0 mgd (July-Oct)	18.0 mgd

*Permitted water withdrawal amount, per Kentucky Division of Water.

** When flows measured at Lock 4 of the Kentucky River decline to 175.0 cfs, Frankfort Electric and Water Plant Board shall reduce its withdrawals to conform to a pre-arranged withdrawal schedule.

In addition to supplying its own customers, Frankfort sells treated water to five other distributors for Franklin County; Farmdale Water District U.S. 60 Water District, Elkhorn Water District, Peaks Mill Water District and North Shelby Water District. See Figure 11.1 in Appendix A for a map of the Franklin County water system. In addition, Frankfort’s water withdrawal permit can be found in Appendix B.

11.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised population projections for the water management planning period of 2000 to 2020. These new figures for Franklin County, shown in Table 11.2, are based on results from the 2000 census data.

Table 11.2 – Franklin County Population Projections

2000 Census	2005	2010	2015	2020
47,687	49,196	50,440	51,469	52,255

* Taken from University of Louisville Kentucky State Data Center.

Between 2000 and 2020, the Franklin County population is expected to increase by approximately 10%, or 4,568 people. In 2000, 99.3% of the county population was served by a public water supplier. It is projected that 99.9% of the population will be served by a public water supply by 2020, for an overall increase of 4,852 individuals. The associated projected water demands for the Frankfort Electric and Water Plant Board are shown in Table 11.3 and illustrated in Figure 11.2.

**Table 11.3 – Summary of Current and Projected Franklin County Water Demand:
Frankfort Electric and Water Plant Board***

	Actual Annual Water Use (million gals)	Projected Annual Water Use (million gallons)			
	2000	2005	2010	2015	2020
Residential	1,203.14	1,241.18	1,272.57	1,298.56	1,318.34
Commercial/Industrial	1,014.23	1,046.30	1,072.74	1,094.67	1,111.34
Public/Unaccounted For	684.38	706.02	723.85	738.65	749.90
Other	0	0	0	0	0
Total	2,901.75	2,993.50	3,069.16	3,131.88	3,179.58
Avg. Daily Production (mgd)	7.950	8.201	8.409	8.580	8.711
Peak Day (mgd)	14.207	13.713	14.059	14.347	14.565

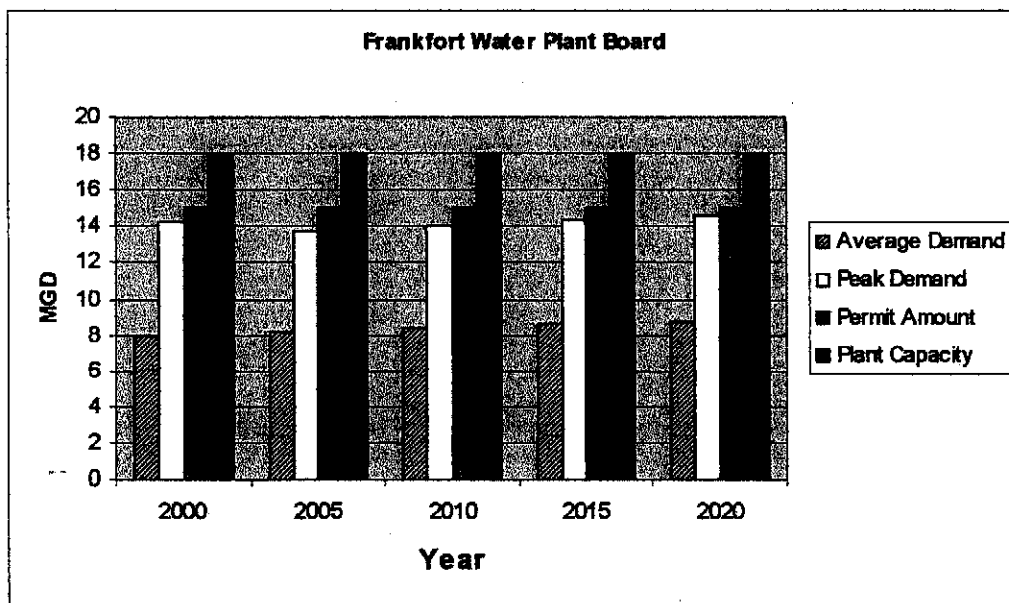
(Taken from Bluegrass Area Water Management Plan)

* also includes demand from Elkhorn Water District, Peaks Mill Water District, Farmdale Water District, U.S. 60 Water District, N. Shelby County Water Company, and Stamping Ground

Frankfort’s average daily water use demand is expected to increase by approximately 9.6% between 2000 and 2020. In 2001, Frankfort reported withdrawing an average daily amount of 8.149 mgd, which is slightly greater than predictions for 2000.

Frankfort’s projected peak demand for 2020 of 14.565 mgd is in the range of its current permitted water withdrawal amount of 14 – 15 mgd, and is less than its treatment plant capacity of 18.0 mgd.

Demand management through water conservation measures is predicted to have the potential to reduce Frankfort’s annual average demand by approximately 6% and its maximum day demand by approximately 6.5%.



* Used maximum withdrawal permit amount of 15.0 mgd.

Figure 11.2 – Comparison of Frankfort’s Predicted Average Demand/Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Frankfort’s predicted average and peak demands are expected to remain less than its permitted water withdrawal amount through 2020. Additionally, the water treatment plant is expected to be adequate for treating both average and peak demands through 2020.

11.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors.

Critical to the determination of supply adequacy is the relationship between the permitted withdrawal amount, and statistical measures of flow measured at the point of withdrawal such as 1) the normal flow, 2) the 7Q10 flow and 3) the 7Q20 flow. Values for each of these statistics for Pool 4 are provided in Table 11.4.

Table 11.4 – Franklin County Supply Sources and Capacities

Supply Source	Normal Flow*	7Q10 **	7Q20 ***
Kentucky River Pool 4	113.2 mgd	111.1 mgd	80.8 mgd

*Normal flow = 10% of lowest monthly mean flow

**Represents minimum flow

*** Represents drought conditions

The Kentucky Division of Water has established the “normal flow” as the basis for determining the maximum amount that any one permittee may be allowed to withdraw. Thus, Frankfort’s current and projected demands are well within this available allotment.

The Kentucky Division of Water considers a regulated stream source adequate if the average withdrawal rate is less than 20% of the stream source’s 7Q10. Frankfort’s predicted 2020 average demand rate of 8.711 mgd is 7.8% of the 7Q10 for Kentucky River Pool 4. As a result, Frankfort’s water supply has been assigned a drought susceptibility classification of A, as shown in Table 11.5.

Table 11.5 – Franklin County Water Supply Adequacy Assessment

Water Supplier / Supply Source	Drought Susceptibility Class
Frankfort Electric and Water / Kentucky River Pool 4	A

The drought susceptibility classification of “A” indicates that the system is unlikely to experience a water shortage during drought conditions. See Appendix C for further explanation of the Kentucky Division of Water’s drought susceptibility classification.

11.4 Water Supply Alternatives

Franklin County’s water supply from the Kentucky River was found to be adequate through 2020. Therefore, no supply alternatives were considered.

11.5 Narrative Summary

11.5.1 General assessment of system

Frankfort's supply source of Kentucky River Pool 4 is believed to have an adequate supply capacity to meet both projected average and peak demands through 2020. In addition, the water treatment plant capacity of 18.0 mgd is predicted to be adequate to meet both average and peak demands through 2020.

In 2001, Frankfort reported an average monthly withdrawal rate of 8.149 mgd and a maximum monthly average of 9.018 mgd. Each of these figures is still well within the maximum withdrawal and plant capacities.

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap between water purchased for resale and cumulative sales to water customers. Year 2000 unaccounted-for loss estimates for systems in Franklin County resulted in the following:

Frankfort Water Plant Board	13.3%
Peaks Mill Water District	19.1%
Farmdale Water District	13.1%
Elkhorn Water District	9.8%
US 60 Water District	1.4%
North Shelby Water Company	3.1%

According to the water management plan, it is expected that the leakage loss rate for Peaks Mill Water District will be reduced to 15% by 2005.

11.5.2 Water shortage response plans / Contamination response plans

Water Shortage Response Plan:

Due to the projected water supply adequacy of Kentucky River Pool 4, the Frankfort Electric and Water Plant Board has not adopted an individual water shortage response plan. However, it would rely on the state's model Water Shortage Response Plan if drought conditions caused Frankfort to experience a water supply shortage.

Water Supply Contamination Response Plan:

The Franklin County Disaster and Emergency Management Agency has a state-approved Emergency Response Plan that addresses the ways that accidental contaminant releases will be handled. Among the topics included in this plan are: the identification of the appropriate response agencies, the methods of protecting citizens from the contaminants, mitigation measures, and hazard alleviation.

All of the water utilities operating in Kentucky are required to have a volume of stored water that is equal to the amount of water the utility produces or sells in a 24-hour period. All the water

utilities operating in the Frankfort water service area, with the exception of the Farmdale Water District and the North Shelby Water Company, meet this requirement. Despite the fact that these two utilities do not meet the requirement for one day's potable water storage in the event of a contamination occurrence, the Frankfort Electric and Water Plant Board can shut down its water intake until the threat has passed. This is provided that the threat is less than twenty-four hours in duration.

Additionally, if there is a water shortage emergency resulting from a contamination event, the utility would rely upon the state's model Water Shortage Response Plan. Although this plan is designed for a drought situation, elements of the plan could be adapted to a contamination event.

11.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning period. These funding need estimates are listed below for the short-term period of 2000 to 2005 (Table 11.6a) and the longer term period of 2006 to 2020 (Table 11.6b).

Table 11.6a: Short-Term Infrastructure Funding Needs (2000-2005) – Franklin County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Franklin Co.	9.5	35	337	2,500	404	2,000	2,500	7,741

* Taken from *Water Resource Development: A Strategic Plan* (KIA, 1999)

Table 11.6b: Long-Term Infrastructure Funding Needs (2006-2020) – Franklin County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Franklin Co.	21.0	49	937	7,162	--	--	3,900	11,999

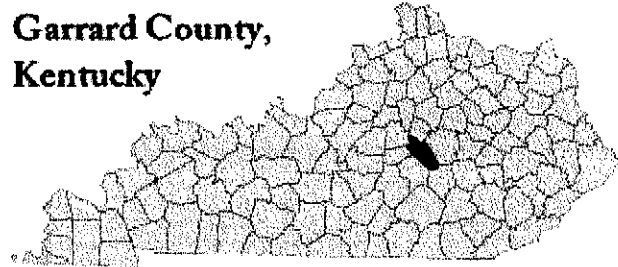
* Taken from *Water Resource Development: A Strategic Plan* (KIA, 1999)

Franklin County's immediate infrastructure needs account for 35 new customers between 2000 and 2005 and requisite system upgrade costs of approximately \$7.7 million. Between 2006 and 2020, 49 additional customers are expected. New distribution lines, line rehabilitation and tank and pump upgrades are expected to necessitate an additional long-term system upgrade cost of approximately \$12 million.

11.5.4 Other major issues

Frankfort is a participant in the Bluegrass Water Supply Consortium, an alliance of water utilities and government agencies that are working to address the potable water needs of central Kentucky. The BWSC's goal is to construct a transmission grid connecting the participating water utilities. This grid will enable the movement of treated water from points of availability to points of need throughout the system. The BWSC is also endeavoring to identify a supply source that will augment that of the Kentucky River and other supplier sources in order to ensure water availability during a drought. Thus, existing treatment facilities and distribution systems will remain in operation. The regionalization offered by the BWSC will provide system reliability that is not possible for individual suppliers.

12.0 GARRARD COUNTY



Garrard County is located in central Kentucky in the middle region of the Kentucky River Basin. It is bounded by the Kentucky River on its northern border with Jessamine County, Paint Lick Creek on its eastern border with Madison County, and the Dix River on its western borders with Boyle and Mercer Counties. Although Pools 7 and 8 of the Kentucky River are both located in northern Garrard County, Lancaster utilizes Pool 8 as its water supply source.

12.1 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute their finished, potable water to their customers or sell the water to other distributors. Table 12.1 lists the water suppliers for Garrard County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier’s overall water treatment plant capacity.

Table 12.1 – Summary of Garrard County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity*	Treatment Plant Capacity
Lancaster Municipal Water Works	Kentucky River Pool 8	Kentucky River	1.2 mgd (Jan-Feb) 1.3 mgd (March, Dec) 1.4 mgd (April) 1.5 mgd (Nov) 1.6 mgd (May) 1.7 mgd (June-Oct)	2.1 mgd

*Permitted water withdrawal amount, per Kentucky Division of Water.

** When flows measured at Lock 7 of the Kentucky River reach 144.0 cfs, Lancaster Municipal Water Works shall reduce to conform to the a pre-arranged withdrawal schedule.

In addition to supplying its own customers, Lancaster Municipal Water Works sells water to two other distributors for Garrard County; the Garrard County Water Association and Crab Orchard. The Garrard County Water Association also purchases treated water from Danville and Berea College Utilities. See Figure 12.1 in Appendix A for a map of the Garrard County water system. In addition, Lancaster’s water withdrawal permit can be found in Appendix B.

12.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised population projections for the water management planning period of 2000 to 2020. These new figures for Garrard County, shown in Table 12.2, are based on results from the 2000 census data.

Table 12.2 – Garrard County Population Projections

2000 Census	2005	2010	2015	2020
14,792	16,943	19,251	21,840	24,683

* Taken from University of Louisville Kentucky State Data Center.

Between 2000 and 2020, the Garrard County population is expected to increase by approximately 67%, or 9,891 people. In 2000, 95.6% of the county population was served by a public water supplier. It is projected that 99.7% of the population will be served by a public water supply by 2020, for an overall increase of 10,467 individuals. The associated projected water demands for Lancaster Municipal Water Works are shown in Table 12.3 and illustrated in Figure 12.2.

**Table 12.3 – Summary of Current and Projected Garrard County Water Demand:
Lancaster Municipal Water Works**

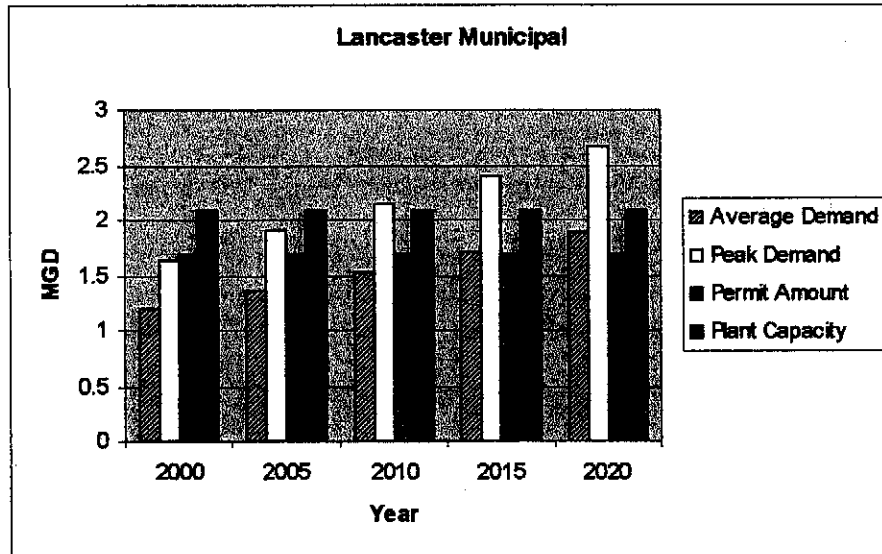
	Average Annual Water Use (million gals)	Projected Annual Water Use (million gals)			
	2000	2005	2010	2015	2020
Residential	292.67	335.29	380.91	432.13	488.37
Commercial/Institutional	9.55	10.62	11.57	12.56	13.56
Industrial	8.03	8.93	9.73	10.56	11.40
Public/Unaccounted For	126.54	140.70	153.28	166.44	179.67
Total Production	436.79	495.54	555.49	621.70	693.00
Avg. Daily Production (mgd)	1.197	1.358	1.522	1.703	1.899
Peak Day (mgd)	1.643	1.916	2.147	2.403	2.679

(Taken from Bluegrass Area Water Management Plan)

*Also includes demand from Garrard County Water Association and Crab Orchard

Lancaster’s average daily water use demand is expected to increase by approximately 59% between 2000 and 2020. In 2001, Lancaster reported withdrawing an average daily amount of 1.410 mgd, which is slightly greater than predictions for 2005.

Demand management through water conservation measures is predicted to have the potential to reduce Lancaster’s annual average demand by approximately 5.4% and its maximum day demand by approximately 6%.



Note: The permit amount used is 1.7 mgd, Lancaster’s maximum permitted withdrawal during the year.

Figure 12.2 – Comparison of Lancaster’s Predicted Average Demand/Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Lancaster’s predicted average demand is expected to narrowly exceed its permitted water withdrawal amount by 2015, but remain within the treatment capacity through 2020. The system’s peak demand is predicted to surpass the permitted water withdrawal amount by 2005 and its treatment plant capacity by 2010.

12.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors.

Critical to the determination of supply adequacy is the relationship between the permitted withdrawal amount, and statistical measures of flow measured at the point of withdrawal such as 1) the normal flow, 2) the 7Q10 flow and 3) the 7Q20 flow. Values for each of these statistics for Pool 8 are provided in Table 12.4.

Table 12.4 – Garrard County Supply Sources and Capacities

Supply Source	Normal Flow ¹	7Q10 ²	7Q20 ³
Kentucky River Pool 8	81.6 mgd	80.8 mgd	67.2 mgd

¹Normal flow = 10% of lowest monthly mean flow; maximum amount that any single user can be permitted to withdraw

²7Q10 = lowest consecutive 7 day streamflow that is likely to occur in a ten year period; for planning purposes, represents “minimum flow”

³7Q20 = lowest consecutive 7 day streamflow that is likely to occur in a twenty year period; for planning purposes, represents “drought conditions”

The Kentucky Division of Water has established the “normal flow” as the basis for determining the maximum amount that any one permittee may be allowed to withdraw. Thus, Lancaster’s current and projected demands are well within this available allotment.

The Kentucky Division of Water considers a regulated stream source adequate if the average rate of water use is less than 20 percent of the stream source’s 7Q10 value. Lancaster’s predicted 2020 average demand rate of 1.899 mgd is 2.4% of the 7Q10 for Kentucky River Pool 8. As a result, Lancaster’s water supply has been assigned a drought susceptibility classification of A, as shown in Table 12.5.

Table 12.5 – Garrard County Water Supply Adequacy Assessment

Water Supplier/ Supply Source	Drought Susceptibility Class
Lancaster Municipal/ Kentucky River Pool 8	A

The drought susceptibility classification of “A” indicates that the system is unlikely to experience a water shortage during drought conditions. See Appendix C for further explanation of the Kentucky Division of Water’s drought susceptibility classification.

12.4 Water Supply Alternatives

Garrard County’s water supply from the Kentucky River was found to be adequate through 2020. Therefore, no supply alternatives were considered.

12.5 Narrative Summary

12.5.1 General assessment of system

Lancaster’s supply source of the Kentucky River Pool 8 has an adequate supply capacity to meet both projected average and peak demands. However, peak demands are predicted to exceed Lancaster’s treatment plant capacity by 2010. This suggests that Winchester will need to upgrade its plant capacity before the conclusion of the 20-year planning period. Average demand is expected to surpass Lancaster’s withdrawal permit in 2015, indicating that the permit may also need to be increased.

In 2001, Lancaster reported an average monthly withdrawal rate of 1.41 mgd and a maximum monthly average of 1.632 mgd. Each of these figures is within the maximum withdrawal and plant capacities, although the 2001 maximum monthly average of 1.632 mgd is nearing the maximum permitted withdrawal amount of 1.7 mgd. Additionally, the 2001 average demand exceeds that predicted for 2005, indicating that demand predictions may need to be revised to reflect actual demands.

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap between water purchased for resale and cumulative sales to water customers. Year 2000 unaccounted-for loss estimates for systems in Garrard County resulted in the following:

Lancaster Municipal Water Works	12.7%
Garrard County Water Association	20.8%

It is expected that the leakage rate for the Garrard County Water Association will be reduced to 15% by 2005.

12.5.2 Water shortage response plans / Contamination response plans

Water Shortage Response Plan:

Lancaster and Crab Orchard (which purchases potable water from Lancaster) have not formally adopted water shortage response plans, largely because the supply has been considered adequate to meet projected future demand. However, Lancaster has notified the Kentucky Division of Water of its intent to follow the model provided in the 1988 *Kentucky Water Shortage Response Plan*, should such a response be needed.

The Garrard County Water Association (GCWA) has formally adopted a water shortage response plan and filed it with the Public Service Commission. The GCWA plan closely follows the KDOW model.

Water Supply Contamination Response Plan:

Garrard County Emergency Management has a state-approved Emergency Response Plan that addresses the ways that accidental contaminant releases will be handled. Among the topics

included in this plan are: identification of the appropriate response agencies, methods of protecting citizens from the contaminants, mitigation measures and hazard alleviation.

Kentucky Division of Water regulations require water systems to have a volume of stored potable water which is equal to the amount of water that the utility purchases or produces in a 24-hour period. For relatively brief emergencies caused by infrastructure problems, for instance, the Lancaster water system would rely on this source. However, should there be a shortage lasting longer than one day, caused by such factors as a major line break or plant shutdown, the water system will implement measures in accordance with the 1988 *Kentucky Water Shortage Response Plan*.

12.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning period. These funding need estimates are listed below for the short-term period of 2000 to 2005 (Table 12.6a) and the longer term period of 2006 to 2020 (Table 12.6b).

Table 12.6a: Short-Term Infrastructure Funding Needs (2000-2005) – Garrard County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Garrard Co.	16.5	46	196	200	1,800	--	50	2,246

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

Table 12.6b: Long-Term Infrastructure Funding Needs (2006-2020) – Garrard County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Garrard Co.	24.0	215	980	1,787	400	--	--	3,167

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

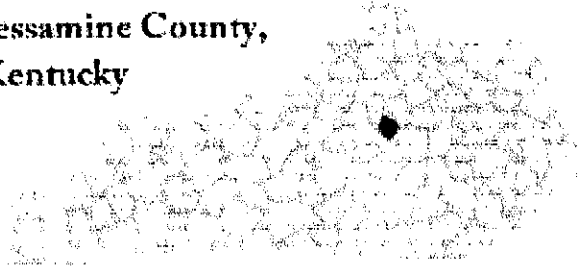
Garrard County’s immediate infrastructure needs account for 46 new customers between 2000 and 2005 and requisite system upgrade costs of approximately \$2.25 million. Between 2006 and 2020, 215 additional customers are expected. New distribution lines, line rehabilitation and supply source development are expected to necessitate an additional long-term system upgrade cost of approximately \$3.2 million.

12.5.4 Other major issues

Lancaster is a participant in the Bluegrass Water Supply Consortium, an alliance of water utilities and government agencies that are working to address the potable water needs of central Kentucky. The BWSC's goal is to construct a transmission grid connecting the participating water utilities. This grid will enable the movement of treated water from points of availability to points of need throughout the system. The BWSC is also endeavoring to identify a supply source that will augment that of the Kentucky River and other supplier sources in order to ensure water availability during a drought. Thus, existing treatment facilities and distribution systems will remain in operation. The regionalization offered by the BWSC will provide system reliability that is not possible for individual suppliers.

13.0 JESSAMINE COUNTY

Jessamine County,
Kentucky



Jessamine County is located in central Kentucky in the middle region of the Kentucky River Basin. Pools 6, 7 and 8 of the Kentucky River form Jessamine County’s borders with Madison, Garrard and Mercer Counties.

13.1 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute their finished, potable water to their customers or sell the water to other distributors. Table 13.1 lists the water suppliers for Jessamine County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier’s overall water treatment plant capacity.

Table 13.1 – Summary of Jessamine County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity*	Treatment Plant Capacity
Nicholasville Municipal Water Department	Kentucky River Pool 8	Kentucky River	2.0 mgd (Feb) 2.5 mgd (Jan, Dec) 2.6 mgd (March, Nov) 2.7 mgd (April-May) 2.8 mgd (June, Oct) 2.9 mgd (July, Sept) 3.0 mgd (Aug)	6.0 mgd
Wilmore Municipal Water Works	Kentucky River Pool 6	Kentucky River	1.0 mgd	0.684 mgd

*Permitted water withdrawal amount, per Kentucky Division of Water.

In addition to supplying its own customers, the Nicholasville Municipal Water Department is also the sole source of potable water to the Jessamine County Water District No. 1, the primary source of water supply to the Spears Water Company (which it is in the process of acquiring) and is a partial supplier of potable water to the Jessamine-South Elkhorn Water District. Wilmore sells water to its own customers but does not sell water to any other water utility for resale. See

Figure 13.1 in Appendix A for a map of the Jessamine County water system. In addition, Nicholasville’s and Wilmore’s water withdrawal permits can be found in Appendix B.

13.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised population projections for the water management planning period of 2000 to 2020. These new figures for Jessamine County, shown in Table 13.2, are based on results from the 2000 census data.

Table 13.2 – Jessamine County Population Projections

2000 Census	2005	2010	2015	2020
39,041	43,521	48,116	53,174	58,647

* Taken from University of Louisville Kentucky State Data Center.

Between 2000 and 2020, the Jessamine County population is expected to increase by approximately 50%, or 19,606 people. In 2000, 98.7% of the county population was served by a public water supplier. It is projected that 99.9% of the population will be served by a public water supply by 2020, an overall increase of 20,055 individuals. The associated projected water demands for the Nicholasville Municipal Water Department are shown in Table 13.3a and illustrated in Figure 13.2. Projected water demands for Wilmore Municipal Water Works are shown in Table 13.3b and illustrated in Figure 13.3.

**Table 13.3a – Summary of Current and Projected Jessamine County Water Demand:
Nicholasville Municipal Water Department**

	Average Annual Water Use (million gals)	Projected Annual Water Use (million gals)			
	2000	2005	2010	2015	2020
Residential	586.43	667.06	747.70	828.33	908.96
Commercial/Institutional	99.50	113.18	126.86	140.54	154.22
Industrial	56.80	64.61	72.42	80.23	88.04
Public/Unaccounted For	320.03	364.03	408.03	452.04	496.04
Other	4.15	4.65	4.63	5.80	6.43
Total Production	1,066.90	1,213.53	1,359.64	1,506.93	1,653.69
Avg. Daily Production (mgd)	2.923	3.325	3.725	4.129	4.531
Peak Day (mgd)	4.562	5.273	5.908	6.548	7.186

(Taken from Bluegrass Area Water Management Plan)

Nicholasville’s average daily water use demand is expected to increase by approximately 55% between 2000 and 2020. In 2001, it reported withdrawing an average daily amount of 3.021 mgd, which is slightly greater than average predictions for 2000, but less than the predicted average demand for 2005.

Nicholasville’s projected 2020 average demand of 4.531 mgd is greater than its current permitted water withdrawal amount of 2.0 – 3.0 mgd, but less than its treatment plant capacity of 6.0 mgd. The 2020 peak demand of 7.186 exceeds both the permit amount and plant capacity.

Demand management through water conservation measures is predicted to have the potential to reduce Nicholasville’s annual average demand by approximately 6.2% and its maximum day demand by approximately 6.6%.

**Table 13.3b – Summary of Current and Projected Jessamine County Water Demand:
Wilmore Municipal Water Works**

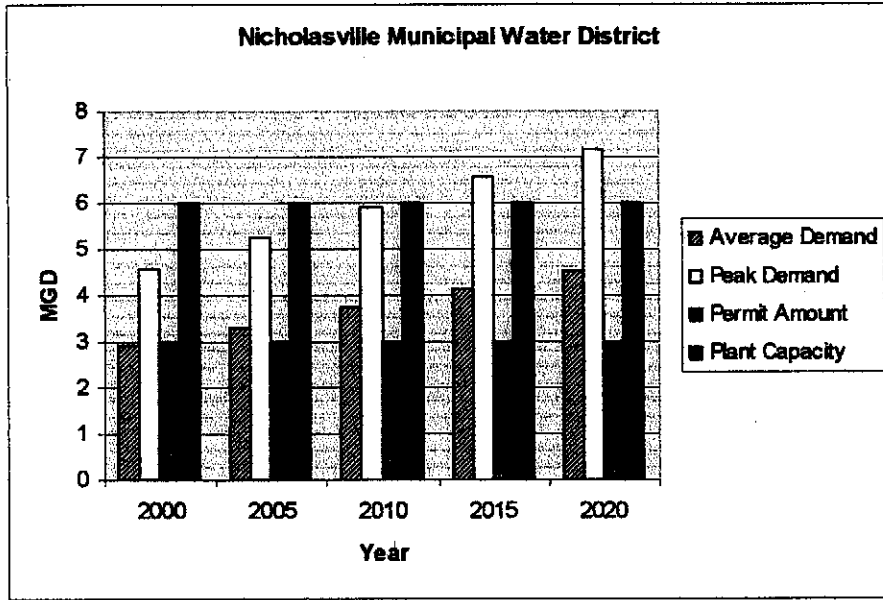
	Average Annual Water Use (million gals)	Projected Annual Water Use (million gals)			
	2000	2005	2010	2015	2020
Residential	183.39	197.48	211.85	202.21	245.77
Commercial/Institutional	8.59	9.31	10.29	19.10	12.54
Industrial	1.20	1.30	1.44	2.67	1.75
Public/Unaccounted For	18.61	20.15	22.28	41.34	27.15
Other	0.00	0.00	0.00	0.00	0.00
Total Production	211.79	228.23	245.85	265.32	287.22
Avg. Daily Production (mgd)	0.580	0.625	0.674	0.727	0.787
Peak Day (mgd)	0.909	1.022	1.101	1.188	1.286

(Taken from Bluegrass Area Water Management Plan)

Wilmore’s average daily water use demand is expected to increase by approximately 36% between 2000 and 2020. In 2001, it reported withdrawing an average daily amount of 0.596 mgd, which is slightly greater than predictions for 2000, but less than the predicted demand for 2005.

Wilmore’s projected 2020 average demand of 0.787 mgd is less than its current permitted water withdrawal and treatment plant capacity amounts of 1.0 mgd. However, the 2020 peak demand of 1.286 exceeds both the permit amount and plant capacity.

Demand management through water conservation measures is predicted to have the potential to reduce Wilmore’s annual average demand by approximately 5.7% and its maximum day demand by approximately 6.3%.



Note: The permit amount used is 3.0 mgd, Nicholasville’s maximum permitted withdrawal during the year.

Figure 13.2 – Comparison of Nicholasville’s Predicted Average Demand/Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Nicholasville’s predicted average demand is expected to exceed its permitted water withdrawal amount by 2005, but remain less than its treatment capacity through 2020. The system’s peak demand was predicted to surpass the permitted water withdrawal amount by 2000 and is expected to exceed its treatment plant capacity by 2015.

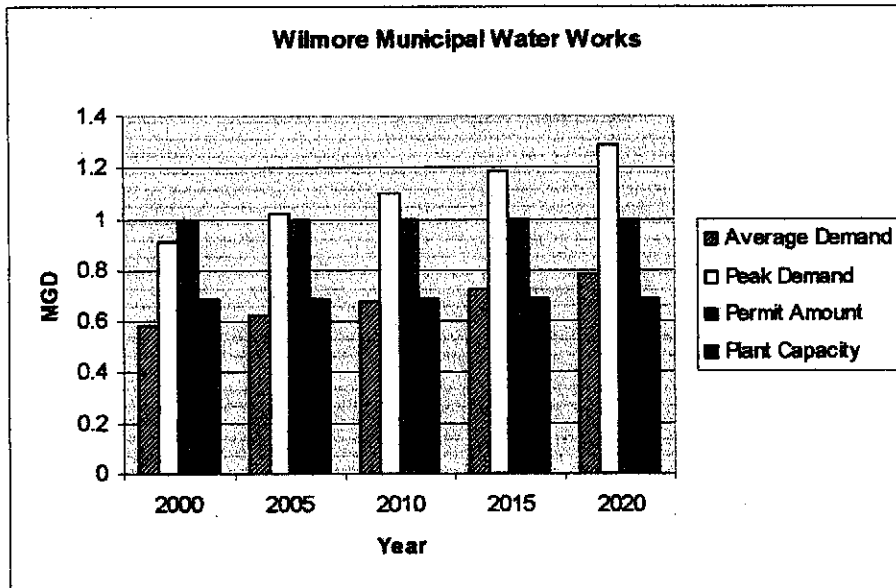


Figure 13.3 – Comparison of Wilmore’s Predicted Average Demand/Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Wilmore’s predicted average demand is not expected to exceed its permitted water withdrawal amount through 2020, but is expected to surpass the treatment plant capacity by 2015. The system’s peak demand was predicted to surpass the plant capacity in 2000 and is expected to exceed the permit amount by 2005.

13.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors.

Critical to the determination of supply adequacy is the relationship between the permitted withdrawal amount, and statistical measures of flow measured at the point of withdrawal such as 1) the normal flow, 2) the 7Q10 flow and 3) the 7Q20 flow. Values for each of these statistics for Pool 6 and 8 are provided in Table 13.4.

Table 13.4 – Jessamine County Supply Sources and Capacities

Supply Source	Normal Flow ¹	7Q10 ²	7Q20 ³
Kentucky River Pool 8	81.6 mgd	80.8 mgd	67.2 mgd
Kentucky River Pool 6	101.9	85.9	78.8

¹Normal flow = 10% of lowest monthly mean flow; maximum amount that any single user can be permitted to withdraw

²7Q10 = lowest consecutive 7 day streamflow that is likely to occur in a ten year period; for planning purposes, represents “minimum flow”

³7Q20 = lowest consecutive 7 day streamflow that is likely to occur in a twenty year period; for planning purposes, represents “drought conditions”

The Kentucky Division of Water has established the “normal flow” as the basis for determining the maximum amount that any one permittee may be allowed to withdraw. Thus, both Nicholasville’s and Wilmore’s current and projected demands are well within available allotments.

The Kentucky Division of Water considers a regulated stream source adequate if the average rate of water use is less than 20 percent of the stream source’s 7Q10 value. In relation to Nicholasville, the predicted 2020 average rate of water use (4.531 mgd) is 5.6% of the 7Q10 flow value for the Kentucky River Pool 8. In regard to Wilmore, the predicted 2020 average rate of water use (0.787 mgd) is only 1% of the 7Q10 for Pool 6. As a result, Nicholasville’s and Wilmore’s water supplies have been assigned drought susceptibility classifications of A, as shown in Table 13.5.

Table 13.5 – Jessamine County Water Supply Adequacy Assessment

Supply Source	Drought Susceptibility Class
Nicholasville Municipal/ Kentucky River Pool 8	A
Wilmore Municipal/ Kentucky River Pool 6	A

The drought susceptibility classification of “A” indicates that the system is unlikely to experience a water shortage during drought conditions. See Appendix C for further explanation of the Kentucky Division of Water’s drought susceptibility classification.

13.4 Water Supply Alternatives

Jessamine County’s water supplies from the Kentucky River were found to be adequate through 2020. Therefore, no supply alternatives were considered.

13.5 Narrative Summary

13.5.1 General assessment of system

Nicholasville’s supply source of the Kentucky River Pool 8 is deemed adequate to meet both projected average and peak demands. However, peak demands are predicted to exceed Nicholasville’s treatment plant capacity by 2015. This suggests that the city will need to upgrade its plant capacity during the 20-year planning period. Also, Nicholasville’s average demand is expected to exceed its permitted water withdrawal by 2005, implying that the permit will need to be revised. In 2001, Nicholasville reported an average monthly withdrawal rate of 3.021 mgd and a maximum monthly average of 3.308 mgd. Each of these figures exceeds the maximum permitted withdrawal amount (3.0 mgd), but remains less than the treatment plant capacity (6.0 mgd).

Wilmore’s supply source of the Kentucky River Pool 6 has an adequate supply capacity to meet both projected average and peak demands. However, peak demands were predicted to exceed Wilmore’s treatment plant capacity by 2000. This suggests that Wilmore needs to begin plans to upgrade its plant capacity. In 2001, Wilmore reported an average monthly withdrawal rate of 0.596 mgd and a maximum monthly average of 0.621 mgd. Each of these figures is still within the maximum withdrawal amount (1.0 mgd) and plant capacity (0.684 mgd) for Wilmore.

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap

between water purchased for resale and cumulative sales to water customers. Year 2000 unaccounted-for loss estimates for systems in Jessamine County resulted in the following:

Nicholasville Municipal Water	10.9%
Jessamine County Water District	5.4%
Jessamine-S. Elkhorn Water District	10.8%
Spears Water Company	14.7%
City of Wilmore	1%

13.5.2 Water shortage response plans / Contamination response plans

Water Shortage Response Plan:

Both Nicholasville and Wilmore have adopted water shortage response plans modeled on the 1988 *Kentucky Water Shortage Response Plan*. In addition, Nicholasville and the two water systems to which it sells water (Jessamine County Water District No. 1 and the Spears Water Company) have created a Water Management Task Force that has the authority to implement the emergency measures called for in the shortage response plan should they become necessary.

Water Supply Contamination Response Plan:

Jessamine County Emergency Management (formerly DES) has a state-approved Emergency Response Plan that addresses the ways that accidental contaminant releases will be handled. Among the topics included in this plan are: identification of the appropriate response agencies, methods of protecting citizens from the contaminants, mitigation measures and hazard alleviation.

The Kentucky Division of Water regulations require water systems to have a volume of stored potable water which is equal to the amount of water that the utility purchases or produces in a 24-hour period. For relatively brief emergencies caused by infrastructure problems, for instance, Nicholasville, Wilmore, and the two rural water systems supplied by Nicholasville would rely on this source. However, if a shortage lasts longer than one day (caused by such factors as a major line break or plant shutdown), the water system will implement measures in accordance with their water shortage response plans.

13.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning period. These funding need estimates are listed below for the short-term period of 2000 to 2005 (Table 13.6a) and the longer-term period of 2006 to 2020 (Table 13.6b).

Table 13.6a: Short-Term Infrastructure Funding Needs (2000-2005) – Jessamine County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Jessamine Co.	39.0	247	1,978	1,570	200	2,100	1,950	7,798

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

Table 13.6b: Long-Term Infrastructure Funding Needs (2006-2020) – Jessamine County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Jessamine Co.	17.0	57	744	2,363	--	5,500	1,100	9,707

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

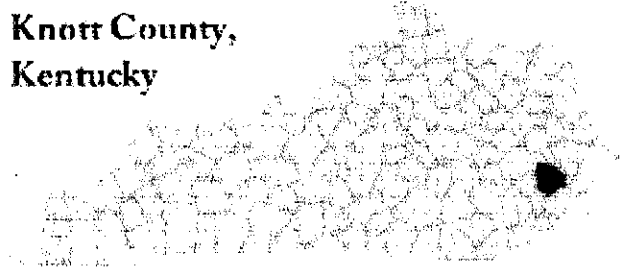
Jessamine County’s immediate infrastructure needs account for 247 new customers between 2000 and 2005 and requisite system upgrade costs of approximately \$7.8 million. Between 2006 and 2020, 57 additional customers are expected. New distribution line and additional long-term system upgrade costs are expected to be approximately \$9.7 million.

13.5.4 Other major issues

Nicholasville is a participant in the Bluegrass Water Supply Consortium, an alliance of water utilities and government agencies that are working to address the potable water needs of central Kentucky. The BWSC’s goal is to construct a transmission grid connecting the participating water utilities. This grid will enable the movement of treated water from points of availability to points of need throughout the system. The BWSC is also endeavoring to identify a supply source that will augment that of the Kentucky River and other supplier sources in order to ensure water availability during a drought. Thus, existing treatment facilities and distribution systems will remain in operation. The regionalization offered by the BWSC will provide system reliability that is not possible for individual suppliers.

14.0 KNOTT COUNTY

**Knott County,
Kentucky**



Knott County is located in southeastern Kentucky in the North Fork Region of the upper section of the Kentucky River Basin. The county falls within the Eastern Kentucky Coalfield physiographic region, which is characterized by mountainous terrain, rapid surface runoff, and moderate rates of groundwater drainage. Groundwater in the Troublesome Creek watershed, a tributary of the North Fork, supplies drinking water to the municipal system in Hindman.

14.1 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute their finished, potable water to their customers or sell the water to other distributors. Table 14.1 lists the water suppliers for Knott County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier’s overall water treatment plant capacity.

Table 14.1 – Summary of Knott County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity*	Treatment Plant Capacity
Hindman Municipal Water Works	3 wells along Troublesome Creek	Kentucky River	180,000 gpd (October – March) 220,000 gpd (April – September)	0.465 mgd
Knott County Water & Sewer District	7 wells along Caney Creek	Big Sandy River	144,000 gpd	0.144 mgd

*Permitted water withdrawal amount, per Kentucky Division of Water.

The Hindman Municipal Water Works treats their own water, but also has a contract to purchase treated water from the Southern Water District in Floyd County. See Figure 14.1 in Appendix A for a map of the Knott County water system. In addition, Hindman’s water withdrawal permit can be found in Appendix B.

NOTE: The Knott County Water and Sewer District withdraws water from sources in the Big Sandy River Basin, rather than the Kentucky River Basin, and is only minimally evaluated in this summary.

14.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised population projections for the water management planning period of 2000 to 2020. These new figures for Knott County, shown in Table 14.2, are based on results from the 2000 census data.

Table 14.2 – Knott County Population Projections

2000 Census	2005	2010	2015	2020
17,649	17,449	17,145	16,726	16,173

* Taken from University of Louisville Kentucky State Data Center.

Between 2000 and 2020, the Knott County population is expected to decrease by 8.4%, or 1,476 people. In 2000, only 14% of the county population was served by a public water supplier. It is projected that 61% of the population will be served by a public water supply by 2020, for an overall increase of 7,395 individuals. The associated projected water demands for Hindman Municipal Water Works are shown in Table 14.3 and illustrated in Figure 14.2.

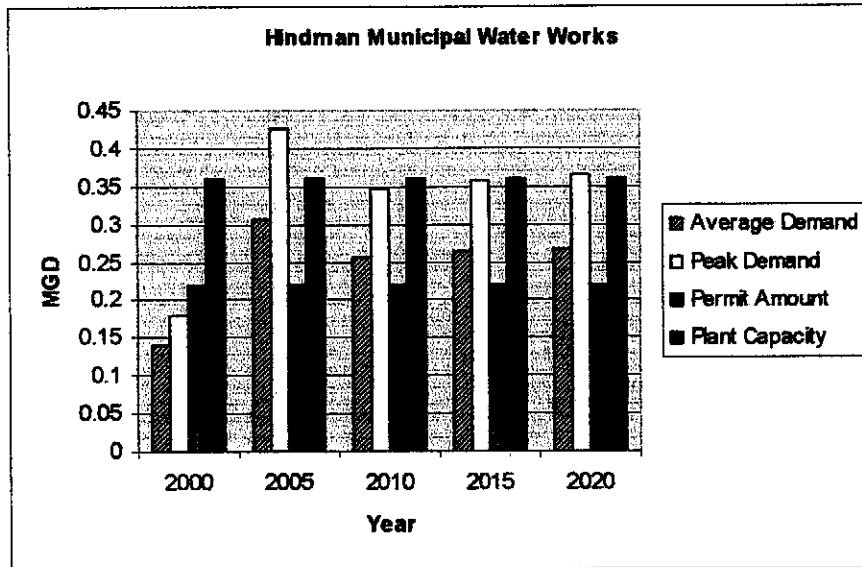
Table 14.3 – Summary of Current and Projected Knott County Water Demand: Hindman Municipal Water Works

	Average Water Use (gpd)	Projected Daily Water Use (gpd)			
	2000	2005	2010	2015	2020
Residential	111,781	192,117	196,911	202,663	206,306
Wholesale	0	70,000	0	0	0
Subtotal - Water Sold	111,781	262,117	196,911	202,663	206,306
Unaccounted	27,945	46,256	34,749	35,764	36,407
Total Average Daily Production	139,726	308,373	256,660	263,427	267,713
Peak Day	179,589	425,060	347,490	357,641	364,070

(Taken from Kentucky River Area Water Management Plan, 2002)

The Hindman Municipal Water Works does not anticipate a significant increase in demand beyond the year 2005. Between 2000 and 2020, the average daily demand is expected to increase by 92%

NOTE: Most of the increase in Knott County’s water demand will be due to water line extensions into rural Knott County and will be distributed by the Knott County Water and Sewer District. Thus, the average daily water use demand for the Knott County Water and Sewer District is expected to increase dramatically between 2000 and 2020, from 63,179 gpd to 526,881 gpd.



* Used highest withdrawal permit amount of 0.220 mgd.

Figure 14.2 – Comparison of Hindman’s Predicted Average Demand/Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Hindman’s predicted average demand is expected to exceed its current permitted water amount by 2005, but remain less than the treatment plant capacity through 2020. The system’s peak demand is predicted to surpass the permit amount in 2005. Peak demand is expected to temporarily exceed the plant capacity in 2005, and then remain below capacity until 2020.

14.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors. Table 14.4 provides information relating to availability at Hindman’s groundwater well sources.

Table 14.4 – Knott County Supply Sources and Capacities

Supply Source	Groundwater Availability
Hindman Municipal Water Works/ 3 groundwater wells	160 gals/minute per well

Based on Hindman’s wellhead protection plan, water availability from its well sources along Troublesome Creek is estimated to be 160 gallons per minute at each well. Thus, total production from its three wells is estimated to be 691,200 gallons per day. This estimate is significantly greater than Hindman’s predicted 2020 average demand rate of 364,000 gpd, resulting in the drought susceptibility classification shown in Table 14.5.

Table 14.5 – Knott County Water Supply Adequacy Assessment

Supply Source	Drought Susceptibility Class
Hindman Municipal Water Works / 3 groundwater wells	A

The drought susceptibility classification of “A” indicates that the system is unlikely to experience a water shortage during drought conditions. See Appendix C for further explanation of the drought susceptibility classification.

NOTE: Although the groundwater wells used as a supply source for Hindman seem to be adequate to meet 2020 demands, the current supply for Knott County as a whole is inadequate to meet the projected demand. The Knott County Water and Sewer District (formerly Caney Creek Water District) has the responsibility for most of the increased demand during the planning period. The District does not have an adequate supply from its Big Sandy River basin source (6 wells along Caney Creek) and will need to identify a supplemental source.

14.4 Water Supply Alternatives

Hindman’s water supply from its groundwater wells was found to be adequate through 2020. However, the Knott County Water and Sewer District will need to identify an alternative supply to meet the majority of the county’s increase in demand. Table 14.6 lists the supply alternatives being considered by Knott County Water and Sewer.

Table 14.6: Knott County Water Supply Alternatives

Alternatives	Comments
Interconnection with Southern Water District in Floyd County	Preferred short-term alternative, will enable service to new customers in eastern Knott County
Treatment plan on Carr Creek Lake	Necessary in order to provide potable water to all county residents. Preferred long-term alternative.
Develop new wells	Source adequacy uncertain.
Purchase treated water from Hazard	Hazard is also a drought vulnerable system, so is not a reliable alternative source.
Excess water from proposed power plant in Knott County	Private venture, county water suppliers have no control over its completion.

Note: Preferred alternative is in bolded text.

14.5 Narrative Summary

14.5.1 General assessment of system

In addition to its groundwater well supply, Hindman purchases supplemental treated water from the Southern Water District in Floyd County. The Southern Water District withdraws water from Levisa Fork of the Big Sandy River. The combination of these sources is expected to provide an adequate water supply for Hindman Municipal through 2020.

Hindman’s predicted average and peak demands are expected to exceed its current permitted water amount by 2005. Thus, Hindman may need to increase its withdrawal permit amount in the near future; unless it begins using another permitted source or purchasing water from another supplier. Except for a temporary peak demand in 2005, Hindman’s current treatment plant capacity of 0.465 mgd is adequate to meet both the predicted average and peak demands until 2020.

The Knott County Water and Sewer District will have the primary responsibility of providing potable water to rural Knott county residents throughout the planning period. Initially, they will be purchasing treated water from surrounding suppliers and maintaining their small water treatment plant. The District then plans to develop its own source or purchase from the Carr Creek Water Commission if a plant is constructed at Carr Creek Lake. The eastern section of Knott County is to be directly served by the Southern Water District.

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap between water purchased for resale and cumulative sales to water customers. Year 2000 unaccounted-for loss estimates for systems in Knott County resulted in the following:

Hindman Municipal Water Works	20%
Knott County Water and Sewer District	25%

The loss percentage for the Knott County Water and Sewer District is projected to decrease during the planning period. The Hindman Municipal Water Works has decreased the amount of water loss within the last two years.

14.5.2 Water Shortage Response Plan / Contamination Response Plans

A general, combined water shortage and contamination response plan was developed for the entire Kentucky River Area Development District and can be found in Chapter 12 of its 2002 Water Management Plan.

14.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning period. These funding need estimates are listed below for the short-term period of 2000 to 2005 (Table 14.7a) and the longer term period of 2006 to 2020 (Table 14.7b).

Table 14.7a: Short-Term Infrastructure Funding Needs (2000-2005) – Knott County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Knott Co.	124.1	1,635	8,088	--	3,000	6,000	1,400	18,488

* Taken from *Water Resource Development: A Strategic Plan* (KIA, 1999)

Table 14.7b: Long-Term Infrastructure Funding Needs (2006-2020) – Knott County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Knott Co.	170.0	1,520	9,500	--	--	5,000	1,800	16,300

* Taken from *Water Resource Development: A Strategic Plan* (KIA, 1999)

Knott County’s immediate infrastructure needs account for 1,635 new customers between 2000 and 2005 and requisite system upgrade costs of approximately \$18.5 million. Between 2006 and 2020, 1,520 additional customers are expected. A long-term system upgrade cost of \$16.3 million is anticipated, with the majority of infrastructure funding targeted toward the proposed water treatment plant at Carr Creek Lake and the installation of new water distribution lines.

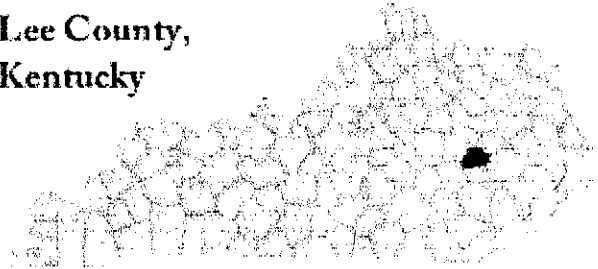
14.5.4 Other major issues

Both the Hindman Municipal Water Works and Knott County Water and Sewer District are members of the Carr Creek Water Commission. Other members include Southern Floyd Water

District, Letcher County Water and Sewer District, and the City of Vicco. Their common goal is to secure a water supply allocation from Carr Creek Lake and construct a regional water treatment plant.

15.0 LEE COUNTY

Lee County,
Kentucky



Lee County is located in eastern Kentucky in the upper reaches of the Kentucky River Basin. The South, Middle and North Forks of the Kentucky River converge in Lee County, forming the main stem of the river. Locks and Dams 13 and 14 are also located in Lee County, creating Kentucky River Pools 13 and 14.

15.1 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute their finished, potable water to their customers or sell the water to other distributors. Table 15.1 lists the water suppliers for Lee County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier’s overall water treatment plant capacity.

Table 15.1 – Summary of Lee County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity*	Treatment Plant Capacity
Beattyville Water Works	North Fork of Kentucky River	Kentucky River	605,000 – 750,000 gpd	1.0 mgd

*Permitted water withdrawal amount, per Kentucky Division of Water.

In addition to serving its own customers, Beattyville Water Works sells water to the Southside Water Association for distribution. See Figure 15.1 in Appendix A for a map of the Lee County water system. In addition, Beattyville’s water withdrawal permit can be found in Appendix B.

15.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised

population projections for the water management planning period of 2000 to 2020. These new figures for Lee County, shown in Table 15.2, are based on results from the 2000 census data.

Table 15.2 – Lee County Population Projections

2000 Census	2005	2010	2015	2020
7,916	8,214	8,483	8,692	8,830

* Taken from University of Louisville Kentucky State Data Center.

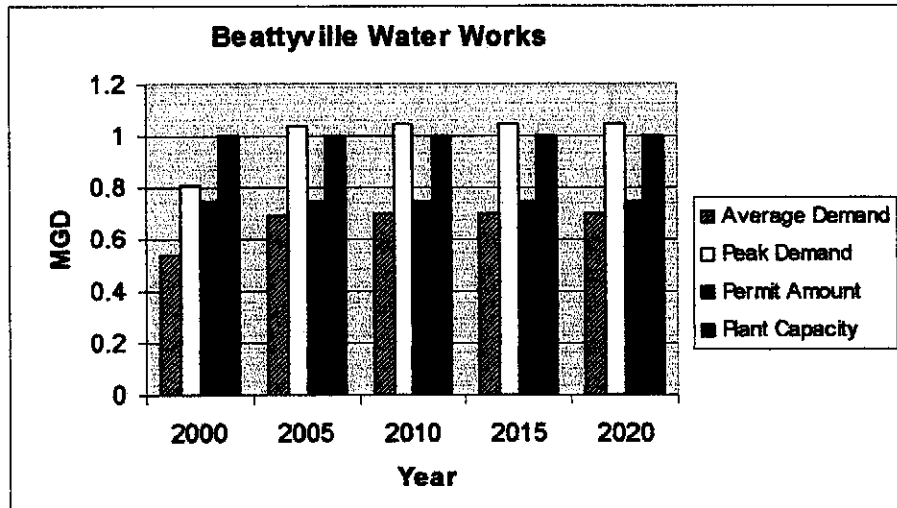
The Lee County population is expected to increase by 11.5%, or 914 people, between 2000 and 2020. In 2000, 78% of the county population was served by a public water supplier. It is projected that 82% of the population will be served by a public water supply by 2020, an increase of 1,066 individuals. The associated projected water demands for Beattyville Water Works are shown in Table 15.3 and illustrated in Figure 15.2.

**Table 15.3 – Summary of Current and Projected Lee County Water Demand:
Beattyville Water Works**

	Average Water Use (gpd)	Projected Daily Water Use (gpd)			
		2000	2005	2010	2015
Residential	283,288	317,098	317,098	317,098	317,098
Industrial	46,027	50,000	55,000	55,000	55,000
Wholesale	75,616	175,616	175,616	175,616	175,616
Subtotal - Water Sold	404,931	542,714	547,714	547,714	547,714
Water Loss	134,975	149,314	150,814	150,814	150,814
Total Average Daily Production	539,906	692,028	698,528	698,528	698,528
Peak Daily Demand, gpd	809,859	1,038,042	1,047,792	1,047,792	1,047,792

(Taken from Kentucky River Area Water Management Plan, 2002)

The average daily water use demand in Lee County is expected to increase by approximately 29.4% between 2000 and 2020. In 2001, Beattyville reported withdrawing an average daily amount of 0.546 mgd, which is just greater than the predicted average demand for 2000.



* Used highest withdrawal permit amount of 0.750 mgd.

Figure 15.2 – Comparison of Beattyville’s Predicted Average Demand/Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Beattyville’s predicted average demand is not expected to exceed its current permitted water amount or treatment plant capacity through 2020. The system’s peak demand was predicted to surpass the withdrawal permit amount in 2000 and is expected to exceed the plant capacity in 2005.

15.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors.

Critical to the determination of supply adequacy is the relationship between the permitted withdrawal amount, and statistical measures of flow measured at the point of withdrawal such as 1) the normal flow, 2) the 7Q10 flow and 3) the 7Q20 flow. Values for each of these statistics for the North Fork Kentucky River are provided in Table 15.4.

Table 15.4 – Lee County Supply Sources and Capacities

Supply Source	Normal Conditions¹	7Q10²	7Q20³
North Fork of Kentucky River	24.6 mgd (38.1 cfs)	34.25 mgd (53 cfs)	29.08 mgd (45 cfs)

¹Normal flow = 10% of lowest monthly mean flow; maximum amount that any single user can be permitted to withdraw

²7Q10 = lowest consecutive 7 day streamflow that is likely to occur in a ten year period; for planning purposes, represents “minimum flow”

³7Q20 = lowest consecutive 7 day streamflow that is likely to occur in a twenty year period; for planning purposes, represents “drought conditions”

The Kentucky Division of Water has established the “normal flow” as the basis for determining the maximum amount that any one permittee may be allowed to withdraw. Thus, Beattyville’s current and projected demands are well within this available allotment.

The Kentucky Division of Water considers a regulated stream source adequate if the average rate of water use is less than 20 percent of the stream source’s 7Q10 value. Beattyville’s predicted 2020 average rate of water use (0.698 mgd) is 2% of the estimated 7Q10 of the North Fork at its intake. As a result, Beattyville’s water supply has been assigned a drought susceptibility classification of A, as shown in Table 15.5.

Table 15.5 – Lee County Water Supply Adequacy Assessment

Supply Source	Drought Susceptibility Class
Beattyville Water Works/ North Fork of Kentucky River	A

The drought susceptibility classification of “A” indicates that the system is unlikely to experience a water shortage during drought conditions. See Appendix C for further explanation of the Kentucky Division of Water’s drought susceptibility classification.

15.4 Water Supply Alternatives

Lee County’s water supply from the North Fork of the Kentucky River was found to be adequate through 2020. Therefore, no supply alternatives were considered.

15.5 Narrative Summary

15.5.1 General assessment of system

Lee County has been designated part of a Renewal Community, along with Breathitt, Owsley and Wolfe counties. It is hoped that business and industry will increase in these counties, which would thereby increase water demand. Since the Beattyville Water Works has existing water lines at or near each of the counties in the Renewal Community Program and has an adequate water supply source, it is situated as a potential regional water provider. Thus, the City of Beattyville has proposed a new 2 mgd water treatment plant to serve Lee County, as well as surrounding water suppliers.

Beattyville’s supply from the North Fork of the Kentucky River was found to be adequate for the 20-year planning period and is expected to be able to meet demand even during a drought situation. The water treatment plant and water withdrawal permit are predicted to be adequate to meet average demands throughout the planning period. However, they may need to be increased to accommodate peak demands, which were predicted to begin exceeding the permit amount in 2000 and are predicted to surpass the treatment capacity in 2005.

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap between water purchased for resale and cumulative sales to water customers. Year 2000 unaccounted-for loss estimates for systems in Lee County resulted in the following:

Beattyville Water Works	27%
Southside Water Association	9%

According to the water management plan, it is expected that the Beattyville’s system’s leakage rate will be decreased to at least 15% by 2005.

15.5.2 Water shortage response plans / Contamination response plans

A general, combined water shortage and contamination response plan was developed for the entire Kentucky River Area Development District and can be found in Chapter 12 of its 2002 Water Management Plan.

15.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning period. These funding need estimates are listed below for the short-term period of 2000 to 2005 (Table 15.6a) and the long-term period of 2006 to 2020 (Table 15.6b).

Table 15.6a: Short-Term Infrastructure Funding Needs (2000-2005) – Lee County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Lee Co.	47.0	270	1,841	--	--	--	600	2,441

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

Table 15.6b: Long-Term Infrastructure Funding Needs (2006-2020) – Lee County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Lee Co.	4.7	50	250	--	7,000	2,000	--	9,250

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

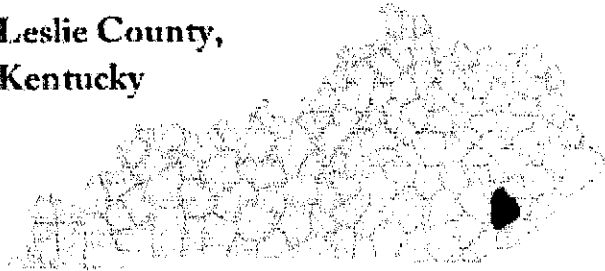
Lee County’s immediate infrastructure needs account for 270 new customers between 2000 and 2005 and requisite system upgrade costs of approximately \$2.4 million. Between 2006 and 2020, 50 additional customers are expected, as well as upgrades to sources and treatment equipment, necessitating an estimated additional long-term system upgrade cost of \$9.25 million.

15.5.4 Other major issues

None.

16.0 LESLIE COUNTY

**Leslie County,
Kentucky**



Leslie County is located in southeastern Kentucky in the upper region of the Kentucky River Basin. The Middle Fork of the Kentucky River flows through the center of the county and serves as the water supply for the Hyden-Leslie County Water District.

16.1 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute their finished, potable water to their customers or sell the water to other distributors. Table 16.1 lists the water suppliers for Leslie County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier’s overall water treatment plant capacity.

Table 16.1 – Summary of Leslie County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity*	Treatment Plant Capacity
Hyden-Leslie County Water District	Middle Fork of Kentucky River	Kentucky River	730,000 gpd	0.792 mgd

*Permitted water withdrawal amount, per Kentucky Division of Water.

The Hyden Leslie County Water District is the major supplier and distributor of potable water in Leslie County. A map of the Leslie County water system is provided in Figure 16.1 in Appendix A. In addition, Hyden-Leslie’s water withdrawal permit can be found in Appendix B.

16.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised population projections for the water management planning period of 2000 to 2020. These new figures for Leslie County, shown in 16.2, are based on results from the 2000 census data.

Table 16.2 – Leslie County Population Projections

2000 Census	2005	2010	2015	2020
12,401	11,713	10,999	10,241	9,454

* Taken from University of Louisville Kentucky State Data Center.

The Leslie County population is expected to decrease by approximately 24%, or 2,947 people, between 2000 and 2020. In 2000, only 44% of the county population was served by a public water supplier. It is projected that 96% of the population will be served by a public water supply by 2020, an increase of 3,619 individuals. The associated projected water demands for the Hyden-Leslie County Water District are shown in Table 16.3 and illustrated in Figure 16.2.

**Table 16.3 – Summary of Current and Projected Leslie County Water Demand:
Hyden-Leslie County Water District**

	Average Water Use (gpd)	Projected Daily Water Use (gpd)			
	2000	2005	2010	2015	2020
Residential	292,603	399,004	412,158	458,197	458,197
Commercial	75,616	77,762	79,102	79,907	79,907
Wholesale	0	0	0	0	0
Subtotal - Water Sold	368,219	476,766	491,260	538,104	538,104
Water Loss	207,123	268,180	276,334	302,683	302,683
Total Average Daily Demand	575,342	744,946	767,594	840,787	840,787
Peak Daily Demand, gpd	863,013	1,117,419	1,151,391	1,261,181	1,261,181

(Taken from Kentucky River Area Water Management Plan, 2002)

The average daily water use demand in Leslie County is expected to increase by approximately 46% between 2000 and 2020. Most of the increase in water demand will be due to water line extensions into rural Leslie County and will be distributed by the Hyden-Leslie County Water District. In 2001, the Hyden-Leslie County Water District reported withdrawing an average daily amount of 0.740 mgd of water, which is just slightly less than the predicted average demand for 2005.

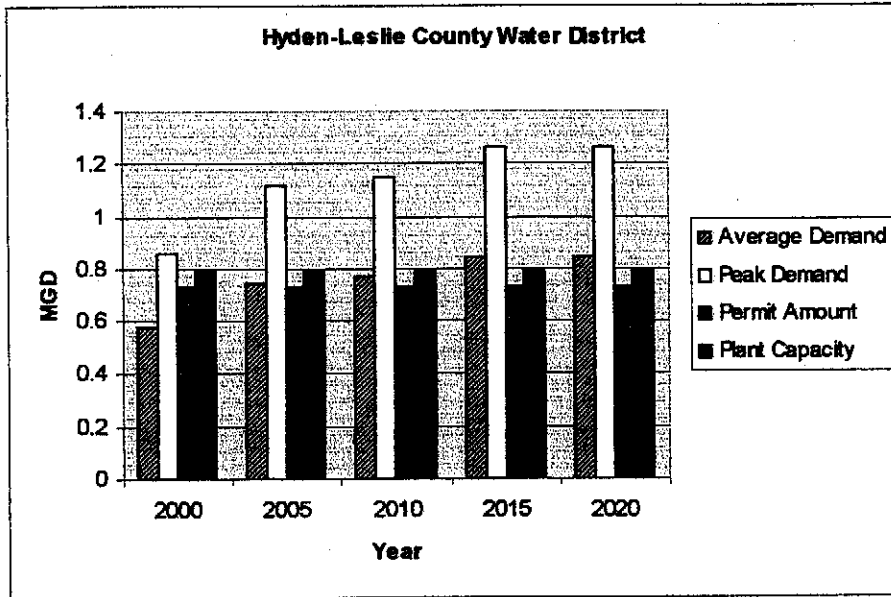


Figure 16.2 – Comparison of Hyden-Leslie County’s Predicted Average Demand/ Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Hyden-Leslie County’s predicted average demand is expected to narrowly exceed its permitted water withdrawal amount by 2005 and its treatment plant capacity by 2015. The system’s peak demand was predicted to surpass the permitted amount and plant capacity in 2000.

16.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors.

Critical to the determination of supply adequacy is the relationship between the permitted withdrawal amount, and statistical measures of flow measured at the point of withdrawal such as 1) the normal flow, 2) the 7Q10 flow and 3) the 7Q20 flow. Values for each of these statistics for the Middle Fork Kentucky River are provided in Table 16.4.

Table 16.4 – Leslie County Supply Sources and Capacities

Supply Source	Normal Flow ¹	7Q10 ²	7Q20 ³
Middle Fork of Kentucky River	2.9 mgd (4.5 cfs)	2.07 mgd (3.2 cfs)	0.06 mgd (0.09 cfs)

¹Normal flow = 10% of lowest monthly mean flow; maximum amount that any single user can be permitted to withdraw

²7Q10 = lowest consecutive 7 day streamflow that is likely to occur in a ten year period; for planning purposes, represents “minimum flow”

³7Q20 = lowest consecutive 7 day streamflow that is likely to occur in a twenty year period; for planning purposes, represents “drought conditions”

The Kentucky Division of Water has established the “normal flow” as the basis for determining the maximum amount that any one permittee may be allowed to withdraw. Thus, Hyden-Leslie’s current and projected demands are within this available allotment.

The Kentucky Division of Water considers a regulated stream source adequate if the average rate of water use is less than 20 percent of the stream source’s 7Q10 value. If the average demand is between 20 percent and 65 percent of the 7Q10, the source’s adequacy is questionable and it receives a “B” classification. Hyden-Leslie’s predicted 2020 average rate of water use (840,787 gpd) is 41% of the estimated 7Q10 flow at its South Fork intake. As a result, Hyden-Leslie’s water supply has been assigned a drought susceptibility classification of B, as shown in Table 16.5.

Table 16.5 – Leslie County Water Supply Adequacy Assessment

Supply Source	Drought Susceptibility Class
Hyden-Leslie County Water District / Middle Fork of Kentucky River	B

The drought susceptibility classification of “B” indicates that the system should be examined for susceptibility to water shortage during drought. Plans need to be made for response to possible shortage. See Appendix C for further explanation of the Kentucky Division of Water’s drought susceptibility classification.

16.4 Water Supply Alternatives

Leslie County’s water supply from the Middle Fork of the Kentucky River was found to be inadequate through 2020. The Hyden-Leslie County Water District is considering the supply alternatives listed in Table 16.6.

Table 16.6 – Leslie County Water Supply Alternatives

Alternatives	Discussion
Abandoned deep mines	Several abandoned mines are located in the Leslie County area, with potential flooding volumes of 6,000 to 9,000 acre-feet. The estimated cost of drilling a well and installing a raw water line to access water from the mines is \$944,000.
New reservoir	A new reservoir with a volume of at least 640 acre-feet would be required to meet projected water supply needs (with additional volume for sedimentation, aquatic life and other uses). Estimated cost of the reservoir, intake and raw water line is \$4.34 million.
Conservation	An average water use reduction of 31 percent was projected through the use of conservation measures. However, this measure alone cannot assure an adequate supply.

Note: Preferred alternative is in bolded text.

16.5 Narrative Summary

16.5.1 General assessment of system

In order to meet projected water use demands through 2020, Leslie County will need to develop an alternative water supply source to augment its current supply from the Middle Fork of the Kentucky River. The primary alternative under consideration is the use of flooded abandoned mines located within six miles of the Hyden-Leslie water treatment plant. Additional supply adequacy could be gained by encouraging conservation measures, which have the estimated potential of reducing demand by 31%.

Both Hyden-Leslie County Water District’s water withdrawal permit and treatment plant will likely need to be increased during the planning period. Average demand is predicted to begin exceeding the permit amount in 2005 and the treatment plant capacity in 2015. Peak demands were expected to begin exceeding the permit and plant capacities in 2000. Further, the average withdrawal in 2001 of 0.740 mgd was already greater than the maximum withdrawal permit amount of 0.730 mgd, and is approaching the treatment plant capacity of 0.792 mgd.

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap between water purchased for resale and cumulative sales to water customers. In 2000, Hyden-Leslie County’s system water losses were estimated to be 36%. Clearly, Leslie County’s water supply adequacy could be improved by reducing its system leakage.

16.5.2 Water shortage response plans / Contamination response plans

A general, combined water shortage and contamination response plan was developed for the entire Kentucky River Area Development District and can be found in Chapter 12 of its 2002 Water Management Plan.

16.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning period. These funding need estimates are listed below for the short-term period of 2000 to 2005 (Table 16.7a) and the long-term period of 2006 to 2020 (Table 16.7b).

Table 16.7a: Short-Term Infrastructure Funding Needs (2000-2005) – Leslie County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Leslie Co.	86.2	1,176	4,600	250	--	1,000	500	6,350

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

Table 16.7b: Long-Term Infrastructure Funding Needs (2006-2020) – Leslie County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Leslie Co.	61.0	518	2,400	--	3,000	4,000	600	10,000

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

Leslie County’s immediate infrastructure needs account for 1,176 new customers between 2000 and 2005 and requisite system upgrade costs of approximately \$6.35 million. Between 2006 and 2020, Leslie County plans to upgrade its sources, treatment plant and tanks and pumps, in addition to adding 518 customers, thereby necessitating an additional long-term system upgrade cost of \$10 million.

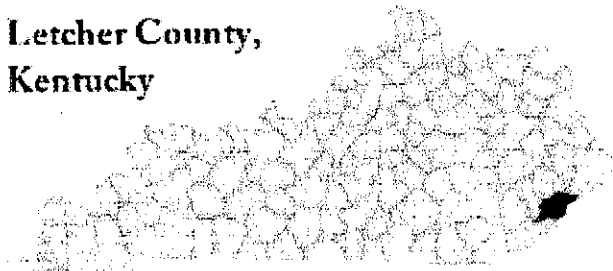
16.5.4 Other major issues

There are significant permitted water withdrawals from coal companies located upstream from the Hyden-Leslie County Water District’s water intake at mile 76.6 of the Middle Fork of the Kentucky River. These have the potential to reduce the availability of Hyden-Leslie’s water supply. The following coal companies withdraw water from the Middle Fork upstream of Hyden-Leslie County’s raw water intake.

Company Name	Withdrawal Location on Middle Fork	Water Withdrawal Permit Amount
Leeco, Inc.	Mile 78.5	0.310 mgd
Shamrock Coal	Mile 5.8 of Beech Fork of Middle Fork	0.300 mgd

17.0 LETCHER COUNTY

Letcher County,
Kentucky



Letcher County is located in southeastern Kentucky in the upper region of the Kentucky River Basin. The North Fork of the Kentucky River forms in eastern Letcher County and flows westward through the county.

17.1 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute their finished, potable water to their customers or sell the water to other distributors. Table 17.1 lists the water suppliers for Letcher County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier’s overall water treatment plant capacity.

Table 17.1 – Summary of Letcher County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity*	Treatment Plant Capacity
Blackey Water System	North Fork of Kentucky River	Kentucky River	150,000 gpd	300,000 gpd
Fleming-Neon Water Company	Deep mine wells	Kentucky River	360,000 gpd	430,000 gpd
	Well on Tom Biggs Branch	Kentucky River	100,000 gpd	
Whitesburg Municipal Water Works	North Fork of Kentucky River	Kentucky River	412,000 gpd	864,000 gpd
Jenkins Water System	Elkhorn Lake	Big Sandy River	700,000 gpd	1 mgd
	Well on Elkhorn Creek	Big Sandy River	400,000 gpd (July) 850,000 gpd (Aug-Dec)	
	Elkhorn Creek	Big Sandy River	186,000 gpd	

*Permitted water withdrawal amount, per Kentucky Division of Water.

The Blackey Water System, Fleming-Neon Water Company and Whitesburg provide treated water from Kentucky River Basin sources to residents of Letcher County. The Jenkins Water System utilizes water supply sources in the Big Sandy River Basin and will not be further evaluated in this report (see 17.1.4 at conclusion of report). The Letcher County Water and Sewer District will purchase treated water for distribution to rural residents of the county. A map of the Letcher County water system is provided in Figure 17.1 in Appendix A. In addition, water withdrawal permits for Blackey, Fleming-Neon and Whitesburg can be found in Appendix B.

17.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised population projections for the water management planning period of 2000 to 2020. These new figures for Letcher County, shown in Table 17.2, are based on results from the 2000 census data.

Table 17.2 – Letcher County Population Projections

2000 Census	2005	2010	2015	2020
25,277	24,546	23,660	22,620	21,452

* Taken from University of Louisville Kentucky State Data Center.

The Letcher County population is expected to decrease by 15%, or 3,825 people, between 2000 and 2020. In 2000, only 32% of the county population was served by a public water supplier. It is projected that 93% of the population will be served by a public water supply by 2020, for an overall increase of 11,862 individuals. The associated projected water demands for the Blackey Water System, the Fleming-Neon Water Company, Whitesburg Municipal Water Works and the Letcher County Water and Sewer District are shown in Tables 17.3a – d and illustrated in Figures 17.2, 17.3 and 17.4.

Table 17.3a – Summary of Current and Projected Letcher County Water Demand: Blackey Water System

	Average Water Use gpd	Projected Daily Water Use, gpd			
	2000	2005	2010	2015	2020
Residential	40,110	43,280	43,280	43,280	43,280
Commercial	592	592	592	592	592
Industrial	0	0	0	0	0
Wholesale	0	157,808	167,671	177,534	187,397
Subtotal - Water Sold	40,702	201,680	211,543	221,406	231,269
Water Loss	5,055	24,927	26,146	27,365	28,584
Total Average Daily Demand	45,757	226,607	237,689	248,771	259,853
Peak Day Demand	71,636	339,911	356,534	373,157	389,780

(Taken from Kentucky River Area Water Management Plan, 2002)

Blackey’s average and peak daily water use demands are expected to increase by more than five times between 2000 and 2020. The majority of this increase is due to expected water sales to the Letcher County Water and Sewer District. In 2001, Blackey reported withdrawing an average daily amount of 72,000 gpd, which is greater than predictions for 2000 but less than the predicted average demand for 2005.

Table 17.3b – Summary of Current and Projected Letcher County Water Demand: Fleming-Neon Water Company

	Average Water Use gpd	Projected Daily Water Use, gpd			
	2000	2005	2010	2015	2020
Residential	129,049	177,952	186,103	190,178	194,253
Commercial	16,932	16,932	16,932	16,932	16,932
Industrial	0	0	0	0	0
Wholesale	0	0	0	0	0
Subtotal - Water Sold	145,981	194,884	203,035	207,110	211,185
Water Loss	95,733	34,391	35,830	36,549	37,268
Total Average Daily Demand	241,714	229,275	238,865	243,659	248,453
Peak Day Demand	362,571	343,913	358,298	365,489	372,680

(Taken from Kentucky River Area Water Management Plan, 2002)

Fleming-Neon’s average and peak daily water use demands are expected to increase by 3% between 2000 and 2020. In 2001, Fleming-Neon reported withdrawing an average daily amount of 266,000 gpd (231,000 gpd from mine source, 35,000 gpd from wells), which is greater than average predictions for 2010.

Table 17.3c – Summary of Current and Projected Letcher County Water Demand: Whitesburg Municipal Water Works

	Average Water Use gpd	Projected Daily Water Use, gpd			
	2000	2005	2010	2015	2020
Residential	123,288	132,248	192,279	254,102	292,629
Commercial	52,603	54,247	55,890	57,534	57,534
Industrial	0	0	0	0	0
Wholesale	0	0	0	0	0
Subtotal - Water Sold	175,891	186,495	248,169	311,636	350,163
Water Loss	120,548	32,911	43,795	54,995	61,794
Total Average Day Demand	296,439	219,406	291,964	366,631	411,957
Peak Day Demand	444,659	329,109	437,964	549,946	617,936

(Taken from Kentucky River Area Water Management Plan, 2002)

Whitesburg’s average and peak daily water use demands are expected to increase by 39% between 2000 and 2020. In 2001, Whitesburg reported withdrawing an average daily amount of 389,000 gpd, which is greater than predictions for 2015.

Table 17.3d – Summary of Current and Projected Letcher County Water Demand: Letcher County Water and Sewer District

	Average Water Use gpd	Projected Daily Water Use, gpd			
	2000	2005	2010	2015	2020
Residential	0	125,753	272,466	406,603	560,301
Commercial	0	13,973	27,945	41,918	55,890
Industrial	0	3,551	3,551	3,551	3,551
Wholesale	0	0	0	0	0
Subtotal - Water Sold	0	143,277	303,962	452,072	619,742
Water Loss	0	15,920	54,640	79,777	109,366
Total Avg. Day Demand	0	159,197	357,602	531,849	729,108

(Taken from Kentucky River Area Water Management Plan, 2002)

The average daily water use demand for the Letcher County Water and Sewer District is expected to increase from zero to 109,366 gpd between 2000 and 2020. The District will handle most of the increase in the Letcher County water demand through water line extensions into rural parts of the county. It will distribute treated water purchased from various sources, possibly including the South Floyd Water District, the Blackey Water System and Whitesburg Municipal Water Works.

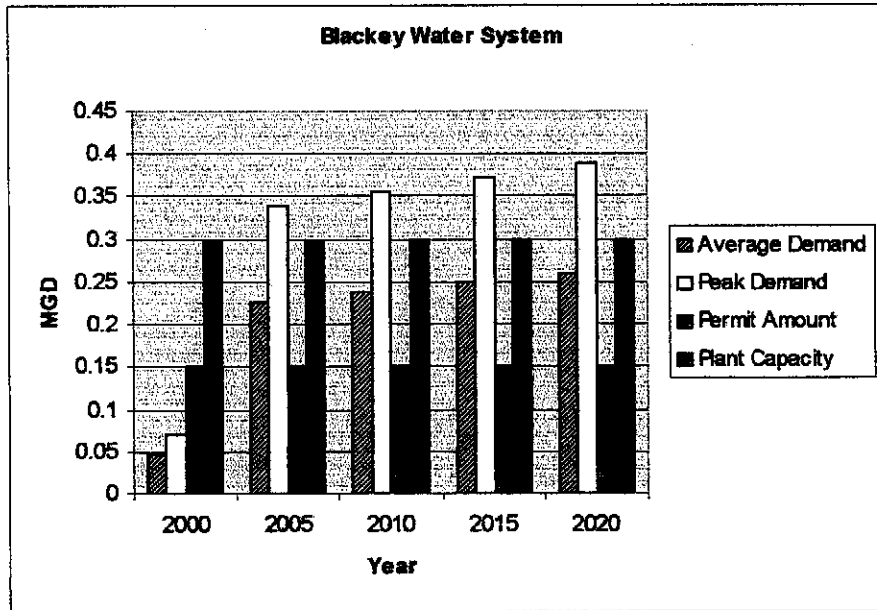


Figure 17.2 – Comparison of Blackey’s Predicted Average Demand/Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Blackey’s predicted average demand is expected to exceed its permitted water withdrawal amount in 2005, but remain less than its treatment plant capacity through 2020. The system’s peak demand is predicted to surpass the permitted water withdrawal amount and plant capacity by 2005.

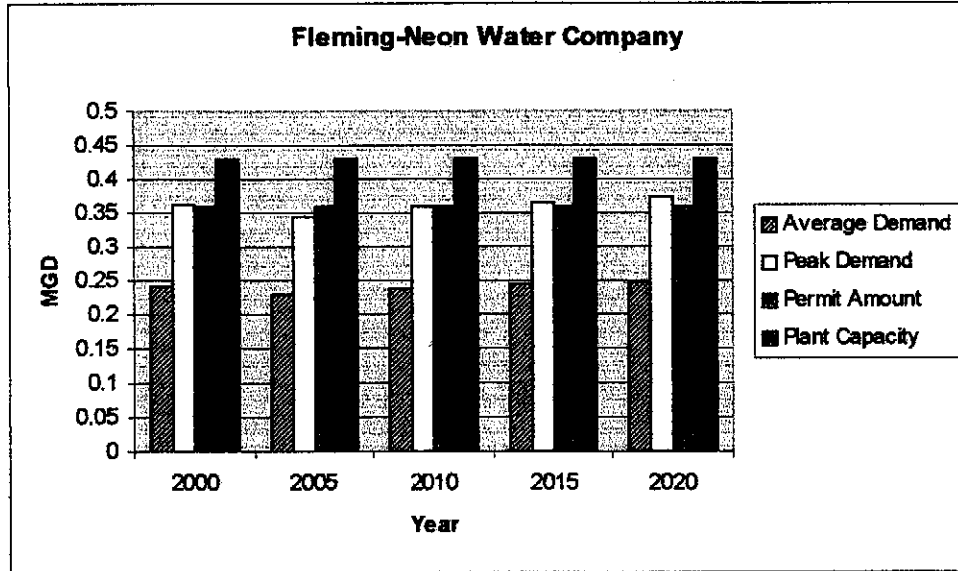


Figure 17.3 – Comparison of Fleming-Neon’s Predicted Average Demand/Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Fleming-Neon’s predicted average demand is not expected to exceed its permitted water withdrawal amount or its treatment plant capacity through 2020. The system’s peak demand was predicted to narrowly surpass the withdrawal permit amount in 2000, then fall below the amount until 2015. Peak demands are not expected to exceed plant capacity through 2020.

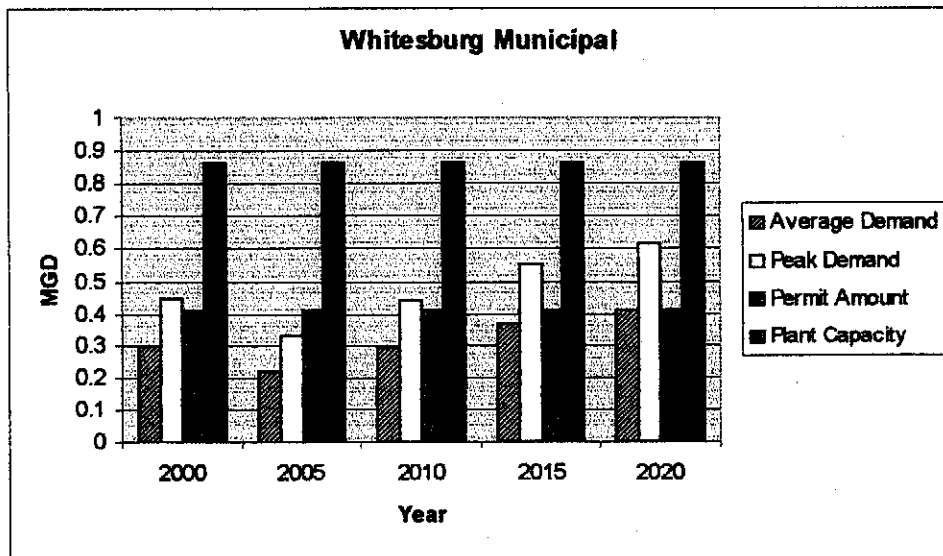


Figure 17.4 – Comparison of Whitesburg’s Predicted Average Demand/Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Whitesburg’s predicted average demand is expected to remain less than its current permitted water withdrawal amount and current treatment plant capacity through 2020. The system’s peak demand was predicted to narrowly surpass the withdrawal permit amount in 2000, then fall

below the amount until 2010. Peak demands are not expected to exceed plant capacity through 2020.

17.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors. Table 17.4 provides information relating to water availability for the water supplies of Blackey, Fleming-Neon and Whitesburg.

Critical to the determination of supply adequacy is the relationship between the permitted withdrawal amount, and statistical measures of flow measured at the point of withdrawal such as 1) the normal flow, 2) the 7Q10 flow and 3) the 7Q20 flow. Values for each of these statistics for the North Fork Kentucky River are provided in Table 17.4, in addition to the estimated capacity of Fleming-Neon’s deep mine well source.

Table 17.4 – Letcher County Supply Sources and Capacities

Supply Source	Normal Flow ¹	7Q10 ²	7Q20 ³	Full Reservoir
Blackey Water System/ North Fork of Ky. River	2.61 mgd (4.04 cfs)	1.6 mgd (2.5 cfs)	0.34 mgd (0.52 cfs)	N/A
Fleming-Neon Water System/Deep mine wells	N/A	N/A	N/A	18,000,000 gal.
Whitesburg Intake/ North Fork of Ky. River	1.45 mgd (2.24 cfs)	1.6 mgd (2.5 cfs)	0.12 mgd (0.18 cfs)	N/A

¹Normal flow = 10% of lowest monthly mean flow; maximum amount that any single user can be permitted to withdraw

²7Q10 = lowest consecutive 7 day streamflow that is likely to occur in a ten year period; for planning purposes, represents “minimum flow”

³7Q20 = lowest consecutive 7 day streamflow that is likely to occur in a twenty year period; for planning purposes, represents “drought conditions”

The Kentucky Division of Water has established the “normal flow” as the basis for determining the maximum amount that any one permittee may be allowed to withdraw. Thus, Blackey’s and Whitesburg’s current and projected demands are within these available allotments.

The Kentucky Division of Water considers a regulated stream source adequate if the average rate of water use is less than 20 percent of the stream’s 7Q10 flow. Average demands equal to between 20 and 65 percent of the 7Q10 are given a “B” drought vulnerability rating. Blackey’s predicted 2020 average rate of water use, 259,853 gpd, is 16% of the 7Q10 for the North Fork. Therefore, Blackey’s source is considered adequate and receives an “A” drought vulnerability

rating. Whitesburg’s predicted 2020 average demand, 586,893 gpd, is 37% of the 7Q10 and it is considered potentially drought vulnerable.

It is estimated that Fleming-Neon’s abandoned mine source contains a supply of approximately 18 million gallons of water. Given a predicted 2020 average demand of 273,439 gpd, the entire capacity of the mine would provide only 65 days of supply. The rate of groundwater replenishment of the underground reservoir is not known.

According to these analyses, drought susceptibilities for Blackey, Fleming-Neon and Whitesburg are shown in Table 17.6.

Table 17.6 – Letcher County Water Supply Adequacy Assessment

Supply Source	Drought Susceptibility Class
Blackey Water System/ North Fork of Ky. River	A
Fleming-Neon Water System/Deep mine wells	Unknown
Whitesburg Intake/North Fork of Ky. River	B

The drought susceptibility classification of “A” indicates that the system is unlikely to experience a water shortage during drought conditions. The drought susceptibility classification of “B” indicates that the system should be examined for susceptibility to water shortage during drought. Plans need to be made for response to possible shortage. See Appendix C for further explanation of the Kentucky Division of Water’s drought susceptibility classification system.

17.4 Water Supply Alternatives

In Letcher County, water supplies for the Whitesburg Municipal Water Works and possibly Fleming-Neon were found to be inadequate through 2020. Supply alternatives for Whitesburg are listed in Table 17.7.

Table 17.7 –Water Supply Alternatives for Whitesburg Municipal Water Works

Alternatives	Comments
Existing well	Short-term alternative. This well has previously served as a water supply for the city of Whitesburg.
Interconnection with Letcher County Water and Sewer District	Long-term alternative. The Letcher County Water and Sewer District will purchase treated water from a variety of sources, including the Southern Water District in Floyd County (which withdraws water from the Levisa Fork of the Big Sandy River).
Abandoned mines	Involves use of abandoned mines to act as reservoir for ground water that floods the mines. There are reported to be many abandoned mines in area surrounding Whitesburg. Wells drilled into mine would recover the stored water. Would also require construction of raw water line to transport water to treatment plant. Will require a feasibility study determining location, quality and quantity of potential water supply.
Conservation	It was determined that an average reduction in water use demand of 29% could result from the use of various water conservation measures. However, the projected water use demand of 1.1 cfs for 2010 with conservation methods in place exceeds the 7Q10 value of 1.0 cfs. Conservation methods alone cannot ensure an adequate water supply from the North Fork.

Preferred alternative in bold text.

Originally, Letcher County’s Water Supply Plan recommended the use of flooded abandoned mines as the primary alternative source. However, much of the projected water use for Whitesburg in the original plan has now become the responsibility of the Letcher County Water and Sewer District, who have several alternatives for the purchase of treated water. Lower projected demands, as well as recent efforts that have decreased the amount of system water losses, have greatly improved the outlook for supply adequacy during the planning period. The primary short-term alternative for Whitesburg Municipal Water Works is an old well that once served the city. An interconnection with the Letcher County Water and Sewer District will serve as the primary alternative later in the planning period.

Additionally, there are some concerns about the adequacy of supply for the Fleming-Neon Water System. A project has been proposed to drill a new well into a deeper pool of water near the existing well and the catchment basin near the community of McRoberts. Fleming-Neon could further ensure their ability to provide a dependable water supply through planned interconnections with surrounding water suppliers.

17.5 Narrative Summary

17.5.1 General assessment of system

Due to inadequate supplies within the county and no plans for the construction of a reservoir, Letcher County will need to rely on purchased water from suppliers in surrounding counties in order to meet their projected needs. Additionally, the interconnection of all water suppliers within the county and the construction of a water treatment plant on Carr Creek Lake will enable an adequate water supply for Letcher County through the year 2020. The proposed treatment plant on Carr Creek Lake has the potential to provide 2.0 mgd to residents of Letcher County.

The Blackey Water System – Since Blackey’s average demand is expected to exceed its water withdrawal permit in 2005, either the current permit amount will need to be increased or another source will need to be developed and permitted. In addition, Blackey’s treatment plant capacity will need to be increased to accommodate peak demands beginning in 2005 unless another treated water source is being used.

Fleming-Neon Water System – Both Fleming-Neon’s current water withdrawal permit and treatment plant capacity amounts are adequate to meet average demands through 2020. The treatment plant is also capable of meeting peak demands throughout the planning period. However, the adequacy of Fleming-Neon’s well and mine sources is questionable, and it is being recommended that another well be constructed that would access a deeper pool of water in the abandoned mine. Further reliability could be achieved through interconnections with other nearby suppliers.

Whitesburg Municipal Water Works – Although Whitesburg’s treatment plant capacity seems to be adequate until the end of the planning period, the water withdrawal permit may need to be increased at around 2010 when peak demands are predicted to begin exceeding the current permit amount. Additionally, Whitesburg’s supply from the North Fork will need to be augmented through the use of an existing well and an interconnection to the Letcher County Water and Sewer District.

Letcher County Water and Sewer District – The Water and Sewer District does not have a water withdrawal permit or treatment plant, since it plans to purchase treated water from surrounding suppliers. Likely providers of treated water include the Southern Water District in Floyd County, as well as Blackey and Whitesburg. The Letcher County Water and Sewer District is also a member of the Carr Creek Water Commission, which is working to secure a water supply from Carr Creek Lake and build a regional water treatment plant.

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap between water purchased for resale and cumulative sales to water customers. Year 2000 unaccounted-for loss estimates for systems in Letcher County resulted in the following:

Blackey Water System	11%
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Fleming-Neon Water Company	39%
Jenkins Water Works	59%
Whitesburg Municipal Water Works	30%

Clearly, Letcher County’s water supply adequacy could be greatly improved by reducing its system leakage. The five publicly owned water providers in Letcher County have agreed to allow an independent engineer/consultant working with the Kentucky Infrastructure Authority to conduct a management assessment of each of the systems. This assessment will gauge the managerial and financial, as well as the technical capacity of each system, and is hoped to lead to an overall reduction in water losses.

17.5.2 Water shortage response plans / Contamination response plans

A general, combined water shortage and contamination response plan was developed for the entire Kentucky River Area Development District and can be found in Chapter 12 of its 2002 Water Management Plan.

17.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning period. These funding need estimates are listed below for the short-term period of 2000 to 2005 (Table 17.8a) and the longer term period of 2006 to 2020 (Table 17.8b).

Table 17.8a – Short-Term Infrastructure Funding Needs (2000-2005) – Letcher County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Letcher Co.	98.4	2,307	8,875	--	2,000	5,000	2,700	18,575

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

Table 17.8b – Long-Term Infrastructure Funding Needs (2006-2020) – Letcher County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Letcher Co.	203.2	2,949	13,000	--	6,000	10,000	1,800	30,800

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

Letcher County’s immediate infrastructure needs account for 2,307 new customers between 2000 and 2005 and requisite system upgrade costs of approximately \$18.6 million. Between 2006 and 2020, 2,949 additional customers are expected, necessitating an additional long-term system upgrade cost of \$30.8 million. The majority of the infrastructure funding will be targeted to the proposed water treatment plant at Carr Creek Lake and installing new water distribution lines.

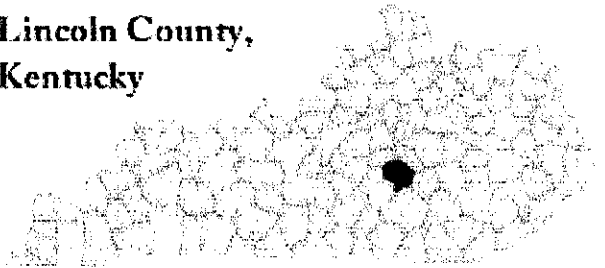
17.5.4 Other major issues

The supply sources for Letcher County's Jenkins Water System were also found to be inadequate to meet demands. Jenkins is most strongly considering the alternative of a connection to the Mountain Water District in Pike County, which uses Levisa Fork of the Big Sandy River as its raw water source. This alternative is projected to require approximately 4 miles of a 12-inch water line, a 500,000-gallon water storage tank, a pump station and a master meter station. This should create an adequate supplemental source for Jenkins at a moderate cost, and could enable the extension of water service to areas not currently served.

It was also determined that a 42% average reduction in Jenkins' water use demand could result from the use of various water conservation measures, mainly that of leakage reduction. Therefore, the detection and repair of system leakage could significantly bolster Jenkins' water supply availability, regardless of the chosen supply alternative.

18.0 LINCOLN COUNTY

**Lincoln County,
Kentucky**



Lincoln County is located in central Kentucky in the middle region of the Kentucky River Basin. The Dix River tributary of the Kentucky River flows in a northerly direction across northeastern Lincoln County. Headwater of the Green River and Upper Cumberland River Basins also fall within Lincoln County.

18.1 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute their finished, potable water to their customers or sell the water to other distributors. Table 18.1 lists the water suppliers for Lincoln County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier’s overall water treatment plant capacity.

Table 18.1 – Summary of Lincoln County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity*	Treatment Plant Capacity
Stanford Municipal Water Works	Henry Rice Reservoir	Kentucky River	1.5 mgd	2.0 mgd
	James Harris Reservoir	Green River	1.0 mgd	

*Permitted water withdrawal amount, per Kentucky Division of Water.

In addition to supplying its own customers, Stanford Municipal Water Works sells water to six other distributors for Lincoln County; Crab Orchard, Eubank, Hustonville, Junction City, McKinney Water District, and Western Rockcastle Water Association. Water is also purchased from Danville and Lancaster for distribution in Lincoln County. See Figure 18.1 in Appendix A for a map of the Lincoln County water system. In addition, Stanford’s water withdrawal permit can be found in Appendix B.

The Henry Rice Reservoir is an impoundment of Neal’s Creek in the Kentucky River Basin. The James Harris Reservoir is an impoundment of Hubert Miracle Creek, which is located in the Green River basin. Stanford’s primary source is the Rice Reservoir. Raw water is pumped from Harris Reservoir into Rice Reservoir. Then, up to 1.5 mgd is pumped from Rice Reservoir to the

treatment plant. Stanford also has plans to begin withdrawing water from Buck Creek Reservoir, an impoundment of Bucks Creek in the Upper Cumberland River Basin. Once these withdrawals begin, Stanford will be withdrawing water from three different river basins; those of the Kentucky River, Green River and Upper Cumberland River.

18.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised population projections for the water management planning period of 2000 to 2020. These new figures for Lincoln County, shown in Table 18.2, are based on results from the 2000 census data.

Table 18.2 – Lincoln County Population Projections

2000 Census	2005	2010	2015	2020
23,361	25,450	27,520	29,709	32,012

* Taken from University of Louisville Kentucky State Data Center.

Between 2000 and 2020, the Lincoln County population is expected to increase by approximately 37%, or 8,651 people. In 2000, 97.4% of the county population was served by a public water supplier. It is projected that 99.8% of the population will be served by a public water supply by 2020, for an overall increase of 9,194 individuals. The associated projected water demands for Stanford Municipal Water Works are shown in Table 18.3 and illustrated in Figure 18.2.

**Table 18.3 – Summary of Current and Projected Lincoln County Water Demand:
Stanford Municipal Water Works**

	Average Annual Water Use (million gals)	Projected Annual Water Use (million gals)			
		2000	2005	2010	2015
Residential	182.86	199.31	215.77	232.23	248.68
Commercial/Institutional	43.57	47.49	51.41	55.33	59.25
Industrial	13.00	14.17	15.34	16.51	17.68
Public/Unaccounted For	111.10	121.10	131.10	141.09	151.09
Other	0.80	0.86	0.83	1.01	1.09
Total Production	351.32	382.93	414.45	446.17	477.80
Avg. Daily Production (mgd)	0.963	1.049	1.135	1.222	1.309
Peak Day (mgd)	1.328	1.286	1.392	1.499	1.605

(Taken from the Bluegrass Area Water Management Plan)

The average daily water use demand for Stanford is expected to increase by approximately 36% between 2000 and 2020. In 2001, it reported withdrawing an average daily amount of 0.956 mgd from Rice Reservoir, which is slightly less than demand predictions for 2000.

Stanford’s projected 2020 average demand of 1.309 mgd is less than its current permitted water withdrawal amount of 1.5 mgd from Rice Reservoir, as well as being less than its water treatment plant capacity of 2.0 mgd. The 2020 peak demand of 1.605 mgd is greater than the permit amount, but remains less than the plant capacity.

Demand management through water conservation measures is predicted to have the potential to reduce Stanford’s annual average demand by approximately 5.9% and its maximum day demand by approximately 6.1%.

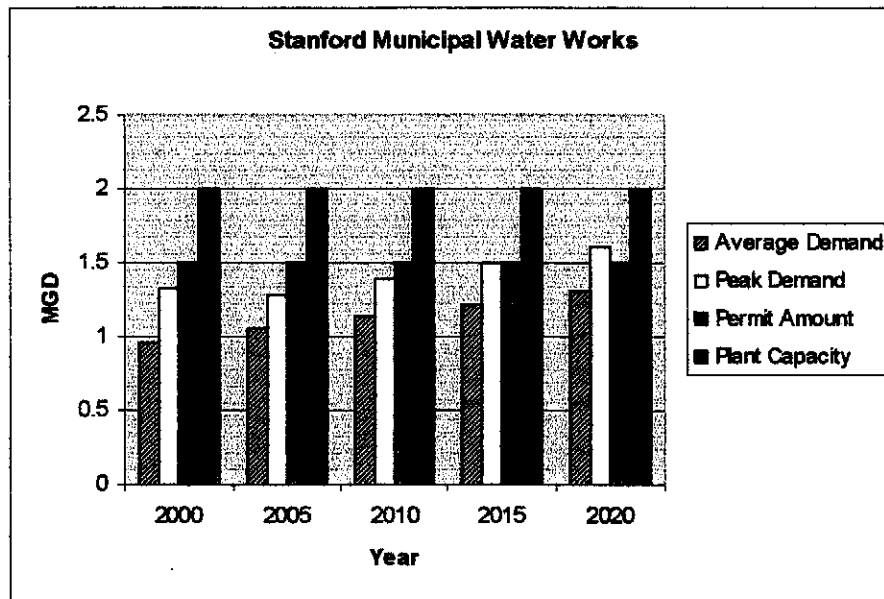


Figure 18.2 – Comparison of Stanford’s Predicted Average Demand/Predicted Peak Demand/Current Current Water Withdrawal Permit Amount/Current WTP Capacity

Stanford’s predicted average demand is not expected to exceed its permitted water withdrawal amount or treatment plant capacity through 2020. The system’s peak demand is predicted to surpass the permitted water withdrawal amount in 2020, but remain less than the treatment plant capacity throughout the planning period.

18.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors.

Critical to the determination of supply adequacy is the relationship between the permitted withdrawal amount and a reservoir’s drainage area and storage volume. Values for each of these statistics for Henry Rice Reservoir and James Harris Reservoir are provided in Table 18.4.

Table 18.4 – Lincoln County Supply Sources and Capacities

Supply Source	Drainage Area	Full Reservoir
Henry Rice Reservoir	0.78 sq. miles	208.6 million gals.
James Harris Reservoir	0.94 sq. miles	263.1 million gals.

Assuming the 7Q10 and 7Q20 inflows to Rice and Harris Reservoirs are both 0 mgd and a combined drainage area of less than five square miles (1.72 square miles), the DOW’s classification criteria require at least 201 days of storage at average demand rates to be considered adequate (“B” classification). An “A” classification is not possible for reservoirs with a drainage area of less than five square miles and a 7Q10 inflow of zero. Table 18.5 shows estimates of Stanford’s 201-day demand through 2020.

Table 18.5 – 201-Day Supply Demand – Stanford Municipal

Year	Projected Demand (MGD)	201-Day Average Demand
2000	0.963	193.6 MG
2005	1.049	210.8 MG
2010	1.135	228.1 MG
2015	1.222	245.6 MG
2020	1.309	263.1 MG

The estimated full capacity of Harris and Rice Reservoirs (471.7 million gallons) is greater than the 201-day average demand through 2020, resulting in the “B” drought vulnerability classification shown in Table 18.6.

Table 18.6 – Lincoln County Water Supply Adequacy Assessment

Water Supplier/ Supply Source	Drought Susceptibility Class
Stanford Municipal Water Works / Henry Rice and James Harris Reservoirs	B

The drought susceptibility classification of “B” indicates that the system should be examined for susceptibility to water shortage during drought. Plans need to be made for response to possible shortage. See Appendix C for further explanation of the Kentucky Division of Water’s drought susceptibility classification.

18.4 Water Supply Alternatives

Stanford’s water supply from Harris and Rice Reservoirs was found to be marginally adequate through 2020. Lincoln County is positioned at the headwaters of the Kentucky River Basin, the Green River Basin and the Cumberland River Basin. Accordingly, most streams exhibit low flows during dry times. Stanford is considering the alternative supply sources listed in Table 18.7.

Table 18.7 – Lincoln County Water Supply Alternatives

Alternative	Comments
Newly purchased Buck Creek Lake	Would supplement existing supply by linking lake with treatment plant via raw water lines and pumps.
Potential interconnections with Danville, Junction City, Hustonville, Crab Orchard, Eubank, Lancaster and/or Garrard County Water Association	Neighbor-to-neighbor interconnections for the everyday transfer of water or for standby uses are being encouraged. At least from a proximity point of view, these interconnections are possible

Preferred alternative is in bold text.

In addition to Stanford’s small reservoirs in the Kentucky River and Green River Basins, Stanford has recently purchased an existing small dam and reservoir on Buck Creek in southern Lincoln County. Buck Creek Lake falls within the Cumberland River Basin and has a drainage area of approximately 6,000 acres. Linking Buck Creek Lake with the Stanford Water treatment plant by means of pumps and a transmission pipeline should improve Stanford’s present Class B Drought Susceptibility Class.

18.5 Narrative Summary

18.5.1 General assessment of system

The adequacy of Stanford’s reservoir sources, Harris and Rice Reservoirs, are questionable during a drought situation. For this reason, Stanford is pursuing a raw water connection to its newly purchased Buck Creek Lake in southern Lincoln County. Although Stanford does not presently have the ability to convey water contained in Buck Creek Lake north to the municipal water treatment plant, efforts are underway to develop financial support for installing the necessary low service pumps and the raw water transmission line. The addition of the Buck Creek Lake source will ensure an adequate water supply for Stanford through 2020.

Stanford’s predicted average demand is not expected to exceed its permitted water withdrawal amount or treatment plant capacity through 2020. The system’s peak demand is not predicted to surpass the plant capacity through 2020, but is expected to exceed the permitted water withdrawal amount in 2020. Thus, it appears as though the current treatment plant will be adequate throughout the entire planning period, and the current water withdrawal permit amounts will be adequate for meeting average demands.

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap

between water purchased for resale and cumulative sales to water customers. Year 2000 unaccounted-for loss estimates for systems in Lincoln County resulted in the following:

Stanford Water Commission	15%.
McKinney Water District	14.7%
City of Crab Orchard	16%
Western Rockcastle Water Association	7.3%

According to the water management plan, it is expected that Crab Orchard's system leakage rate will be reduced to at least 15% by 2005.

18.5.2 Water shortage response plans / Contamination response plans

Water Shortage Response Plan:

Stanford does not presently have a water shortage response plan, but would follow the guidance provided in the Kentucky Division of Water's model Water Shortage Response Plan should a water supply shortage occur.

Water Supply Contamination Response Plan:

Lincoln County Emergency Management has a state-approved Emergency Response Plan that addresses the ways that accidental contaminant releases will be handled. Among the topics included in this plan are: identification of the appropriate response agencies, methods of protecting citizens from the contaminants, mitigation measures, and hazard alleviation.

The Kentucky Division of Water regulations require water systems to have a volume of stored potable water which is equal to the amount of water that the utility purchases or produces in a 24-hour period. For relatively brief emergencies caused by infrastructure problems, for instance, the Stanford water system would rely on this source. However, should there be a shortage lasting longer than one day (caused by such factors as a major line break or plant shutdown), the water system will implement measures in accordance with the 1988 *Kentucky Water Shortage Response Plan*.

The city plans to connect the Harris Reservoir to the water treatment plant with a valve system enabling either reservoir to be used as a direct supply source. Thus, regardless of which reservoir might become contaminated, the other one could be utilized as a supply source until the contamination threat has cleared. Since the two reservoirs are in different major watersheds (the Kentucky River and the Green River), it is unlikely that a contamination event would affect both at the same time. Until this connection can be made permanent, it would be possible, on a short-term emergency basis, to lay temporary lines aboveground to pump from the Harris Reservoir to the treatment plant.

18.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning

period. These funding need estimates are listed below for the short-term period of 2000 to 2005 (Table 18.7a) and the long-term period of 2006 to 2020 (Table 18.7b).

Table 18.7a: Short-Term Infrastructure Funding Needs (2000-2005) – Lincoln County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Lincoln Co.	44.5	188	2,015	1,340	--	2,800	--	6,155

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

Table 18.7b: Long-Term Infrastructure Funding Needs (2006-2020) – Lincoln County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Lincoln Co.	45.5	163	2,170	1,305	--	--	460	3,935

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

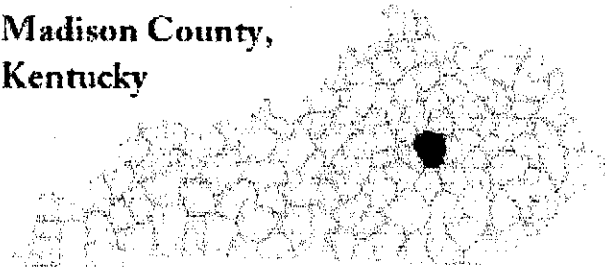
Lincoln County’s immediate infrastructure needs account for 188 new customers between 2000 and 2005 and requisite system upgrade costs of approximately \$6.155 million. Between 2006 and 2020, 163 additional customers are expected. New distribution lines, line rehabilitation and tank and pump upgrades are expected to necessitate an additional long-term system upgrade cost of approximately \$3.935 million.

18.5.4 Other major issues

Stanford plans to develop Buck Creek Lake as a supplemental water supply source in two phases, the first costing \$2 million and the second \$1.3 million. Stanford has already received approval for \$1 million in grant assistance for the project. In March 2003, Stanford’s water department superintendent asked the city council for a nearly 25 percent rate increase to help fund the development of Buck Creek Lake, as well as a 1 million gallon water tank. However, this request was temporarily denied by the city council due to Stanford’s recent violations of drinking water standards. Drinking water violations resulted from exceedances of standards for total trihalomethanes (TTHM) and haloacetic acids (HAA), both of which are byproducts of the drinking water disinfection process. The maximum acceptable level for TTHM is 0.080 milligrams/liter, and Stanford’s drinking water concentration was 0.109 mg/L. The maximum acceptable level for HAA is 0.060 mg/L, while Stanford’s was 0.76 mg/L.

19.0 MADISON COUNTY

Madison County,
Kentucky



Madison County is located in central Kentucky in the middle region of the Kentucky River Basin. Pools 8, 9 and 10 of the river extend along the northern border of Madison County, and Lock and Dam 11 creates Pool 11 on Madison County’s eastern border with Estill County.

19.1 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute their finished, potable water to their customers or sell the water to other distributors. Table 19.1 lists the water suppliers for Madison County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier’s overall water treatment plant capacity.

Table 19.1 – Summary of Madison County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity ¹	Treatment Plant Capacity
Richmond Water, Gas and Sewer Works	Kentucky River Pool 11	Kentucky River	9.0 mgd ²	9.0 mgd
Berea College Water Department	Kales Lake B (Silver Creek) Lake Cowbell Lake Owsley Fork Lake	Kentucky River	2.0 mgd (Kales) 2.5 mgd (B) 2.5 mgd (Cowbell) 2.5 (Owsley) ³	4.0 mgd

¹Permitted water withdrawal amount, per Kentucky Division of Water.

²As river flows diminish during a drought, permitted water withdrawals are similarly diminished.

³The four withdrawal permits state that the aggregate withdrawals may not exceed 2.0 mgd.

In addition to supplying its own customers, Richmond sells water to two other distributors in Madison County; Madison County Utilities District and the Kirksville Water Association. Berea also sells water to two distributors; Garrard County Water Association and Southern Madison Water District. See Figure 19.1 in Appendix A for a map of the Madison County water system. In addition, Richmond and Berea’s water withdrawal permits can be found in Appendix B.

19.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised population projections for the water management planning period of 2000 to 2020. These new figures for Madison County, shown in Table 19.2, are based on results from the 2000 census data.

Table 19.2 – Madison County Population Projections

2000 Census	2005	2010	2015	2020
70,872	77,378	83,629	89,741	96,102

* Taken from University of Louisville Kentucky State Data Center.

Between 2000 and 2020, the Madison County population is expected to increase by approximately 36%, or 25,230 people. In 2000, 98.9% of the county population was served by a public water supplier. It is projected that 99.9% of the population will be served by a public water supply by 2020, for an overall increase of 25,913 individuals. The associated projected water demands for the Lawrenceburg Water and Sewer Department are shown in Table 19.3a and illustrated in Figure 19.2. Projected demands for the Berea College Water Department are shown in Table 19.3b and illustrated in Figure 19.3.

**Table 19.3a – Summary of Current and Projected Madison County Water Demand:
Richmond Water, Gas and Sewer Works***

	Average Annual Water Use (million gals)	Projected Annual Water Use, million gals				
	2000	2005	2010	2015	2020	
Residential	1,044.84	1,140.78	1,232.90	1,323.05	1,416.79	
Commercial/Institutional	595.04	649.65	702.12	753.46	806.85	
Industrial	135.68	148.13	160.10	171.80	183.98	
Public/Unaccounted For	391.46	427.40	461.92	495.69	530.82	
Other	0.00	0.00	0.00	0.00	0.00	
Total Production	2,167.03	2,365.96	2,557.03	2,743.99	2,938.44	
Avg. Daily Production (mgd)	5.937	6.482	7.006	7.518	8.051	
Peak Day (mgd)	8.640	9.496	10.263	11.014	11.794	

(Taken from Bluegrass Area Water Management Plan)

* Also includes demand from Madison County Utilities and Kirksville Water Association.

The average daily water use demand for Richmond is expected to increase by approximately 36% between 2000 and 2020. In 2001, Richmond reported withdrawing an average daily amount of 5.861 mgd from Kentucky River Pool 11, which is slightly less than demand predictions for 2000.

Richmond’s projected 2020 average demand of 8.051 mgd is less than its current permitted water withdrawal amount and treatment plant capacity, both of which are 9.0 mgd. However, the 2020 peak demand of 11.794 mgd is greater than both its permit amount and plant capacity.

Demand management through water conservation measures is predicted to have the potential to reduce Richmond’s annual average demand by approximately 6.2% and its maximum day demand by approximately 6.6%.

Table 19.3b – Summary of Current and Projected Madison County Water Demand: Berea College Water Department*

	Average Annual Water Use (million gals)	Projected Annual Water Use (million gals)			
	2000	2005	2010	2015	2020
Residential	337.95	363.72	393.11	421.86	448.73
Commercial/Institutional	98.83	107.89	116.62	125.14	134.57
Industrial	193.56	211.32	228.42	245.10	263.57
Public/Unaccounted For	249.32	272.19	294.21	315.70	339.48
Other	0.00	0.00	0.00	0.00	0.00
Total Production	879.65	955.14	1,032.35	1,107.79	1,186.34
Avg. Daily Production (mgd)	2.410	2.617	2.828	3.035	3.250
Peak Day (mgd)	3.167	3.530	3.815	4.094	4.385

(Taken from Bluegrass Area Water Management Plan.)

*Also includes demand from South Madison County Water District and Garrard Water Association.

The average daily water use demand for Berea is expected to increase by approximately 35% between 2000 and 2020. In 2001, Berea reported withdrawing an average daily amount of 2.03 mgd from three of its reservoirs, which is less than predictions for 2000. Berea did not report withdrawing any water from Kales Lake in 2001.

Berea’s projected 2020 average demand of 3.25 mgd is greater than its current permitted water withdrawal amount of 2.0 mgd, but less than its treatment plant capacity of 4.0 mgd. The 2020 peak demand of 4.385 mgd is greater than both its permit amount and plant capacity.

Demand management through water conservation measures is predicted to have the potential to reduce Berea’s annual average demand by approximately 5.5% and its maximum day demand by approximately 6.3%.

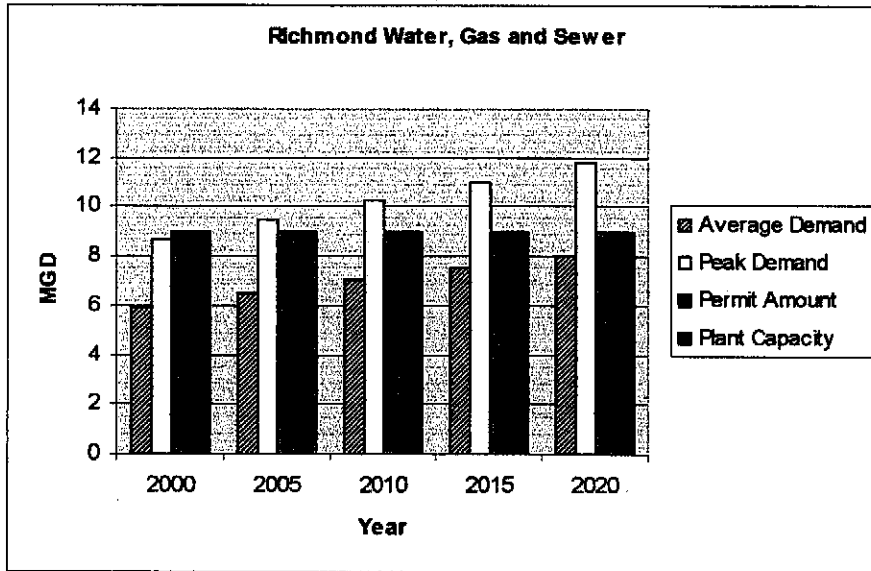


Figure 19.2 – Comparison of Richmond’s Predicted Average Demand/Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Richmond’s predicted average daily demand is not expected to exceed its permitted water withdrawal amount or water treatment plant capacity through 2020. However, the system’s peak demand is predicted to surpass the permitted water withdrawal amount and treatment plant capacity by 2005.

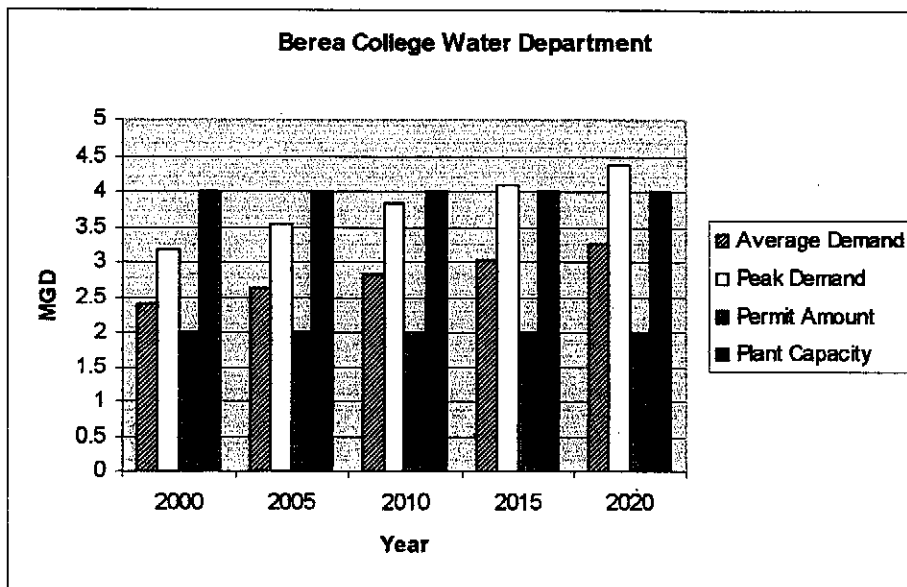


Figure 19.3 – Comparison of Berea’s Predicted Average Demand/Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Berea’s predicted average daily demand was expected to exceed its permitted water withdrawal amount in 2000, but is not predicted to exceed its water treatment plant capacity through 2020.

The system’s peak demand was also predicted to surpass the permitted water withdrawal amount in 2000 and is expected to exceed treatment plant capacity by 2015.

19.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors.

Critical to the determination of supply adequacy is the relationship between the permitted withdrawal amount, and statistical measures of flow measured at the point of withdrawal such as 1) the normal flow, 2) the 7Q10 flow and 3) the 7Q20 flow. Values for each of these statistics for Pool 11 are provided in Table 19.4. In addition, the estimated full capacities of Berea’s four reservoirs are listed in Table 19.4.

Table 19.4 – Madison County Supply Sources and Capacities

Supply Source	Normal Flow ¹	7Q10 ²	7Q20 ³	Full Reservoir Capacity
Richmond/ Kentucky River, Pool 11	59.5 mgd	64.6 mgd	38.8 mgd	N/A
Berea / Kales Lake	N/A	N/A	N/A	26.76 million gals
Berea / B Lake	N/A	N/A	N/A	82 million gals
Berea / Cowbell Lake	N/A	N/A	N/A	148.75 million gals
Berea / Owsley Fork Lake	N/A	N/A	N/A	722.1 million gals

¹Normal flow = 10% of lowest monthly mean flow; maximum amount that any single user can be permitted to withdraw

²7Q10 = lowest consecutive 7 day streamflow that is likely to occur in a ten year period; for planning purposes, represents “minimum flow”

³7Q20 = lowest consecutive 7 day streamflow that is likely to occur in a twenty year period; for planning purposes, represents “drought conditions”

The Kentucky Division of Water has established the “normal flow” as the basis for determining the maximum amount that any one permittee may be allowed to withdraw. Thus, Richmond’s current and projected demands are well within the available allotment from Pool 11

The Kentucky Division of Water considers a regulated stream source adequate if the average rate of water use is less than 20 percent of the stream source’s 7Q10 value. Richmond’s predicted 2020 average rate of water use (8.051 mgd) is 12% of the 7Q10 flow value for Kentucky River Pool 11. As a result, Richmond’s water supply has been assigned a drought susceptibility classification of A, as shown in Table 19.6.

Based on their drainage areas, ranging from 0.4 to 7.0 square miles and totaling 9.4 square miles, Berea’s four reservoirs should contain at least 201 days of supply to be considered adequate (B

19.4 Water Supply Alternatives

Richmond’s water supply from the Kentucky River was found to be adequate through 2020. Therefore, no supply alternatives to Pool 11 of the Kentucky River were considered. However, Berea College’s water supply from its four lakes was found to be inadequate. Berea is considering the supply alternatives listed in Table 19.7.

Table 19.7 – Madison Water Supply Alternatives

Berea College Water Department

Alternative	Comments
Construction of fifth reservoir	Would likely be constructed in southeastern Madison County. Officials have been evaluating new reservoir options in the Owsley Fork watershed for more than five years, and it seems likely that a specific project will be initiated by 2010.
Linkage with the Bluegrass Water Supply Consortium	Berea is a Consortium participant, however its distance from the other participating communities may pose linkage problems.
Potential interconnections with Richmond, Estill County Water District, Kirksville Water Association and/or Garrard County Water Association	Neighbor-to-neighbor interconnections for the everyday transfer of water or for standby uses are being encouraged. At least from a proximity point of view, these interconnections are possible.

Preferred alternative is in bold text.

To offset future shortages, Berea College is planning to develop a fifth water supply reservoir. Berea could also link with the Bluegrass Water Supply Consortium, of which it is a participant. While a linkage with the gridded system of water lines proposed by the Consortium could provide an alternative supply, the distance separating Berea from the Central Bluegrass could be prohibitive. It seems more likely that Berea will construct a fifth water supply reservoir.

19.5 Narrative Summary

19.5.1 General assessment of system

Richmond’s supply source of the Kentucky River Pool 11 is expected to have an adequate capacity to meet both projected average and peak demands. Richmond’s predicted average demand is not expected to exceed its permitted water withdrawal amount or treatment plant capacity through 2020. However, peak demands are predicted to exceed both permit and treatment plant capacities by 2005. This suggests that Richmond may need to upgrade its water treatment plant capacity and withdrawal permit amount during the 20-year planning period. The Bluegrass ADD’s 1998 Water and Sewer Plan Update recommends that Richmond increase its water treatment plant capacity from 9.0 mgd to 12.0 mgd by approximately 2008 and to 15.0

mgd by approximately 2015. In 2001, Richmond reported an average monthly withdrawal rate of 5.861 mgd and a maximum monthly average of 6.365 mgd. Each of these figures is still well within the current maximum withdrawal and plant capacities of 9.0 mgd.

The adequacy of Berea’s four supply reservoirs is uncertain during drought conditions. The water department is therefore considering the construction of a fifth reservoir to meet demand. The construction of this reservoir in the Owsley Fork watershed in southeastern Madison County is predicted to commence by 2010. In addition, Berea’s current water withdrawal permit should be increased to reflect actual and predicted demands. The 2001 average withdrawals exceeded the allowable combined withdrawal amount of 2.0 mgd, and future demands are expected to continue this trend. Peak demands are predicted to begin exceeding the current treatment plant capacity in 2015. In accordance with this prediction, the Bluegrass ADD’s 1998 Water and Sewer Plan Update recommends that Berea increase its plant capacity to from 4.0 to 6.0 mgd by 2017.

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap between water purchased for resale and cumulative sales to water customers. Year 2000 unaccounted-for loss estimates for systems in Madison County resulted in the following:

Richmond Utilities	10.9%
Madison Co. Utilities District	15.9%
Kirksville Water Association	4.2%
Berea College Water Utilities	13.4%
Southern Madison Water District	9.4%

It is expected that the Madison County Utilities District will decrease its system leakage rate to at least 15% by 2005.

19.5.2 Water shortage response plans / Contamination response plans

Water Shortage Response Plan:

Richmond Utilities enacted a Water Shortage Response Ordinance on October 22, 1986. The ordinance is broad enough to cover any customer who purchases water from the city’s water distribution system, as well as other utilities that purchase potable water for resale.

Berea College Utilities has not adopted a water shortage response plan of its own, but would instead rely upon the Kentucky Division of Water’s model Water Shortage Response Plan in the event of an inadequate water supply during times of drought or other water outage.

Water Supply Contamination Response Plan:

The Madison County Emergency Management Agency has a state-approved Emergency Operations Plan (EOP) that addresses the ways that accidental contaminant releases will be handled. Among the topics included in this plan are: identification of the appropriate response agencies, methods of protecting citizens from the contaminants, mitigation measures and hazard alleviation.

The Madison County EMA reports that there are currently 20 Hazardous Material Plans for fixed facilities contained in the Madison County Emergency Operations Plan. It is important to note that such a plan is not required under SARA Title III, but the 20 plans are included in the EOP as a precaution. The various chemicals stored at some facilities are chlorine, anhydrous ammonia, sulfur dioxide, sulfuric acid, and acrylonitrile. In addition, a variety of other chemicals are included such as pesticides and fertilizers. The Blue Grass Chemical Activity, a separate organization located on the Blue Grass Army Depot, stores military chemical warfare agents GB, VX, and mustard. Other potential hazardous chemical spills could occur on transportation corridors. Interstate 75, the CSX rail line, and other major thoroughfares are the primary concerns. Commodity flow studies have been conducted and are on hand for the interstate highway and for the rail system. Many of the chemicals and accident scenarios involving transportation pose the greatest threat to the general public, property and the environment.

Richmond’s direct water service area, together with the service area of the two suburban/rural water utilities which are Richmond-supplied, were evaluated to determine their individual and collective abilities to withstand short (defined as 24-hours or less) interruptions in water supply. It was concluded that, while the water storage in the suburban and rural areas of Richmond’s area of water service is somewhat less than 24 hours of average daily water use, Richmond’s significant potable water storage capacity more than compensates for that suburban/rural shortfall. Accordingly, it would appear that a volume of potable stored water for the sum of Richmond and its Richmond-supplied suburban/rural water utilities is presently available to meet a water outage of up to 24 hours.

A volume of potable stored water in the Berea College system and its Berea College-supplied rural water utility—taken as a unit—is presently available to meet a water outage of up to 24 hours. And, the Blue Grass Army Depot would likely be able to tap a Richmond-supplied water source in the event of a drought-related water shortage.

19.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning period. These funding need estimates are listed below for the short-term period of 2000 to 2005 (Table 19.8a) and the long-term period of 2006 to 2020 (Table 19.8b).

Table 19.8a: Short-Term Infrastructure Funding Needs (2000-2005) – Madison County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Madison Co.	23.0	109	1,000	1,000	--	2,300	2,350	6,650

* Taken from *Water Resource Development: A Strategic Plan* (KIA, 1999)

Table 19.8b: Long-Term Infrastructure Funding Needs (2006-2020) – Madison County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Madison Co.	72.5	350	3,385	11,470	3,000	18,600	7,150	43,605

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

Madison County’s immediate infrastructure needs account for 109 new customers between 2000 and 2005 and requisite system upgrade costs of approximately \$6.65 million. Between 2006 and 2020, 350 additional customers are expected, and an additional long-term system upgrade cost of approximately \$43.6 million is expected. The majority of the infrastructure funding will be targeted to the water treatment plant, tanks and pumps and water line rehabilitation.

19.5.4 Other major issues

Berea is a participant in the Bluegrass Water Supply Consortium, an alliance of water utilities and government agencies that are working to address the potable water needs of central Kentucky. The BWSC’s goal is to construct a transmission grid connecting the participating water utilities. This grid will enable the movement of treated water from points of availability to points of need throughout the system. The BWSC is also endeavoring to identify a supply source that will augment that of the Kentucky River and other supplier sources in order to ensure water availability during a drought. Thus, existing treatment facilities and distribution systems will remain in operation. The regionalization offered by the BWSC will provide system reliability that is not possible for individual suppliers.

20.0 MERCER COUNTY

**Mercer County,
Kentucky**



Mercer County is located in central Kentucky, with the eastern portion of the county falling in the middle region of the Kentucky River Basin. Locks and Dams 6 and 7 are both positioned on eastern Mercer County’s border with Woodford and Jessamine Counties, respectively. These dams create Pools 6 and 7 of the Kentucky River in an area known as the Palisades due to the high limestone cliffs that were formed by the river.

20.1 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute their finished, potable water to their customers or sell the water to other distributors. Table 20.1 lists the water suppliers for Mercer County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier’s overall water treatment plant capacity.

Table 20.1 – Summary of Mercer County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity*	Treatment Plant Capacity
Harrodsburg Municipal Water Department	Kentucky River Pool 7	Kentucky River	3.2 mgd	4.0 mgd

*Permitted water withdrawal amount, per Kentucky Division of Water.

** When flows measured at Lock 6 are 150 cfs or less for four consecutive days, Harrodsburg Municipal shall conform to a pre-arranged withdrawal schedule.

In addition to supplying its own customers, Harrodsburg sells water to two other distributors in Mercer County; Burgin Municipal Water Department, North Mercer Water District and Lake Village Water Association. Lake Village also purchases treated water from Danville. See Figure 20.1 in Appendix A for a map of the Mercer County water system. In addition, Harrodsburg’s water withdrawal permit can be found in Appendix B.

20.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised population projections for the water management planning period of 2000 to 2020. These new figures for Mercer County, shown in Table 20.2, are based on results from the 2000 census data.

Table 20.2 – Mercer County Population Projections

2000 Census	2005	2010	2015	2020
20,817	21,735	22,549	23,339	24,110

* Taken from University of Louisville Kentucky State Data Center.

Between 2000 and 2020, the Mercer County population is expected to increase by approximately 16%, or 3,293 people. In 2000, 98.1% of the county population was served by a public water supplier. It is projected that 99.8% of the population will be served by a public water supply by 2020, for an overall increase of 3,640 individuals. The associated projected water demands for the Harrodsburg Municipal Water Department are shown in Table 20.3 and illustrated in Figure 20.2.

Table 20.3 – Summary of Current and Projected Mercer County Water Demand: Harrodsburg Municipal Water Department*

	Average Annual Water Use million gals	Projected Annual Water Use, million gals			
	2000	2005	2010	2015	2020
Residential	486.28	504.52	522.75	540.99	559.22
Commercial/Institutional	78.86	81.81	84.78	87.72	90.68
Industrial	65.04	67.48	69.91	72.36	74.80
Public/Unaccounted For	363.08	376.70	390.31	403.93	417.54
Other	1.00	1.03	0.95	1.10	1.15
Total Production	994.26	1,031.54	1,068.70	1,106.10	1,143.39
Avg. Daily Production (mgd)	2.724	2.826	2.928	3.030	3.133
Peak Day (mgd)	3.650	4.013	4.158	4.303	4.448

(Taken from Bluegrass Area Water Management Plan)

* Also includes demand from North Mercer WD, Lake Village WA and Burgin

The average daily water use demand for Harrodsburg is expected to increase by approximately 15% between 2000 and 2020. In 2001, it reported withdrawing an average daily amount of 2.635 mgd from Kentucky River Pool 7, which is slightly less than demand predictions for 2000.

Harrodsburg’s projected peak demand for 2020 of 4.448 mgd is greater than its current permitted water withdrawal amount of 3.2 mgd, as well as its current water treatment plant capacity of 4.0 mgd.

Demand management through water conservation measures is predicted to have the potential to reduce Harrodsburg’s annual average demand by approximately 6% and its maximum day demand by approximately 6.5%.

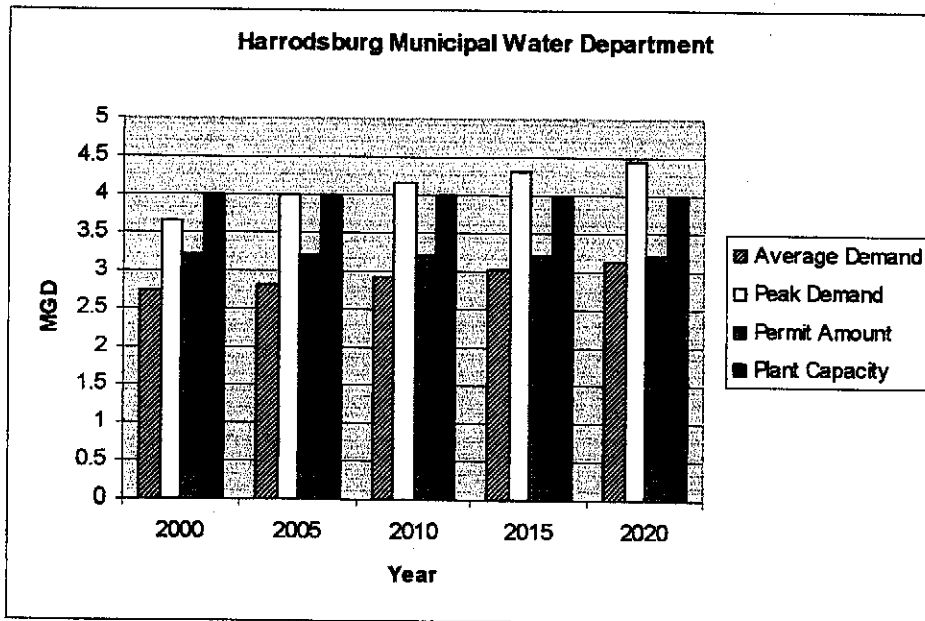


Figure 20.2 – Comparison of Harrodsburg’s Predicted Average Demand/Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Harrodsburg’s predicted average demand is not expected to exceed its permitted water withdrawal amount or its treatment plant capacity through 2020. The system’s peak demand was predicted to surpass the permitted water withdrawal amount in 2000 and is expected to narrowly exceed the current plant capacity beginning in 2005.

20.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors.

Critical to the determination of supply adequacy is the relationship between the permitted withdrawal amount, and statistical measures of flow measured at the point of withdrawal such as 1) the normal flow, 2) the 7Q10 flow and 3) the 7Q20 flow. Values for each of these statistics for Pool 5 are provided in Table 20.4.

Table 20.4 – Mercer County Supply Sources and Capacities

Supply Source	Normal Flow ¹	7Q10 ²	7Q20 ³
Kentucky River Pool 7	101.9 mgd	84.0 mgd	77.5 mgd

¹Normal flow = 10% of lowest monthly mean flow; maximum amount that any single user can be permitted to withdraw

²7Q10 = lowest consecutive 7 day streamflow that is likely to occur in a ten year period; for planning purposes, represents “minimum flow”

³7Q20 = lowest consecutive 7 day streamflow that is likely to occur in a twenty year period; for planning purposes, represents “drought conditions”

The Kentucky Division of Water has established the “normal flow” as the basis for determining the maximum amount that any one permittee may be allowed to withdraw. Thus, Harrodsburg’s current and projected demands are well within this available allotment.

The Kentucky Division of Water considers a regulated stream source adequate if the average rate of water use is less than 20 percent of the stream source’s 7Q10 value. Harrodsburg’s predicted 2020 average demand rate of 3.133 mgd is 3.7% of the 7Q10 for Kentucky River Pool 7. Thus, Harrodsburg’s Kentucky River source is considered adequate. As a result, Harrodsburg’s water supply has been assigned a drought susceptibility classification of A, as shown in Table 20.5.

Table 20.5 – Mercer County Water Supply Adequacy Assessment

Water Supplier/ Supply Source	Drought Susceptibility Class
Harrodsburg Municipal / Kentucky River Pool 7	A

The drought susceptibility classification of “A” indicates that the system is unlikely to experience a water shortage during drought conditions. See Appendix C for further explanation of the Kentucky Division of Water’s drought susceptibility classification.

20.4 Water Supply Alternatives

Harrodsburg’s water supply from the Kentucky River was found to be adequate through 2020. Therefore, no supply alternatives were considered.

20.5 Narrative Summary

20.5.1 General assessment of system

Harrodsburg’s supply source from Kentucky River Pool 7 has an adequate capacity to meet both projected average and peak demands. However, peak demands are predicted to exceed Harrodsburg’s treatment plant capacity by 2005. This suggests that the city will need to upgrade its plant capacity in the near future. Also, Harrodsburg’s average demand is expected to near its permitted water withdrawal amount by 2020, implying that the permit amount may need to be increased during the 20-year planning period.

In 2001, Harrodsburg reported an average monthly withdrawal rate of 2.635 mgd and a maximum monthly average of 2.808 mgd. These figures are well below the maximum permitted withdrawal amount (3.2 mgd) or the treatment plant capacity (4.0 mgd).

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap between water purchased for resale and cumulative sales to water customers. Year 2000 unaccounted-for loss estimates for systems in Mercer County resulted in the following:

Harrodsburg Municipal Water	22.3%
Burgin Municipal Water Dept.	0%
North Mercer Water District	12%
Lake Village Water Association	19.3%

According to the water management plan, it is expected that the Harrodsburg and Lake Village water loss rates will be reduced to 15% by 2005.

20.5.2 Water shortage response plans / Contamination response plans

Water Shortage Response Plan:

Harrodsburg has not adopted an ordinance or formalized a plan to deal with a water shortage. Harrodsburg’s water utility management has indicated, however, that it is in the process of preparing such a plan. In considering the effects of a shortage, water utility management noted the lack of alternative water sources and determined that the Lake Village Water Association would be asked to switch to its Danville supply, thus freeing up a limited water supply for other Harrodsburg users. In addition to the LVWA suggestion, management would provide public

service announcements describing the nature and severity of any water shortage and ask that users conserve the water available to them.

Water management officials also noted the option of the municipal passage of legislation restricting water use. Further, these mandates would be passed along through the distributing utilities that purchase Harrodsburg-produced water. Lastly, Harrodsburg management identified remedies offered by the state's model Water Shortage Response Plan, as well as the availability of plans from other jurisdictions.

The North Mercer Water District Management has prepared a water shortage plan, which follows the guidelines of the Division of Water's model guide. The Lake Village Water Association feels its water storage capacity is adequate and has not, as yet, developed a water shortage plan. Burgin has not adopted a formal municipal ordinance governing actions should a water shortage occur. In the event Harrodsburg's intake is closed, alternative water sources are limited to bringing in water by tank truck.

Water Supply Contamination Response Plan:

The Mercer County Emergency Management Agency has prepared Emergency Response Plans, which address the ways in which accidental contaminant releases will be handled; defining appropriate response agencies, identifying protection of civilians, and suggesting strategies for mitigation and alleviation of the hazard. In the event of an occurrence that may contaminate the county's source of water supply, Harrodsburg could shut down its water intake until the threat presented by the hazard has passed. It could rely on its storage of treated water, provided the threat is less than 24 hours in duration.

The North Mercer Water District does not meet the 24-hour rule. Utility management has indicated that storage tanks are, for the most part, filled or near capacity. In the event that Harrodsburg's intake is closed, alternative sources of water are limited to bringing in water by tank truck. The Lake Village Water Association is in the enviable position of having an alternative source of water in the event of a shortage or water cutoff due to contamination. As previously noted, Lake Village also purchases potable water from Danville. Although the water sources are currently isolated, the two systems could be connected if necessary.

20.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning period. These funding need estimates are listed below for the short-term period of 2000 to 2005 (Table 20.6a) and the longer-term period of 2006 to 2020 (Table 20.6b).

Table 20.6a: Short-Term Infrastructure Funding Needs (2000-2005) – Mercer County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Mercer Co.	40.0	138	1,830	5,000	--	--	820	7,650

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

Table 20.6b: Long-Term Infrastructure Funding Needs (2006-2020) – Mercer County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Mercer Co.	50.0	124	2,035	830	500	4,100	--	7,465

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

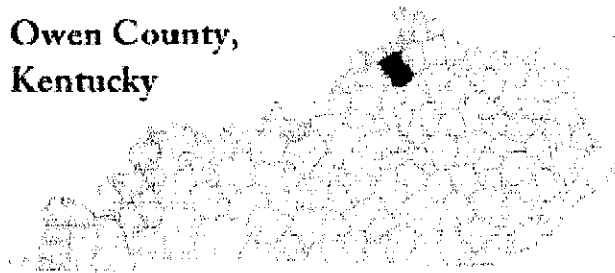
Mercer County’s immediate infrastructure needs account for 138 new customers between 2000 and 2005 and requisite system upgrade costs of approximately \$7.65 million. Between 2006 and 2020, 124 additional customers are expected. New distribution lines, as well as line rehabilitation and upgrades to source and treatment equipment, are expected to necessitate an additional long-term system upgrade cost of approximately 7.5 million.

20.5.4 Other major issues

Harrodsburg is a participant in the Bluegrass Water Supply Consortium, an alliance of water utilities and government agencies that are working to address the potable water needs of central Kentucky. The BWSC’s goal is to construct a transmission grid connecting the participating water utilities. This grid will enable the movement of treated water from points of availability to points of need throughout the system. The BWSC is also endeavoring to identify a supply source that will augment that of the Kentucky River and other supplier sources in order to ensure water availability during a drought. Thus, existing treatment facilities and distribution systems will remain in operation. The regionalization offered by the BWSC will provide system reliability that is not possible for individual suppliers.

21.0 OWEN COUNTY

**Owen County,
Kentucky**



Owen County is located in north central Kentucky in the lower region of the Kentucky River Basin. Locks and Dams 2 and 3 are situated on the western border of the county. Thus, Pools 1, 2 and 3 of the Kentucky River form Owen County’s western border with Henry County. In addition, Eagle Creek, a major tributary of the Kentucky River, forms Owen County’s northern border with Carroll and Gallatin Counties. This portion of the Kentucky River watershed is located in the hills of the bluegrass subregion of the Bluegrass physiographic region, which is characterized by hilly terrain, very rapid surface runoff and slow groundwater drainage.

21.1 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute their finished, potable water to their customers or sell the water to other distributors. Table 21.1 lists the water suppliers for Owen County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier’s overall water treatment plant capacity.

Table 21.1 – Summary of Owen County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity*	Treatment Plant Capacity
Owenton Water Works	Lower Thomas Lake (primary source)	Kentucky River	800,000 – 900,000 gpd	1.44 mgd
	Severn Creek (supplemental source)	Kentucky River	800,000 – 900,000 gpd	

*Permitted water withdrawal amount, per Kentucky Division of Water.

Owenton Water Works is the major supplier and/or distributor of treated water in Owen County. Elk Lake Water Company also supplies water to Owen County residents from its Elk Lake source. However, it was not evaluated in the county water management plan, because it is a completely residential, non-growth system. Its average water use is 17,000 gpd, with a peak demand of 75,000 gpd. See Figure 20.1 in Appendix A for a map of the Owen County water systems. In addition, Owenton’s water withdrawal permit can be found in Appendix B.

21.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised population projections for the water management planning period of 2000 to 2020. These new figures for Owen County, shown in Table 21.2, are based on results from the 2000 census data.

Table 21.2 – Owen County Population Projections

2000 Census	2005	2010	2015	2020
10,547	11,575	12,618	13,728	14,911

* Taken from University of Louisville Kentucky State Data Center.

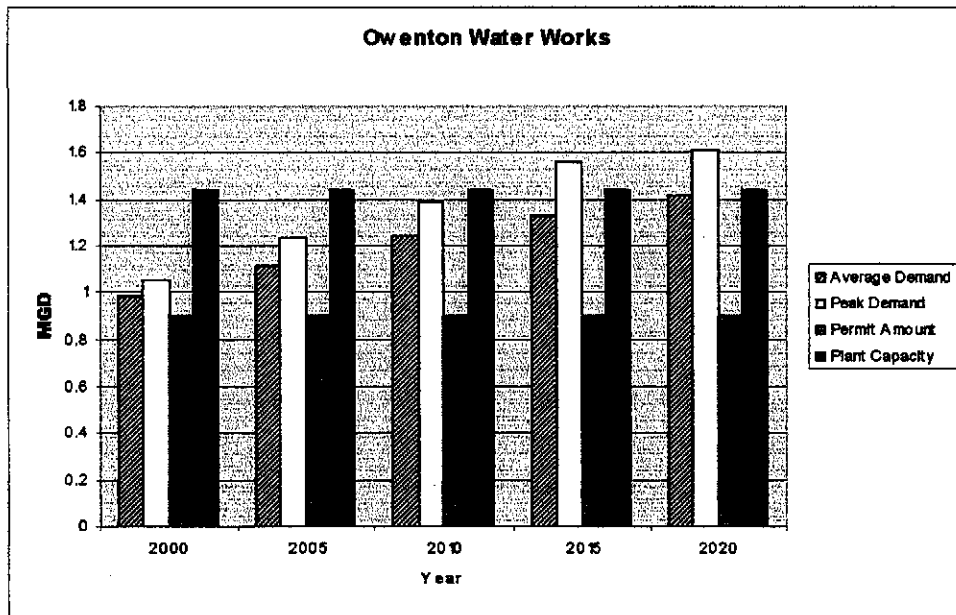
Between 2000 and 2020, the Owen County population is expected to increase by approximately 41%, or 4,364 people. In 2000, 67% of the county population was served by a public water supplier. It is projected that 92% of the population will be served by a public water supply by 2020, for an overall increase of 3,500 individuals. The associated projected water demands for Owenton Water Works are shown in Table 21.3 and illustrated in Figure 21.2.

**Table 21.3 – Summary of Current and Projected Owen County Water Demand:
Owenton Water Works**

	Average Daily Water Use gpd	Projected Daily Water Use, gpd			
	2000	2005	2010	2015	2020
Residential	375,000	450,000	510,000	550,000	590,000
Non-Residential	514,000	561,000	621,000	658,000	693,000
Other (Unmetered)	100,000	101,000	112,000	120,800	128,000
Avg. Daily Demand	989,000	1,112,000	1,243,000	1,328,800	1,411,000
Peak Day Demand	1.054	1.234	1.392	1.556	1.608

(Taken from Northern Kentucky Area Water Management Plan, 2002)

Owenton Water Work’s average daily water use demand is expected to increase by approximately 43% between 2000 and 2020. In 2001, Owenton reported withdrawing an average daily amount of 0.712 mgd from Lower Thomas Lake to meet water demands, which is significantly less than the average demand predicted for 2000. (Raw water withdrawals from Severn Creek are pumped to Lower Thomas Lake for direct transfer to the treatment plant. Thus, only the lake withdrawal amounts are indicative of the amount of water treated to meet demand.)



Permit amount is maximum from either of its two sources.

Figure 21.2 – Comparison of Owenton’s Predicted Average Demand/Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Both Owenton’s average and peak demands were predicted to surpass the water withdrawal permit amount in 2000. The peak demand is expected to exceed the treatment plant capacity in 2015, but the average demand is expected to remain within the plant’s capacity through 2020.

21.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors.

Critical to the determination of supply adequacy is the relationship between the permitted withdrawal amount and the estimated reservoir capacity. The estimated full capacity of Lower Thomas Lake is shown in Table 21.4. Also critical to determining supply adequacy are statistical measures of flow measured at the point of withdrawal such as 1) the normal flow, 2) the 7Q10 flow and 3) the 7Q20 flow. Available values for each of these statistics for Severn Creek and Kentucky River Pool 2 are also provided in Table 21.4.

Table 21.4 – Owen County Supply Sources and Capacities

Supply Source	Normal Flow ¹	7Q10 ²	7Q20 ³	Full Reservoir Capacity
Lower Thomas Lake	N/A	N/A	N/A	50,000,000 gals.
Severn Creek	0.258 mgd (0.4 cfs)	?	?	N/A
Kentucky River Pool 2	132.4 mgd (204.9 cfs)	133 mgd (206 cfs)	49.4 mgd (76.5 cfs)	N/A

¹Normal flow = 10% of lowest monthly mean flow; maximum amount that any single user can be permitted to withdraw

²7Q10 = lowest consecutive 7 day streamflow that is likely to occur in a ten year period; for planning purposes, represents “minimum flow”

³7Q20 = lowest consecutive 7 day streamflow that is likely to occur in a twenty year period; for planning purposes, represents “drought conditions”

Currently, Owenton relies on Lower Thomas Lake as its primary water supply source and Severn Creek as a supplemental source. The volume of Lower Thomas Lake has been greatly reduced by siltation, and it has a very small watershed of only 160 acres or 0.25 square miles.

Assuming the 7Q10 and 7Q20 inflows to Lower Thomas Lake are both 0 mgd and a drainage area of less than one square mile, the Kentucky Division of Water’s classification criteria state that it is not adequate to meet demand during drought conditions (i.e., a “C” drought vulnerability classification). Furthermore, with an average 2001 withdrawal rate of 712,000 gpd, the reservoir provides only 70 days of storage—far less than the 201-day storage recommendation for reservoirs with drainage areas of between five and ten square miles.

Owenton’s supplemental source, Severn Creek, is a backwater pool of the Kentucky River. The estimated 7Q10 and 7Q20 flows are not available for Severn Creek. However, during dry summer months, it has been observed to have virtually no flow.

Owenton is planning to move its Severn Creek intake to Kentucky River Pool 2. This source will be considered adequate to meet Owenton’s water demands during both normal and drought conditions. The Kentucky Division of Water considers a regulated stream source adequate if the average rate of water use is less than 20 percent of the stream source’s 7Q10 value. Owenton’s projected 2020 average demand rate of 1.411 mgd is only 1% of the 7Q10 flow for the planned Kentucky River source, far less than the recommended twenty percent of 7Q10.

According to an analysis of Owenton’s current water supply from Lower Thomas Lake and Severn Creek, it has been determined to have the drought susceptibility classification shown in Table 21.5.

Table 21.5 – Owen County Water Supply Adequacy Assessment

Water Supplier / Supply Source	Drought Susceptibility Class
Owenton Water Works/ Lower Thomas Lake and Severn Creek	B

The drought susceptibility classification of “B” indicates that the system is likely to experience a water shortage during drought conditions. Plans for response to shortage are necessary. See Appendix C for further explanation of the Kentucky Division of Water’s drought susceptibility classification.

21.4 Water Supply Alternatives

Owen County’s water supplies from Lower Thomas Lake and Severn Creek were found to be inadequate through 2020. Owenton is considering the water supply alternatives listed in Table 21.6.

Table 21.6 – Owen County Water Supply Alternatives

Alternative	Comments
Move intake from Severn Creek to Kentucky River	Would allow water withdrawal from lower elevation of river, virtually eliminating water shortage.
Dredging Lower Thomas Lake	Would increase volume and reduce pumping costs. Deemed too costly, with an unsubstantial added yield.
Piping raw water from Elk Lake to Owenton treatment plant	Too costly to pump water from lake, which is located 7 miles from treatment plant.
New reservoir above Lower Thomas Lake	Not guaranteed to yield adequate supply.
New well in Gallatin County	Would require construction of new treatment plant. Results in increased cost of pumping water from Gallatin County.

Preferred alternative is in bold text.

Owenton is planning to extend its Severn Creek intake to a lower elevation within the Kentucky River in 2003. This new intake will provide access to a water source that is adequate, even during drought conditions, and is superior in water quality. This preferred alternative would be implemented in two phases. The first phase involves the installation of 500 feet of 12-inch pipe to transport water directly from Severn Creek to the treatment plant (bypassing Lower Thomas Lake). The second phase consists of moving the intake, installing a new intake structure and pump station in the Kentucky River and upgrading the raw water pipeline to the river. In

additional to available local funds for this project, Owenton has succeeded in gaining funding from the Kentucky Infrastructure Authority and the U.S. Environmental Protection Agency.

21.5 Narrative Summary

21.5.1 General assessment of system

Owenton Water Works is in the process of moving its raw water intake from Severn Creek of the Kentucky River to a point directly within Kentucky River Pool 2. The completion of this project should adequately increase Owenton’s water supply to meet projected demands through 2020. An increase in the water withdrawal permit amounts once the Kentucky River intake is complete should bring projected demands within compliance with maximum permitted withdrawals. In addition, the existing water treatment plant should be adequate to meet average demand predictions for the Owenton system throughout the planning period. Peak demands are expected to exceed the plant capacity by 2015. Thus, a treatment plant upgrade may become necessary later in the 20-year planning period.

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap between water purchased for resale and cumulative sales to water customers. Year 2000 unaccounted-for loss estimates for systems in Owen County resulted in the following:

Owenton Water Works	5%
Tri-Village Water	7%
Elk Lake Water District	14%

21.5.2 Water shortage response plans / Contamination response

Water Shortage Response Plan:

Both the City of Owenton and the Tri-Village Water District have had water shortage ordinances since 1988. In the event of a water shortage that required rationing, referred to as an “extreme emergency,” the Department of Fish and Wildlife has agreed to allow Owenton to withdraw water from Elmer Davis Lake. Raw water would be pumped to Lower Thomas Lake and treated at the existing plant. There is a stipulation that the piping must be above ground. Waterworks personnel estimate that implementation might take as long as a week. However, it is unlikely that this additional source will become necessary once Owenton’s Kentucky River source is available.

Water Supply Contamination Response Plan:

A notification procedure for Tri-Village Water and all major water users would be put in place during a contamination event. Assuming that the contamination occurred in Severn Creek or the Kentucky River, Lower Thomas Lake would provide 10 to 15 days of storage. For a short-term emergency, additional water could be trucked to Lower Thomas Lake for storage. For a longer-

term emergency, water could be pumped from Elmer Davis Lake to Lower Thomas Lake or, possibly, directly to the treatment plant.

21.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning period. These funding need estimates are listed below for the short-term period of 2000 to 2005 (Table 21.7a) and the longer-term period of 2006 to 2020 (Table 21.7b).

Table 21.7a: Short-Term Infrastructure Funding Needs (2000-2005) – Owen County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Owen Co.	137.4	378	1,860	--	--	--	1,300	3,160

* Taken from *Water Resource Development: A Strategic Plan* (KIA, 1999)

Table 21.7b: Long-Term Infrastructure Funding Needs (2006-2020) – Owen County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Owen Co.	181.4	950	6,400	--	4,000	--	--	10,400

* Taken from *Water Resource Development: A Strategic Plan* (KIA, 1999)

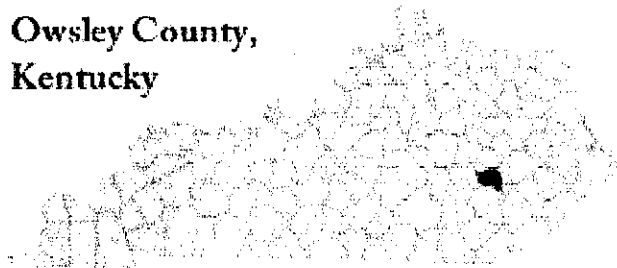
Owen County’s immediate infrastructure needs account for 378 new customers between 2000 and 2005 and requisite system upgrade costs of approximately \$3.2 million. Between 2006 and 2020, 950 additional customers are expected. A long-term system upgrade cost of approximately \$10.4 million is predicted for the installation of new distribution lines and source water-related projects.

21.5.4 Other major issues

None.

22.0 OWSLEY COUNTY

**Owsley County,
Kentucky**



Owsley County is located in southeastern Kentucky in the upper region of the Kentucky River Basin. The South Fork of the Kentucky River flows in a northerly direction through the county and serves as the water supply source for the city of Booneville. Portions of the county fall within the Eastern Kentucky Coal Field physiographic region, which is characterized by mountainous terrain, rapid surface runoff and moderate rates of groundwater drainage. Other parts of Owsley County are in the plateau area of this physiographic region, which is characterized by rolling terrain, medium to rapid surface runoff and slow to moderate groundwater drainage.

22.1 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute their finished, potable water to their customers or sell the water to other distributors. Table 22.1 lists the water suppliers for Owsley County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier’s overall water treatment plant capacity.

Table 22.1 – Summary of Owsley County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity*	Treatment Plant Capacity
Booneville Water & Sewer District	South Fork of Kentucky River	Kentucky River	355,000 gpd	864,000 gpd

*Permitted water withdrawal amount, per Kentucky Division of Water.

Booneville Water and Sewer District is the sole supplier and/or distributor of treated water in Owsley County. See Figure 22.1 in Appendix A for a map of the Owsley County water system. In addition, Booneville’s water withdrawal permit can be found in Appendix B.

22.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised population projections for the water management planning period of 2000 to 2020. These new figures for Owsley County, shown in Table 22.2, are based on results from the 2000 census data.

Table 22.2 – Owsley County Population Projections

2000 Census	2005	2010	2015	2020
4,858	4,797	4,712	4,610	4,492

* Taken from University of Louisville Kentucky State Data Center.

The Owsley County population is expected to decrease by 7.5%, or 366 people, between 2000 and 2020. In 2000, 76% of the county’s population was served by a public water supplier. It is projected that 96% of the population will be served by a public water supply by 2020, for an overall increase of 620 individuals. The associated projected water demands for the Booneville Water and Sewer District are shown in Table 22.3 and illustrated in Figure 22.2.

**Table 22.3 – Summary of Current and Projected Owsley County Water Demand:
Booneville Water & Sewer District**

	Average Daily Water Use gpd	Projected Daily Water Use, gpd			
	2000	2005	2010	2015	2020
Residential	236,712	275,000	275,000	275,000	275,000
Commercial	42,740	50,000	50,000	50,000	50,000
Wholesale	0	0	0	0	0
Subtotal - Water Sold	279,452	325,000	325,000	325,000	325,000
Water Loss	35,500	48,750	48,750	48,750	48,750
Total Average Day Demand	314,952	373,750	373,750	373,750	373,750
Peak Day Demand	472,428	560,625	560,625	560,625	560,625

(Taken from Kentucky River Area Water Management Plan, 2002)

Booneville’s average daily water use demand is expected to increase by approximately 19% between 2000 and 2020. In 2001, Booneville reported withdrawing an average daily amount of 0.307 mgd, which is less than the predicted average demand for 2000.

It is expected that all residents of Owsley County that can reasonably be served by the District will have access to potable water by 2005. Also, a small increase in commercial sales is planned for the Lone Oak Industrial Park located near Booneville.

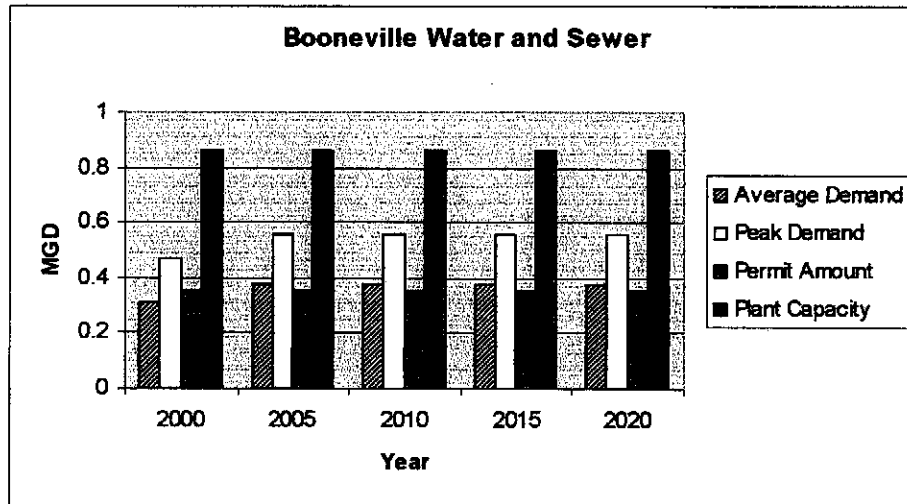


Figure 22.2 – Comparison of Booneville’s Predicted Average Demand/Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Booneville’s predicted average demand is expected to exceed its permitted water withdrawal amount by 2005, but remain within the treatment capacity through 2020. The system’s peak demand was predicted to surpass the permitted water withdrawal amount in 2000, but is expected to remain less than its treatment plant capacity through 2020.

22.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors.

Critical to the determination of supply adequacy is the relationship between the permitted withdrawal amount, and statistical measures of flow measured at the point of withdrawal such as 1) the normal flow, 2) the 7Q10 flow and 3) the 7Q20 flow. Values for each of these statistics for the South Fork Kentucky River are provided in Table 22.4.

Table 22.4 – Owsley County Supply Sources and Capacities

Supply Source	Normal Flow ¹	7Q10 ²	7Q20 ³
South Fork of Kentucky River	8.85 mgd (13.7 cfs)	0.646 mgd (1.0 cfs)	0.317 mgd (0.49 cfs)

¹Normal flow = 10% of lowest monthly mean flow; maximum amount that any single user can be permitted to withdraw

²7Q10 = lowest consecutive 7 day streamflow that is likely to occur in a ten year period; for planning purposes, represents “minimum flow”

³7Q20 = lowest consecutive 7 day streamflow that is likely to occur in a twenty year period; for planning purposes, represents “drought conditions”

The Kentucky Division of Water has established the “normal flow” as the basis for determining the maximum amount that any one permittee may be allowed to withdraw. Thus, Booneville’s current and projected demands are within this available allotment.

The Kentucky Division of Water considers an unregulated stream source inadequate if the average rate of water use is more than 50 percent of the available 7Q10 value. Booneville’s predicted 2020 average rate of water use (373,750 gpd) is 58% of the estimated 7Q10 flow at its South Fork intake. Thus, the water supply from the South Fork is not considered adequate and is given the drought susceptibility classification shown in Table 22.5.

Table 22.5 – Owsley County Water Supply Adequacy Assessment

Supply Source	Drought Susceptibility Class
Booneville Water & Sewer District/ South Fork of the Kentucky River	C

The drought susceptibility classification of “C” indicates that the system is likely to have a water shortage during drought conditions. Plans for a response to a shortage are necessary. See Appendix C for further explanation of the Kentucky Division of Water’s drought susceptibility classification.

22.4 Water Supply Alternatives

Owsley County’s water supply from the South Fork of the Kentucky River was found to be inadequate through 2020. In order to supplement its supply from the South Fork of the Kentucky River, Booneville Water and Sewer is considering the supply alternatives listed in Table 22.6.

Table 22.6 – Owsley County Water Supply Alternatives

Alternative	Comments
Construction of dam on Buck Creek	Would ensure adequacy of Owsley County’s supply and enable Booneville to become a regional water supplier.
Low water dam on South Fork of Kentucky River	Short-term alternative; may not be adequate to meet long-term demand.
Interconnection with Beattyville Water Works	Would enhance Booneville’s adequacy for meeting Owsley County demand

Preferred alternative is in bold text.

The preferred alternative is the construction of a dam on Buck Creek about 2 miles from Booneville and approximately one mile from the existing water intake on the South Fork of the Kentucky River. In addition to alleviating the supply inadequacy during drought conditions, the dam would allow the Booneville Water and Sewer District to become a supplemental source for surrounding providers. The estimated cost of the dam is \$5.7 million. If the dam proves to be economically impractical, a low water dam on the South Fork of the Kentucky River just below the current raw water intake should improve water supply during drought conditions. However, the South Fork dam may not be an adequate long-term solution.

22.5 Narrative Summary

22.5.1 General assessment of system

Booneville’s supply source from the South Fork of the Kentucky River is not considered adequate to meet projected water demands for Owsley County through 2020. Thus, Booneville is considering the construction of a dam on Buck Creek, which would create an adequate supply for its customer base. It would also enable Booneville Water and Sewer District to serve as a regional supplier to areas of Breathitt County and Buckhorn in Perry County. The proposed dam would be located about 2 miles from Booneville and about one mile from the existing water intake on the South Fork of the Kentucky River. The Water Management Plan did not contain information on the economic viability of this plan or potential funding sources.

Unless a secondary source is developed within the next five years, Booneville will likely need to revise its South Fork water withdrawal permit to accommodate projected increases in average demands. The treatment plant is expected to have adequate capacity to meet both average and peak demands through 2020.

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap

between water purchased for resale and cumulative sales to water customers. In 2000, the estimated system water loss for Booneville Water and Sewer District was 15%.

22.5.2 Water Shortage Response Plan / Contamination Response Plans

A general, combined water shortage and contamination response plan was developed for the entire Kentucky River Area Development District and can be found in Chapter 12 of its 2002 Water Management Plan.

22.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning period. These funding need estimates are listed below for the short-term period of 2000 to 2005 (Table 22.7a) and the longer-term period of 2006 to 2020 (Table 22.7b).

Table 22.7a – Short-Term Infrastructure Funding Needs (2000-2005) – Owsley County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Owsley Co.	43.0	267	1,500	--	--	--	1,000	2,500

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

Table 22.7b – Long-Term Infrastructure Funding Needs (2006-2020) – Owsley County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Owsley Co.	--	--	--	--	2,000	2,000	--	4,000

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

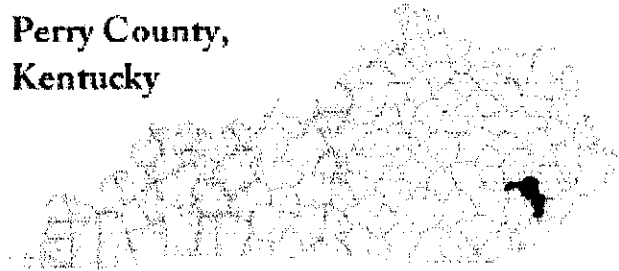
Owsley County’s immediate infrastructure needs account for 267 new customers between 2000 and 2005 and requisite system upgrade costs of \$2.5 million. Between 2006 and 2020, no additional customers are expected, but an additional long-term system upgrade cost of \$4 million is projected for source and treatment-related projects.

22.5.4 Other major issues

None.

23.0 PERRY COUNTY

Perry County,
Kentucky



Perry County is located in southeastern Kentucky in the upper region of the Kentucky River Basin. The North Fork of the Kentucky River flows in a northwesterly direction through the county and serves as Hazard’s water supply source. The watershed falls in the Eastern Kentucky Coal Field physiographic region, which is characterized by mountainous terrain, rapid surface runoff, and moderate rates of groundwater drainage.

23.1 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute their finished, potable water to their customers or sell the water to other distributors. Table 23.1 lists the water suppliers for Perry County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier’s overall water treatment plant capacity.

Table 23.1 – Summary of Perry County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity*	Treatment Plant Capacity
Hazard Water Department	North Fork Ky. River	Kentucky River	3.75 mgd	5.0 mgd

*Permitted water withdrawal amount, per Kentucky Division of Water.

In addition to supplying its own customers, the Hazard Water Department sells treated water to two other Perry County water distributors; Vicco Water Supply and the Village of Buckhorn. See Figure 23.1 in Appendix A for a map of the Perry County water system. In addition, Hazard’s water withdrawal permit can be found in Appendix B.

23.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised

population projections for the water management planning period of 2000 to 2020. These new figures for Perry County, shown in Table 23.2, are based on results from the 2000 census data.

Table 23.2 – Perry County Population Projections

2000 Census	2005	2010	2015	2020
29,390	28,870	28,105	27,111	25,930

* Taken from University of Louisville Kentucky State Data Center.

The Perry County population is expected to decrease by 12%, or 3,460 people, between 2000 and 2020. In 2000, 63% of the county’s population was served by a public water supplier. It is projected that 94% of the population will be served by a public water supply by 2020, for an increase of 5,800 individuals. The associated projected water demands for Hazard, Buckhorn and Vicco are shown in Tables 23.3a – 23.3c and illustrated in Figure 3.2. The combined demand projections (for all three distributors) shown in Table 23.3a are based on Hazard’s continued use of its existing North Fork source only.

**Table 23.3a – Summary of Current and Projected Perry County Water Demand:
Hazard Water System***

	Average Daily Water Use gpd	Projected Daily Water Use, gpd			
		2000	2005	2010	2015
Residential	1,116,000	1,350,000	1,588,000	1,600,000	1,615,000
Commercial	950,000	1,003,750	1,022,000	1,040,250	1,058,500
Wholesale	190,000	211,000	236,000	236,000	236,000
Subtotal – Water Sold	2,256,000	2,564,750	2,846,000	2,876,250	2,909,500
Water Loss	496,000	452,603	502,235	507,573	513,441
Average Day Demand (gpd)	2,752,000	3,017,353	3,348,235	3,383,823	3,422,941
Peak Daily Demand (gpd)	4,128,000	4,526,030	4,542,353	4,595,735	4,654,412

(Taken from Kentucky River Area Water Management Plan, 2002)

* Also includes demand from Village of Buckhorn and Vicco Water System.

**Table 23.3b – Summary of Current and Projected Perry County Water Demand:
Village of Buckhorn**

	Average Daily Water Use gpd	Projected Daily Water Use, gpd			
	2000	2005	2010	2015	2020
Residential	24,000	40,000	60,000	60,000	60,000
Commercial	15,000	15,000	15,000	15,000	15,000
Wholesale	0	0	0	0	0
Subtotal – Water Sold	39,000	55,000	75,000	75,000	75,000
Water Loss	3,500	4,000	5,000	5,000	5,000
Average Day Demand	42,500	59,000	80,000	80,000	80,000

(Taken from Kentucky River Area Water Management Plan, 2002)

**Table 23.3c – Summary of Current and Projected Perry County Water Demand:
Vicco Water System**

	Average Daily Water Use gpd	Projected Daily Water Use, gpd			
	2000	2005	2010	2015	2020
Residential	93,699	113,325	132,318	132,318	132,318
Wholesale	0	0	0	0	0
Subtotal – Water Sold	93,699	113,325	132,318	132,318	132,318
Water Loss	55,029	66,556	77,710	77,710	77,710
Average Day Demand	148,728	179,880	210,028	210,028	210,028

(Taken from Kentucky River Area Water Management Plan, 2002)

The Hazard Water System is expected to continue to meet the entire demand of treated water for Perry County and will continue to sell treated water to Buckhorn and Vicco. Hazard’s average daily water use demand is expected to increase by approximately 24% between 2000 and 2020. In 2001, Hazard reported withdrawing an average daily amount of 3.577 mgd, which is approximately equivalent to the predicted average demand for 2015.

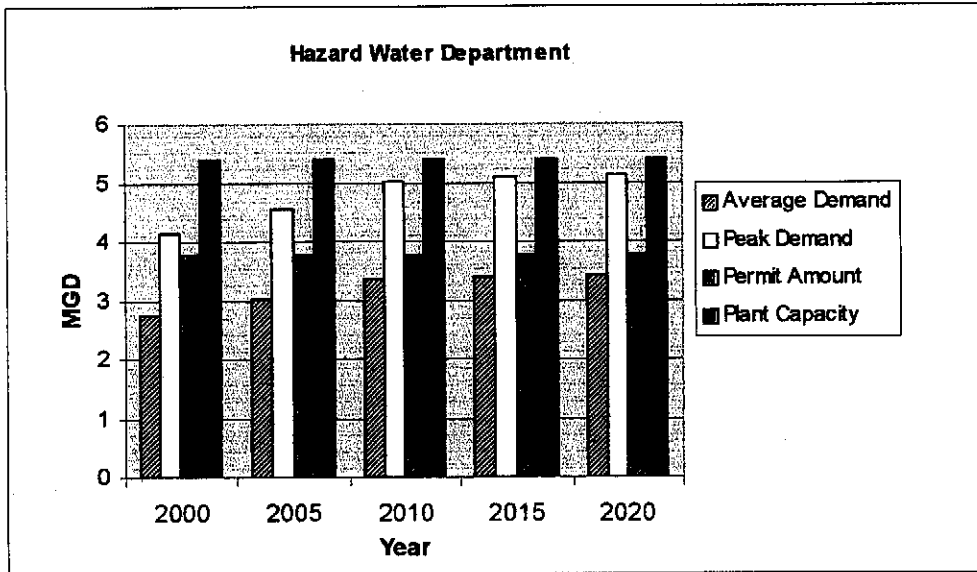


Figure 23.2 – Comparison of Hazard’s Predicted Average Demand/Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Hazard’s predicted average demand is expected to remain less than its permitted water withdrawal amount and its treatment plant capacity through 2020. The system’s peak demand was predicted to surpass the current withdrawal permit amount in 2000, but remain less than the combined plant capacities through 2020.

23.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors.

Critical to the determination of supply adequacy is the relationship between the permitted withdrawal amount, and statistical measures of flow measured at the point of withdrawal such as 1) the normal flow, 2) the 7Q10 flow and 3) the 7Q20 flow. Values for each of these statistics for the North Fork Kentucky River are provided in Table 23.4.

Table 23.4– Perry County Supply Sources and Capacities

Supply Source	Normal Flow ¹	7Q10 ²	7Q20 ³
North Fork Ky. River	10.21 mgd (15.8 cfs)	3.23 mgd (5.0 cfs)	3.23 mgd (5.0 cfs)

¹Normal flow = 10% of lowest monthly mean flow; maximum amount that any single user can be permitted to withdraw

²7Q10 = lowest consecutive 7 day streamflow that is likely to occur in a ten year period; for planning purposes, represents “minimum flow”

³7Q20 = lowest consecutive 7 day streamflow that is likely to occur in a twenty year period; for planning purposes, represents “drought conditions”

The Kentucky Division of Water has established the “normal flow” as the basis for determining the maximum amount that any one permittee may be allowed to withdraw. Thus, Jackson’s current and projected demands are within this available allotment.

The listed 7Q10 and 7Q20 values are equivalent to the minimum flow release from Carr Fork Dam. Releases from the dam flow into Carr Fork, which is a tributary of the North Fork Kentucky River upstream of Hazard. The Kentucky Division of Water considers a regulated stream source inadequate if average withdrawal rates are greater than 65 percent of the 7Q10. Hazard Water Department’s predicted 2020 average rate of water use (3.618 mgd) is greater than the entire 7Q10 flow value for the North Fork at Hazard’s intake (3.23 mgd). Thus, the North Fork is not considered adequate as Hazard’s supply source and is given the drought susceptibility classification shown in Table 23.5.

Table 23.5 – Perry County Water Supply Adequacy Assessment

Water Supplier / Supply Source	Drought Susceptibility Class
Hazard Water System / North Fork Kentucky River	C

The drought susceptibility classification of “C” indicates that the system is likely to have a water shortage during drought conditions. Plans for a response to a shortage are necessary. See Appendix C for further explanation of the Kentucky Division of Water’s drought susceptibility classification system.

23.4 Water Supply Alternatives

Perry County’s water supply from the North Fork of the Kentucky River was found to be inadequate through 2020. In order to supplement its supply from the North Fork, the Hazard Water System is considering the supply alternatives listed in Table 23.6.

Table 23.6 – Perry County Water Supply Alternatives

Alternative	Comments
Additional treatment plant in southern Perry County, treating water from abandoned mines	Likely to provide adequate supply through 2020 in combination with existing plant. Expected to supply 400,000 gpd. Project partially funded.
Additional water treatment plant at Carr Creek Lake	Carr Creek Lake is located in Knott county, close to the eastern Perry county border. This option would reduce demand from City of Vicco, who would purchase water from the Carr Creek Water Commission. However, it would also require the construction of a new treatment plant in southern Perry county.
Additional treatment plant at Buckhorn Lake	Would either provide secondary source for Hazard, or relieve demand from Vicco and the Village of Buckhorn.
Excess capacity from proposed power plant in Knott County	To be located near Perry County line. Private venture, county water suppliers have no control over its completion.

Preferred alternative is in bold text.

About 2000 households in southern Perry do not have access to potable water, and the Hazard Water System will have difficulty meeting that demand with its existing supply. The possibility of creating a new water district in southern Perry County was discussed, but it was determined that the Hazard Water System could build, operate and maintain a new plant more economically. The new 400,000 gpd plant is proposed to be built in southern Perry County in order to treat water from abandoned mines.

Other alternatives are new regional plants that would treat water from either Buckhorn Lake or Carr Creek Lake. Even if Hazard were not directly supplied by one of these options, it would indirectly benefit due to a reduced wholesale demand from Vicco and the Village of Buckhorn. Additionally, the interconnections with Vicco and Buckhorn would enable either of these distributors to provide Hazard with a reliable secondary source of potable water.

23.5 Narrative Summary

23.5.1 General assessment of system

A proposed 400,000 gpd water treatment plant in southern Perry County, owned by the Hazard Water System, would treat water from abandoned mines to serve residents of this area, as well as serve as an alternative supplemental source for the rest of the county. This project is already partially funded and could potentially be in operation early in the planning period. The combination of the North Fork and abandoned mine supply sources is predicted to be adequate to meet Perry County water demands through 2020.

In 2001, Hazard reported withdrawing an average daily amount of 3.577 mgd, which is approximately equivalent to the predicted average demand for 2015. Demand estimates for the planning period may therefore need to be revised based on actual, observed demand rates.

Hazard’s average water demand is predicted to remain less than its current water withdrawal permit and treatment plant capacity through 2020. Obviously, the adequacy of the withdrawal permits and plant capacities should continue to remain acceptable if a second plant is constructed at the proposed abandoned mine source. Further, the addition of a withdrawal permit for the abandoned mine source would likely prevent any water withdrawal permitting exceedances of peak demands.

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap between water purchased for resale and cumulative sales to water customers. Year 2000 unaccounted-for loss estimates for systems in Perry County resulted in the following:

Hazard Water Department	19%
Vicco Water Supply	38%

According to the Water Management Plan, it is expected that Hazard and Vicco’s system leakage rates will be reduced to at least 15% by 2005. This will improve the efficiency and adequacy of Hazard’s water supply by reducing losses of treated water throughout the system.

23.5.2 Water Shortage Response Plan / Contamination Response Plans

A general, combined water shortage and contamination response plan was developed for the entire Kentucky River Area Development District and can be found in Chapter 12 of its 2002 Water Management Plan.

23.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning period. These funding need estimates are listed below for the short-term period of 2000 to 2005 (Table 23.7a) and the longer-term period of 2006 to 2020 (Table 23.7b).

Table 23.7a – Short-Term Infrastructure Funding Needs (2000-2005) – Perry County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Perry Co.	138.5	2,209	7,400	--	--	4,000	300	11,700

* Taken from *Water Resource Development: A Strategic Plan* (KIA, 1999)

Table 23.7b – Long-Term Infrastructure Funding Needs (2006-2020) – Perry County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Perry Co.	77.1	1,220	4,150	--	3,000	--	--	7,150

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

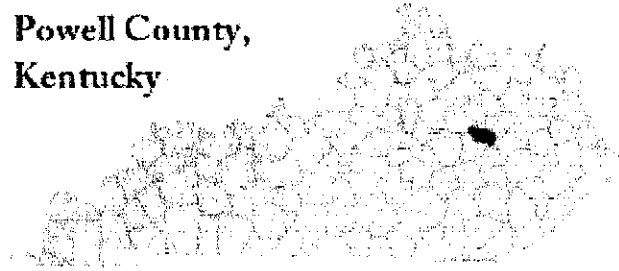
Perry County’s immediate infrastructure needs account for 2,209 new customers between 2000 and 2005 and include new water distribution lines, treatment capacity and tanks and pumps, estimated to cost \$11.7 million. Between 2006 and 2020, 1,220 additional customers are expected, with additional new distribution lines and raw water source improvements that are expected to cost approximately \$7.15 million.

23.5.4 Other major issues

The City of Vicco is a member of the Carr Creek Water Commission. Other members include Hindman Municipal Water Works, Knott County Water and Sewer District, Southern Floyd Water District and Letcher County Water and Sewer District. Their goal is to secure a water supply allocation from Carr Creek Lake and construct a regional water treatment plant.

24.0 POWELL COUNTY

**Powell County,
Kentucky**



Powell County is located in east-central Kentucky in the middle region of the Kentucky River Basin. A main tributary of the Kentucky River, the Red River, flows in a westerly direction through the county and serves as a water supply source for Powell County’s Beech Fork Water Commission. Eastern portions of the county fall within the escarpment and plateau areas of the Eastern Kentucky Coal Field physiographic region, characterized by rolling to hilly terrain, medium to very rapid surface runoff, and slow to medium groundwater drainage. The western portion of Powell County is in the Knobs physiographic region, which is characterized by hilly terrain, very rapid surface runoff, and very slow groundwater drainage.

24.1 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute their finished, potable water to their customers or sell the water to other distributors. Table 24.1 lists the water suppliers for Powell County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier’s overall water treatment plant capacity.

Table 24.1 – Summary of Powell County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity*	Treatment Plant Capacity
Beech Fork Water Commission	Beech Fork Reservoir	Kentucky River	1.5 mgd	1.944 mgd
	Red River	Kentucky River	0-4 mgd, dependent on flow rates**	
Natural Bridge State Park	Mill Creek Lake	Kentucky River	0.03 mgd (Jan-March, Nov-Dec) 0.05 mgd (Sept-Oct) 0.06 mgd (April-June) 0.07 mgd (July-Aug)	0.144 mgd

*Permitted water withdrawal amount, per Kentucky Division of Water.

**Flow at Clay City >16.0 cfs, 4.0 mgd allowable withdrawal; Flow = 14 – 16 cfs, 3.0 mgd allowable withdrawal; Flow = 12 – 13.00, 2.0 mgd allowable withdrawal; Flow = 10 – 11.99 cfs, 1.0 mgd allowable withdrawal; Flow < 10 mgd, 0.0 mgd allowable withdrawal

The Beech Fork Water Commission does not distribute water. It sells water to three distributors for Powell County; the City of Stanton, City of Clay City and the Powell’s Valley Water District. The Natural Bridge State Park (in far eastern Powell County) is self-contained. See Figure 24.1 in Appendix A for a map of the Powell County water systems. In addition, water withdrawal permits for Beech Fork Water Commission and Natural Bridge State Park can be found in Appendix B.

Beech Fork Reservoir is an impoundment of Beech Fork, a tributary of the Red River. The reservoir is used as Beech Fork’s primary raw water source, and water is pumped from the Red River to replenish the reservoir’s supply when river flow is adequate. Although it has been proposed, there is not a direct raw water line from the Red River to the treatment plant.

Natural Bridge State Park has decided to discontinue use of its Mill Creek Lake treatment plant and instead purchase water from the Powell’s Valley Water District. This arrangement is expected to begin in 2003.

24.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised population projections for the water management planning period of 2000 to 2020. These new figures for Powell County are based on results from the 2000 census data.

Table 24.2 – Powell County Population Projections

2000 Census	2005	2010	2015	2020
13,237	14,189	15,063	15,866	16,590

* Taken from University of Louisville Kentucky State Data Center.

Between 2000 and 2020, the Powell County population is expected to increase by approximately 25%, or 3,353 people. In 2000, 98.1% of the county population was served by a public water supplier. It is projected that 99.9% of the population will be served by a public water supply by 2020, for an overall increase of 3,353 individuals. The associated projected water demands for the Beech Fork Water Commission are shown in Table 24.3a and illustrated in Figure 24.2. The projected demands for Natural Bridge State Park are shown in Table 24.3b.

**Table 24.3a – Summary of Current and Projected Powell County Water Demand:
Beech Fork Water Commission***

	Actual Annual Water Use million gals	Projected Annual Water Use million gals			
		2000	2005	2010	2015
Residential	244.47	262.19	279.92	297.64	315.37
Commercial/Industrial	24.86	26.67	28.47	30.27	32.08
Public/Unaccounted For	141.08	151.30	161.53	171.76	181.99
Other	0	0	0	0	0
Total	410.41	440.16	469.92	499.67	529.43
Average Daily Production (mgd)	1.124	1.206	1.287	1.369	1.450
Peak Day (mgd)	1.447	1.708	1.823	1.938	2.054

(Taken from Bluegrass Area Water Management Plan)

*Includes demand from Powell’s Valley Water District, Stanton and Clay City.

Beech Fork’s average daily water use demand is expected to increase by approximately 29% between 2000 and 2020. In 2001, the Beech Fork Water Commission reported withdrawing an average daily amount of 0.903 mgd from Beech Fork Reservoir, which is less than predictions for 2000.

Beech Fork’s projected peak demand for 2020 of 2.054 mgd is greater than its current permitted water withdrawal amount of 1.5 mgd from its reservoir. It is also greater than Beech Fork’s treatment plant capacity of 1.944 mgd.

Demand management through water conservation measures is predicted to have the potential to reduce Beech Fork’s annual average demand by approximately 4.8% and its maximum day demand by approximately 5.4%.

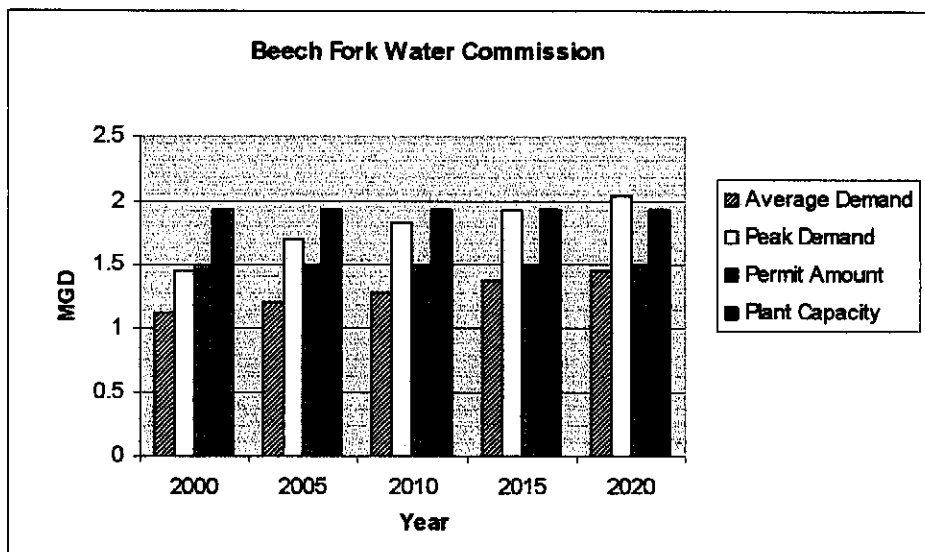
Table 24.3b – Summary of Current and Projected Powell County Water Demand: Natural Bridge State Resort Park

	Actual Annual Water Use million gals.	Projected Annual Water Use million gals.			
	2000	2005	2010	2015	2020
Residential	0.00	0.00	0.00	0.00	0.00
Commercial/Industrial	12.55	12.55	12.55	12.55	12.55
Public/Unaccounted For	0.00	0.00	0.00	0.00	0.00
Other		0.00	0.00	0.00	0.00
Total	12.55	12.55	12.55	12.55	12.55
Average Daily Production (mgd)	0.034	0.034	0.034	0.034	0.034
Peak Day (mgd)	0.075	0.082	0.082	0.082	0.082

(Taken from Bluegrass Area Water Management Plan.)

The average daily water use demand for Natural Bridge State Park is not expected to change between 2000 and 2020. In 2001, the State Park reported withdrawing an average daily amount of .034 mgd from Mill Creek Lake, which is equivalent to predictions for 2000 through 2020.

The park’s projected peak demand for 2020 of 0.082 mgd is just greater than its maximum permitted water withdrawal amounts of 0.07 mgd, but it is considerably less than its treatment plant capacity of 0.144 mgd.



Used maximum withdrawal permit amount of 1.5 mgd from the Beech Fork Reservoir source.

Figure 24.2 – Comparison of Beech Fork’s Predicted Average Demand/Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Beech Fork’s predicted average demand is not expected to exceed its permitted water withdrawal amount or treatment plant capacity through 2020. The system’s peak demand is predicted to surpass the permitted water withdrawal amount in 2005 and exceed the plant capacity by 2020.

24.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors.

Critical to the determination of supply adequacy is the relationship between the permitted withdrawal amount and the estimated reservoir capacity. The estimated full capacity of Beech Fork Reservoir and Mill Creek Lake are shown in Table 24.4. Also critical to determining supply adequacy are statistical measures of flow measured at the point of withdrawal such as 1) the normal flow, 2) the 7Q10 flow and 3) the 7Q20 flow. Values for each of these statistics for Red River are also provided in Table 24.4.

Table 24.4 – Powell County Supply Sources and Capacities

Supply Source	Normal Flow ¹	7Q10 ²	7Q20 ³	Full Reservoir
Beech Fork Reservoir	N/A	N/A	N/A	364.3 million gals.
Red River	5.16 mgd	2.3 mgd	1.4 mgd	N/A
Mill Creek Lake	N/A	N/A	N/A	286.6 million gals.

¹Normal flow = 10% of lowest monthly mean flow; maximum amount that any single user can be permitted to withdraw

²7Q10 = lowest consecutive 7 day streamflow that is likely to occur in a ten year period; for planning purposes, represents “minimum flow”

³7Q20 = lowest consecutive 7 day streamflow that is likely to occur in a twenty year period; for planning purposes, represents “drought conditions”

The Kentucky Division of Water has established the “normal flow” as the basis for determining the maximum amount that any one permittee may be allowed to withdraw. Thus, Beech Fork’s current and projected demands are within this available allotment from the Red River.

The Kentucky Division of Water considers an unregulated stream source inadequate if the average rate of water use is greater than 50 percent of the stream’s 7Q10 flow. Beech Fork’s predicted 2020 average rate of water use, 1.45 mgd, is 63% of the 7Q10 for the Red River. Therefore, this source is not considered adequate and receives a C drought vulnerability rating.

Assuming the 7Q10 and 7Q20 inflows to Beech Fork Reservoir are both 0 mgd and a drainage area of less than five square miles (1.9 square miles), the DOW’s classification criteria require at least 201 days of storage at average demand rates to be considered adequate (“B” classification). An “A” classification is not possible for reservoirs with a drainage area of less than five square miles and a 7Q10 inflow of zero. Table 24.5 shows estimates of Beech Fork’s 201-day demand through 2020.

Table 24.5 – 200-Day Supply Demand – Beech Fork Water Commission

Year	Projected Demand (MGD)	201-Day Average Demand
2000	1.124 mgd	225.9 MG
2005	1.206 mgd	242.4 MG
2010	1.287 mgd	258.7 MG
2015	1.369 mgd	275.2 MG
2020	1.450 mgd	291.4 MG

The estimated full capacity of Beech Fork Reservoir (364.3 million gallons) is greater than the 201-day average demand through 2020, resulting in a “B” classification. Because the Beech Fork system relies on both a reservoir and a stream source, the drought susceptibilities were combined to result in an overall B classification, as shown in Table 24.6.

Assuming the 7Q10 and 7Q20 inflows to Mill Creek Lake are both 0 mgd and a drainage area of greater than ten square miles (16 square miles), the DOW’s classification criteria require at least 201 days of storage at average demand rates to be considered adequate. The projected demand at Natural Bridge State Park is expected to remain constant at 0.034 mgd between 2000 and 2020. The estimated full capacity of Mill Creek Lake (286.6 million gallons) is greater than the 201-day average demand (6.834 mgd) through 2020, resulting in an “A” classification, shown in Table 24.6.

It should be noted that these source assessments assume that the full volume of the reservoirs will be available for withdrawals during a drought. This assumption is problematic because the reservoirs are unlikely to be at full pool during a drought situation. Additionally, a portion of the volume will not be accessible for drinking water treatment due to the height of the intake and the quality of water at lower levels within the reservoir.

Table 24.6 – Powell County Water Supply Adequacy Assessment

Water Supplier / Supply Source	Drought Susceptibility Class
Beech Fork Water Commission/ Beech Fork Reservoir & Red River	B
Natural Bridge SRP	A

The drought susceptibility classification of “A” indicates that the system is unlikely to experience a water shortage during drought conditions. A drought susceptibility classification of “B” indicates that the system should be examined for susceptibility to water shortage during drought. Plans need to be made for response to possible shortage. See Appendix C for further explanation of the drought susceptibility classification.

Although its Mill Creek Lake source was found to be adequate, Natural Bridge State Resort Park plans to discontinue use of Mill Creek Lake as a water supply, and instead connect to the Powell’s Valley Water District in 2003.

24.4 Water Supply Alternatives

The Beech Fork Water Commission’s water supplies from the Beech Fork Reservoir and the Red River were found to be inadequate through 2020. Therefore, Beech Fork is considering the water supply alternatives listed in Table 24.7.

Table 24.7 – Powell County Water Supply Alternatives

Beech Fork Water Commission

Alternative	Comments
Raw water line directly from Red River to water treatment plant	Would relieve concerns about water supply, as well as raw water quality.
Connection with Irvine Municipal (Estill County)	Irvine withdraws from Pool 11 of the Kentucky River.
Interservice connections between Powell’s Valley Water District and Natural Bridge State Park and/or Estill County Water District	Would alleviate demand on Beech Fork’s supply.
Enhanced water conservation	Could reduce any increases in demand, which are expected to be minimal due to little expected growth in population and the existence of water service to most of the retail service areas.

24.5 Narrative Summary

24.5.1 General assessment of system

Water supply options in Powell County are somewhat limited. Flows in the Red River are known to drop to extremely low levels during prolonged dry periods. The Beech Fork Reservoir was originally designed to provide more than 1.8 mgd during the most severe drought on record for the area (which occurred in 1954). Given a projected 2020 average daily demand of 1.45 mgd, this supply rate should be adequate. However, in 1996, a drop in the reservoir level was observed when conditions were not observed as being dry. Due to concern raised by this event, it has been suggested that a raw water line be constructed from the Red River directly to the Beech Fork water treatment plant. In addition to addressing water quantity concerns, this direct supply source would provide another option when water quality in the Beech Fork Reservoir is suspect.

Interconnections with other suppliers in the region are also being considered to improve reliability of Beech Fork’s water supply. A supplemental supply from Irvine Municipal Utilities’ more dependable water source from the Kentucky River would alleviate a potential shortage for the Beech Fork Water Commission. And interservice connection has also been proposed linking the Powell’s Valley Water District with the Estill County Water District. The completion of this connection would alleviate demand on the Beech Fork Water Commission.

Since there are few non-served areas within the retail water service area of the Beech Fork Water Commission, the demand for additional water is predicted to come primarily from net growth in population. A net increase in population of only about 3,500 is estimated by 2020. Enhanced water conservation should be promoted during periods of peak demand.

Beech Fork’s treatment plant capacity and water withdrawal permits seem to be adequate to meet average demands throughout the planning period. The predicted peak demand is not expected to exceed the plant capacity until around 2020, but will begin to surpass the maximum withdrawal permit amount in 2005.

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap between water purchased for resale and cumulative sales to water customers. Year 2000 unaccounted-for loss estimates for systems in Powell County resulted in the following:

Beech Fork Water Commission	no estimate
Clay City	8.5%
Powell’s Valley Water District	11.3%

24.5.2 Water shortage response plans / Contamination response plans

Water Shortage Response Plan

The Beech Fork Water Commission has not adopted a water shortage response plan of its own, but would rely upon the Kentucky’s model Water Shortage Response Plan in the event of an inadequate water supply during times of drought. The three water-purchasing utilities (Stanton, Clay City, and the Powell’s Valley Water District) would follow any water shortage response plan activated by their water supplying utility, the Beech Fork Water Commission.

Natural Bridge State Resort Park also does not have its own water shortage response plan. The park’s response to any water outage that would continue longer than its 153,500 gallons of storage would allow would likely be to close the resort for the duration of the water shortage.

Contamination Response Plan

The Powell County Disaster and Emergency Management Agency has a State-approved Emergency Operations Plan that addresses the ways that contaminant releases will be handled. Among the topics included in this plan are: identification of the appropriate response agencies, methods of protecting citizens from the contaminants, mitigation measures and hazard alleviation.

The ability of the four Powell County water utilities to withstand short interruptions of water supply was evaluated. Accordingly, these four water utilities—all linked by a common water source—have a combined potable water storage capacity of 3.05 million gallons. Each of the systems individually and collectively has a potable water storage capacity that significantly exceeds the state standard of 24 hours of stored potable water at an average rate of usage. Therefore, it would appear that, individually and collectively, each could withstand a water supply interruption of 24 hours or less.

24.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning period. These funding need estimates are listed below for the short-term period of 2000 to 2005 (Table 24.8a) and the longer-term period of 2006 to 2020 (Table 24.8b).

Table 24.8a: Short-Term Infrastructure Funding Needs (2000-2005) – Powell County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Powell Co.	6.0	28	343	1,146	700	700	180	3,069

* Taken from *Water Resource Development: A Strategic Plan* (KIA, 1999)

Table 24.8b: Long-Term Infrastructure Funding Needs (2006-2020) – Powell County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Powell Co.	23.5	54	1,042	457	--	--	250	1,749

* Taken from *Water Resource Development: A Strategic Plan* (KIA, 1999)

Powell County’s immediate infrastructure needs account for 28 new customers between 2000 and 2005 and requisite system upgrade costs of approximately \$3.1 million. Between 2006 and 2020, 54 additional customers are expected, with new distribution lines, line rehabilitation and tank and pump upgrades necessitating an additional long-term system upgrade cost of approximately \$1.75 million.

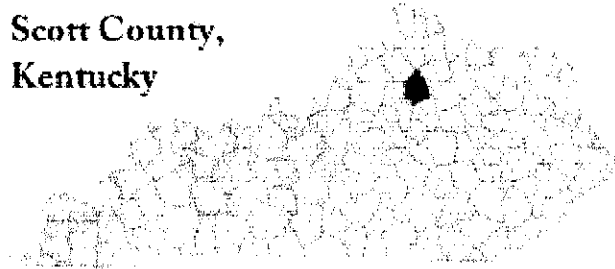
24.5.4 Other major issues

Drinking Water Quality

Trihalomethane and turbidity exceedances have frequently been detected in Beech Fork’s drinking water supply. In order to correct these problems, modifications have been suggested for the treatment plant; including the addition of tube settlers and a new clear well.

25.0 SCOTT COUNTY

**Scott County,
Kentucky**



Scott County is located in north central Kentucky in the lower region of the Kentucky River Basin. A main tributary of the Kentucky River, North Elkhorn Creek, flows in a westerly direction through southern Scott County and formerly served as an alternate supply source for the city of Georgetown. The watershed is within the Inner Bluegrass physiographic region, characterized by an undulating terrain and moderate rates of surface runoff and groundwater drainage. Most of the watershed lies above thick layers of easily dissolved limestone that form carbonate aquifers. Groundwater flows through channels in the limestone, so caves and springs are common in regions with this geology. One of these springs, Royal Spring Creek, currently serves as Georgetown’s main water supply source.

25.1 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute their finished, potable water to their customers or sell the water to other distributors. Table 25.1 lists the water suppliers for Scott County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier’s overall water treatment plant capacity.

Table 25.1 – Summary of Scott County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity*	Treatment Plant Capacity
Georgetown Municipal Water and Sewer	Royal Spring Creek	Kentucky River	4.0 mgd	4.0 mgd

*Permitted water withdrawal amount, per Kentucky Division of Water.

In addition to Georgetown Municipal Water and Sewer, several other distributors provide treated water to Scott County residents. Stamping Ground Municipal Water distributes Frankfort-treated water purchased through the Elkhorn Water District. The Kentucky-American Water Company serves a large portion of eastern Scott County and areas north of Georgetown. A small number of Scott County customers are served by the Corinth Water District and the Harrison County Water Association. See Figure 25.1 in Appendix A for a map of the Scott County water systems. In addition, Georgetown’s water withdrawal permits can be found in Appendix B.

25.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised population projections for the water management planning period of 2000 to 2020. These new figures for Scott County, shown in Table 25.2, are based on results from the 2000 census data.

Table 25.2 – Scott County Population Projections

2000 Census	2005	2010	2015	2020
33,061	38,696	44,851	51,981	60,146

* Taken from University of Louisville Kentucky State Data Center.

Between 2000 and 2020, the Scott County population is expected to increase by approximately 82%, or 27,085 people. In 2000, 99.9% of the county population was served by a public water supplier. It is projected that 100% of the population will be served by a public water supply by 2020, for an overall increase of 27,119 individuals. The associated projected water demands for Georgetown Municipal Water and Sewer are shown in Table 25.3 and illustrated in Figure 25.2.

**Table 25.3 – Summary of Current and Projected Scott County Water Demand:
Georgetown Municipal Water and Sewer Service**

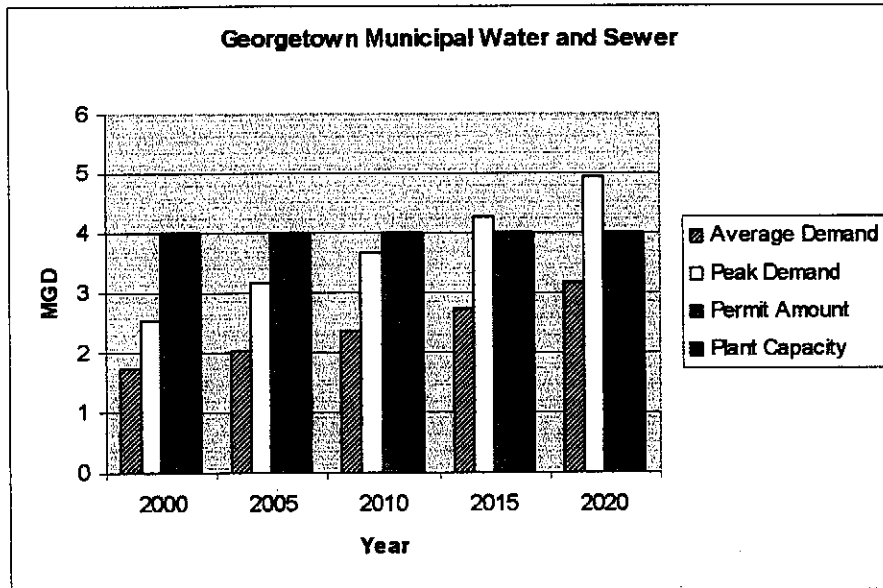
	Actual Annual Water Use (million gals)	Projected Annual Water Use (million gals)			
		2000	2005	2010	2015
Residential	301.77	353.21	409.37	474.48	548.99
Commercial/Institutional	116.20	136.00	157.63	182.69	211.39
Industrial	40.49	47.39	54.93	63.67	73.66
Public/Unaccounted For	174.09	203.76	236.17	273.72	316.71
Other	0	0	0	0	0
Total Production	632.54	740.37	858.10	994.55	1,150.75
Avg. Daily Production (mgd)	1.733	2.028	2.351	2.725	3.153
Peak Day (mgd)	2.531	3.170	3.675	4.259	4.928

(Table taken from the Bluegrass Area Water Management Plan)

Georgetown’s average daily water use demand is expected to increase by approximately 82% between 2000 and 2020. In 2001, Georgetown reported withdrawing an average daily amount of 2.263 mgd from Royal Springs, which is slightly greater than demand predictions for 2005 but less than the current withdrawal permit amount of 4.0 mgd.

Georgetown’s projected peak demand for 2020 of 4.928 mgd is greater than its current permitted water withdrawal amount of 4.0 mgd, as well as its treatment plant capacity of 4.0 mgd.

Demand management through water conservation measures is predicted to have the potential to reduce Georgetown’s annual average demand by approximately 5.4% and its maximum day demand by approximately 6%.



* Permit amount is for Royal Springs source only.

Figure 25.2 – Comparison of Georgetown’s Predicted Average Demand/Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Georgetown’s predicted average demand is not expected to exceed its permitted water withdrawal amount or treatment capacity by 2020. The system’s peak demand is predicted to surpass both the permit amount and treatment capacity in 2015.

25.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors.

Critical to the determination of supply adequacy is the relationship between the permitted withdrawal amount, and statistical measures of flow measured at the point of withdrawal such as 1) the normal flow, 2) the 7Q10 flow and 3) the 7Q20 flow. Values for each of these statistics for Royal Spring Creek are provided in Table 25.4.

Table 25.4 – Scott County Supply Sources and Capacities

Supply Source	Normal Flow ¹	7Q10 ²	7Q20 ³
Royal Spring Creek	0.31 mgd	0.16 mgd	0 mgd

¹Normal flow = 10% of lowest monthly mean flow; maximum amount that any single user can be permitted to withdraw

²7Q10 = lowest consecutive 7 day streamflow that is likely to occur in a ten year period; for planning purposes, represents “minimum flow”

³7Q20 = lowest consecutive 7 day streamflow that is likely to occur in a twenty year period; for planning purposes, represents “drought conditions”

The Kentucky Division of Water has established the “normal flow” as the basis for determining the maximum amount that any one permittee may be allowed to withdraw. Georgetown’s projected 2020 average daily demand of 3.153 mgd and peak daily demand of 4.729 mgd are both much greater than this allotment from Royal Spring Creek. Furthermore, the estimated streamflow during 7Q20 conditions is 0 mgd, meaning that zero flow would be available for water withdrawals during this estimate of “drought conditions.”

The Kentucky Division of Water considers an unregulated stream source inadequate if the average rate of water use is more than 50 percent of the stream’s 7Q10. Georgetown’s predicted 2020 average rate of water use is more than ten times the available water in Royal Springs during 7Q10 conditions. Thus, Georgetown’s source is therefore considered inadequate and is given the drought susceptibility classification shown in Table 25.5.

Table 25.5 – Scott County Water Supply Adequacy Assessment

Water Supplier / Supply Source	Drought Susceptibility Class
Georgetown Water and Sewer/ Royal Spring Creek	C

The drought susceptibility classification of “C” indicates that the system is likely to experience a water shortage during drought conditions. Plans for response to shortage are necessary. See Appendix C for further explanation of the Kentucky Division of Water’s drought susceptibility classification system.

25.4 Water Supply Alternatives

Georgetown’s water supply from Royal Spring was found to be inadequate through 2020. The assurance of Georgetown’s water supply adequacy is particularly important given Scott County’s 88 percent growth rate predicted between 2000 and 2020. Supply alternatives listed in Table 25.6 are already being utilized or are being considered.

Table 25.6 – Scott County Water Supply Alternatives

Georgetown Water and Sewer

Alternative	Comments
Connections with Frankfort and Kentucky-American Water Company	Already purchases 15% from Frankfort and 5% from Kentucky-American (which is also a drought vulnerable system)
Construction of new reservoir on Lytles Fork of Eagle Creek	Expect to begin construction on new reservoir in near future.
Regional solution determined by Bluegrass Water Supply Consortium	Selection of supply alternative expected by summer of 2003.

Georgetown has already exercised two options to enhance its potable water supply. It has made potable water supply connections to both Frankfort and to the Kentucky-American Water Company. Both Frankfort and KAWC are daily supplemental suppliers to Georgetown. Further, Georgetown is pursuing the construction of a new reservoir in northwestern Scott County in the near future. A raw water pipeline would connect the reservoir to the municipal water treatment plant in the city center. Further, Georgetown is a participant in the Bluegrass Water Supply Consortium, which is working to develop a regional water supply solution for Central Kentucky (see Section 25.5.4 below). The Consortium expects to determine an alternative supply source by the summer of 2003 and begin construction on the project and/or the distribution grid within 3-5 years.

25.5 Narrative Summary

25.5.1 General assessment of system

Although Georgetown’s water withdrawal permit amount and water treatment plant capacity amounts are adequate to meet predicted average demands through 2020 and predicted peak demands until 2015, its supply source is not considered adequate. Under normal or drought conditions, the available flow in Royal Springs is less than Georgetown’s current average demand (2.263 mgd in 2001).

Georgetown’s connections to the Frankfort and Kentucky-American water systems have enabled current demand to be met. However, during a low flow event in Royal Springs, this primary source would not be adequate. For this reason, Georgetown is pursuing the construction of a new reservoir in northwestern Scott County, as well as participating in the Bluegrass Water Supply Consortium. Either the construction of the reservoir or a connection to the Consortium’s supply alternative would ensure the adequacy of Georgetown’s water supply through 2020.

The observed average demand in 2001 exceeded the predicted average demand for 2005. Thus, it seems that demand predictions may need to be revised to reflect actual observed demands from Georgetown Municipal.

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap between water purchased for resale and cumulative sales to water customers. Year 2000 unaccounted-for loss estimates for systems in Scott County resulted in the following:

Georgetown Municipal Water Service	14%
Stamping Ground	not estimated

By reducing system leakage, Georgetown could further enhance its water supply adequacy to meet predicted demands.

25.5.2 Water shortage response plans / Contamination response plans

Water Shortage Response Plan:

Georgetown believes a water shortage response plan is not needed because of their redundant sources of water supply. The Kentucky Water Shortage Response Plan would serve as a model for action, if necessary.

Contamination Response Plan

The Scott County Disaster and Emergency Management office has an Emergency Response Plan that discusses how the county will deal with a possible threat to the county’s water supply. In addition to the Emergency Response Plan, Scott County also has an Emergency Operation Plan for Water Management. Scott County’s state-approved Emergency Response Plan addresses the ways that accidental contaminant releases will be handled. Among the topics included in this plan are: identification of the appropriate response agencies, methods of protecting citizens from the contaminants, mitigation measures and hazard alleviation.

Since Georgetown already purchases water on a daily basis from the Frankfort Plant Board and the Kentucky-American Water Company, it has acceptable plans for a short-term alternative water source. Stamping Ground is seeking to interconnect to the Georgetown Municipal Water System for redundancy of its treated water supply, which it currently purchases through the Elkhorn Water District.

25.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning period. These funding need estimates are listed below for the short-term period of 2000 to 2005 (Table 25.7a) and the longer-term period of 2006 to 2020 (Table 25.7b).

Table 25.7a: Short-Term Infrastructure Funding Needs (2000-2005) – Scott County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Scott Co.	14.0	218	730	1,093	--	1,000	--	2,823

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

Table 25.7b: Long-Term Infrastructure Funding Needs (2006-2020) – Scott County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Scott Co.	13.0	51	810	694	--	--	1,500	3,004

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

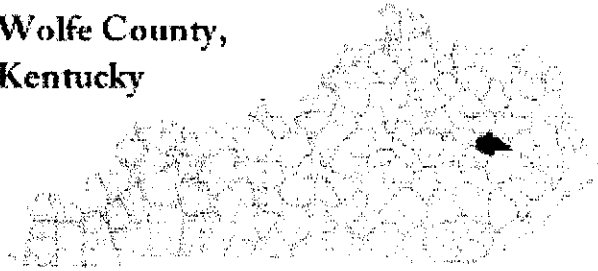
Scott County’s immediate infrastructure needs account for 218 new customers between 2000 and 2005 and requisite system upgrade costs of approximately \$2.8 million. Between 2006 and 2020, 51 additional customers are expected. New distribution lines, line rehabilitation and upgrades to tanks and pumps are expected to necessitate an additional long-term system upgrade cost of approximately \$3 million.

25.5.4 Other major issues

Georgetown is a participant in the Bluegrass Water Supply Consortium, an alliance of water utilities and government agencies that are working to address the potable water needs of central Kentucky. The BWSC’s goal is to construct a transmission grid connecting the participating water utilities. This grid will enable the movement of treated water from points of availability to points of need throughout the system. The BWSC is also endeavoring to identify a supply source that will augment that of the Kentucky River and other supplier sources in order to ensure water availability during a drought. Thus, existing treatment facilities and distribution systems will remain in operation. The regionalization offered by the BWSC will provide system reliability that is not possible for individual suppliers.

26.0 WOLFE COUNTY

**Wolfe County,
Kentucky**



Wolfe County is located in east central Kentucky in the middle to upper reaches of the Kentucky River Basin. A main tributary of the Kentucky River, the Red River, flows through the northern portion of the county. The higher, eastern part of the Red River watershed is in the Eastern Kentucky Coal Field physiographic region, characterized by mountainous terrain, rapid rates of surface runoff, and moderate rates of groundwater drainage. The lower part of the Red River watershed is located in the escarpment and plateau areas of this physiographic region, which are characterized by rolling to hilly terrain, medium to very rapid surface runoff, and slow to medium groundwater drainage.

26.1 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute their finished, potable water to their customers or sell the water to other distributors. Table 26.1 lists the water suppliers for Wolfe County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier’s overall water treatment plant capacity.

Table 26.1 – Summary of Wolfe County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity*	Treatment Plant Capacity
Campton Water Works	Campton Lake	Kentucky River	350,000 gpd (December – May) 375,000 gpd (June – November)	430,000 gpd

*Permitted water withdrawal amount, per Kentucky Division of Water.

Campton Water Works is the sole supplier and distributor of potable water in Wolfe County. Its supply source, Campton Lake, is an impoundment of Hiram Branch. See Figure 26.1 in Appendix A for a map of the Wolfe County water system. In addition, Campton’s water withdrawal permit can be found in Appendix B.

26.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised population projections for the water management planning period of 2000 to 2020. These new figures for Wolfe County, shown in Table 26.2, are based on results from the 2000 census data.

Table 26.2 – Wolfe County Population Projections

2000 Census	2005	2010	2015	2020
7,065	7,413	7,715	7,975	8,197

* Taken from University of Louisville Kentucky State Data Center.

Between 2000 and 2020, the Wolfe County population is expected to increase by 16%, or 1,132 people. In 2000, only 35% of the county population was served by a public water supplier. It is projected that 56% of the population will be served by a public water supply by 2020, for an overall increase of 2,118 individuals. The associated projected water demands for Campton Water Works are shown in Table 26.3 and illustrated in Figure 26.2.

**Table 26.3 – Summary of Current and Projected Wolfe County Water Demand:
Campton Water Works**

	Average Daily Water Use (gpd)	Projected Daily Water Use (gpd)			
	2000	2005	2010	2015	2020
Residential	213,699	226,093	293,764	318,696	318,696
Commercial	0	5,000	10,000	10,000	10,000
Wholesale	0	0	0	0	0
Subtotal – Water Sold	213,699	231,093	303,764	328,696	328,696
Water Loss	91,585	76,221	53,605	58,005	58,005
Total Avg. Daily Demand	305,284	308,124	357,369	386,701	386,701
Peak Daily Demand, gpd	457,926	312,186	386,054	430,052	430,052

(Taken from Kentucky River Area Water Management Plan, 2002)

The average daily water use demand in Wolfe County is expected to increase by 27% between 2000 and 2020. In 2001, Campton reported withdrawing an average daily amount of 0.398 mgd, which is greater than average predictions for 2020, as well as Campton’s current water withdrawal permit amounts of 350,000 to 375,000 gpd.

Campton’s projected peak demand for 2020 of 430,052 gpd is greater than its current maximum permitted water withdrawal amount of 375,000 gpd, and is slightly greater than its treatment plant capacity of 430,000 gpd.

Campton plans to begin purchasing 100,000 gpd from Beattyville by 2005. This supplemental source should alleviate demand pressures on Campton Lake and Campton’s water treatment plant.

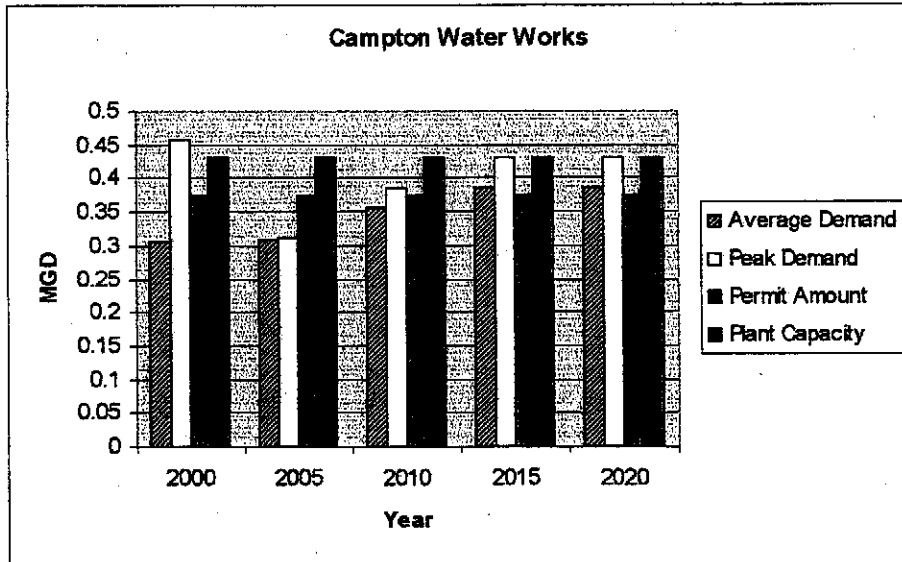


Figure 26.2 – Comparison of Campton’s Predicted Average Demand/Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Campton’s predicted average demand is expected to exceed its permitted water withdrawal amount in 2015, but is predicted to remain within its treatment capacity through 2020. The system’s peak demand was predicted to surpass the permitted water withdrawal amount and plant capacity by 2000. Campton’s projected peak demand declines in 2005 due to its plan to begin purchasing 100,000 gpd from Beattyville at that time.

26.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors.

Critical to the determination of supply adequacy is the relationship between the permitted withdrawal amount and a reservoir’s drainage area and storage volume. Values for each of these statistics for Campton Lake are provided in Table 26.4.

Table 26.4 – Wolfe County Supply Sources and Capacities

Supply Source	Reservoir Drainage Area	Reservoir Capacity*
Campton Lake	1.3 sq. mi.	81,100,000 gals.

* Normal pool volume

Assuming the 7Q10 and 7Q20 inflows to Campton Lake are both 0 mgd and a drainage area of between one and five square miles, the DOW’s classification criteria require at least 201 days of storage at average demand rates to be considered adequate (“B” classification). An “A” classification is not possible for reservoirs with a drainage area of less than five square miles and a 7Q10 inflow of zero.

Table 26.5 – Supply Assessment – Campton Lake

Year	Projected Demand (gpd)	201-Day Average Demand
2000	305,284	61.4 MG
2005	308,124	61.9 MG
2010	357,369	71.8 MG
2015	386,701	77.7 MG
2020	386,701	77.7 MG

The estimated full capacity of the reservoir (81.1 million gallons) is slightly greater than the 201-day average demand in 2020 (77.7 million gallons). Based on these calculations, Campton Lake would receive a “B” drought vulnerability classification.

Campton estimates the maximum safe withdrawal from Campton Lake at normal pool to be 550,000 gpd, which would meet projected demand through 2020 during normal conditions. It is also noted that there are no known competing users in the Campton Lake drainage area. However, Campton’s drought susceptibility is rated as a “C” in the Kentucky River Area Water Management Plan, as shown in Table 26.6.

Table 26.6 – Wolfe County Water Supply Drought Susceptibility

Water Supplier/ Supply Source	Drought Susceptibility Class
Campton Water Works/ Campton Lake	C

The drought susceptibility classification of “C” indicates that the system is likely to experience a water shortage during drought conditions. Plans for a response to a shortage are necessary. See Appendix C for further explanation of the drought susceptibility classification system.

26.4 Water Supply Alternatives

The adequacy of Wolfe County’s water supply from Campton Lake was found to be questionable through 2020. In order to meet increased demand, Campton Water Works proposes to purchase 100,000 gpd from Beattyville Water Works by 2005 and purchase from a proposed treatment plant on Cave Run Lake later in the planning period.

Table 26.7 – Wolfe County Water Supply Alternatives

Alternative	Comments
Interconnection with City of Beattyville	Would provide needed supply to Wolfe County, as well as providing a supply to Beattyville in an emergency.
Regional treatment plant on Cave Run Lake	Long-term alternative for supplemental source. Campton is a member of the Cave Run Lake Water Commission, which is responsible for securing funding for the project and coordinating its completion.

26.5 Narrative Summary

26.5.1 General assessment of system

It was concluded that Campton Lake is an inadequate water supply source for meeting Campton’s projected water supply needs. Therefore, Campton is seeking alternative sources in order to ensure an adequate supply of potable water for the service area. Campton Water Works and Beattyville Water Works have proposed an interconnection that would provide water to Wolfe County, but would also allow Campton to supply Beattyville in an emergency. Campton plans to begin purchasing 100,000 gpd from Beattyville in 2005. Additionally, Campton is participating in the Cave Run Lake Water Commission, which is pursuing a regional treatment plant on Cave Run Lake. This source would ensure the long-term adequacy of Campton’s water supply.

Campton’s predicted average demand is expected to exceed its permitted water withdrawal amount in 2010 and its treatment capacity between 2010 and 2015. Thus, Campton’s water withdrawal permit amount may need to be increased in the near future, unless purchases of treated water from another source offset withdrawal demands from Campton Lake. Campton should also begin considering an increase in its treatment plant capacity of 430,000 gpd, unless the Cave Run regional plant becomes a reality.

In 2001, Campton reported withdrawing an average daily amount of 0.398 mgd, which is greater than predictions for 2005. Thus, demand predictions may need to be revised to reflect actual water demand.

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap between water purchased for resale and cumulative sales to water customers. Year 2000 unaccounted-for loss estimates for systems in Wolfe County resulted in the following:

Campton Water Works 30%

Campton's water loss rate should be reduced to at least 15% by 2005 in order to more effectively and efficiently meet projected demands.

26.5.2 Water Shortage Response Plan / Contamination Response Plans

A general, combined water shortage and contamination response plan was developed for the entire Kentucky River Area Development District and can be found in Chapter 12 of its 2002 Water Management Plan.

26.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning period. These funding need estimates are listed below for the short-term period of 2000 to 2005 (Table 26.8a) and the longer-term period of 2006 to 2020 (Table 26.8b).

Table 26.8a – Short-Term Infrastructure Funding Needs (2000-2005) – Wolfe County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Wolfe Co.	--	--	--	--	--	--	--	--

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

Table 26.8b – Long-Term Infrastructure Funding Needs (2006-2020) – Wolfe County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Wolfe Co.	95.0	700	5,000	--	8,000	5,000	1,500	19,500

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

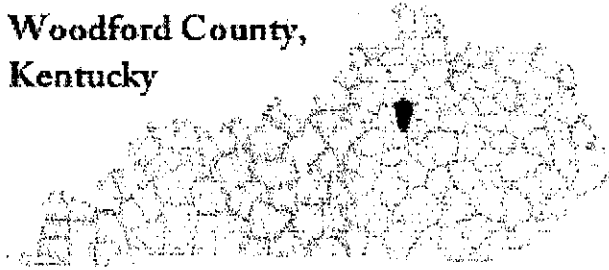
Wolfe County does not anticipate any new customers or infrastructure funding needs between 2000 and 2005. Between 2006 and 2020, system upgrades and 700 additional customers are expected to necessitate a long-term system upgrade cost of \$19.5 million.

26.5.4 Other major issues

The City of Campton is a member in the Cave Run Lake Water Commission. The Commission has proposed to construct a water treatment plant at Cave Run Lake, which is an impoundment of the Licking River located in Bath, Menifee, Morgan and Rowan counties. In addition to serving as a supplemental water source for Campton, Jeffersonville and Morgan County, the regional treatment plant would serve as the main water source for Menifee County.

27.0 WOODFORD COUNTY

**Woodford County,
Kentucky**



Woodford County is located in central Kentucky in the middle region of the Kentucky River Basin. The Kentucky River flows along the western edge of the county in the Kentucky River Palisades watershed. This watershed falls in the inner subregion of the Bluegrass physiographic region, characterized by undulating terrain and moderate rates of both surface runoff and groundwater drainage. Locks and Dams 5 and 6 of the river are also located on Woodford County’s western border, and Kentucky River Pool 5 serves as Versailles’ water supply source.

27.1 County Water Suppliers: Current Sources & Treatment Capability

Water suppliers treat raw water and distribute finished, potable water to their customers or sell the water to other distributors. Table 27.1 lists the water suppliers for Woodford County, as well as the supply source, the river basin in which the source is located, the water withdrawal permit amount and the individual supplier’s overall water treatment plant capacity.

Table 27.1 – Summary of Woodford County Water Suppliers

Water Supplier	Supply Source	Basin Location of Source	Permitted Supply Capacity*	Treatment Plant Capacity
Versailles Municipal Water	Kentucky River Pool 5	Kentucky River	3.0 mgd (Jan, Feb, Dec) 3.2 mgd (March, April, Nov) 3.8 mgd (May, Oct) 4.0 mgd (June-Sept)	4.0 mgd

*Permitted water withdrawal amount, per Kentucky Division of Water.

**When flows measured at Lock 6 of the Kentucky River decline to 140.0 cfs, Versailles Municipal shall conform to a pre-arranged withdrawal schedule.

In addition to Versailles Municipal Water, two other distributors provide Versailles-treated water to Woodford County residents; Northeast Woodford Water District and South Woodford Water District. Four distributors provide Woodford County residents with water from sources other than Versailles; the Frankfort Plant Board, Georgetown Municipal Water Service, Kentucky-American Water Company and Midway Municipal Water Works (which purchases from

Kentucky-American). See Figure 27.1 in Appendix A for a map of the Woodford County water system. In addition, Versailles' water withdrawal permit can be found in Appendix B.

27.2 Water Demand

In general, the water demand in Kentucky counties is expected to increase over the next twenty years as populations increase. In addition, an effort to increase the coverage of public water supplies to currently un-served or under-served areas of the state will result in increased water demand. The Kentucky State Data Center at the University of Louisville has developed revised population projections for the water management planning period of 2000 to 2020. These new figures for Woodford County, shown in Table 27.2 are based on results from the 2000 census data.

Table 27.2 – Woodford County Population Projections

2000 Census	2005	2010	2015	2020
23,208	24,896	26,427	27,897	29,288

* Taken from University of Louisville Kentucky State Data Center.

Between 2000 and 2020, the Woodford County population is expected to increase by approximately 26%, or 6,080 people. In 2000, 98.9% of the county population was served by a public water supplier. It is projected that 99.9% of the population will be served by a public water supply by 2020, for an overall increase of 6,306 individuals. The associated projected water demands for Versailles Municipal Water are shown in Table 27.3 and illustrated in Figure 27.2.

Table 27.3 – Summary of Current and Projected Woodford County Water Demand: Versailles Municipal Water

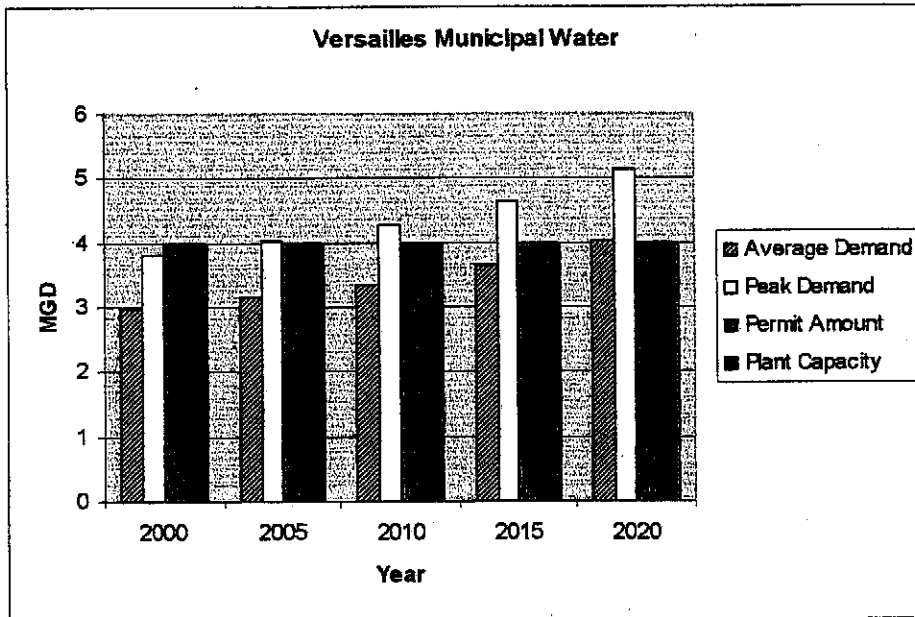
	Actual Annual Water Use (million gals.)	Projected Annual Water Use (million gals)			
		2000	2005	2010	2015
Residential	692.24	742.53	798.22	892.60	1,007.33
Commercial/Institutional	35.72	37.17	38.64	39.93	41.92
Industrial	78.79	81.98	85.23	88.07	92.46
Public/Unaccounted For	276.21	287.42	298.80	308.77	324.15
Other	0	0	0	0	0
Total Production	1,082.96	1,149.10	1,220.89	1,329.37	1,465.87
Avg. Daily Production (mgd)	2.967	3.148	3.345	3.642	4.016
Peak Day (mgd)	3.802	4.020	4.271	4.651	5.129

(Taken from Bluegrass Area Water Management Plan.)

Versailles’s average daily water use demand is expected to increase by approximately 35% between 2000 and 2020. In 2001, Versailles reported withdrawing an average daily amount of 3.106 mgd, which is slightly greater than average demand predictions for 2000 and less than the predicted average demand for 2005.

Versailles’ projected peak demand for 2020 of 5.129 mgd is greater than its current permitted water withdrawal amount of 3.0 – 4.0 mgd, as well as its treatment plant capacity of 4.0 mgd.

Demand management through water conservation measures is predicted to have the potential to reduce Versailles’ annual average demand by approximately 5.8% and its maximum day demand by approximately 6.3%.



Used maximum withdrawal permit amount of 4.0 mgd.

Figure 27.2 – Comparison of Versailles’s Predicted Average Demand/Predicted Peak Demand/Current Water Withdrawal Permit Amount/Current WTP Capacity

Versailles’s predicted average demand is expected to narrowly exceed its permitted water withdrawal amount and its treatment plant capacity by 2020. The system’s peak demand is predicted to surpass the permitted water withdrawal amount and plant capacity in 2005.

27.3 Supply Assessment & Drought Susceptibility

Individual supply sources are assessed in the county water management plans for adequacy with respect to average demand projections during both normal conditions and drought conditions. The Kentucky Division of Water has developed specific criteria for allowable withdrawal amounts. Permits are issued based on water availability, evidence of demand, treatment plant capacity and other factors.

Critical to the determination of supply adequacy is the relationship between the permitted withdrawal amount, and statistical measures of flow measured at the point of withdrawal such as 1) the normal flow, 2) the 7Q10 flow and 3) the 7Q20 flow. Values for each of these statistics for Pool 5 are provided in Table 27.4.

Table 27.4 – Woodford County Supply Sources and Capacities

Supply Source	Normal Flow ¹	7Q10 ²	7Q20 ³
Kentucky River Pool 5	106.9 mgd	96.9 mgd	80.1 mgd

¹Normal flow = 10% of lowest monthly mean flow; maximum amount that any single user can be permitted to withdraw

²7Q10 = lowest consecutive 7 day streamflow that is likely to occur in a ten year period; for planning purposes, represents “minimum flow”

³7Q20 = lowest consecutive 7 day streamflow that is likely to occur in a twenty year period; for planning purposes, represents “drought conditions”

The Kentucky Division of Water has established the “normal flow” as the basis for determining the maximum amount that any one permittee may be allowed to withdraw. Thus, Versailles’ current and projected demands are well within this available allotment.

The Kentucky Division of Water considers a regulated stream source adequate if the average rate of water use is less than 20 percent of the stream source’s 7Q10 value. Versailles’ predicted 2020 average rate of water use, 4.016 mgd, is only 4% of the 7Q10 flow. As a result, Versailles’ water supply has been assigned a drought susceptibility classification of A, as shown in Table 27.5.

Table 27.5 – Woodford County Water Supply Adequacy Assessment

Water Supplier / Supply Source	Drought Susceptibility Class
Versailles Municipal Water / Kentucky River Pool 5	A

The drought susceptibility classification of “A” indicates that the system is unlikely to experience a water shortage during drought conditions. See Appendix C for further explanation of the Kentucky Division of Water’s drought susceptibility classification.

27.4 Water Supply Alternatives

Woodford County’s water supply from Kentucky River Pool 5 was found to be adequate through 2020. Therefore, no supply alternatives were considered.

27.5 Narrative Summary

27.5.1 General assessment of system

Versailles' supply source of Kentucky River Pool 5 is believed to have an adequate capacity to meet both projected average and peak demands through 2020. In 2001, Versailles reported an average monthly withdrawal rate of 3.106 mgd and a maximum monthly average of 3.545 mgd. Each of these figures is still within the maximum withdrawal (3.0 – 4.0 mgd) and plant (4.0 mgd) capacities. However, average demands are expected to surpass the permit amount and plant capacity by 2020, and peak demands are predicted to exceed both withdrawal permit amount and treatment plant capacities by 2005. This suggests that Versailles will need to increase its permitted water withdrawal amount and upgrade its water treatment plant capacity during the planning period.

A connection with the Frankfort Plant Board has been proposed in order for Versailles to have an alternate supply source. This arrangement would provide additional assurance of Versailles' ability to provide treated water during times of emergency, such as may occur during a drought, flood or supply contamination event.

The Kentucky Public Service Commission has established 15 percent as the maximum allowable unaccounted for water leakage or loss for a public water supply system. Water loss is defined as the percentage gap between water production and cumulative sales to water customers. For water utilities that purchase potable water for resale, water loss is defined as the percentage gap between water purchased for resale and cumulative sales to water customers. Year 2000 unaccounted-for loss estimates for systems in Woodford County resulted in the following:

Versailles Municipal Water	not estimated
Midway Municipal Water Works	14.6%
South Woodford Water District	19.3%
Northeast Woodford County W.D.	5.6%

According to the Water Management Plan, it is expected that South Woodford Water District's water loss rate will be reduced to 15% by 2005.

27.5.2 Water shortage response plans / Contamination response plans

Water Shortage Response Plan

Because of the projected water supply adequacy of the Kentucky River, the City of Versailles has not adopted a water shortage response plan. However, if a drought-related water shortage should occur, Versailles would follow the recommendations provided in the Kentucky Division of Water's model Water Shortage Response Plan.

Contamination Response Plan

In the instance of a water shortage emergency resulting from a contamination event, Versailles would rely on the state's model Water Shortage Response Plan. Although this plan is designed for a drought situation, elements of the plan could also be adapted to a contamination event.

All water utilities in the Versailles water service area have storage capacity in excess of one day's average usage. Subsequently, in the event of a contaminant occurrence, Versailles could shut down its water intake until the threat had passed, provided the threat is less than twenty-four hours in duration.

Other options available to Versailles are the city's standby connection with the Lexington-based Kentucky-American Water Company or a proposed connection with Frankfort. In the event of contamination to the Versailles/Woodford County source of water supply, Versailles could shutdown its raw water intake on the Kentucky River and purchase finished water until the threat of contamination has passed. This would also allow the Versailles-supplied water utilities in the Woodford County water service area to continue to operate as long as the City of Versailles can purchase finished water from the Kentucky-American Water Company or Frankfort.

27.5.3 Proposed projects and estimated costs

In its 1999 report, *Water Resource Development: A Strategic Plan*, the Kentucky Infrastructure Authority compiled projections for county infrastructure funding needs for the 20-year planning period. These funding need estimates are listed below for the short-term period of 2000 to 2005 (Table 27.6a) and the longer-term period of 2006 to 2020 (Table 27.6b).

Table 27.6a: Short-Term Infrastructure Funding Needs (2000-2005) – Woodford County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Woodford Co.	6.0	35	260	830	--	--	900	1,990

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

Table 27.6b: Long-Term Infrastructure Funding Needs (2006-2020) – Woodford County

	New Miles of Line	New Customers Served	New Lines in \$1000	Line Rehab in \$1000	Sources in \$1000	Treatment in \$1000	Tanks & Pumps in \$1000	TOTAL NEEDS in \$1000
Woodford Co.	41.5	193	1,929	1,000	--	3,800	275	7,004

* Taken from Water Resource Development: A Strategic Plan (KIA, 1999)

Woodford County's immediate infrastructure needs account for 35 new customers between 2000 and 2005 and requisite system upgrade costs of approximately \$2 million. Between 2006 and 2020, 193 additional customers are expected. New distribution lines, in addition to other upgrade expenses, are expected to necessitate an additional long-term system upgrade cost of approximately \$7 million.

27.5.4 Other major issues

Bluegrass Water Supply Consortium

Versailles is a participant in the Bluegrass Water Supply Consortium, an alliance of water utilities and government agencies that are working to address the potable water needs of central Kentucky. The BWSC's goal is to construct a transmission grid connecting the participating water utilities. This grid will enable the movement of treated water from points of availability to points of need throughout the system. The BWSC is also endeavoring to identify a supply source that will augment that of the Kentucky River and other supplier sources in order to ensure water availability during a drought. Thus, existing treatment facilities and distribution systems will remain in operation. The regionalization offered by the BWSC will provide system reliability that is not possible for individual suppliers.

APPENDIX A:
COUNTY WATER SYSTEM MAPS

APPENDIX B:
WATER WITHDRAWAL PERMITS

COMMONWEALTH OF KENTUCKY
 NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
 DEPARTMENT FOR ENVIRONMENTAL PROTECTION
 DIVISION OF WATER
 FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #0229

Issued to: **Lawrenceburg Municipal Water Works
 205 E. Woodford Street
 Lawrenceburg, KY 40342**

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

Kentucky River, approximately 1000 feet downstream from Blackburn Memorial Bridge on Highway 62, approximately 2 miles east of Lawrenceburg; Anderson County

St. 10/15/99

Lat.
 38°02'41.19"N
 38° 02' 29.50"

Long.
 84°50'57.42" W
 84° 50' 47.65"

River mile 83.75

Water withdrawals are limited to the following rates from the specified location:

Jan. 2,500,000 gpd	April 2,500,000 gpd	July 2,500,000 gpd	Oct. 2,500,000 gpd
Feb. 2,500,000 gpd	May 2,500,000 gpd	Aug. 2,500,000 gpd	Nov. 2,500,000 gpd
March 2,500,000 gpd	June 2,500,000 gpd	Sept. 2,500,000 gpd	Dec. 2,500,000 gpd

Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.

Issued: March 28, 1979

Latest Revision: February 24, 1997

A. Leon Amothers

Manager, Water Resources Branch
 Division of Water

WR Unit Code 05100205-033

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #0486

Issued to: **Bullock Pen Water District
One Farrell Drive
Crittenden, KY 41030**

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

Surface intake located in Bullock Pen Lake at RM 2.8 of Bullock Pen Creek, off of Highway 1548; Grant County; Latitude 38°47'53"N, Longitude 84°38'30"W.

Water withdrawals are limited to the following rates from the specified location:

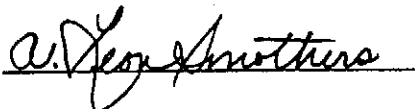
Jan. 750,000 gpd	April 750,000 gpd	July 850,000 gpd	Oct. 750,000 gpd
Feb. 750,000 gpd	May 850,000 gpd	Aug. 850,000 gpd	Nov. 750,000 gpd
March 750,000 gpd	June 850,000 gpd	Sept. 850,000 gpd	Dec. 750,000 gpd

Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.

Issued: March 2, 1967

Latest Revision: April 16, 1997



Manager, Water Resources Branch
Division of Water

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: 0213

Issued to : **Danville Water Works**
P.O. Box 670
Danville, Kentucky 40423

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

Withdrawals from Dix River (Herrington Lake) at RMI 18.6, Boyle County - latitude 37° 41' 38", longitude 84° 44' 02".

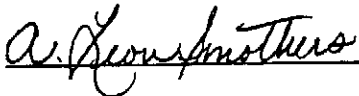
Water withdrawals are limited to the following rates from the specified location:

Jan. 7.500 MGD	April 7.500 MGD	July 7.500 MGD	Oct. 7.500 MGD
Feb. 7.500 MGD	May 7.500 MGD	Aug. 7.500 MGD	Nov. 7.500 MGD
March 7.500 MGD	June 7.500 MGD	Sept. 7.500 MGD	Dec. 7.500 MGD

Limitations to this permit are as follows: Withdrawal rates must be accurately measured by meter or other device as approved by the Cabinet.

Issued: July 25, 1966

Latest Revision: December 18, 1991



Manager, Water Resources Branch
Division of Water

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
 DEPARTMENT FOR ENVIRONMENTAL PROTECTION
 DIVISION OF WATER
 FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit No. 0014

Issued to: Northpoint Training Center

Address: P.O. Box 479

(Street)

Burgin

Kentucky

40310

(City)

(State)

(Zip Code)

The Natural Resources and Environmental Protection Cabinet acting in accordance with KRS 151.140-KRS 151.210 authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

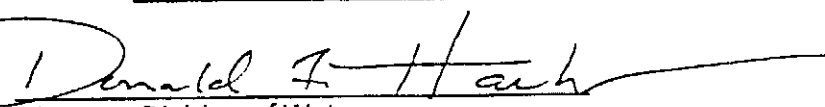
Surface withdrawal from Herrington Lake approximately four miles north of Danville, Boyle County.

Water withdrawals are limited to the following rates from the specified location:

Jan. <u>300,000</u> gpd.	April <u>300,000</u> gpd.	July <u>300,000</u> gpd.	Oct. <u>300,000</u> gpd.
Feb. <u>300,000</u> gpd.	May <u>300,000</u> gpd.	Aug. <u>300,000</u> gpd.	Nov. <u>300,000</u> gpd.
Mar. <u>300,000</u> gpd.	June <u>300,000</u> gpd.	Sept. <u>300,000</u> gpd.	Dec. <u>300,000</u> gpd.

Limitations to this permit are as follows:

Issued: 16 June 1966 Latest Revision: 8 July 1985


 Director, Division of Water,
 Natural Resources and Environmental
 Protection Cabinet

COMMONWEALTH OF KENTUCKY
DEPARTMENT FOR NATURAL RESOURCES & ENVIRONMENTAL PROTECTION
BUREAU OF NATURAL RESOURCES
DIVISION OF WATER RESOURCES
FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit No. 0163

Issued to: Water and Sewer Works Department, City of Jackson

Address: Broadway Street
(Street)
Jackson Kentucky 41339
(City) *(State)* *(Zip Code)*

The Department for Natural Resources and Environmental Protection acting in accordance with KRS 151.140 - KRS 151.210 authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water. In times of drought or emergency, the Department may temporarily alter the conditions of the permit. Any violation of the Water Resources Action of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

Surface intake located at mile 305.45¹/₂ of the North Fork of the Kentucky River, Breathitt County. (Latitude 37° 32' 45" Longitude 83° 22' 15")

Water withdrawals are limited to the following rates from the specified withdrawal location:

Jan. 1,500,000 gpd. April 1,500,000 gpd. July 1,500,000 gpd. Oct. 1,500,000 gpd.
Feb. 1,500,000 gpd. May 1,500,000 gpd. Aug. 1,500,000 gpd. Nov. 1,500,000 gpd.
Mar. 1,500,000 gpd. June 1,500,000 gpd. Sept. 1,500,000 gpd. Dec. 1,500,000 gpd.

Limitations to this permit are as follows:

Issued: July 6, 1966 Latest Revision: January 18, 1980

By 
Director, Division of Water Resources

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #0622

Issued to: Winchester Municipal Utilities Water Plant
Water Works Road
Winchester, KY 40391-0098

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

surface withdrawal from Winchester Reservoir (Carol E. Ecton Reservoir) at Lower Howard Creek, mile 6.32L: Clark County; Latitude 37°56'51.93"N and Longitude 84°13'38.76"W

Water withdrawals are limited to the following rates from the specified location:

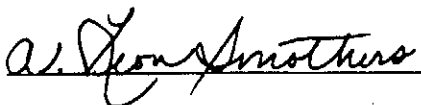
Jan. 5,300,000 mgd	April 5,300,000 mgd	July 5,300,000 mgd	Oct. 5,300,000 mgd
Feb. 5,300,000 mgd	May 5,300,000 mgd	Aug. 5,300,000 mgd	Nov. 5,300,000 mgd
March 5,300,000 mgd	June 5,300,000 mgd	Sept. 5,300,000 mgd	Dec. 5,300,000 mgd

Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.

Issued: February 16, 1968

Latest Revision: April 8, 1997



Manager, Water Resources Branch
Division of Water

COMMONWEALTH OF KENTUCKY
 NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
 DEPARTMENT FOR ENVIRONMENTAL PROTECTION
 DIVISION OF WATER
 FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #0623

Issued to: **Winchester Municipal Utilities**
Water Works Road
Winchester, KY 40391-0098

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw public water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

A surface water intake located at mile 176.51 of the Kentucky River, Pool #10 ; Clark County;
 Latitude 37°54'40"N and Longitude 84°15'88"W.

Water withdrawals are limited to the following rates from the specified location:

Jan. 15,000,000 gpd	April 15,000,000 gpd	July 15,000,000 gpd	Oct. 15,000,000 gpd
Feb. 15,000,000 gpd	May 15,000,000 gpd	Aug. 15,000,000 gpd	Nov. 15,000,000 gpd
March 15,000,000 gpd	June 15,000,000 gpd	Sept. 15,000,000 gpd	Dec. 15,000,000 gpd

Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.
2. When flows measured at Lock 10 are 190 cfs or less for four (4) consecutive days, Winchester Municipal Utilities' withdrawals shall conform to the following schedule:

<u>Lock 10 Flow (cfs)</u>	<u>Allowable Withdrawals</u>
>190	15.0 MGD
157.0 - 189.9	10.0 MGD
124.0 - 156.9	5.0 MGD
90.0 - 123.9	4.0 MGD
<90.0	2.8 MGD

3. Winchester Municipal Utilities shall obtain continuous gaging information for flows at the United States Geological Survey gage at Lock 10. Gage and water withdrawal data shall be reported to the Division of Water daily when flows are below 190.0 cfs. The Division may specify reasonable reporting intervals, no more frequently than hourly, as flows decrease.
4. Water withdrawals in excess of the prevailing water-treatment plant capacity will be pumped to the Carroll Ecton Reservoir only.

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #0418

Issued to: **Manchester Water Works**
P.O. Box 279
Manchester, KY 40962

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

A surface water intake located in Bert Combs Lake, an impoundment at mile 3.8 of Beech Creek; latitude 37°09'57.73" N, longitude 83°42'25.85" W, Clay County.

Water withdrawals are limited to the following rates from the specified location:

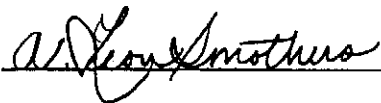
Jan. 2,000,000 GPD	April 2,000,000 GPD	July 2,000,000 GPD	Oct. 2,000,000 GPD
Feb. 2,000,000 GPD	May 2,000,000 GPD	Aug. 2,000,000 GPD	Nov. 2,000,000 GPD
March 2,000,000 GPD	June 2,000,000 GPD	Sept. 2,000,000 GPD	Dec. 2,000,000 GPD

Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.
2. Under no circumstances shall withdrawals by Manchester Water Works lower the level of water in Bert Combs Lake more than three (3) vertical feet from the normal pool elevation of 980 feet above mean sea level.

Issued: November 1, 1966

Latest Revision: February 16, 1996



Manager, Water Resources Branch
Division of Water

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #1217

Issued to: **Manchester Water Treatment Plant**
P.O. Box 279
Memorial Drive
Manchester, Kentucky 40962

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

A surface water intake located at mile 19.5 of Goose Creek;
latitude 30°10'06" N, longitude 83°45'00" W, Clay County.

Water withdrawals are limited to the following rates from the specified location:

Jan. 1.0 MGD	April 1.0 MGD	July 1.0 MGD	Oct. 1.0 MGD
Feb. 1.0 MGD	May 1.0 MGD	Aug. 1.0 MGD	Nov. 1.0 MGD
March 1.0 MGD	June 1.0 MGD	Sept. 1.0 MGD	Dec. 1.0 MGD

Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.
2. Under no circumstances shall these withdrawals reduce flows in Goose Creek immediately below this intake to a rate of 0.28 cubic feet per second or less. When flows immediately below the raw water intake approach 0.28 cubic feet per second, withdrawals must be reduced. When flows immediately below the raw water intake are 0.28 cubic feet per second or less for four (4) consecutive days, withdrawals must cease in order to comply with this requirement.

SEE ATTACHED PAGE FOR ADDITIONAL CONDITIONS

Issued: July 2, 1992

Latest Revision: _____

A. Leo Snodgrass

Manager, Water Resources Branch
Division of Water

COMMONWEALTH OF KENTUCKY
DEPARTMENT FOR NATURAL RESOURCES & ENVIRONMENTAL PROTECTION
BUREAU OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER
FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit No. 0882

Issued to: City of Irvine/Irvine Municipal Utilities

Address: 144 Broadway
(Street)
Irvine Kentucky 40336
(City) *(State)* *(Zip Code)*

The Department for Natural Resources and Environmental Protection acting in accordance with KRS 151.140 - KRS 151.210 authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water. In times of drought or emergency, the Department may temporarily alter the conditions of the permit. Any violation of the Water Resources Action of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

Surface intake located on the Kentucky River opposite mile 218.5 R,
Estill County.

Water withdrawals are limited to the following rates from the specified withdrawal location:

Jan. <u>2,000,000</u> gpd.	April <u>2,000,000</u> gpd.	July <u>2,000,000</u> gpd.	Oct <u>2,000,000</u> gpd.
Feb. <u>2,000,000</u> gpd.	May <u>2,000,000</u> gpd.	Aug. <u>2,000,000</u> gpd.	Nov. <u>2,000,000</u> gpd.
Mar. <u>2,000,000</u> gpd.	June <u>2,000,000</u> gpd.	Sept. <u>2,000,000</u> gpd.	Dec. <u>2,000,000</u> gpd.

Limitations to this permit are as follows:

Issued: May 4, 1981 Latest Revision: _____

Jackie Swigart
Director, Division of Water

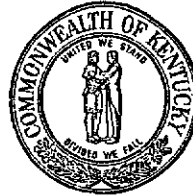
By Thomas S. Swiska
Director, Division of Water

Commonwealth of Kentucky
Department of Natural Resources
DIVISION OF WATER
Frankfort, Kentucky

NON-TRANSFERABLE

Amended December 1, 1971
Effective Date July 19, 1966

Permit No. 201
Expires Indefinite



PERMIT TO WITHDRAW PUBLIC WATER
Issued to

Lexington Water Company, Richmond Road Plant, Lexington, Kentucky, Fayette County

Persuant to KRS 151.140, KRS 151.150, and KRS 151.170 of the Commonwealth of Kentucky, a Permit is hereby granted to withdraw water from Public Water Sources limited to the following rates from the specified withdrawal location:

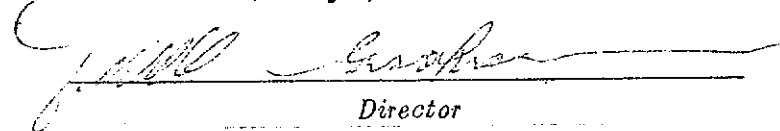
Jan. <u>16,000,000</u> gpd.	April <u>16,000,000</u> gpd.	July <u>16,000,000</u> gpd.	Oct. <u>16,000,000</u> gpd.
Feb. <u>16,000,000</u> gpd.	May <u>16,000,000</u> gpd.	Aug. <u>16,000,000</u> gpd.	Nov. <u>16,000,000</u> gpd.
March <u>16,000,000</u> gpd.	June <u>16,000,000</u> gpd.	Sept. <u>16,000,000</u> gpd.	Dec. <u>16,000,000</u> gpd.

The location of the authorized water withdrawal is as follows:

Reservoir No. 4 on Hickman Creek in Fayette County, 2.44 miles southeast of Lexington, Kentucky off U. S. Highway 25.

This Permit reserves for you the quantity of Public Water authorized above except during emergency periods as specified in KRS 151.200. Any violation of the Water Resources Act of 1966 is subject to penalties as set forth in KRS 151.990.

IN WITNESS WHEREOF I have hereunto set my hand this 1st. day of December 1971


Director

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: # 0200

Issued to: **Kentucky-American Water Company**
2300 Richmond Road
Lexington, Kentucky 40502

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

A surface water intake located at river mile 167.3 (pool 9) of the Kentucky River; latitude 37°54'07" North, longitude 84°22'39" West, Fayette County.

Water withdrawals are limited to the following rates from the specified location:

Jan. 60.0 MGD	April 60.0 MGD	July 63.0 MGD	Oct. 63.0 MGD
Feb. 60.0 MGD	May 63.0 MGD	Aug. 63.0 MGD	Nov. 60.0 MGD
March 60.0 MGD	June 63.0 MGD	Sept. 63.0 MGD	Dec. 60.0 MGD


Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.
2. This permit is subject to revision if data collected pursuant to permit condition No. 6 indicate that withdrawals negatively impact the quantity and quality of water below the intake.

For additional conditions see attached sheets

Issued: July 19, 1966

Latest Revision: September 17, 1999



Manager, Water Resources Branch
Division of Water

9. Kentucky-American shall notify the Natural Resources and Environmental Protection Cabinet and the Kentucky River Authority as each Management Phase is declared in the Demand Management Plan adopted above, beginning with the Advisory Phase.
10. Kentucky-American Water Company and the Division of Water recognize that all permitted water withdrawers are equals without seniority, priority, or privilege given to any permit holder along the Kentucky River.
11. Kentucky-American Water Company recognizes its role as the largest water purveyor in demonstrating leadership in protecting the Kentucky River as source of supply of the Central Kentucky Region.

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #0024

Issued to: **Frankfort Electric & Water Plant Board**
P.O. Box 308
Frankfort, KY 40601

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times, and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

A surface intake at mile 69.8 of the Kentucky River, pool #4, in Franklin County, with coordinates;

latitude 38°10'15.29"N, longitude 84°51'43.84"W.

Water withdrawals are limited to the following rates from the specified location:

Jan.	14.0 MGD	April	14.0 MGD	July	15.0 MGD	Oct.	15.0 MGD
Feb.	14.0 MGD	May	14.0 MGD	Aug.	15.0 MGD	Nov.	14.0 MGD
March	14.0 MGD	June	14.0 MGD	Sept.	15.0 MGD	Dec.	14.0 MGD

Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.
2. Frankfort Electric and Water Plant Board shall obtain gaging information for flows from the United States Geological Survey gage (#03287500) at Lock 4 of the Kentucky River. Gage and water withdrawal data shall be reported to the Division of Water when flows are below 175.0 cfs. The Division may specify reasonable reporting intervals, no more frequently than hourly, as flows decrease.

(conditions continued on page 2)

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
 DEPARTMENT FOR ENVIRONMENTAL PROTECTION
 DIVISION OF WATER
 FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #0013

Issued to: **Lancaster Water Works**
367 Water Works Road
Lancaster, Kentucky 40444

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times, and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

River mile 141.67 of the Kentucky River, 0.25 mile above lock 8, immediately below the mouth of Davis Creek; Garrard County; latitude 37°43'43.08", longitude 84°34'12.63".

Water withdrawals are limited to the following rates from the specified location:

Jan. 1,200,000 gpd	April 1,400,000 gpd	July 1,700,000 gpd	Oct. 1,700,000 gpd
Feb. 1,200,000 gpd	May 1,600,000 gpd	Aug. 1,700,000 gpd	Nov. 1,500,000 gpd
March 1,300,000 gpd	June 1,700,000 gpd	Sept. 1,700,000 gpd	Dec. 1,300,000 gpd

Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.
2. When flows measured at Lock 7 of the Kentucky River reach 144.0 cfs Lancaster Municipal Water Works shall conform to the following schedule:

<u>Lock 7 Flow (cfs)</u>	<u>Allowable Withdrawals (mgd)</u>
>144.0	1.70
125.0 - 144.0	1.66
100.0 - 124.9	1.58
<100.0	1.50

3. Lancaster Municipal Water Works shall obtain gaging information for flows for the United States Geological Survey gage at Lock 7. Gage and water withdrawal data shall be reported to the

→ see next pg.

COMMONWEALTH OF KENTUCKY
DEPARTMENT FOR NATURAL RESOURCES & ENVIRONMENTAL PROTECTION
BUREAU OF NATURAL RESOURCES
DIVISION OF WATER RESOURCES
FRANKFORT, KENTUCKY 40601

Permit No. 0050

PERMIT TO WITHDRAW PUBLIC WATER

Issued to: City of Nicholasville, Kentucky

Address: 517 North Main Street

Nicholasville (City), Jessamine (County), Kentucky (State), 40356 (Zip Code)

The Department for Natural Resources and Environmental Protection acting in accordance with KRS 151.140 - KRS 151.210 authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water. In times of drought or emergency, the Department may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

Surface intake located at mile 154.1R of the Kentucky River, Jessamine County.

Water withdrawals are limited to the following rates from the specified withdrawal location:

Jan. <u>2,500,000</u> gpd.	April <u>2,700,000</u> gpd.	July <u>2,900,000</u> gpd.	Oct. <u>2,800,000</u> gpd.
Feb. <u>2,000,000</u> gpd.	May <u>2,700,000</u> gpd.	Aug. <u>3,000,000</u> gpd.	Nov. <u>2,600,000</u> gpd.
Mar. <u>2,600,000</u> gpd.	June <u>2,700,000</u> gpd.	Sept. <u>2,900,000</u> gpd.	Dec. <u>2,500,000</u> gpd.

Limitations to this permit are as follows:

Issued this 9th day of November, 1978

By *Dave Keserian*
Director, Division of Water Resources

COMMONWEALTH OF KENTUCKY
DEPARTMENT FOR NATURAL RESOURCES & ENVIRONMENTAL PROTECTION
BUREAU OF NATURAL RESOURCES
DIVISION OF WATER RESOURCES
FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit No. 0045

Issued to: Wilmore Utilities System

Address: 335 East Main Street
(Street)

Wilmore Kentucky 40390
(City) (State) (Zip Code)

The Department for Natural Resources and Environmental Protection acting in accordance with KRS 151.140 - KRS 151.210 authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water. In times of drought or emergency, the Department may temporarily alter the conditions of the permit. Any violation of the Water Resources Action of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

Intake located at mile 114.0R of the Kentucky River, Jessamine County.

Water withdrawals are limited to the following rates from the specified withdrawal location:

Jan. 1,000,000 gpd. April 1,000,000 gpd. July 1,000,000 gpd. Oct. 1,000,000 gpd.
Feb. 1,000,000 gpd. May 1,000,000 gpd. Aug. 1,000,000 gpd. Nov. 1,000,000 gpd.
Mar. 1,000,000 gpd. June 1,000,000 gpd. Sept. 1,000,000 gpd. Dec. 1,000,000 gpd.

Limitations to this permit are as follows:

Issued: June 20, 1966 Latest Revision: March 31, 1980

Jackie Swigart
Secretary, Department for Natural
Resources and Environmental Protection

By Dave Resenbourn
Director, Division of Water Resources

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #0474

Issued to: City of Beattyville
P.O. BOx 307
Beattyville, KY 41311

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

A surface water intake located at mile 256.05 of the North Fork of the Kentucky River;
latitude 37°34'46.09" N, longitude 83°41'44.50" W, Lee County.

Water withdrawals are limited to the following rates from the specified location:

Jan. 640,000 GPD	April 675,000 GPD	July 750,000 GPD	Oct. 605,000 GPD
Feb. 640,000 GPD	May 720,000 GPD	Aug. 745,000 GPD	Nov. 605,000 GPD
March 690,000 GPD	June 740,000 GPD	Sept. 715,000 GPD	Dec. 605,000 GPD

Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.
2. Under no circumstances shall these withdrawals reduce flows in the North Fork of the Kentucky River immediately below this intake to a rate of 35 cubic feet per second or less. When flows immediately below the raw water intake approach cubic feet per second, withdrawals must be reduced. When flows immediately below the raw water intake are 35 cubic feet per second or less for four (4) consecutive days, withdrawals must cease in order to comply with this requirement.

Issued: February 7, 1967

Latest Revision: February 22, 1994



Manager, Water Resources Branch
Division of Water

COMMONWEALTH OF KENTUCKY
 NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
 DEPARTMENT FOR ENVIRONMENTAL PROTECTION
 DIVISION OF WATER
 FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #0650

Issued to: **Hyden-Leslie County Water District**
HC 61, Box 2590
Hyden, KY 41749

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

a surface water intake located on the Middle Fork Kentucky River at river mile 75.6R; at latitude 37°08'26.68"N, longitude 83°22'40.76"W; Leslie County.

Water withdrawals are limited to the following rates from the specified location:

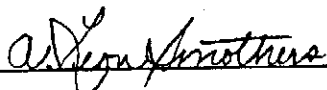
Jan. 730,000 gpd	April 730,000 gpd	July 730,000 gpd	Oct. 730,000 gpd
Feb. 730,000 gpd	May 730,000 gpd	Aug. 730,000 gpd	Nov. 730,000 gpd
March 730,000 gpd	June 730,000 gpd	Sept. 730,000 gpd	Dec. 730,000 gpd

Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.
2. Under no circumstances shall these withdrawals reduce flows in the Middle Fork Kentucky River immediately below this intake to a rate of 0.28 cubic feet per second or less. When flows immediately below the raw water intake approaches 0.28 cubic feet per second, withdrawals must be reduced. When flows immediately below the raw water intake are 0.28 cubic feet per second or less for four (4) consecutive days, withdrawals must cease in order to comply with this requirement.

Issued: February 10, 1970

Latest Revision: March 6, 1997



Manager, Water Resources Branch
 Division of Water

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
FRANKFORT, KENTUCKY 40601

EXECUTIVE SUMMARY OF PERMIT TO WITHDRAW PUBLIC WATER

Issued to: City of Blackey (Blackey Water System)
265 Main Street Loop
Blackey, Kentucky 41804

Permit Number: #1420
Activity ID Number: #APE20020001

Location: A surface water intake located at river mile 387.43 of the North Fork of the Kentucky River, Letcher County

Geographic Coordinates: latitude 37° 08' 20.46" N, longitude 82° 58' 51.72" W.

Water Withdrawal Limits:

Jan.	0.300 mgd	April	0.300 mgd	July	0.300 mgd	Oct.	0.300 mgd
Feb.	0.300 mgd	May	0.300 mgd	Aug.	0.300 mgd	Nov.	0.300 mgd
March	0.300 mgd	June	0.300 mgd	Sept.	0.300 mgd	Dec.	0.300 mgd

Water Withdrawal Restrictions:

1. The City of Blackey is prohibited from reducing flows immediately below its intake in the North Fork of the Kentucky River to a rate of 2.5 cubic feet per second or less. In order to comply with this condition, Blackey may have to reduce or even suspend withdrawals.

Additional Conditions: All other conditions associated with this withdrawal are on the accompanying permit.

Issued: July 21, 1998

Latest Revision: October 24, 2002

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COMMONWEALTH OF KENTUCKY
DEPARTMENT FOR NATURAL RESOURCES & ENVIRONMENTAL PROTECTION
BUREAU OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER
FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit No. 0910

Issued to: Fleming-Neon Water System

Address: P.O. Box 66
(Street)
Neon Kentucky 41840
(City) *(State)* *(Zip Code)*

The Department for Natural Resources and Environmental Protection acting in accordance with KRS 151.140 - KRS 151.210 authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water. In times of drought or emergency, the Department may temporarily alter the conditions of the permit. Any violation of the Water Resources Action of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

Withdrawal from deep mine well located at N37° 13' 05" and W82° 41' 11",
Letcher County.

Water withdrawals are limited to the following rates from the specified withdrawal location:

Jan. <u>360,000</u> gpd.	April <u>360,000</u> gpd.	July <u>360,000</u> gpd.	Oct <u>360,000</u> gpd.
Feb. <u>360,000</u> gpd.	May <u>360,000</u> gpd.	Aug. <u>360,000</u> gpd.	Nov. <u>360,000</u> gpd.
Mar. <u>360,000</u> gpd.	June <u>360,000</u> gpd.	Sept. <u>360,000</u> gpd.	Dec. <u>360,000</u> gpd.

Limitations to this permit are as follows:

Issued: July 1, 1982 Latest Revision: _____

Jackie Swigart
Secretary, Department for Natural
Resources and Environmental Protection

By John T. Smither
Director, Division of Water
John T. Smither

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
 DEPARTMENT FOR ENVIRONMENTAL PROTECTION
 DIVISION OF WATER
 FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit No. 0809

Issued to: Fleming Neon Water System

Address: P.O. Box 66
(Street)
Neon Kentucky 41840
(City) (State) (Zip Code)

The Natural Resources and Environmental Protection Cabinet acting in accordance with KRS 151.140-KRS 151.210 authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

For a deep mine and well opposite mile 2.5 on Tom Biggs Branch opposite mile 6.3 of Wright Fork. Letcher County, Kentucky.

Water withdrawals are limited to the following rates from the specified location:

Jan. <u>100,000</u> gpd.	April <u>100,000</u> gpd.	July <u>100,000</u> gpd.	Oct. <u>100,000</u> gpd.
Feb. <u>100,000</u> gpd.	May <u>100,000</u> gpd.	Aug. <u>100,000</u> gpd.	Nov. <u>100,000</u> gpd.
Mar. <u>100,000</u> gpd.	June <u>100,000</u> gpd.	Sept. <u>100,000</u> gpd.	Dec. <u>100,000</u> gpd.

Limitations to this permit are as follows:

Issued: December 9, 1984

Latest Revision: September 13, 1985

By Donald F. Hank

Secretary, Natural Resources and
Environmental Protection Cabinet

Director, Division of Water

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #0353

Issued to: **Whitesburg Municipal Water Works**
112 North Webb Avenue
Whitesburg, Kentucky 41858

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

River mile 406.3R of the North Fork of the Kentucky River in Letcher County; latitude 37°06'55" and longitude 82°48'50".

Water withdrawals are limited to the following rates from the specified location:

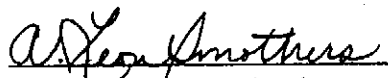
Jan. 412,000 gpd	April 412,000 gpd	July 435,000 gpd	Oct. 435,000 gpd
Feb. 412,000 gpd	May 412,000 gpd	Aug. 435,000 gpd	Nov. 412,000 gpd
March 412,000 gpd	June 435,000 gpd	Sept. 412,000 gpd	Dec. 412,000 gpd

Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.
2. Whitesburg Municipal Water Works is prohibited from reducing the flows immediately below its intake in the North Fork of the Kentucky River to a rate of 2.5 cubic feet per second. In order to comply with this condition, the City may have to reduce or even suspend withdrawals.
3. This permit has been issued under the condition that the permittee maintain a daily log of flow. This information can be obtained by contacting the USGS. This condition is necessary in order to prevent this site from going dry in severe low flow conditions.

Issued: September 29, 1966

Latest Revision: April 12, 1999


Manager, Water Resources Branch
Division of Water

COMMONWEALTH OF KENTUCKY
 NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
 DEPARTMENT FOR ENVIRONMENTAL PROTECTION
 DIVISION OF WATER
 FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #1108

Issued to: **Stanford Municipal Water Works**
 P.O. Box 35
 305 East Main Street
 Stanford, KY 40484

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

A surface water intake located in the James C. Harris Reservoir, an impoundment at mile 0.8 of Hubert Miracle Creek; Lincoln County; Latitude 37°27'57.18"N and Longitude 84°41'43.86"W.

Water withdrawals are limited to the following rates from the specified location:

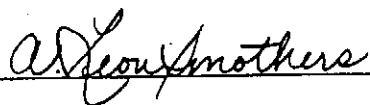
Jan. 1,000,000 gpd	April 1,000,000 gpd	July 1,000,000 gpd	Oct. 1,000,000 gpd
Feb. 1,000,000 gpd	May 1,000,000 gpd	Aug. 1,000,000 gpd	Nov. 1,000,000 gpd
March 1,000,000 gpd	June 1,000,000 gpd	Sept. 1,000,000 gpd	Dec. 1,000,000 gpd

Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.

Issued: March 5, 1991

Latest Revision: November 24, 1997



Manager, Water Resources Branch
 Division of Water

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #0267

Issued to: **Stanford Municipal Water Works**
Box 45
Stanford, KY 40484

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times, and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

A surface water intake located in Rice Lake (Stanford City Lake), an impoundment at mile 5.63 of Neals Creek in Lincoln County, with coordinates:

latitude 37°29'16.43"N, longitude 84°40'46.61"W.

Water withdrawals are limited to the following rates from the specified location:

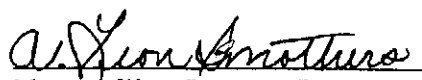
Jan. 1.50 MGD	April 1.50 MGD	July 1.50 MGD	Oct. 1.50 MGD
Feb. 1.50 MGD	May 1.50 MGD	Aug. 1.50 MGD	Nov. 1.50 MGD
March 1.50 MGD	June 1.50 MGD	Sept. 1.50 MGD	Dec. 1.50 MGD

Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.

Issued: September 07, 1966

Latest Revision: April 20, 2000


Manager, Water Resources Branch
Division of Water

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #0310

Issued to: **Richmond Utility Board**
300 Hallie Irvine Street
Richmond, KY 40475

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times, and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

River mile 201.3 of the Kentucky River in Madison County, with coordinates:

latitude 37°46'49"N, longitude 84°06'38"W.

Water withdrawals are limited to the following rates from the specified location:

Jan.	9.0 MGD	April	9.0 MGD	July	9.0 MGD	Oct.	9.0 MGD
Feb.	9.0 MGD	May	9.0 MGD	Aug.	9.0 MGD	Nov.	9.0 MGD
March	9.0 MGD	June	9.0 MGD	Sept.	9.0 MGD	Dec.	9.0 MGD

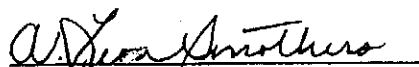
Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.

**** (Additional conditions on page 2)**

Issued: September 21, 1966

Latest Revision: July 28, 2000


Manager, Water Resources Branch
Division of Water

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
 DEPARTMENT FOR ENVIRONMENTAL PROTECTION
 DIVISION OF WATER
 FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #0068

Issued to: **Berea College Water Utility**
CPO 2337
Berea, KY 40404

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

A surface water intake located in Cowbell Lake, an impoundment of Cowbell Creek; Madison County; Latitude 37°32'20.71"N and Longitude 84°13'35.70"W.

Water withdrawals are limited to the following rates from the specified location:

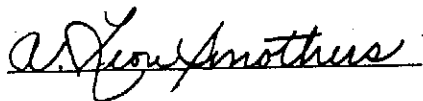
Jan. 2,500,000 gpd	April 2,500,000 gpd	July 2,500,000 gpd	Oct. 2,500,000 gpd
Feb. 2,500,000 gpd	May 2,500,000 gpd	Aug. 2,500,000 gpd	Nov. 2,500,000 gpd
March 2,500,000 gpd	June 2,500,000 gpd	Sept. 2,500,000 gpd	Dec. 2,500,000 gpd

Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.

Issued: June 21, 1966

Latest Revision: January 29, 1998



Manager, Water Resources Branch
 Division of Water

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #1076

Issued to: **Berea College Water Utility**
CPO 2337
Berea, KY 40404

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

A surface water intake located in Lower Silver Creek Lake, an impoundment of the East Fork of Silver Creek; Madison County; Latitude 37°32'35.60"N and Longitude 84°14'18.76"W.

Water withdrawals are limited to the following rates from the specified location:

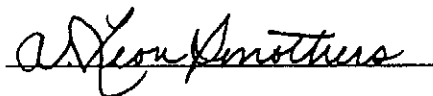
Jan. 2,500,000 gpd	April 2,500,000 gpd	July 2,500,000 gpd	Oct. 2,500,000 gpd
Feb. 2,500,000 gpd	May 2,500,000 gpd	Aug. 2,500,000 gpd	Nov. 2,500,000 gpd
March 2,500,000 gpd	June 2,500,000 gpd	Sept. 2,500,000 gpd	Dec. 2,500,000 gpd

Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.

Issued: February 21, 1990

Latest Revision: January 29, 1998



Manager, Water Resources Branch
Division of Water

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #1078

Issued to: **Berea College Water Utility**
CPO 2337
Berea, KY 40404

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

A surface water intake located in Owsley Fork Lake, an impoundment of Owsley Fork of Redlick Creek; Madison County; Latitude 37°32'44.65"N and Longitude 84°10'55.69"W.

Water withdrawals are limited to the following rates from the specified location:

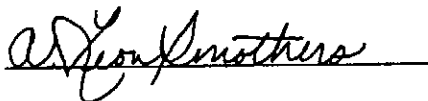
Jan. 2,500,000 gpd	April 2,500,000 gpd	July 2,500,000 gpd	Oct. 2,500,000 gpd
Feb. 2,500,000 gpd	May 2,500,000 gpd	Aug. 2,500,000 gpd	Nov. 2,500,000 gpd
March 2,500,000 gpd	June 2,500,000 gpd	Sept. 2,500,000 gpd	Dec. 2,500,000 gpd

Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.

Issued: February 21, 1990

Latest Revision: January 29, 1998



Manager, Water Resources Branch
Division of Water

COMMONWEALTH OF KENTUCKY
 NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
 DEPARTMENT FOR ENVIRONMENTAL PROTECTION
 DIVISION OF WATER
 FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #0264

Issued to: Harrodsburg Municipal Water Works
 3025 Shakertown Road
 Harrodsburg, KY 40330

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

Two adjacent surface water intakes located at RM 117.85L of the Kentucky River, Pool 7; approximately 2,000 feet downstream of confluence of Kentucky River and Dix River; Mercer County; Latitude 37°49'04.09"N and Longitude 84°43'14.37"W.

Water withdrawals are limited to the following rates from the specified location:

Jan.	3,200,000 gpd	April	3,200,000 gpd	July	3,200,000 gpd	Oct.	3,200,000 gpd
Feb.	3,200,000 gpd	May	3,200,000 gpd	Aug.	3,200,000 gpd	Nov.	3,200,000 gpd
March	3,200,000 gpd	June	3,200,000 gpd	Sept.	3,200,000 gpd	Dec.	3,200,000 gpd

Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.
2. When flows measured at Lock 6 are 150 cfs or less for four (4) consecutive days, Harrodsburg Municipal Water Works shall conform to the following schedule:

<u>Lock 6 Flow (cfs)</u>	<u>Allowable Withdrawals</u>
> 150.0	3.2 mgd
125.0-149.9	2.8 mgd
100.0-124.9	2.2 mgd
< 100.0	1.7 mgd

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #0874

Issued to: **Owenton Water Works**
220 Water Plant Lane
Owenton, Kentucky 40359

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

A surface water intake located in Lower Thomas Lake, mile 6.3 of the North Fork of Severn Creek, in Owen County; latitude 38°31'23.35" and longitude 84°50'58.75".

Water withdrawals are limited to the following rates from the specified location:


Jan. 800,000 gpd	April 800,000 gpd	July 900,000 gpd	Oct. 900,000 gpd
Feb. 800,000 gpd	May 850,000 gpd	Aug. 900,000 gpd	Nov. 800,000 gpd
March 800,000 gpd	June 850,000 gpd	Sept. 900,000 gpd	Dec. 800,000 gpd

Conditions to this permit are as follows:

Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.

Issued: April 10, 1986

Latest Revision: January 21, 1999


Manager, Water Resources Branch
Division of Water

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: **#0863**

Issued to: **Owenton Water Works**
102 Main Street
Owenton, Kentucky 40359

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

A surface water intake located in Severn Creek opposite stream mile 0.55L, in Owen County; latitude 38°28'05.40" and longitude 84°55'01.53".

Water withdrawals are limited to the following rates from the specified location:

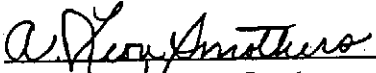
Jan. 800,000 gpd	April 800,000 gpd	July 900,000 gpd	Oct. 900,000 gpd
Feb. 800,000 gpd	May 900,000 gpd	Aug. 900,000 gpd	Nov. 800,000 gpd
March 800,000 gpd	June 900,000 gpd	Sept. 900,000 gpd	Dec. 800,000 gpd

Conditions to this permit are as follows:

1. Owenton Water Works must install a flow meter or other device approved by the Cabinet to accurately measure withdrawal amounts within 30 days of receiving this permit.
2. Owenton is prohibited from reducing the flows of Severn Creek immediately below the intake to a rate of 0.4 cfs.

Issued: July 8, 1980

Latest Revision: January 21, 1999


Manager, Water Resources Branch
Division of Water

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
 DEPARTMENT FOR ENVIRONMENTAL PROTECTION
 DIVISION OF WATER
 FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #0752

Issued to: **Booneville Water and Sewer District**
P.O. Box 218
Booneville, KY 41314

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.500 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

A surface water intake located at mile 12.6 of the South Fork of the Kentucky River;
 latitude 37°28'08.73" N, longitude 83°40'32.01" W, Owsley County.

Water withdrawals are limited to the following rates from the specified location:

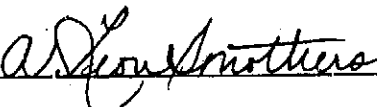
Jan.	355,000 GPD	April	355,000 GPD	July	360,000 GPD	Oct.	355,000 GPD
Feb.	355,000 GPD	May	355,000 GPD	Aug.	360,000 GPD	Nov.	355,000 GPD
March	355,000 GPD	June	360,000 GPD	Sept.	355,000 GPD	Dec.	355,000 GPD

Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.
2. Under no circumstances shall these withdrawals reduce flows in the South Fork of the Kentucky River immediately below this intake to a rate of 1.0 cubic feet per second or less. When flows immediately below the raw water intake approach 1.0 cubic feet per second, withdrawals must be reduced. When flows immediately below the raw water intake are 1.0 cubic feet per second or less for four (4) consecutive days, withdrawals must cease in order to comply with this requirement.

Issued: September 3, 1974

Latest Revision: February 16, 1996



Manager, Water Resources Branch
 Division of Water

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #0026

Issued to: City of Hazard
East Main Street
Hazard, KY 41701

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

A surface water intake located at river mile 361.23 of the North Fork of the Kentucky River; latitude 37°14'45.9" N and longitude 83°10'52" W; Perry County.

Water withdrawals are limited to the following rates from the specified location:

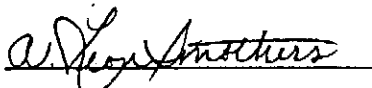
Jan. 3,750,000 gpd	April 3,750,000 gpd	July 3,750,000 gpd	Oct. 3,750,000 gpd
Feb. 3,750,000 gpd	May 3,750,000 gpd	Aug. 3,750,000 gpd	Nov. 3,750,000 gpd
March 3,750,000 gpd	June 3,750,000 gpd	Sept. 3,750,000 gpd	Dec. 3,750,000 gpd

• Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.
2. Under no circumstances shall these withdrawals reduce flows in the North Fork of the Kentucky River immediately below this intake to a rate of 5 cubic feet per second. When flows immediately below the raw water intake are 5 cubic feet per second or less, withdrawals must be reduced or cease altogether in order to comply with this requirement.

Issued: June 17, 1966

Latest Revision: February 19, 1997



Manager, Water Resources Branch
Division of Water

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
 DEPARTMENT FOR ENVIRONMENTAL PROTECTION
 DIVISION OF WATER
 FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #1061

Issued to: **Beech Fork Water Commission**
1900 Pompeii Road
Clay City, KY 40312

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times, and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

A surface intake located in Beech Fork Reservoir, and impoundment of Beech Fork, a tributary of Red River in Powell County, with coordinates:

latitude 37°51'55.05"N, longitude 83°53'34.61"W.

Water withdrawals are limited to the following rates from the specified location:

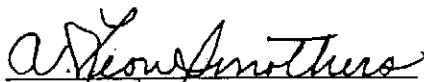
Jan.	1.50 MGD	April	1.50 MGD	July	1.50 MGD	Oct.	1.50 MGD
Feb.	1.50 MGD	May	1.50 MGD	Aug.	1.50 MGD	Nov.	1.50 MGD
March	1.50 MGD	June	1.50 MGD	Sept.	1.50 MGD	Dec.	1.50 MGD

Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.
2. Withdrawals from the Red River in excess of plant capacity shall be used to maintain Beech Fork Reservoir at full storage capacity.

Issued: September 14, 1990

Latest Revision: January 12, 2001


 Manager, Water Resources Branch
 Division of Water

Str. 1

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
 DEPARTMENT FOR ENVIRONMENTAL PROTECTION
 DIVISION OF WATER
 FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #1466

Issued to: **Beech Fork Water Commission**
1900 Pompeii Road
Clay City, KY 40312

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times, and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

A surface intake located at mile 30.5 of the Red River in Powell County, with coordinates:
 latitude 37°51'50.90"N, longitude 83°52'07.63"W.

Water withdrawals are limited to the following rates from the specified location:

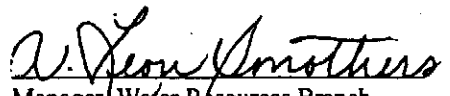
Jan.	4.00 MGD	April	4.00 MGD	July	4.00 MGD	Oct.	4.00 MGD
Feb.	4.00 MGD	May	4.00 MGD	Aug.	4.00 MGD	Nov.	4.00 MGD
March	4.00 MGD	June	4.00 MGD	Sept.	4.00 MGD	Dec.	4.00 MGD

Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.
 (see additional conditions on page 2)

Issued: October 13, 2000

Latest Revision:


 Manager, Water Resources Branch
 Division of Water

COMMONWEALTH OF KENTUCKY
DEPARTMENT FOR NATURAL RESOURCES & ENVIRONMENTAL PROTECTION
BUREAU OF NATURAL RESOURCES
DIVISION OF WATER RESOURCES
FRANKFORT, KENTUCKY 40601

Permit No. 0528

PERMIT TO WITHDRAW PUBLIC WATER

Issued to: Natural Bridge State Park

Address: _____

Slade (Street) Powell Kentucky 40376
(City) (County) (State) (Zip Code)

The Department for Natural Resources and Environmental Protection acting in accordance with KRS 151.140 - KRS 151.210 authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water. In times of drought or emergency, the Department may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

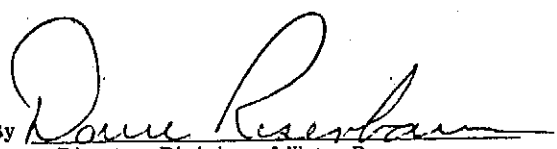
Surface intake located at mile 0.1L of Mill Creek, Powell County.

Water withdrawals are limited to the following rates from the specified withdrawal location:

Jan. <u>30,000</u> gpd.	April <u>60,000</u> gpd.	July <u>70,000</u> gpd.	Oct. <u>50,000</u> gpd.
Feb. <u>30,000</u> gpd.	May <u>60,000</u> gpd.	Aug. <u>70,000</u> gpd.	Nov. <u>30,000</u> gpd.
Mar. <u>30,000</u> gpd.	June <u>60,000</u> gpd.	Sept. <u>50,000</u> gpd.	Dec. <u>30,000</u> gpd.

Limitations to this permit are as follows:

Issued this 9th day of January, 1979

By 
Director, Division of Water Resources

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #0797

Issued to: **Georgetown Municipal Water & Sewer Service
125 West Clinton Street
Georgetown, Kentucky 40324**

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times, and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

Mile 0.61 of Royal Springs, a tributary of North Elkhorn Creek, Scott County.
latitude 38°12'31.64" N, longitude 84°33'43.56" W.

Water withdrawals are limited to the following rates from the specified location:

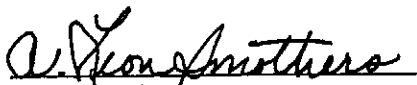
Jan. 4.0 mgd	April 4.0 mgd	July 4.0 mgd	Oct. 4.0 mgd
Feb. 4.0 mgd	May 4.0 mgd	Aug. 4.0 mgd	Nov. 4.0 mgd
March 4.0 mgd	June 4.0 mgd	Sept. 4.0 mgd	Dec. 4.0 mgd

Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.
2. Georgetown Municipal Water & Sewer Service is prohibited from reducing flows immediately below its intake in Royal Springs to a rate of .25 cubic feet per second (or 161,000 gallons per day) or less. In order to comply with this condition, GMWSS may have to reduce or even suspend withdrawals.

Issued: January 19, 1977

Latest Revision: November 16, 2001


Manager, Water Resources Branch
Division of Water

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #0640

Issued to: City of Campton
Main Street
P.O. Box 35
Campton, KY 41301

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

A surface water intake located in Campton Lake, an impoundment of Hiram Branch of Swift Camp Creek; Wolfe County; Latitude 37°44'39.29"N and Longitude 83°32'36.70"W.

Water withdrawals are limited to the following rates from the specified location:

Jan. 350,000 gpd	April 350,000 gpd	July 375,000 gpd	Oct. 375,000 gpd
Feb. 350,000 gpd	May 350,000 gpd	Aug. 375,000 gpd	Nov. 375,000 gpd
March 350,000 gpd	June 375,000 gpd	Sept. 375,000 gpd	Dec. 350,000 gpd

Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.

Issued: May 19, 1969

Latest Revision: April 28, 1997



Manager, Water Resources Branch
Division of Water

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
FRANKFORT, KENTUCKY 40601

PERMIT TO WITHDRAW PUBLIC WATER

Permit Number: #0258

Issued to: **Versailles Municipal Water Works**
196 S. Main Street
Versailles, KY 40383

The Natural Resources and Environmental Protection Cabinet authorizes the above named party to withdraw Public Water of the Commonwealth of Kentucky. This permit has been issued under provisions of KRS Chapter 151.125, 151.140 and 151.150 and regulations promulgated with respect to the withdrawal of public waters. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet, or other state, federal or local agencies. Withdrawals are restricted to the stated quantities, times, and locations specified below. This permit represents a limited right of use and does not vest ownership nor absolute right to withdrawal or use of Public Water, nor does it guarantee that requested amounts will be available for use at all times. In times of drought or emergency, the Cabinet may temporarily alter the conditions of the permit. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990 and other applicable provisions of law.

The location of the authorized water withdrawal is as follows:

A surface water intake located at mile 85.27 of the Kentucky River (pool 5); latitude 38°01'34" N, longitude 84°49'43" W, Woodford County, Kentucky.

Water withdrawals are limited to the following rates from the specified location:

Jan.	3,000,000 gpd	April	3,200,000 gpd	July	4,000,000 gpd	Oct.	3,800,000 gpd
Feb.	3,000,000 gpd	May	3,800,000 gpd	Aug.	4,000,000 gpd	Nov.	3,200,000 gpd
March	3,200,000 gpd	June	4,000,000 gpd	Sept.	4,000,000 gpd	Dec.	3,000,000 gpd

Conditions to this permit are as follows:

1. Withdrawal rates must be accurately measured by meter or other device approved by the Cabinet.
2. When flows measured at Lock 6 of the Kentucky River reach 140.0 cfs Versailles Municipal Water Works shall conform to the following schedule:

<u>Lock 6 Flow (cfs)</u>	<u>Allowable Withdrawals (mgd)</u>
>140.0	Full Permitted Amount * **
139.9 – 120.0	3.8
119.9 – 100.0	3.5
99.9 - 80.0	3.0
79.9 - 55.0	2.5
< 55.0	1.9

*The full permitted amount as stated for each month on this permit.

**Allowable withdrawals will be determined by calculating the average flow for the most recent 4-day period at Lock 6 of the Kentucky River.

APPENDIX C:
DROUGHT SUSCEPTIBILITY CLASSIFICATION

APPENDIX C: Drought Susceptibility Classification System

The Water Resources Branch of the Kentucky Natural Resources and Environmental Protection Cabinet, Division of Water developed a program to evaluate water systems. Water systems are grouped into three classes of susceptibility to water shortages during drought conditions. Systems are classified by comparing average withdrawal rates to water availability at the point of withdrawal during drought conditions. The drought susceptibility classes are:

- A – Systems unlikely to experience water shortage during drought conditions.
- B – Systems that should be examined for susceptibility to water shortage during drought. Plans need to be made for response to possible shortage.
- C – Systems that are likely to have water shortage during drought conditions. Plans for response to shortage are necessary.

The determination of drought susceptibility class depends on the source of supply.

Rivers and Streams

Water systems that rely on *unregulated* streams are classified by comparing average withdrawal rates to the 7Q10.

Drought susceptibility, unregulated streams

Percentage of 7Q10 Used	Drought Classification
< 10	A
10 - 50	B
> 50	C

Water systems that rely on *regulated* streams use:

Drought susceptibility, regulated streams

Percentage of 7Q10 Used	Drought Classification
< 20	A
20 - 65	B
> 65	C

Reservoirs

Water systems that rely on reservoirs were divided into two categories: those with 7Q10 inflow of zero, and those with 7Q10 greater than zero.

Those with zero 7Q10 inflow are classified using:

Drought susceptibility, reservoirs with zero inflow

Days stored	Watershed size in square miles			
	> 10	> 5 - 10	1 - 5	< 1
> 350	A	A	B	C
201 - 350	A	B	B	C
100 - 200	B	B	C	C
< 100	C	C	C	C

Those with 7Q10 inflow during a drought are classified by:

Drought susceptibility, reservoirs with inflow

Days stored	Percent of 7Q10 used			
	< 15	15 - 50	> 50 - 75	> 75 - 100
> 200	A	A	A	B
91- 200	A	A	B	B
51- 90	A	B	B	B
30- 50	B	B	B	C
< 30	B	B	C	C

Groundwater

Classes are determined for groundwater supplies according to historical records of yields.